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Development of Human Capital for SME Innovation Policies
: Turning Technologies into Business Value

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Working Group

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Preface

APEC SME Ministers in 2003 stressed that innovation plays a key role in facilitating the creation of high-growth firms and is directly associated with the levels of competitiveness of SMEs and micro-enterprises. In 2005, Korea suggested the Daegu Initiative on SME IAP (Innovation Action Plan) to APEC for further progress on SME innovation. Then, Ministers welcomed and agreed to review and improve their economic and policy environments for SME innovation, both individually and collectively. The Daegu Initiative also included the establishment of the APEC SME Innovation Center (SMEIC) as an entity to initiate SME innovation in the region. Now, member economies participate in the Daegu Initiative on SME IAP on a voluntary and continual basis. In 2006, APEC SMEIC conducted a comprehensive survey on SME innovation policies and the survey result shows that there exists a clear and wide gap between developed and developing member economies in terms of implementation of SME innovation policies.

In early 2007, the APEC SME Innovation Center set up a plan to disseminate successful policies and their cases of SME innovation to the APEC region. For the first step to implement the plan, the Center decided to design a textbook for a training workshop to enhance the capacity of SME innovation policy makers. Prior to designing the textbook, APEC SMEIC asked developing member economies regarding the most needed policy area to promote SME innovation. And the Center found that their answers were mostly related to technology transfer, financial support and marketing. Therefore, it is conjectured that SMEs in the APEC region seem to prefer a more tailored approach to technology development rather than technology creative ones.

Considering the answers as SME requirements, APEC SMEIC organized a taskforce team and invited experts from Korea, Chinese Taipei and Indonesia on SME innovation environment to develop the textbook. In order to have initial design discussion, it was agreed that Indonesia host a meeting in Jakarta in April, 2007. Then, Indonesia presented their requirements as developing member economy. The taskforce team also took a field trip to technology environmental infrastructure in Indonesia, such as a technology incubator, tenants and a technology development center. Overall, Indonesia’s concerns are linked to cluster, technology incubator and technology collaboration together with financial support system including credit insurance. In addition, their reported concerns appear to be similar to other member economies’ ones: building an innovation environment ideal for SMEs.

The taskforce team first agreed to designate the textbook’s theme as “turning technology into business value” for developing member economies. Focusing on commercializing technologies, the taskforce team set the context of promoting technology development, financing support and marketing with the goal to enhance policymakers' capacities so as to build a SME innovation environment. During the meeting in Jakarta, the taskforce team members proposed their individual initial designs in ten areas to meet the requirements of developing member economies.

The ten areas include: (1)cluster, (2)technology collaboration, (3)business incubation, (4)Research and Business Development (R&BD), (5)financing, (6)technology financing, (7)technology evaluation, (8)business counseling, (9)e-Business , (10)public procurement. The first four areas are selected for technology development promotion, while the next three areas are for financing support promotion and the last three areas are for marketing promotion. Therefore, this book is comprised of three parts: technology development promotion, financing support promotion and marketing promotion.

The first part of the textbook is composed of four areas: cluster, technology collaboration, business incubation and R&BD. All areas in the first part especially emphasize interactions of relevant actors and stakeholders in the network of technology development.

Cluster

Cluster has emerged as a new key success factor of an economy in the era of a knowledge-based economy. The author provides readers with a real-world view into the best practices of cluster formation and cluster management. He also expects them to develop skills and gather tools to enhance the success of their cluster policy-making and management.

Technology Collaboration

It is recognized that SMEs are often facing many kinds of difficulties when they conduct various technology activities because each activity in SMEs consumes the limited and insufficient resources. Therefore, the author proposes that technology collaboration can help forward-thinking businesses and organizations accelerate the pace of innovation and, eventually, bring competitive advantage in the marketplace by establishing a solid mechanism among SMEs, academia, and public research institutes.

Technology Incubation

Business incubators are where individuals or businesses receive assistance to develop and commercialize new products, new technologies, or even new services. Some incubators also help existing firms enhance their chances of success. The author introduces the best practices of incubator establishment and management in the world with his keen notion and practical experiences.

R&BD

R&BD (Research and Business Development) is the concept that R&D is combined with marketing. The author claims that a new approach is needed to successfully implement innovation and R&D in ushering a new era of competition. He describes the concept of R&BD, SBIR of the United States, BUNT of Norway, R&BD instances of Korea and the method for a small and medium enterprise to touch upon the sustainable success.

The second part is composed of three areas: financing, technology financing and technology evaluation. For effective government's intervention in financing, particularly for technology financing, some discrete measures and procedure are inevitable along the growth stages of and available resources inside SMEs with limited government budget.

Financing

SMEs suffer from financial constraints due to information asymmetry problems, lack of collaterals and difficulties to collateralize technology and IPRs. Governments have every reason to intervene in providing direct and indirect financial supports in the form of loans or capitals. The author presents theoretical backgrounds and practical case studies as essential parts of implementing government financing policies for SMEs.

Technology Financing

One of the major hurdles in technology commercialization by SMEs is related to financing, especially because SMEs have experienced great difficulty in attracting capital due to business risk. The author presents a technology financing's role to promote technology commercialization. He proposes definition and classification of SMEs based upon growth stage and resources such as technology, human resources, financing and marketing to rationalize the estimation of required financing size and type.

Technology Evaluation

Technology evaluation as a business feasibility measurement consists of measurements not only for technology status, but also for market status where the designated technology would be applied. In addition, corporate credit including the integrity of financial transactions would be very important in terms of mid- or long-term growth of corporate. The author introduces concepts and issues of technology evaluation as a key factor for the implementation of technology financing and proposes viable policies and following systems for the future.

The third part is composed of three areas: business counseling, e-Business and public procurement. To make is one thing; to sell is another. This part deals with marketing promotion by integrating stakeholders to the success of marketing during the business counseling in a more efficient way using e-Business. It also discusses the government procurement policies for promoting the commercialization of SMEs technologies.

Business Counseling

Micro and small enterprises need business counseling. And that is the concept of consulting with training and management education. The concept is more closely related to mentoring. The author discusses business counseling concepts, the effect of supporting SMEs by providing business counseling and a coupon consulting system in Korea for the small and medium enterprises along with many actual case studies.

e-Business

e-business companies can easily enhance their competitivenes and thus SMEs can hardly be competitive or even survived if they do not incorporate “e-Business.” The author is concerned about how to develop e-business policy for SME policy makers. She includes a series of procedures to plan, execute, control and assess the e-business Policy Making for SMEs.

Public Procurement

Government Procurement can be utilized as a vehicle for innovation for SMEs’ capability build-up and business growth. The author describes general schemes of demand-side SMEs’ innovation policies, strategic procurement policies in advanced economies and recent development in policy agendas, and specific case studies from Korean SMBA experiences.

In overall, the APEC SME Innovation Center has finally published a textbook for training policymakers about SME innovation. The textbook is expected to serve as a useful guidebook for policymakers to establish policies appropriate for their own SME innovation environment. It will be also used as a reference book in a workshop for training and educating policymakers in SME innovation.

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Joo-Yong Kim, Director
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Part I

Technology Development Promotion

Chapter 1. Cluster

Deukgyu Bok[1]

Clustering refers to a geographic concentration of companies, colleges and research labs. Combined, they can achieve synergy effects in terms of sharing in the results of technology development, human resources, and information. A cluster also includes financial institutions and other service providers to support various business services.

As such, "cluster" has emerged as a new key success factor of an economy in this era of a knowledge-based economy. Especially for Korea, which is facing the growing challenges from China as the world's factory, it is urgent for the nation to upgrade its industrial structure and enhance companies' competitiveness by forming clusters. However, at this time, Korea seems only at the initial stage in order to develop clusters. In the past, the nation only established policies for the development of industrial complexes, which are simply an aggregate of companies or factories and only for the construction or the development of infra-structure and land for factories. Nevertheless, there are encouraging signs that the Korean government is now considering policy options to develop clusters comprehensively.

Developed with input from experiences of cluster formation in all over the world including Korea, the course will provide a real-world view into the best practices of cluster formation and cluster management. Participants will develop skills and gather tools to enhance the success of their cluster policy-making and management.

1. Concept

1.1. Definition

A cluster is a geographically proximate group of interconnected companies and associated institutions (e.g. universities, standards agencies, and trade associations) in a particular field, linked by commonalities and complementarities (Porter, 1998). Clusters have drawn increased interest from many regions around the world as knowledge-based economies grew increasingly dominant in the 1990's.

Interest in clusters stems from the fact that innovation and knowledge creation still benefits greatly from face to face communication among participants. This stands in marked contrast to the predictions of many earlier technology watchers that "physical location" would decline in importance as telecommunications grew ever more affordable and sophisticated. In this sense, the increasing

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[1] Senior Researcher, Technology & Industry Department, SERI, Korea

popularity of clusters appears to stem from their possession of the right factor for knowledge creation and technology innovation. Clusters promote innovation and learning through co-operations and improved flows of information and knowledge; they act as magnets for the most competent firms and the best trained labor force; they provide a favorable environments for the launching of new firms; and they spur economic growth and upgrade competitiveness, creating jobs (Nauwelaers, 2003).

Clusters are characterized by five defining features; including: (1) geographical concentration, (2) the presence of the appropriate firms and institutions, (3) specialization in particular fields, (4) well developed networks connecting firms and institutions, and (5) promotion of innovation.

1.1.1. Geographical Concentration

All clusters begin with a geographical concentration of firms and institutions (including governmental bodies). As telecommunications technology has improved and costs have decreased, many companies can now manage their business on a global scale regardless of distance. Under these circumstances, one might legitimately wonder why firms and institutions still prefer to locate in a specific region. Porter noticed this issue when he stated, "If the importance of location has been decreased, why do world-class investment firms continue to gather in the Boston area, automobile manufacturing companies in Southern Germany, and fashion companies in Northern Italy?" Porter concluded that firms which belong to a cluster have advantages in knowledge, relationships, and incentives that do not accrue to firms working outside a cluster.

What then would be the physical boundaries of a cluster? From the foregoing definition, it could be inferred that clusters are bound by the connections and complementary relations between industries and institutions that characterize them. Although some clusters fit into political boundaries, many clusters can cross political boundaries and even national borders. Clusters come in a range of sizes. Silicon Valley, for example, covers several counties and an area of some 1,500 square-miles, while Kista Science City in Sweden has an area of only 200 thousands square-meters. Japan has a semi-official cluster policy stating the distance should be approximately 1~2 hours by car. In short, boundaries of clusters are determined according to the size and customs of each country or region. The most salient fact with respect of a cluster is that participants are close enough together to meet frequently and communicate in a face-to-face manner.

1.1.2. Presences of Diverse Firms and Institutions

Cluster encompasses an array of linked industries and other entities not commonly thought of as parts of an industry. Such organizations can include specialized input providers, service providers, education and training centers and providers of specialized infrastructure (Porter, 1998). Clusters can further expand to customers, sales channels, and providers of complementary products and services. Finally, many clusters may include educational and governmental agencies, (e.g. universities, think tanks, technical support agencies and staffing agencies).

The "wine cluster" in Northern California is an illustrative example. Northern California's wine cluster includes not only the wine industry but many other entities that are not commonly considered as parts of the industry; including local governments, colleges, and research institutes. The wine cluster also maintains an extensive complements of supporting entities for both wine making and grape agriculture; including providers of grape stock, irrigation and harvesting equipments, barrels and labels; specialized public relation and advertising firms, and numerous wine publications (Porter, 1998). The California wine cluster also maintains relations with the food and the tourism clusters in California.

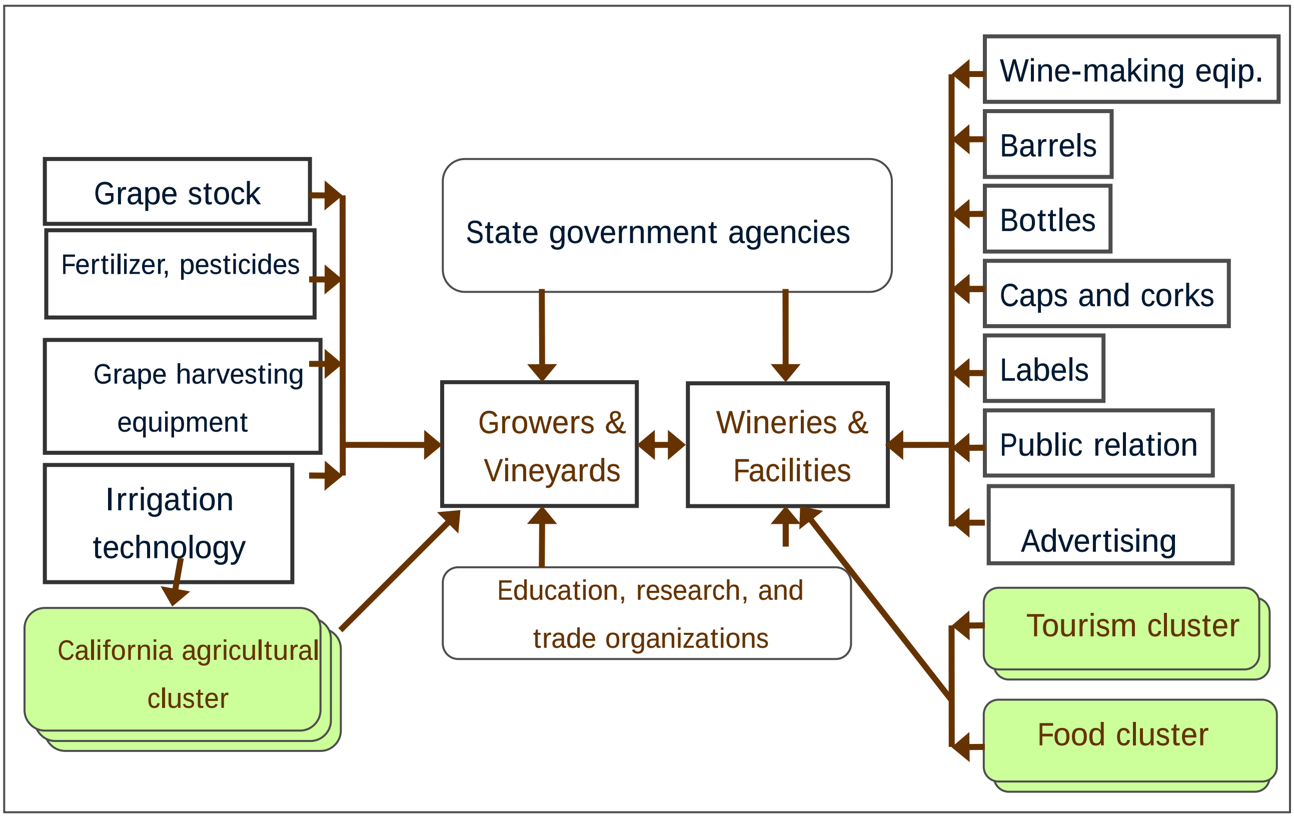

Fig 1 Diverse Entities in a California Wine Cluster

Source: Porter (1998)

1.1.3. Specialization in Particular Fields

The foregoing definition of a "cluster" also requires specialization of the region in a particular field.[2] If the companies and institutes in a cluster do not focus on a particular field, synergy or agglomeration effects would not arise. Specialization need not be limited to one industry or skill and several industries and/or skills can overlap. For example, Silicon Valley maintains more than firms and institutions that provide information technology; it also maintains many "biotech" and "nanotech" firms. These firms pool their world class R&D functions and drive the culture of entrepreneurship in the Silicon Valley region.

A cluster's specialization is closely related to its origin as a cluster. Silicon Valley, for example, developed from Stanford University, one of the world's strongest research centers for information technology, while the San Diego biotech cluster emerged from University of California at San Diego's strong research capability in that industry. Logistics clusters in the Netherlands were formed by leveraging the geographical advantages of that country, including its central European location, broad water channels, and efficient port at Rotterdam. Further examples include Kista Science Park in Sweden, which developed around Ericson, Sweden's largest corporation in telecommunication service and equipment provider, and Toyota City in Japan, which revolves around Toyota, the world's largest automobile company.

1.1.4. Networks among Firms and Institutions

Porter (1998) used the word 'group' as part of his definition of "cluster" to emphasize the existence of networks among the firms and institutions contained within a cluster. While this definition of "network" encompasses physical trade between agents, networks also (and more saliently) act as conduits for the circulation of information and knowledge. Each member in a cluster can access the networks via their personal relations and community ties. Various conferences and seminars held within a cluster and casual meetings at bookstores, coffee shops, and bars further augment networks as effective conduits for the circulation of information and knowledge.

As regards organization theory, a cluster is a hybrid, fluid "organization" encompassing aspects of market and vertically integrated organization (i.e. firms). Compared with trade on the market, clusters have the advantage of boosting cooperation among firms and institutions via their common identity, while providing various networks that strengthen the exchange of information and knowledge. Compared with the vertical integration, clusters enjoy superior ability to promote flexibility and competition, as the weak linkages between firms and institutions in a cluster promote market competition. In brief, a cluster can actually be a robust organizational structure that prevents the disadvantages arising from both the rigid vertical

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[2] In this case, field refers to an industry (IT, automobile, software etc.) or a function (R&D, production, parts etc).

integration within a firm and the rack of structure inherent to a market.

1.1.5. Promotion of Innovation

Clusters tend to promote innovation through smooth circulation of information and knowledge because, other things being equal, a company outside a cluster will spend more time and expense in creating its own proprietary information and knowledge. Furthermore, companies in a cluster may benefit from the more flexible business models provided through the use of supporting firms and institutions in the cluster.

Another factor supporting innovation is the pressure of competition within a cluster. Since companies in a cluster are located relatively close together, pressure from competitors is greater within a cluster than outside the cluster. To avoid falling behind competitors, firms in a cluster must look for new business opportunities and ceaselessly renew and redevelop their technologies. Companies within a cluster will also enjoy easier conditions when starting a business, as clusters provide superior information about new business opportunities and other necessary services like financing, human resources, and technologies. Lowered barriers to entry within a cluster also intensify the competition therein.

1.1.6. Notes on the Diversity of Clusters

It is worth pointing out that the clusters come in a variety of forms. Clusters are diverse in many aspects. First, the formation of a cluster need not limited to high-technical industries. Agriculture and entertainment industries, for example, have long formed clusters.[3] Second, geographical boundaries for clusters may differ in scale, from small towns to counties, to “global scale” clusters. For example, the shoemaking and leather cluster in Italy had its origins in a small town, whereas, Silicon Valley spans several counties in California, while simultaneously being linked with around the world. Third, clusters differ functionally from each other. Some clusters concentrate on R&D while other clusters focus on production or the manufacture of specific parts. Finally, the firms and other institutions that constitute a cluster can also vary. In Italy, clusters tend to form among small and medium-sized firms, while in small but open economies like Sweden and Finland, clusters tend to coalesce around large companies, like Ericson and Nokia. A cluster may focus on colleges and research institutions like the bio-technology cluster in San Diego, California or it may include other entities like start up firms, universities, research institutions and multinationals.

[3] For example, the aforementioned wine cluster in California is an agricultural cluster, while Hollywood is a universally known film cluster.

1.2. Other Regional Innovation Models

Over the decades, many scholars and planners have tried to seek out ‘new’ models of regional development. This paper will briefly introduce three regional innovation models related to clusters: industrial districts, new industrial spaces, and regional innovation systems (RIS).[4]

1.2.1. Industrial Districts

The idea of “industrial districts” originated with Marshall, in his book ‘Industry and Trade’ published in 1919. In this book, the industrial districts are explained as a “geographically localized productive system”, based on a strong local division of labor between small forms specialized in different functions of the process of production. This production system involves multiple relationships between firms, as well as between firms and the local community. Such relationships are commonly based on trust and reciprocity and cannot be understood without considering the role of historical and socio-economic factors. Industrial districts generate benefits like pooling of labor, low transportation costs, and easy access to raw material and parts. This benefit, often called, “agglomeration effects” results from firms being situated in a particular location.

Industrial districts theory attracted relatively little attention until the mid 1980’s, when the success of Italian firms brought renewed attention to the idea (Piore and Sabel, 1984). Italian firms, especially those located in the north pf the country, attained massive success in fashion industry by responding very swiftly to the fast changing demands of world fashion industry through a production system that mimicked Marshall’s idea of industrial districts. These small Italian firms deployed a division labor over a particular area; using a system based on networks of trust and reciprocity built over long period of time. After the success of the Italian firms, many scholars and planners began to re-assess the competitiveness and the value of industrial districts.

1.2.2. New Industrial Spaces

Industrial districts theory emphasizes the agglomeration of small firms with small firms as the primary agents within industrial districts. This reflects the early stage of industrial development during which Marshall lived. However, in modern industrial times, firms can differ vastly in their size, while relationships between such firms can be diverse, ranging from subcontracting and strategic alliances to co-production and co-marketing. Large firms may act

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[4] There are other regional innovation models; including “innovative milieu,” “learning region,” and “local production systems” (Moulaert and Sekia, 2003).

as an incubator for new firms, including startups. From the perspective of participants in modern industry, industrial districts function as a special kind of agglomerations.

Storper and Scott launched this notion of ‘new industrial spaces’ in a paper published in 1998 called “The geographical foundation and social regulation of flexible production complexes” in line with a survey on regional innovation models (Moulaert and Sekia, 2003). This theory of new industrial spaces combines industrial districts, social regulation, and local community dynamics. “New industrial spaces” as a theory involves not only agglomeration effects but also “social regulation systems” which provide (i) the coordination of inter-firm transactions and the dynamics of entrepreneur activity, (ii) the organization of local labor markets and social reproduction of workers, and (iii) the dynamics of community formation and social reproduction. Storper and Scott linked the efficiency of the flexible production system to the agglomeration of a selected set of producers (Moulaert and Sekia, 2003): “This strategy enables them to reduce the spatially-dependent cost of external transactions. In flexible production systems, the tendency to agglomeration is reinforced not only by externalization but also by intensified re-transacting, just-in-time processing, idiosyncratic and variable forms of inter-unit transaction, and the proliferation of many small-scale linkages with high unit costs.”

1.2.3. Regional Innovation Systems

Regional Innovation Systems (RIS) are networks of firms and institutions that facilitate the development of products or processes in the innovation and commercialization of knowledge. RIS consists of an upper structure and lower structure where lower structure refers to physical infrastructure like roads, ports, telecommunication networks and institutional infra (i.e. universities, research institutes, financial institutes, and training centers, etc). Upper structure denotes organizational systems, cultures, and norms of the local community.

RIS theory emphasized the role of region in the process of actual innovation. Although central governments may plan the policy, regions actually implement the policy, making systems formulated in the region of greater importance in the ultimate execution.

The next table summarizes the theories of regional innovation models.

Table 1 Other Regional Innovation Models

Features of innovation	Industrial districts	New industrial spaces	Regional innovation systems
Core of innovation dynamics	Capacity of actors to implement innovation in a system of common values	A result of R&D and its implementation; application of new production methods(JIT, etc.)	Innovation as an interactive, cumulative and specific process of R&D (path dependency)
Role of institutions	Institutions are 'agents' and enabling social regulation, fostering innovation and development	Social regulation for the coordination of inter-firm transactions and the dynamics of entrepreneurial activity	As in the National Systems of Innovation, the definitions vary according to authors, but they all agree that the institutions lead to a regulation of behavior, both inside and outside organization
Regional development	Territorial view based on special solidarity and flexibility of districts; this flexibility is an element of this innovation	Interaction between social regulation and agglomerated production systems	View of the region as a system of 'learning by interacting/and by steering regulation'
Culture	Sharing values among industrial districts agents; trust and reciprocity	Culture of networking and social interaction	The source of learning by interacting
Types of relation among agents	The network is a social regulation mode and a source of discipline. It enables a coexistence of both cooperation and competition	Inter-firm transactions	The network is an organizational mode of 'interactive learning'
Type of relations with the environment	The relationships with the environment impose some constraints and new ideas; must be able to react to changes in the environment; 'rich' relations; limited spatial view of environment	The dynamics of community formation and social reproduction	Balance between inside specific relations and environment constraints; 'rich' relations

Source: Moulaert and Sekia, 2003

2. Advanced Clusters

2.1. Classification of Clusters

We have selected four successful advanced clusters, Silicon Valley in U.S.A., Sophia-Antipolis in France, Toyota City in Japan and Hsinchu Science-based Industrial Park in

Taiwan. The clusters were selected based on their main function ("innovation-based" or "industry-focused") and their original facilitator ("market" or "policy"). These four types of clusters have developed very different regional resources profiles by accumulating resources in a different manner, cultivating different capabilities, and providing different sources of regional advantage.[5] This paper will explain the current profile, the history, and the factors for success in each cluster.

Table 2 A Classification of Advanced Clusters

"Innovative & Market-led" Clusters: Silicon Valley	"Innovative & Policy-led" Clusters: Sophia-Antipolis
"Industrial & Market-led" Clusters: Toyota City	"Industrial & Policy-led" Clusters: Hsinchu Science–based Industrial Park

2.2. Silicon Valley

2.2.1. Profile and Brief History

Silicon Valley covers several counties in California that encompasses an area of 1,500 square-miles and 2006 population of 2,440,000 (Joint Venture: Silicon Valley Network, 2007). The region had attained its nickname, Silicon Valley, as early as 1970, as it grew into a center for the burgeoning semiconductor and computer industry. Since then, Silicon Valley has gone through a number of ups and downs, experienced its most recent difficulties after the collapse of the IT bubbles in the early 2000's. Nevertheless, investments and the overall population have started to increase again from 2004. Recently, Silicon Valley's industrial structure has started to shift form a concentration on IT towards nanotechnology, energy & environments and bio-technology industries.

In fact, the shift from agriculture to high tech in Silicon Valley started as early as the 1930's. At that time, Dr. Terman of Stanford University encouraged graduated students to start businesses in what would become Silicon Valley on concern that talented students would be tempted to move to lucrative jobs offered by companies in East. One venture which started with the advice from professor Terman would later become Hewlett-Packard, today the world's largest information technology company.

Over the next few decades, Silicon Valley would pass through four stages of growth, from an early focus on defense contracting, to the Internet, and on to its next phase of development. The ability to easily leap from one technology to another technology has been the backbone

[5] See John and Pouder (2006) for the difference between "innovation-based" clusters and "industry-focused" clusters.

of Silicon Valley's remarkable dynamism and continuous success.

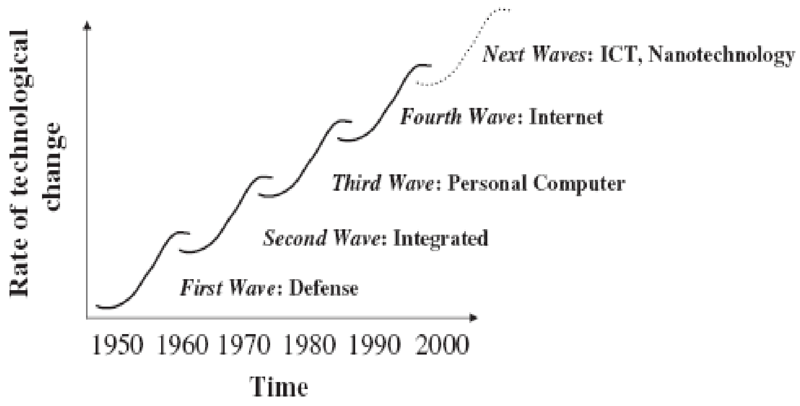


Fig 2 The Evolution of Silicon Valley

Source: Lee et al., 2000

2.2.2. Factors for Success

One of the main factors that lead to Silicon Valley's success is its spirit of entrepreneurialism and its pursuit of the "American Dream." Entrepreneurs in Silicon Valley can amass huge wealth nearly overnight when launching new technology successfully. Another important factor that has helped to foster entrepreneurship is its culture of tolerating failure. In Silicon Valley 'learning by failing' is a very common catchphrase, and honest failure is not punished.

The second factor for success is the availability of a very highly talented workforce, as Silicon Valley boasts several world class universities including Stanford and Berkeley that provide an army of highly trained specialists. Furthermore, since companies in Silicon Valley consider a person's ability as the most important factor, talented people in the world can gather in Silicon Valley regardless of race, age, or gender. As a result, scientists and engineers from foreign countries accounted for 55% of the total number of scientist and engineers working in the Valley in 2005 (Joint Venture: Silicon Valley Network, 2007).

Financing systems to fund new technologies have been another factor for success. In third quarter of 2006, venture capital funds invested in Silicon Valley amounted to 5.2 billion dollars. Venture capital invested in Silicon Valley accounts for 27% of total venture capital investments in America.

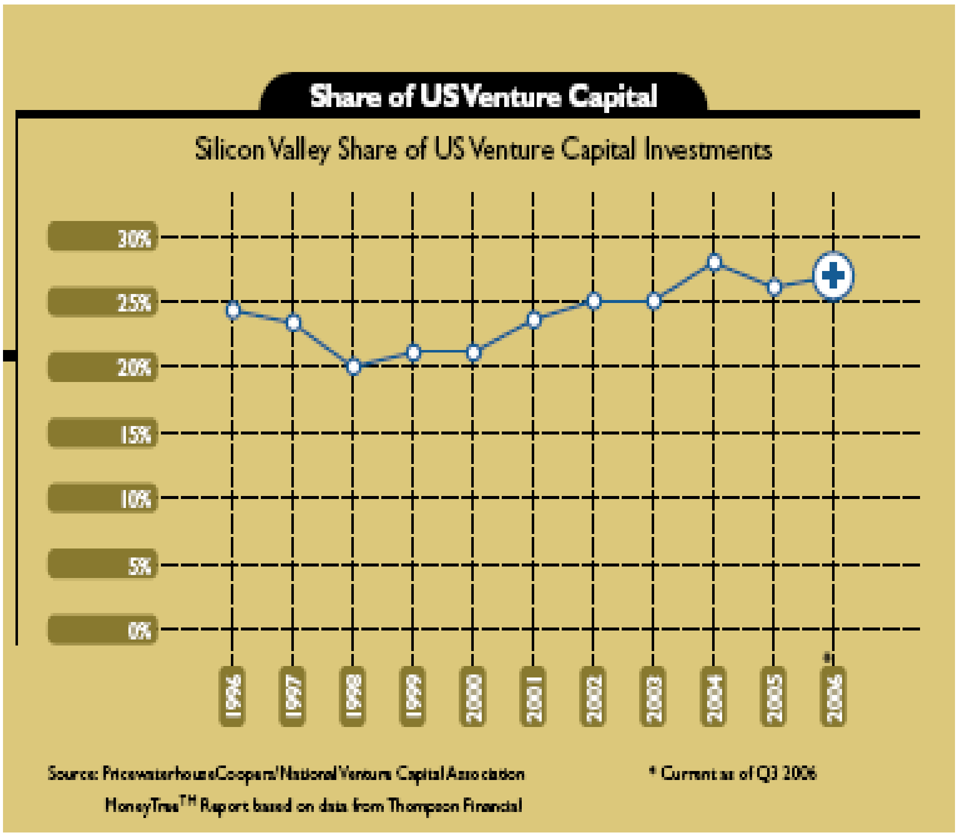


Fig 3 Silicon Valey Share of US Venture Capital Investment

Source: Joint Venture: Silicon Valley Network, 2007

Venture capitalists in Silicon Valley differ from ordinary venture capitalist in important ways. Venture capital in Silicon Valley who are usually familiar with technology not only supplies funds but also offers management expertise to startups (Lee et. al, 2001), and provide a complementary management role to their prospective investments.

The presence of related companies is also another factor for success in Silicon Valley. Firms in Silicon Valley are able to deploy networks among companies and institutions which support fast commercialization, among them universities and research institutes that can deliver advanced technology to industry (in particular, Stanford University, the world's leader in engineering, physics, and biotechnologies). Well-developed service firms that provide specialized services such as professional testing, marketing, packaging, exhibitions, accounting, legislation and head-hunting, have also been important factors for success of firms in Silicon Valley.

According to the 'Index Silicon Valley 2007', networks in Silicon Valley are not limited to the area of Silicon Valley itself, and are in fact connected to the entire world. As a result, the patents with companies in Silicon Valley and ones outside in Silicon Valley increased six times in 2005 over their 1993 number.

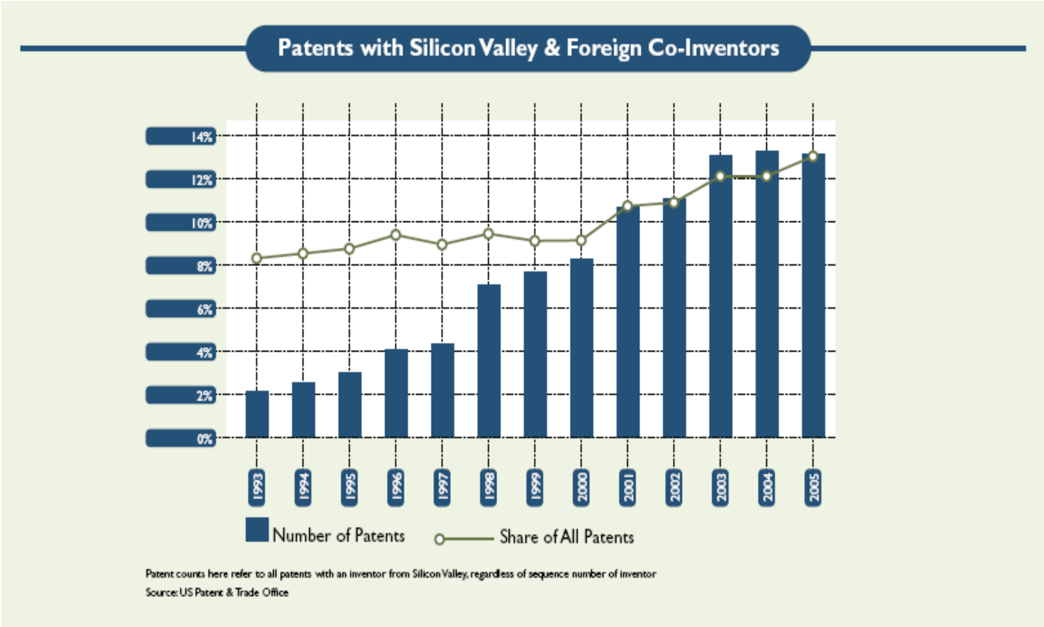


Fig 4 Patents with Silicon Valley & Foreign Co-Inventors

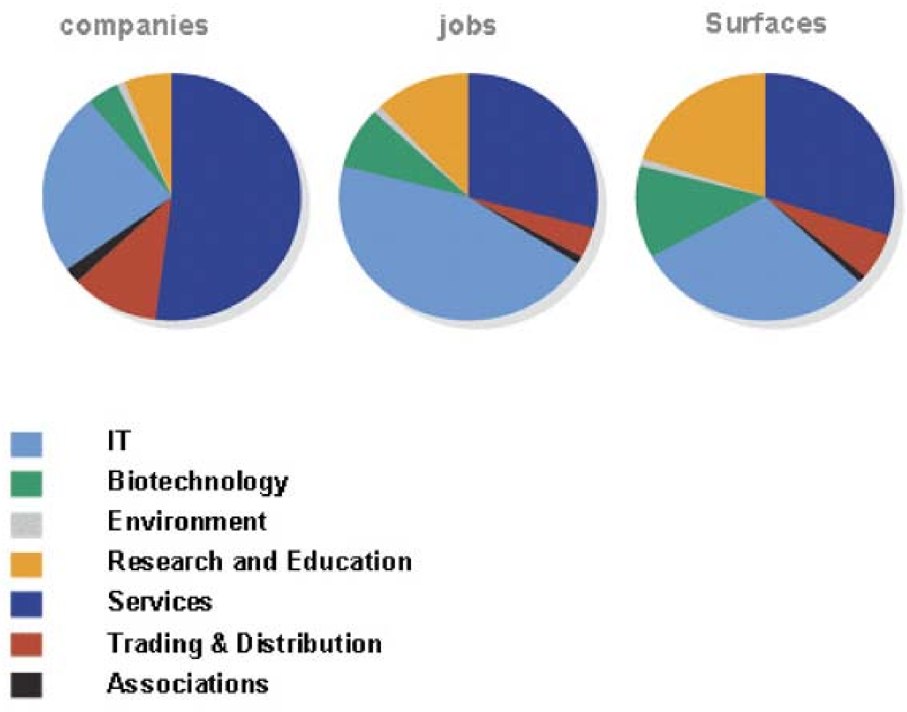
Source: Joint Venture: Silicon Valley Network, 2007

2.3. Sophia-Antipolis

2.3.1. Profile and Brief History

Sophia-Antipolis is located between Cannes and Nice on the French Riviera, an area well-known as a playground for celebrities and other luminaries. The Riviera offers world class recreation and leasure facilities and unparalleled scenery. Researchers, engineers and managers in companies who wish to be free from the stultifying monotony of urban office culture are greatly drawn to the attractions of the Sophia-Antipolis area.

The main industries in Sophia-Antipolis are IT (information and telecommunication) and services. Companies in IT sector account for 50% of all jobs and 29% of all office space in the area while services account for 50% of all companies, 26% of all jobs, and 32% of all office space. Biotechnology has been a recent strong performer, accounting for 4% of all firms, 8% of all jobs, and 12% of all office space.



Source www.sophia-antipolis.net

Fig 5 The Distribution of Industry in Sophia-Antipolis

Sophia-Antipolis could not exist without the influence of one man, Pierre Laffitte, then Assistant Director of the renowned engineering school, L'Ecole Nationale des Mines de Paris. He suggested a rather lofty 'City of Science and Wisdom' and proceeded to embody the idea more concretely in a specific project (Longhi, 1999), whereupon his idea was accepted by the council of the Cote d'Azur area. The council also established its Sophia-Antipolis Joint Management Board, or SYMISA, composed of representatives of local governments and business associations. SYMISA would later established SAEM, which managed the region's facilities and marketing.

However, up to the late 1980's, the area had experienced insufficient networking for the development of cluster (Longhi, 1999). Construction of networks did not begin in earnest until the early 1990's, and with the recession in the early 1990's, large companies operating in Sophia-Antipolis actually increased divestments and outsourcings. Paradoxically, this proved to be the stimulus from which small and medium-sized companies form networks.

2.3.2. Factors for Success

One factor that led to success for Sophia-Antipolis is its high quality of life, with pleasant weather and an enjoyable working environment. The environment had long proved to be an attraction, as well before the establishment of SYMISA, IBM and Texas Instrument had already established themselves in Nice in the 1960's. The attractive environment would continue to draw firms in research and development and leading-edge technology. To maintain the environment, Sophia-Antipolis preserved green belts and parks at 2/3 of the total area, and enforced height limitations to maintain its spectacular scenic views.

The French government's policy for balanced regional development also played an important role. Under this policy, Sophia-Antipolis could depend on the presence of government-funded research institutions and R&D programs.

Furthermore, although it took significant time for them to be fully realized, community activities between companies and professional groups in Sophia-Antipolis also played an important role in the region's success. Since the 1990's, various "clubs" have been established to communicate information and new ideas and to start new projects. One of the most representative examples is "Telecom Valley Club" built on 1991. The club includes local government and associations, and encompassed more than 70 companies, including major players like IBM, AT&T, and Texas Instruments.

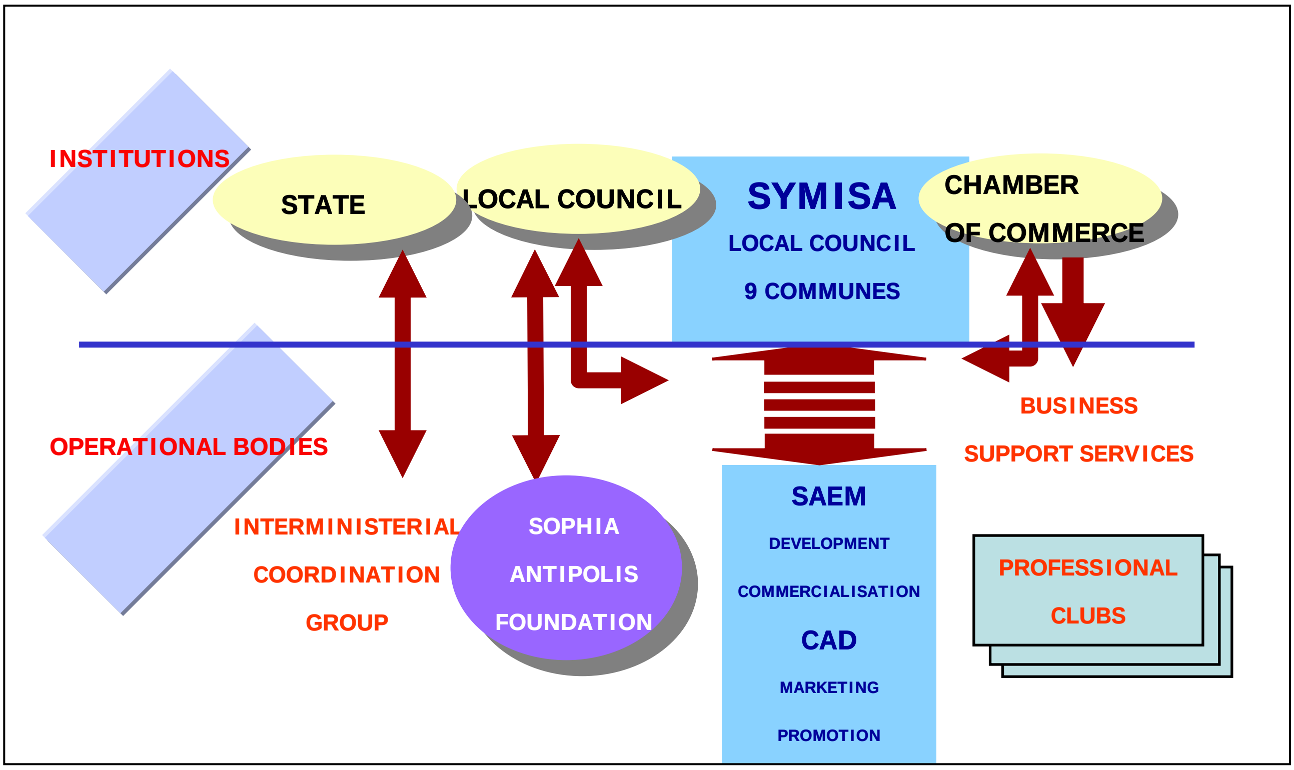


Fig 6 Networks in Sophia-Antipolis

Source: SAEM

2.4. Toyota City

2.4.1. Profile and Brief History

Toyota City is located in the center of Japan towards the Pacific Ocean, 3 km from Nagoya (the city was renamed from Goromo in 1959). Toyota City is the location of Toyota's headquarters as well as several factories and research institutes for the company.

Support from the city was essential for Toyota to begin business in Goromo. When Toyota looked for a location for its assembly plants, the municipal government decided to grant a subsidy that then amounted to 50% of the city's budget. After Toyota established its assembly plants, parts and machinery firms looking for business with Toyota flooded into Toyota City. At that time, Toyota did not have enough capital to establish plants for parts necessary to complete automobiles.

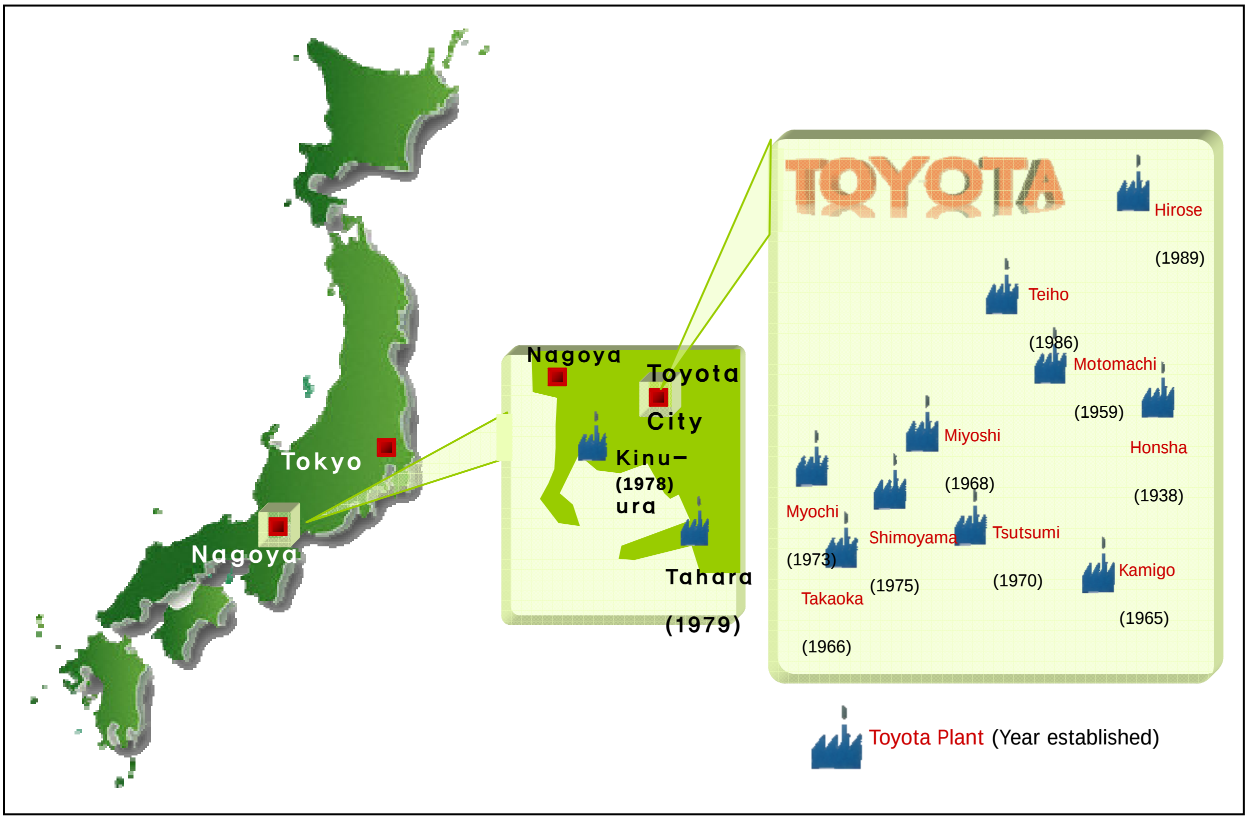


Fig 7 Toyota's Plants in Toyota City

Source: Harvard Business Review, 2007

2.4.2. Factors for Success

JIT (Just in time) production system was of primary importance in compelling part-manufacturing companies to locate near Toyota's factories. In the 1960's, Toyota deployed JIT in order to reduce inventory and to meet the needs of customers. The essential factor in

JIT is to deliver parts only as needed, making it necessary to locate near Toyota's factory due to the need to supply small quantities of parts frequently and on time. If delivery of parts was delayed, parts-manufacturing companies would be held responsible for the losses incurred from interruption to production.

Creating various knowledge networks is also an important factor for success. The most important networks that Toyota has created were (1) the Supplier Association, (2) Toyota's consulting division, (3) voluntary small group learning teams, and (4) inter-firm employee transfers (Dyer and Nobeoka, 2000). Using these networks as channels for circulating information and knowledge, Toyota managed to cut the costs and develop new technologies like hybrid car and fuel cell automobile. These four networks were able to efficiently circulate information and knowledge by utilizing various processes to transfer explicit and tacit knowledge in a multilateral or bilateral setting.

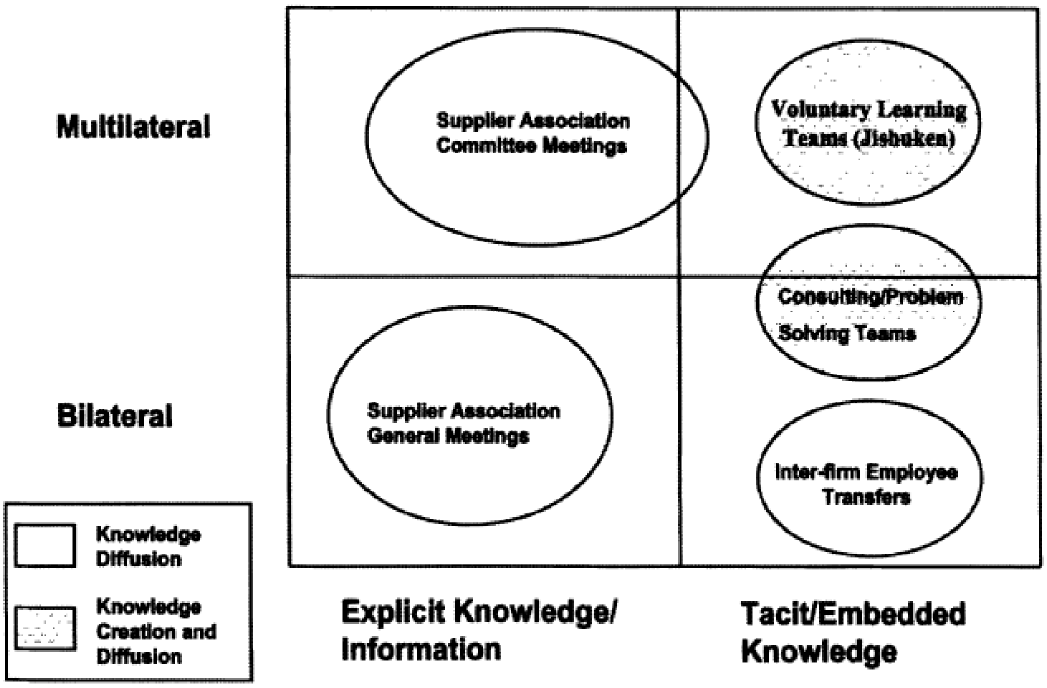


Fig 8 Toyota's Knowledge Sharing Processes

Source: Dyer and Nobeoka, 2000

Supplier association

Toyota established its supplier association in 1943 in order to promote mutual friendship and exchange of information between Toyota and its parts suppliers. The supplier association is a network-level forum for creating a shared community, including network norms, and sharing information (or explicit knowledge). The association has three purposes including: (1)

information exchange between member companies and Toyota, (2) mutual development and training among member companies, and (3) socializing events (Dyer and Nobeoka, 2000). Toyota divides the Supplier Association into three regions since suppliers must be in close distance to achieve the benefits of cluster formation.

There are two kinds of Supplier Association's meetings. The general meetings are intended to communicate explicit knowledge including production plans, policies, and market trends. Committee meetings are designed to communicate more complex knowledge on cost, quality, safety etc.

Consulting/problem solving teams

Toyota's operations management consulting division is a network-level unit assigned the responsibility to acquire, store, and diffuse production knowledge within Toyota's production network and was established in the mid-1960's to help solve operational problems at Toyota and its suppliers. Toyota's consulting division teams facilitate knowledge sharing by providing direct 'on-site' assistance to suppliers. The consulting teams typically stay at a supplier's plant for a period of time ranging from 1 day to many months. According to Dyer and Nobeoka (2000), on average, suppliers received 4.2 visits per year, and these visits lasted an average of 3.1 days.

Voluntary learning teams

In 1977 Toyota organized its key suppliers into voluntary study teams to assist each other with productivity and quality improvements. Each study group consisted of about 5~8 suppliers. The study teams are grouped on the basis of (1) geographic proximity, (2) competition (direct competitors were excluded), and (3) experience with Toyota (Dyer and Nobeoka, 2000). Each group was usually re-grouped every 3 years by Toyota to stimulate diversity and promote new ideas.

The process for the operating study group was as follows: (1) preliminary inspection, (2) diagnosis and experimentation, (3) presentation, and (4) follow-up/evaluation. Study group operated for 4 months with frequent visits from Toyota consultants. Toyota also held a year end conference where all the members of the study teams would meet together to share their experiences.

Inter-firm employee transfer

Inter-firm employee transfer also facilitates job rotations within Toyota's network and enabled the transfer of knowledge among Toyota and its suppliers. In Dyer and Nobeoka's survey, 11% of the suppliers' directors were former employees of Toyota with 120~130 persons per year transferred to other firms within Toyota's network. These transfers were an important channel for sharing knowledge between Toyota and its suppliers, as transferred personnel brought knowledge of Toyota's human resources, systems, and technology.

To summarize, these four networks played an important role in sharing knowledge and facilitating frequent face-to-face communications among Toyota and its suppliers. The networks not only played a role in themselves, but also functioned as a system and complemented each other. In particular, study groups and consulting teams are not found in other automobile clusters.

Finally, it should be noted that these four networks were not established in a day, and Toyota spent more than 30 years and more to make these networks to function efficiently. In the early stage of cluster development, Toyota could depend only on weak ties between the companies and its suppliers, stronger relationships developing only gradually via the Supplier Association and its network of consultants. Suppliers strengthened their relationship by taking part in knowledge sharing meetings and received significant knowledge transfer from Toyota. While the flow of knowledge has remained unilateral from Toyota to its suppliers, the type of knowledge transferred now includes implicit one as well as explicit knowledge. The final stage of cluster development was to enable multilateral ties among suppliers and develop 'sub-networks' like voluntary learning teams. Today the flow of knowledge is increasingly bilateral with a significant degree of implicit knowledge is exchanged.

2.5. Hsinchu Science-based Industrial Park

2.5.1. Profile and Brief History

Hsinchu Science-based Industrial Park was initiated by the Taiwanese government in the 1970's. The governor of government had studied in San Francisco, and impressed by the success of Silicon Valley, tried to build a similar cluster in Taiwan. In the 1980's, the economy of Silicon Valley was sluggish, and some Taiwanese engineers were returning to Taiwan with more than 2,800 engineers coming back by 1997. They son spread Silicon Valley's culture of entrepreneurship into Hsinchu Science-based Industrial Park.

Hsinchu Science-based Industrial Park was built with an investment of NT $ 10 billion from the Taiwanese government. In 1989, 105 companies were already resident in the Park with about 20,000 jobs created there. To accelerate the development of Industrial Park, the government made a 10-year development plan in 1988 and tried to increase the numbers of companies and job offers. By 1997, the numbers of companies in Hsinchu numbered 245 with 70,000 employees. The Park was so successful that the Taiwanese government built a second science industrial park in 1995.

2.5.2. Factors for Success

The primary factors for success in Hsinchu Science-based Industrial Park can be summarized as follows; support from the government, networking among small and medium sized firms, participation from universities and research institutes, and linkages with Silicon Valley.

Hsinchu Science-based Industrial Park was spurred by the Taiwanese government which provided the main investments to build the park's infrastructure. Furthermore, the Taiwanese government offered benefits to companies in the Park in order to induce firms to locate there; including tax breaks, financing, and technological supports. The most important policy, however, was to actively encourage engineers from Silicon Valley to return to Taiwan.

Most companies in the Park were small and medium-sized companies specific to the IT industry, particularly computers and telecommunications equipments. The small size of firms and the fast pace of technological change in the industry made it necessary to encourage networks among small and medium-sized companies to help them produce the best products and services in the fastest possible time frame.

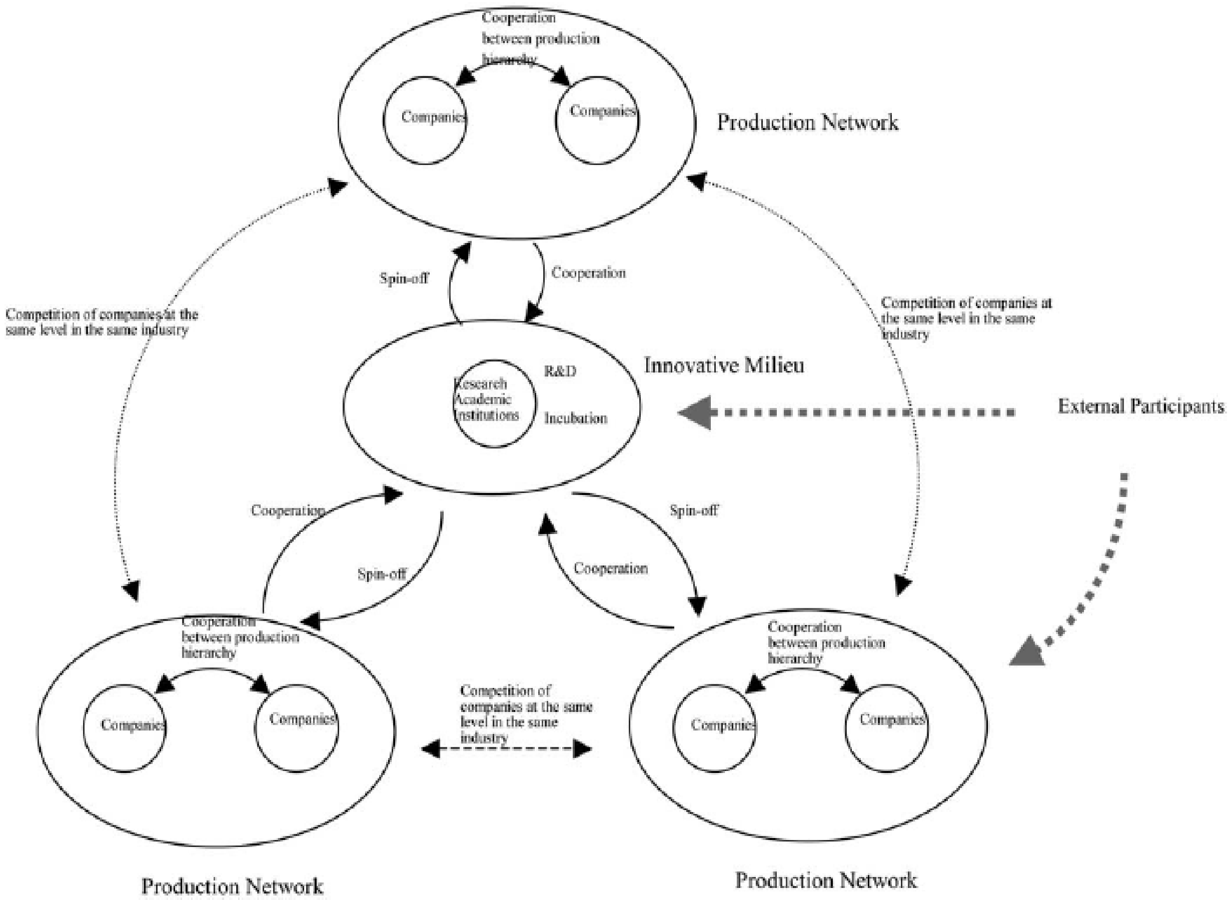


Fig 9 Networks in Hsinchu district

Source: T.-S. Hu et al., 2005

The support of two excellent engineering national universities and six national research institutes in the Park was also a very important factor for success. University research is deeply intertwined with the activities of companies in the Park with respect to research project, education, and co-operative studies. Research institutes operated by the government, like ITRI have also supported applied technologies.

Finally, relationships with Silicon Valley also played an important role as engineers moved from Silicon Valley could leverage not only their human resource networks but also their supply and demand networks. The situation evolved into a dynamic where Silicon Valley would develop basic science and technology, while Hsinchu Science-based Industrial Park developed and produced products and services based on Silicon Valley's work. Recently, China emerged as a world-wide center for production, and the network developed into a triangle of Silicon Valley for R&D, Hsinchu Science-based Industrial Park for development, and China for production.

3. Korean Clusters

3.1. Classification of Korean Clusters

This paper will also discuss the case for Korean clusters, i.e. Daedeok Science Park, Kuro Digital Industrial Complex, Tangjung Crystal Valley and Ulsan Auto Valley. The criteria for classification as such are largely similar to those in other industrialized countries, i.e. their main function (innovation-based vs. industry-focused) and stimulus for formation (market vs. government). Thus the Korean clusters correspond to the advanced clusters examined in chapter 2.

Table 3 Cases of Korean Clusters

Innovative & Market-led Clusters: Kuro Digital Industrial Complex	Innovative & Policy-led Clusters: Daedeok Science Park
Industrial & Market-led Clusters: Tang-jung Crystal Valley	Industrial & Policy-led Clusters: Ulsan Auto Valley

3.2. Daedeok Science Park

3.2.1. Profile and Brief History

Daedeok Science Park, established in 1973 is the largest innovation cluster led by the Korean government. With its more than 30-years of history, Daedeok Science Park has the potential to become increasingly innovation-oriented. It accommodates 63 research institutes from the public and private sectors as well as approximately 12,000 researchers with a master's degree or above. The facility accounts for about 10 percent of the total research manpower in Korea, and about 30 percent of the country's R&D. Currently it has gained attention for its world class research results, registering around 30,000 patents in Korea and abroad. In 2004 the Daedeok R&D Special Zone was enacted to promote commercialization of R&D results and in 2005 the Daedeok Innopolis Agency was established as the managing organization for the area.

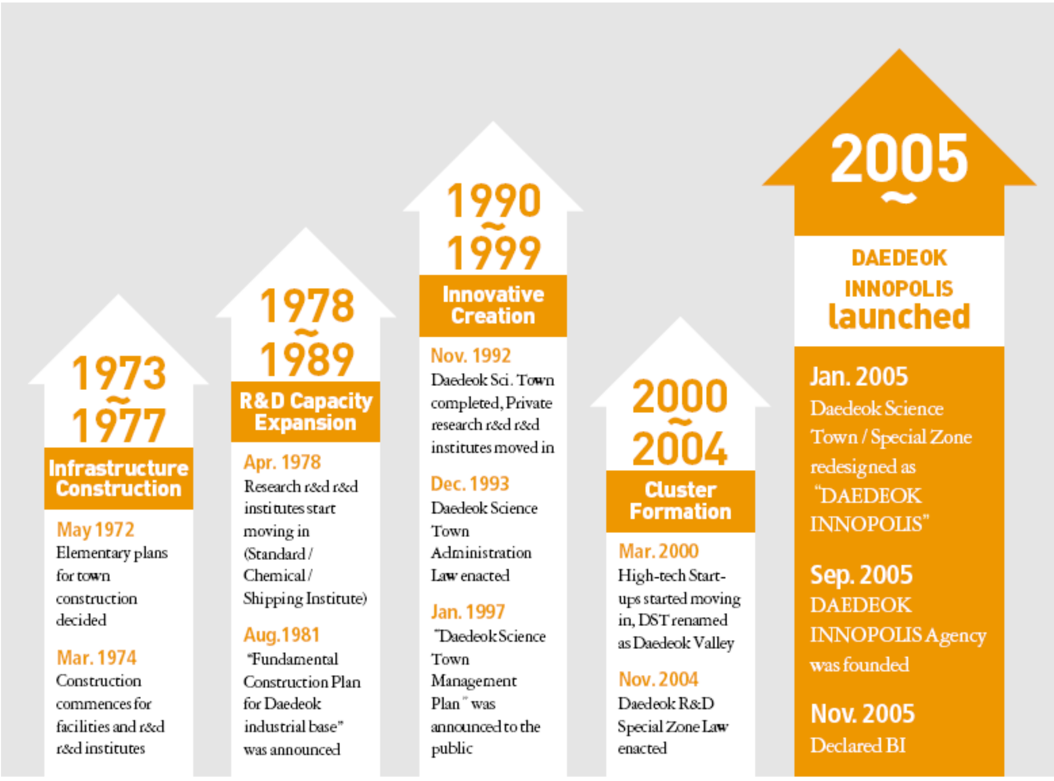


Fig 10 Evolution of Daedeok Science Park

Source: Daedeok Innopolis Agency

3.2.2. Factors for Success

Startups began in Daedeok Science Park right before the economic crisis in the mid 1990's. Before that time, Daedeok had concentrated only on Research and Development functions, as it originally been intended solely for R&D and education rather than industry. After the TIC (Technology Innovation Center) and TBI (Technological Business Incubator) were formed at KAIST in 1994, however, startups were increasingly active in the area. After the mid 1990's, startups increased as support policies from the Daejeon city government became active and after TBI was extended. In 1999, a law allowing the entry of manufacturing firms into

Daedeok was enacted.

The specific stimulus that enabled startups to appear in Daedeok was actually mass layoffs from research institutions operated by the government. After the Asian financial crisis, layoffs and divestments increased while supports for startups by the government expanded. There are 22 TBI arrangements with more than 400 companies, with an active TBI transition program to smooth the transition for companies that have graduated from their TBI to Daedeok. Typically, a support complex is formed for startups to resolve with respect to marketing, production, storages and exhibition, etc.

The Ministry of Science & Technology and the city of Daejeon plan to make Daedeok Science Park into the leading technology cluster in South Korea, encompassing firms, universities and research institutes. The act on the Special R&D Zone for Daedeok passed the National Assembly in December, 2004, which aimed to link R&D and startup establishment by utilizing the assets of R&D assets accumulated over the past 30 years. After the promulgation of the act, the Daedeok Innopolis Agency was established as an office for management of the area. Daedeok Innopolis has tried to transform Daedeok Science Park into a world class cluster by commercializing R&D, networking & dissemination, and provision of a global business environment.

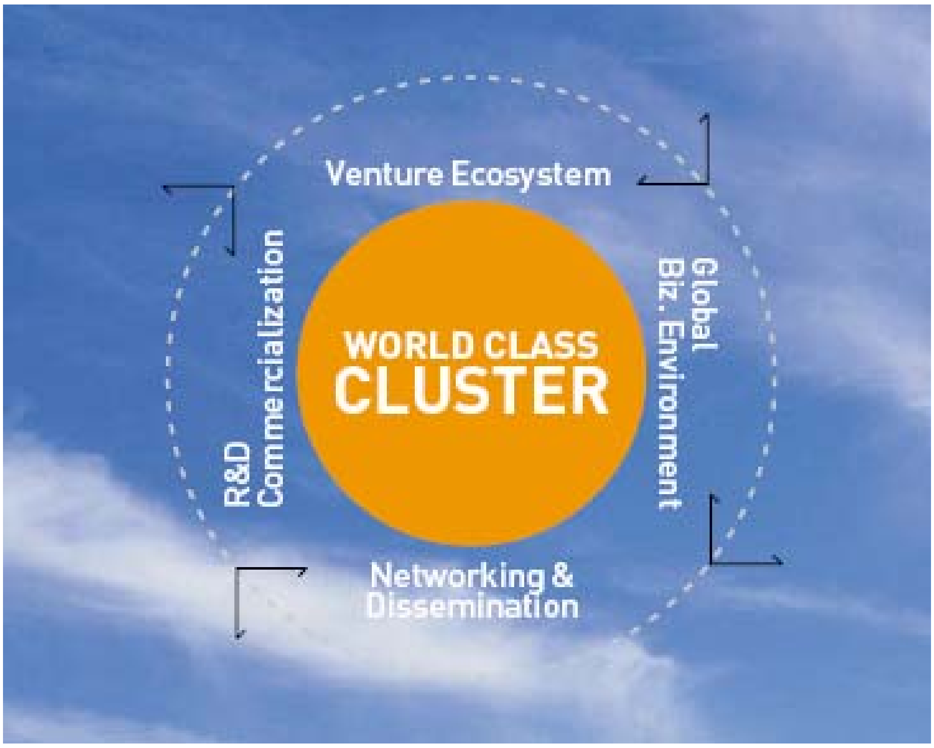


Fig 11 Vision of Daedeok Innopolis Agency

Source: Daedeok Innopolis Agency

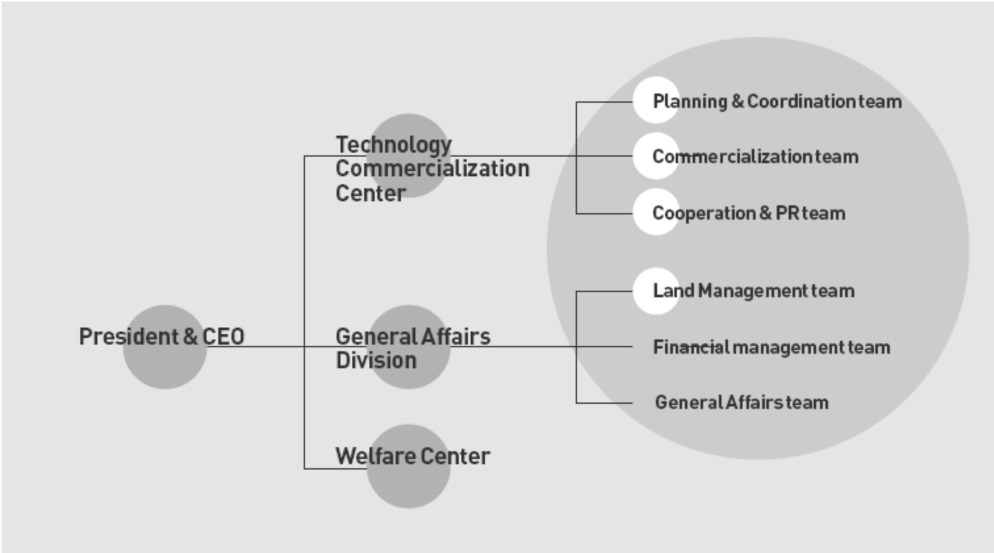


Fig 12 Organization of Daedeok Innopolis Agency

Source: Daedeok Innopolis Agency

3.3. Guro Digital Industrial Complex[6]

3.3.1. Profile and Brief History

Guro Digital Industrial Complex is a good example of success in transforming an old industrial complex into an innovative cluster. The outdated and once almost-abandoned industrial complex has redeveloped itself into the one that provides large business spaces at low prices, successfully attracting state-of-the-art industries and turning it into the incubator of new high-tech businesses (Park, 2007).

Guro Industrial Complex in Seoul, Korea’s first industrial complex founded in the year of 1965, was once decrepit due to the loss of competitiveness of factories against China. But it is now gradually transforming into a ‘within-a-city business park’ undergoing a noticeable quantitative and qualitative expansion. Factories equipped with cutting-edge IT infrastructure and pleasant working environment fill the complex, developing a used-to-be smokestack industrial complex into one filled with environmentally friendly facilities. Particularly, apartment-type factories, which are high-rise buildings with numerous offices, are leading the complex’s renovation.

[6] This section is based on the work of Park (2007).

<1970's> **<2000's>**

Fig 13 Past and Present of Kuro Digital Valley

Over the past decade, the number of firms in the complex has increased as much as 14 times and the number of employees increasing nearly 3.7 times. As of April 2007, 6,711 companies with 92,000 workers operate at Guro.

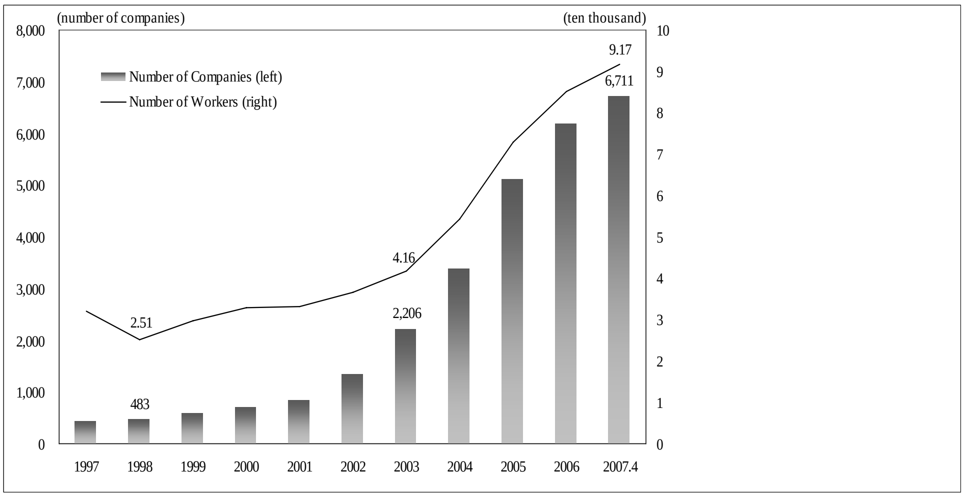


Fig 14 Numbers of Companies and Workers in the Guro Digital Industrial Complex

Source: Korea Industrial Complex Corporation

3.3.2. Factors for Success

Core success factors of Guro come down to the following three, including ① low regulation and low cost, ② geographic comparative advantage and ③ network effects (Park, 2007). Deregulation in the Seoul metropolitan area has played the decisive role in the success of Guro as it led to a supply of inexpensive apartment-type offices, helping meet the business needs of IT startups. At present, Guro Digital Industrial Complex has 61 apartment-type factories, more than any other industrial area. Also, regulations banning non-manufacturing companies from entering the complex were also lifted, opening the complex for IT industries.

Guro's natural strength lies in its access to the knowledge infrastructure of the Seoul metropolitan area, where Korea's largest market with abundant high quality workforce, technology and capital. Additionally, the complex functions as a node of transportation, making human and goods movement convenient. It offers easy access from anywhere in Seoul as well as Incheon (the third largest city) and Gyeonggi province (the province surrounding Seoul) so that high-skilled and frontline workforces can go to and from work conveniently.

Firms in the industrial complex have enjoyed network effects throughout synergy among firms and institutions in the complex. Manufacturers of molds, parts and materials are old residents in the complex, and nearby shops selling tools create synergy with small- and mid-sized startups when they try to produce product prototypes. Due to division of labor between startups and existing manufacturing companies, the former can focus on their core capabilities of R&D and the latter develop into more value added functions. Indeed, in a job satisfaction survey in the complex, the largest group or 20.0% of the total respondents said, "Working with partner companies in the complex together makes things easier." Also, about 29% of respondents said they are enjoying synergy and nearly a half said they expect so.

Guro Digital Industrial Complex is a 'within-a-city corporate ecosystem' created largely by companies, with government support. Traditional manufacturing companies lost competitiveness and gave way to private construction companies, which then they built apartment-type factories and have consequently induced SMEs and venture capital companies. Thanks to this, the complex is enjoying many economic advantages as a cluster, including economies of scale, cost cuts, and a range of business opportunities. The government also helped reinvigorate the complex through deregulation and tax incentives, perhaps, recognizing the importance of the complex as the only national industrial complex located in Seoul.

However, in order to develop further, it is imperative for Guro Digital Industrial Complex to become a flexible cluster for knowledge and technology creation. To this end, the Korea Venture Business Association, the Korea Industrial Complex Corporation and community service providers strengthen community functions like forums, conventions and joint training exercise in the complex. Improvements should also focus on infrastructure in order to boost firms' innovative capabilities. Another urgent task is to build amenities for workers and visitors in the complex including shopping centers, general hospitals, cultural centers, convention centers, and business hotels.

3.4. Tang-Jung Crystal Valley

3.4.1. Profile and Brief History

Tang-Jung Crystal Valley was officially christened on June 23rd 2004. "Crystal Valley" refers to its function as the main source of LCD panels.[7] LCD panel factories and related parts-makers and material providers including glass manufacturers, are clustered around A-San and throughout Cheon-Ahn province.

As the size of LCD panel becomes larger and larger, companies needed to be located within a one hour distance to reduce transportation costs. Equipments in the LCD industry must also be installed with the cooperation of several firms, enabling speedy resolution of problems, always a key factor in the LCD industry. Clusters have likewise formed around LCD-panel companies that include several related firms.

Fig 15 A Picture of Tang-Jung Crystal Valley

3.4.2. Factors for Success

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[7] A liquid crystal display (commonly abbreviated LCD) is a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector (http://en.wikipedia.org/wiki/Liquid_crystal_display). It is prized by engineers because it uses very small amounts of electric power, and is therefore suitable for use in battery-powered electronic devices.

The main factor in the successful formation of Tang-Jung Crystal Valley over relatively short periods of time has been the rapid and substantial investment from LCD-panel companies. Investments from Samsung Electronics in the LCD panel played a key role in the formation of the cluster, as LCD-panels from Samsung Electronics became ubiquitous in laptop computers during the late 1990's and the early 2000's. Conditions in the market were positive as growth in the LCD TV market increased rapidly. The market for LCD TVs grew to 4.9 millions this year, and is predicted to go over 100 million in 2009.

Support from local government was one of the most influential factors. While the timeframe of construction is usually about 36 months; it took only 13 months to construct Crystal Valley. Timing is very important in high-speed industries like LCDs and support from the local government has been critical in shortening time to time. Cooperation among firms and research institutes soon followed, with universities around Crystal Valley, opening display related courses and modifying their curriculum.

Improvements in the quality of life in Crystal Valley also proved very important, with the mayor of ASan changing the city's slogan of city from the 'Spa-tour city' to the 'Education & Culture city'. High quality schools will be built in Crystal Valley and cultural events like musicals and operas have increased their presence.

3.5. Ulsan Auto Valley

3.5.1. Profile and Brief History

Ulsan has been the country's largest automobile industrial cluster since Hyundai Motors founded its first factory there in 1968. Hyundai's Ulsan factory, one of the world's largest, produces 5,500 cars per day and 1.5 million cars per year, accounting for 27% of the national production of automotive vehicles. Ulsan's local economy is dominated by the automobile industry with 54.8% of employees living in Ulsan working for the automobile industry or related industries. Although Hyundai would construct assembly plants in other areas in the 1990's, Ulsan still maintains its status as the number one automobile cluster in Korea.

Hyundai's Ulsan factory was started by producing Ford's 'Cortina' in 1968, producing its first original model the 'Pony' in 1975. Hyundai would later produce its 'Alpha engine', the first engine developed by Korean engineers in 1991.

3.5.2. Factors for Success

The diver of Ulsan's transformation from a quiet fishing village to the country's dominant automobile cluster was government policy. At the time, the Korean government tried to increase exports of heavy industrial products like automobiles, chemicals, and ships, and for that purpose the government planned to form an industrial complex on the coast in order to take advantage of easier transportation. Since Ulsan is located very near the sea, an industrial complex for cars, shipbuilding, and oil & chemicals was built there.

Hyundai was the main factor responsible for the formation of Ulsan Auto Valley. At that time domestic companies did not furnished sufficient technology and capital to create an industrial cluster. However, the enterprising spirit of Korean firms, especially Hyundai, combined with foreign technology and cheap domestic labor proved to be a successful combination. Government backed firms used loans from other countries to supply the capital to Korean companies. Applying he maxim ‘Learning by Doing’, Hyundai developed technologies imported from foreign countries and finally created its own car, the ‘Pony’ in the early 1970’s. Cooperation with parts companies was also an important factor with parts companies supporting the production of high-quality and low-priced automobiles.

Ulsan Auto Valley developed into a “hub-and-spoke” cluster with Hyundai acting as a hub and with parts companies acting as spokes. This type of network is often criticized as inefficient in circulation of information and knowledge as the network is closed and dependent on a hub. However, in earlier times in Korea’s automobile industry, this type of network increased the efficiency of production as parts makers could get the assistance form the hub firm that would not allow the technology information to be diffused to other competitors.

Nevertheless, parts manufacturers in Ulsan are still regarded as simple producers entirely dependent on Hyundai. Additionally, the cooperation network between the suppliers and Hyundai is not well established enough to enable the sharing of tacit knowledge. Ulsan is accordingly not capable of creating the desired knowledge and innovation that typify an industrial cluster at present. Moreover, since Hyundai Motors transferred its R&D center to Namyangju in Kyeonggi province, Ulsan now function simply as an assembly and production cluster with weak R&D.

To overcome these weaknesses, local governments in Ulsan and the Ministry of Commerce, Industry and Energy (MOCIE) have set forth a plan called the “Ulsan Auto Valley.” Under this plan, Ulsan will develop into a genuine automobile cluster composed of various facilities, including the Automotive Parts Innovation Center [8] (to help expedite technological development of auto parts manufacturers), the Parts Materials Complex, the Modulation

[8] The Automotive Parts Innovation Center is an institute that comprehensively supports the automotive parts industry, established jointly by the City of Ulsan and the Ministry of Commerce, Industry and Energy.

Complex, and the Auto Plaza that will house functions like automobile-related marketing, exhibitions and public relations facilities.

Fig 16 The Plan of Ulsan 'Auto Valley '

Source: Automotive Parts Innovation Center

4. Policy Guidelines for Cluster Development[9]

[9] In contrast with the many studies on clusters, there are comparatively few studies to explain practical guidelines for clusters. "A governors' guide to cluster-based economic development" published by the national governors association in 2003 will be one of them. Recently the national governors association with council of competitiveness publishes another report about clusters, "Cluster-Based Strategy for Growing State Economies," under the auspices of the council of competitiveness in 2007. A good guide for best practices can be found under 'Guidelines for developing a biotechnology cluster innovation plan' published by the Ministry of Enterprise, Opportunity and Innovation, Ontario, Canada, in 2003. Though the plan focuses on the biotechnology, procedure and structures in the report are applicable to other industries as well. Advices on clusters can also be found in the website of the competitiveness

The policy guidelines for cluster development suggested here involve a few simple procedures, i.e. “Plan,” “Do,” “See.” Considering Korea’s experience, we have add ‘education & benchmarking’ procedures that can increase the efficiency and effectiveness of the cluster policies.

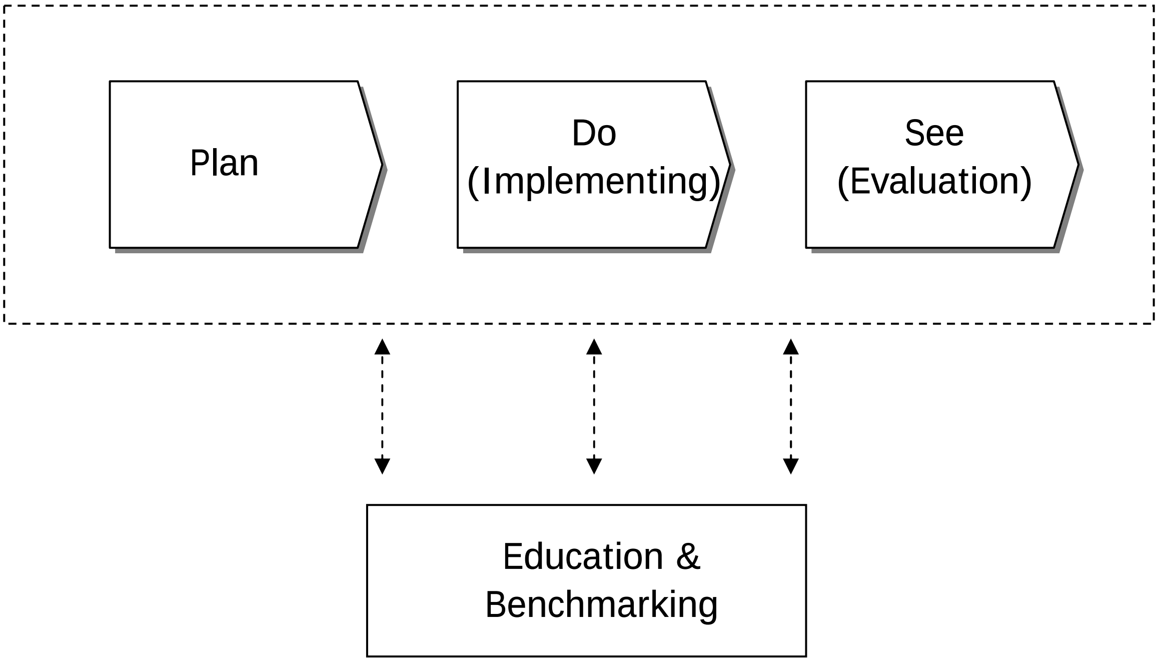

Fig 17 A Procedure of Cluster Policy

4.1. Cluster Planning

4.1.1. Regional Resource Profile

The first step in cluster planning is to identify the resources of region that will be the base of cluster. The purpose of writing down the resource profile is to identify key regional strength and weaknesses. The regional resource profiles will outline the innovative assets within the region and understanding region’s assets industry base like workforce, skill base, universities and research institutions will determine the region’s strengths and global competitive advantages.

The regional resource profiles include (1) community and area profile, (2) industry profile, (3) education and skills profile, (4) research & development profile, (5) transportation and telecommunication infrastructure, and (6) natural resources and specialty infrastructure. At the end of the profile, SWOT (strength, weakness, opportunities, threats) analysis is developed.

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institute (www.competitiveness.org): "A practical guide for developing clusters" by the UK Department of Trade and Industry (DTI) in 2004; and “The Cluster Policies White book” by IKED (International Organization for the Knowledge Economy and Enterprise Development) in 2004 etc.

Community and area profile

The profile of the community and area should include total area and population (compared with other areas), and population statistics (trend of 10-year growth rate). The profile should have the physical infra-structure lists, including total land available for commercial development, number of research parks, commercialization centers, and incubators. For each infrastructure, detailed information on size of facility, tenant companies by sector, available space, and service provided should be described. At the end of community and area profile, existing economic development or innovation plans (developed within the last 3 years) should be attached.

Industry profile

Industry profile in cluster planning includes total employment and unemployment rate, and the weight of an industry in a cluster. For each major industry sectors, the following statistics are needed to be compiled:

- Life cycle of industry (i.e., emerging, nascent, mature, declining)
- Numbers of companies and employees (trend data over 10 years) / Anchor firms
- Key growth factors / Average wage rate
- Total R&D investments
- Total sales / domestic and international market shares / total exports, % of global market
- Expected growth rate within five years
- Key collaborations / alliances
- Determine location quotient factor[10]

Education and skill profile

On the list of education and technology profile, numbers of universities and colleges and their students and enrollment rates of each department should be described over 10 years period. Other relevant educational training facilities are also recorded with following information:

- Number of science, engineering, business degrees/diplomas granted
- Number of PhD scientists, engineers and MBAs employed in the region

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[10] Location quotient is the ratio of the share of regional employment in a particular sector to the share of national employment in that sector. Location quotients can be interpreted by using the following conventions:

(1) If LQ>1, this indicates a relative concentration of the activity in the area, compared to the region as a whole.

(2) If LQ =1, the area has a share of the activity in accordance with its share of the base.

(3) If LQ<1, the area has less of a share of the activity than is more generally, or regionally, found.

- Number of collaborative programs

Research and development profile

On the field of research and development, lists of research institutes, total amount for projects, and the source of the funds, special equipments list must be included. Amount of R&D funding by source of R&D funding (government: federal / provincial / international; private sector: regional / national / international) is also needed. For each research institute, the following information by discipline/research area should be compiled:

- Total value of scientific research conducted (10 year timeline)
- Number of invention disclosures (10 year timeline)
- Number of patents (10 year timeline)
- List of key researchers
- Number of spin-offs created (10 year timeline)
- List industrial collaboration
- Technology transfer infrastructure

Transportation and telecommunication infrastructure

Data of transportation and telecommunications infrastructure is needed with the state of transportation infrastructure, availability of broadband and internet services and number of telecommunication providers, levels of services and prices of them.

Natural resources and specialty infrastructure

If possible, it is necessary to identify and quantify resources of the region. For each resource the following information is needed;

- Type
- Source
- Location
- Quality
- Transportation required

Regional SWOT analysis

SWOT analysis using the data collected in the aforementioned regional innovation profile is needed. The SWOT analysis utilizes the following current and future economic data:

-State of the economy (stage of economic cycle: recession, etc)

- Demographic shift
- Labor/workforce issues

- Government policies and pending legislation
- Change in technology
- Consumer changes/trends

The SWOT analysis will reveal strengths and weaknesses of the region. If particular fields are known to be relative regional strength, then proceed to next step of setting the goals.

4.1.2. Setting the Goals

After identifying regional resources, further considerations for clusters involve the setting of goals. Planners must describe objectives for the details and boundaries of the cluster. After delineating physical boundaries, clusters require an outline of the networks and constituent elements therein that link to each other synergistically. To identify these elements, one must identify the entities responsible for developing the cluster. Thereafter, a vision statement supported by all stakeholders is requisite to describe the desired conditions in 5 or 10 years. A mission statement that sets measurable goals and objectives for the short-term, mid term, and long-term will also be necessary.

Some considerations are needed when setting goals for clusters. First, every member in a cluster should agree on overall goals to prevent problems from occurring in the future. Even though this process takes substantial time and effort, such goals should be induced through reasoned discussion and persuasion. And needlessly to say, the process of discussion and persuasion must be clear and fair. Second, goals should be based on a region’s strengths as can be inferred from the previous explanations of successful clusters. If a cluster is not formed based on its inherent strengths, it will be difficult to gather the needed firms and institutions, and the cluster will not be sustained. Third, a global perspective will be necessary since most industries are already internationalized. Not only domestic clusters but also international ones need be reviewed, while networks with other regions and countries must also be taken into consideration. Finally, clusters need staged policy goals with a long-term view. As mentioned in the case studies, formation of a cluster requires significant investments of time, as cooperative networks require substantial experiences and interaction. Successful clusters will never be built in a day.

4.2. Implementing Cluster Policy

4.2.1. Roadmap for Cluster Implementation

After analyzing resources and setting the goals, further roadmaps for prospective clusters will be required. The road map should be arranged as projects staged for the short-term (1~2-year), mid-term (2~5-year) and long-term (5~10-year), with each step including detailed explanations on how to perform action plans successfully. Furthermore, roadmaps also provide an organizational structure that can enhance implementation, including a detailed budget that denotes the support provided by members and stakeholders.

From the foregoing case studies, organizations should clearly be based on regional members who know about the area and can establish detailed strategies. To enable more effective cluster policies, organizations should include the core members in the region. Organizations that manage clusters come in various forms. The central government can be the main organization, as is the case in Korea and Japan. In the case of Europe, the local government functions as the main impetus. Organizations also vary in their legal status. Some organizations that function as de facto clusters are operated by the government; others are mixed with public/private organizations; while still others are 100% private organizations. The character of organizations depends on the historical and cultural backgrounds of the regions.

4.2.2. Implementation Plan

Clusters require a number of actions to be successfully implemented. This implementation plan will identify some near term milestones that clusters need to achieve. The implement plan includes the following components;

- project description
- rationale or justification
- financial plan
- marketing plan
- operational plan
- support for the project, partnerships, and collaborations, synergy and linkages with regional and external resources and infrastructure

Special care is needed on the following points. First, as shown in the case studies, networks between firms and institutes are the most important factor in getting clusters to succeed. Hence, a successful implementation plan should furnish systems of networks that create new technology and knowledge or business models continuously, based on the active interchange of information and knowledge. When promoting networks, informal and casual meetings need to be given equal status to more formal networks. Informal network activities should not be regarded as options that complement the formal network, and instead should be regarded as equivalent to official network activities.

Second, if the implementation plan requires government support for the development of physical infrastructure, a detailed business plan must be submitted. When regions start to implement cluster policy, they tend to ask for the local or central government to supply the physical infrastructure first without devising appropriate business plans or evaluating the financial sustainability of the proposed infrastructure. Before asking for the construction of expensive infrastructure, business plans that demonstrate financial viability are absolutely necessary.

4.3. Evaluation

To guarantee the transparency and responsibilities of cluster policies and to contribute increasing international competitive power, an evaluation system that analyzes the overall process and achievements of cluster policy is needed. Through this evaluation system, omissions and errors can be adjusted while successful examples can be shared among personnel, ultimately helping to drive more effective cluster policies. Evaluations also allow personnel in each region to compete with each other to improve results.

When implementing evaluation, identifying key performance indicators is required such as;

- Economic Indicators: number of start-up companies, number of new direct and indirect jobs, increased sales and exports, venture capital invested, R&D investment attracted, tax revenue generated, etc.
- Human Resource Development Indicators: number of entrepreneurs, number of business training seminars or mentorship, etc.
- Commercialization Indicators: number of patents awarded, number of technologies licensed, university revenue from licensing agreements, etc.

Several things should be considered when building an effective evaluation system. First, evaluation should be performed by an independent organization that is separate from the evaluated organization. Second, basic evaluation plans should be set in advance so that evaluated organizations should know about the evaluation plans before they are assessed. Third, the evaluation results should be used to reflect incentives and improvements in policy to induce more effective actions on the part of personnel who perform the policy.

4.4. Education and Benchmarking

4.4.1. Education

To guarantee an efficient and effective results from cluster policy, every member, whether they participate in policy management directly or indirectly, should have basic knowledge about the cluster policy. In particular, since the cluster policy differ from industrial policy or science-technology policy, education will be mandatory.

Education on clusters can convey the backgrounds, goals, and factors for success, as well as providing successful case studies. Education will lead to greater understanding and more active participation in cluster policies so that the efficiency of the policy can be increased.

Accordingly, cluster education programs should be performed as a dialogue, rather than just a unilateral indoctrination. Through discussions, participants can more clearly perceive what they wish to obtain from education, while programs can be established and managed according to their needs. Furthermore, education programs that describe real situations should be developed to minimize the gap between academic theory and real world practices. Even if outstanding programs are offered, such programs are meaningless if they do not actually provide participants want. Therefore, during and after the education programs, evaluations of the level of participants' satisfaction should be performed to increase the quality thereof.

4.4.2. Benchmarking

One important method to improve the policy is to find and analyze successful examples and distribute expertise to other members. There are several methods to benchmark successful examples in cluster policies.

First, the hosting of conferences, exhibitions and tournaments where members performing cluster policies can meet and examine the performance of other members can be an effective means to improve policy and exchange information. Second, management expertise on the promotion of clusters should be published in the form of white papers. Third, databases should be devised to maximize achievement and to pool and develop shared knowledge.

4.5. Final Remarks

4.5.1. Characteristics of Cluster Policy

First, there is no universal cluster policy which can be applied indiscriminately to all regions (Raines, 2002). The OECD's study on clusters (1999, 2001) concluded that simply copying and applying cluster policies does not, *in se*, guarantee success. In this sense, cluster policy should be unique and reflect the particularities of each region's environment.

Second, as the OECD study (1999, 2001) emphasized, the cluster policy can overlap with various other policies including industrial policy, regional development policy, and science & technology policy. It is thus essential to have a system that can coordinate activities between different policy areas.

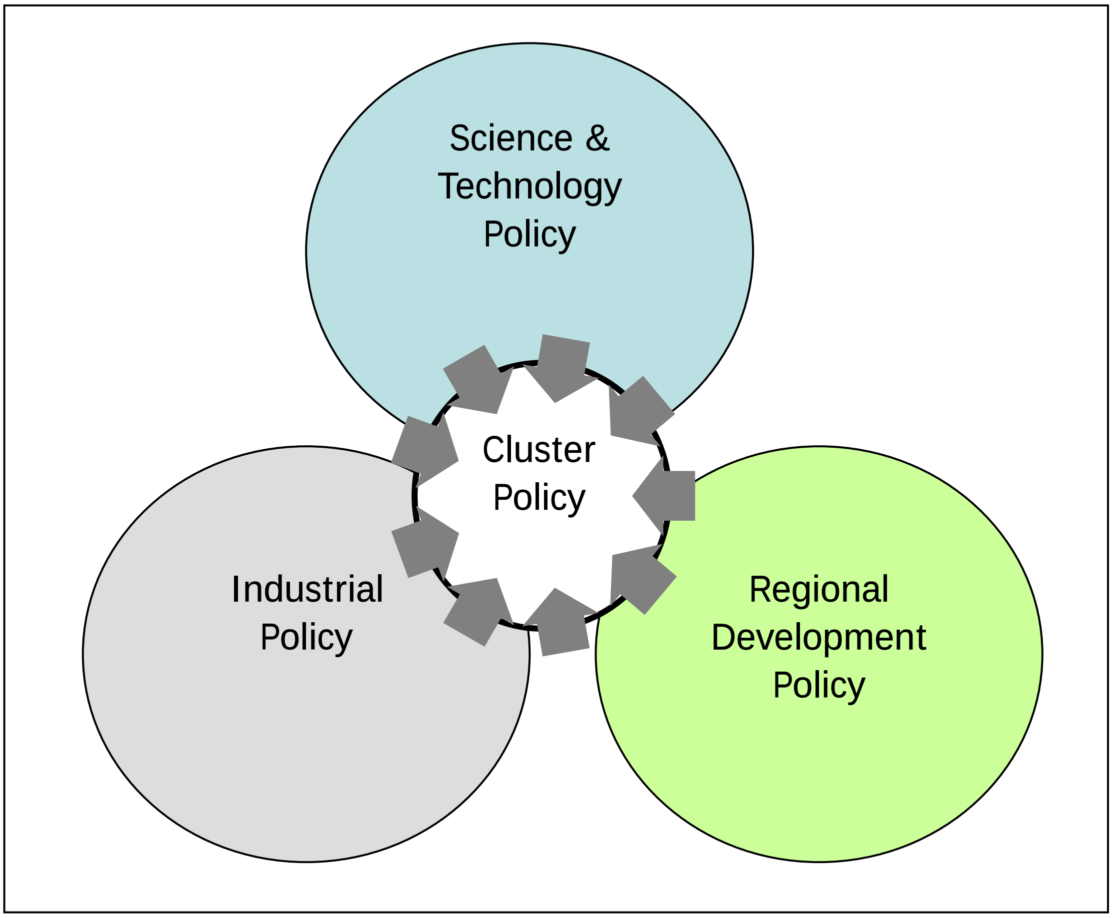

Fig 18 Characteristics of Cluster Policy

Third, the focus of cluster policy should be on the formation of active networks among companies and institutions. In clusters, networks among large and small-and medium sized firms, and cooperative projects between firms and universities/institutions are more important than solving problems of individual entities.

Fourth, some researchers have noted that the participation of private firms in formulating cluster policies may be the main factor to forming a successful cluster (Nauwelaers, 2003). Education, preparation of statistical data and research funds etc. are usually treated as a function of government, but in a cluster, private firms actively participate and offer these public goods also (Porter, 1998). Therefore, provision of incentives to the private firms to participate in formulating policy, could be a very important factor in determining a cluster's success.

4.5.2. Final Notes

When a particular region initiates a cluster policy, such policy tends to include all the items that comprise a cluster. However, a cluster is not in fact an autarky.[11] It is actually uncommon for a region or a country to have all the resources necessary to form a cluster, and even though it has, there is no guarantee that such resources will be very competitive vis-a'-vis other regional rivals. Focusing on the strengths of the region and networking with other regions is a more viable way to create a successful cluster.

Furthermore, formation of a cluster is by no means a cure-all-measure simply a means of solving regional problems (Nauwelaers, 2003). There is no definite evidence about the effects of clusters. The studies to analyze the effects of clusters report different results so far (Nesta et. al., 2003).

Clusters can also lead to excessive dependence on a single industry, and such dependence can cause the region to suffer from lock-in, i.e. the inability to adapt to changes in the global environment. The watch industry cluster in Switzerland, for example, was paralyzed by a group-think influenced attachment to traditional technology in the 1980's. Such lock-in led to a nonchalant attitude towards the effects of digital technology on the watch industry, which continues to experience difficult times on the low-end and mid-range levels (Glasmeier, 1991).

It is also important to guarantee the high quality of life, which encourages talented people and their families to gather in a cluster. For example, Kista Science Park in Sweden changed its name from Kista Science Park to Kista Science City in 2001. Changing 'Park' to 'City' may seem immaterial, but such a nominal shift is actually very meaningful. A 'Park' is a place to relax from time to time, but a 'City' is a place for people to work and live 24 hours a day. Changing the name to City indicates that the cluster's custodians will manage the city as a convenient place for people to live, rather than simply a place for companies to enjoy good access to services. A cluster should accordingly provide an environment that is suitable not only for running business but also for providing high quality of life.

Finally, forming a successful cluster might not be enough to foster regional development. In this era of globalization and hyper-competition, clusters have become numerous all over the world. Outpacing other regions may ultimately require more than the simple formation of a cluster to succeed.

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[11] An autarky is a closed economy that limits trade with the outside world, or an ecosystem not affected by influences from the outside, and thus relying entirely on its own resources.

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Chapter 2. Technology Collaboration

Rern-jier Sheu[1]

Stepping into the era of globalization, R&D activities often have key effects on industrial competitiveness. The extensive R&D activities in business include the modification in product and/or process, the application of new materials, the new design on package, and business model innovation. Major R&D activities have turned out to be more and more costly. In such hard situation, collaboration in research activities is a better way for firms who cannot afford the required budget alone.

SMEs are often facing many kinds of difficulties when they conduct in technology activities such as applying an existing technology to a new application, applying a new technology or business model to an existing application, improving an existing technology or product upon various aspects. Each activity consumes the limited, insufficient resources owned by SMEs. Therefore, how to leverage outside resources efficiently and turn that activity into business value has become a critical issue for SMEs. Among APEC members, many successful stories can be found and revised into learning materials.

Technology collaboration can help forward-thinking businesses and organizations accelerate the pace of innovation and bring competitive advantage in the marketplace. How to establish a solid mechanism to promote technology collaborations among SMEs, academia, and public research institutes is an important topic for those developing economies of APEC.

In this training course, ITRI's experience and some policies applied by Chinese-Taipei will be backbones of the content. In essence, this course will focus on helping SMEs overcome the barriers to technology development and adoption from a policy maker's point of view.

1. Introduction

1.1. Preface

The manufacturing paradigm is evolving from a large number of discrete, monolithic organizations to decentralized suppliers linked in supply chains. To optimize performance, supply chains operate in a highly coordinated manner through virtual manufacturing networks. The fact is: SMEs are hard pressed to keep pace with this emerging environment. Developing a brand new idea, concept or new technology seems to be a popular solution to SMEs' difficulties nowadays.

Stepping into the era of globalization, R&D activities often have key effects on industrial competitiveness. The extensive R&D activities in business include the modification in product and/or process, the application of new materials, the new design on package, and business model innovation. Major R&D activities have turned out to be more and more costly. In such hard situation, collaboration in research activities is a better way for firms who cannot afford the required budget alone.

The requirement for SMEs to collaborate, as a means to supplementing and complementing limited internal resources, has dominated much of the academic and policy debate on regional

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development and SMEs innovation throughout the late 1980s and 1990s. However, relatively little empirical work has sought to look further than simple frequency enumeration- noting that the most innovative and better performing firms are generally more likely to have links with external organizations. While the general findings point to innovators making greater use of external linkages, of certain types and in particular directions (notably the preponderance of vertical value chain linkages), the results are less emphatic than might have been anticipated. This leads to consideration of the factors contributing to and impeding joint innovation and the firms' perceptions of the impact of innovation. From this, it appears that much of the observed difference between innovators and non-innovators lies in less objective measures.

Furthermore, the process of SMEs' Technology Collaboration is very sophisticated. Inter-personal dynamics, attitude and expectations in facilitating successful collaboration are critical for SMEs' Technology Collaboration.

Limited by critical mass, SMEs always need to cooperate with other department to perform technological innovation projects. In recent three years, the ratio of manufacturing SMEs who had innovation cooperation projects in some typical countries like Austria, France, Netherlands, and the average of European Union was about 12%. Such ratio of developing countries and economies of APEC was lower.

Significant economic benefits can be generated by appropriate technology collaboration. But in most cases of APEC members, SMEs do not have enough capability to conduct successful innovation alone. It is critical for developing economies of APEC members to learn how to establish an effective mechanism that encouraging technology collaboration from a government's point of view.

Technology collaboration can help forward-thinking businesses and organizations accelerate the pace of innovation and bring competitive advantage in the marketplace. How to establish a solid mechanism to promote technology collaborations among SMEs, academia, and public research institutes (PRI) is an important topic for those developing economies of APEC.

Commercialization seems to be always an issue in technology development and innovation. With more than 34 years of industrial service experiences, Industrial Technology Research Institute (ITRI) has long been a policy think tank for industrial development and faithful partners for industries in Chinese-Taipei's economic development history. ITRI is well experienced in not only industrial services, but also in collaboration R&D with universities and SMEs. For SMEs who have developed an innovative technology, ITRI can help them locate organizations interested in using it. ITRI can assist SMEs in further development of their technology or process and point them towards collaboration possibilities that may lead to licensing, commercial agreements or technical assistance.

Taipei

In this training course, ITRI's experience and some policies applied by Chinese-Taipei will be backbones of the content. In essence, this course will focus on helping SMEs overcome the barriers to technology development and adoption from a policy maker's point of view.

Why this program?

In general, most high-level research personnel (with a doctor degree) are in universities, indicating that universities own plentiful research capacity that can be exploited by industry to pursue innovation and technological development. On the other hand, SMEs lack R&D resource and capability. Theoretically, this can be improved by collaboration with universities. However, exactly due to SMEs' lack of resource and difficulty to access the information, SMEs are relatively unable to build the cooperative relationship with the academia. To promote collaboration between SMEs and academia, the government should draw up a series of policies to establish a favorable environment and create intermediary mechanisms for industry-university collaboration.

Expected benefits

Trainees will learn practical knowledge to help them:

- Have a clear picture for related policy-making
- Build stronger relationships among SMEs, government, academia, research institutes
- Obtain a better skill in technology collaboration projects management
- Help government to identify more suitable resources allocation
- Establish effective mechanism for technology collaboration
- Increase the success rate of technology collaboration
- Build up an international networking for technology collaboration

Such benefits may not be seen in a short period of time. But the important issue is how trainees do practice what they have learned during the course. The change of mindset takes great efforts to achieve. Once a policy maker changes his/her mindset, with proper techniques, the positive policy effect will appear sooner or latter. Thus the value of the course can be measured.

A check list of your needs

Please fill in questions:

1. The most important industry of your country's SMEs is:

☐ Service industry ☐ Manufacturing industry ☐ Agriculture & fishing

2. Is Technology Collaboration an important issue in your country?

☐ Yes ☐ No

3. Did you ever involve in the management/policy making of Technology Collaboration for SMEs?

☐ Yes ☐ No

4. Do you have some successful Technology Collaboration examples in your country?

☐ None ☐ Very few ☐ Some ☐ Quite many

5. How many research organizations do you have in your country to assist SMEs' R&D activities?

☐ None ☐ Only few ☐ Less than 10 ☐ More than 10

6. How many universities/colleges do you have to serve SMEs' R&D activities?

☐ None ☐ Only few ☐ Less than 10 ☐ More than 10

7. What is the main objective of SMEs' Technology Collaboration in your country?

☐ To expand the global market

☐ To upgrade the nation's industrial technology level

☐ Both

☐ None of the above, it is ……

8. Your evaluation on the performance of SMEs' Technology Collaboration activities in your country is

☐ Need much to be improved

☐ Need to be improved

☐ Fair

☐ Good to excellent

9. Key issues of the future development of SMEs' Technology Collaboration inyour country:

(Please identifying three issues.)

1.2. Some models of technology collaboration

An SME-Academia-Public Research Institute Technology Collaboration Project could be in form of many types. By establishing an analytical matrix, one can easily develop many kinds of models. It appears that the Technology Collaboration by nature is a sophisticated process and needs lots of efforts inside.

Table 1 Model Matrix of Technology Collaboration

Party involved **Comparative Item**	**SME**	**Academia/PRI**	**Government**
Project size Small Medium Large			
Project period Short-term Mid-term Long-term			
Project level International National State/Province Local/community			
Leadership Mono Co-own			
IPR ownership Monopolistic Co-own Equally sharing Unequally sharing			
Number of each party Single Multiple Alliance			
Team Formal Informal On-site Virtual			
Technology source In-house Introducing overseas			
Government support With Without			
Objectives Mass production Pilot run Prototype Proof Test			

1.3. A brief introduction of the SBIR Program in the USA

Background

- The risk and expense of conducting serious R&D efforts are often beyond the means of many SMEs.
- Targets the entrepreneurial sector where most innovation and innovators thrive.
- The Federal Government reserve a specific percentage of federal R&D funds for SMEs.
- SBIR protects the SME and enables it to compete on the same level as larger businesses.
- Funds the critical startup and development stages
- Encourages the commercialization of the technology, product, or service
- Enact in 1982 as part of the Small Business Innovation Development Act
- A highly competitive program that encourages SMEs to explore their technological potential and provides the incentive to profit from its commercialization

Four major goals designed by the US Congress

- Stimulate technological innovation
- Use small business to meet federal R&D needs
- Foster and encourage participation by minorities and disadvantaged persons in technological innovation
- Increase private-sector commercialization innovations derived from federal R&D

Eligibility

- Organized for－profit U.S. business
- At least 51% U.S.－owned and independently operated
- Small Business located in the U.S.
- Project instructor’s primary employment with small business during project
- Five hundred or fewer employees
- Eligibility is determined at time of award
- No appendices allowed in Phase I
- The project instructor is not required to have a Ph.D. but is required to have expertise to oversee project scientifically and technically
- Applications may be submitted to different agencies for similar work

- Awards may not be accepted from different agencies for duplicative projects

The system

Annually, eleven federal departments and agencies are required by SBIR to reserve a portion of their R&D funds for award to SMEs. These agencies designate R&D topics and accept proposals. The approval of awards is based on SMEs' qualification, degree of innovation, technical merit, and future market potential.

Three－phase program

- Phase I: Startup phase. Awards of up to $100,000 for approximately 6 months support exploration of the technical merit or feasibility of an idea or technology.
- Phase II awards of up to $750,000, for as many as 2 years, expand Phase I results. During this time, the R&D work is performed and the developer evaluates commercialization potential. Only Phase I award winners are considered for Phase II.
- Phase III: Period during which Phase II innovation moves from the laboratory into the marketplace. No SBIR funds support this phase. The SME must find funding in the private sector or other non-SBIR federal agency funding.

Table 2 SBIR Awarded 2004

	Ⅰ	Ⅱ	**Total**
Number of awards	4,304	2,044	6,348
Dollars	497 million	1,517 million	2,015 million
Average Dollar Size	US$115,000	US$742,000	US$317,000

(Source: SBIR, the USA)

2. The Nature of Technology Collaboration

2.1. From Technology Innovation to Value Creation

Innovation and technology excellence do not bring in value before they have fulfilled business realities. A common myth among many researchers and engineers is that they tend to take interesting and challenging R&D topics but ignoring the importance of economic value.

For one who get involved in R&D activities, one should put oneself in the customer's shoes：

- Understand what drives the customer's business
- Be an expert in the customer's microhabitat
- Know the customer's customers
- Ask what keeps the customer up at night
- Ask how much the customer would pay for a solution

2.2. Win-win game vs. zero-sum game

A win-win game is a game designed in a way that all participants can profit from it in one way or the other. It emphasizes the importance of cooperation, sharing, care and over-all group success in contrast to domination, egotistic behavior and single party's gain. All players are treated as equally important and valuable. As the same, the purpose of any Technology Collaboration is to obtain benefit by each party. Team members are from different parties with different backgrounds and working patterns, thorough communication and negotiation before embarkation and building mutual trust during the process is the key to achieve a win-win game.

The result of the Technology Collaboration is "either profit or loss sharing." Due to its complicated nature, a proper design of the game rule and a healthy mindset are essential.

2.3. Evolving roles of R&D in different phases

In macro aspect, the economic development of a nation is a process of evolution. Take Chinese Taipei as an example, its development can be divided into six phases since 1953 after the Korean War:

- Import-Substitution / Labor-intensive Industry : 1953-1962
- Export-Expansion / Light Industry : 1963-1972
- Import-Substitution / Heavy Industry : 1973-1980
- Industry Upgrade / Strategy Industry : 1981-1990
- Hi-Tech Industry : 1991-2000
- Creative R&D Industry : after 2001

In a micro aspect, the role of R&D is also evolving in different phases. A completed process of R&D is a combination of creativity, innovation, and commercialization.

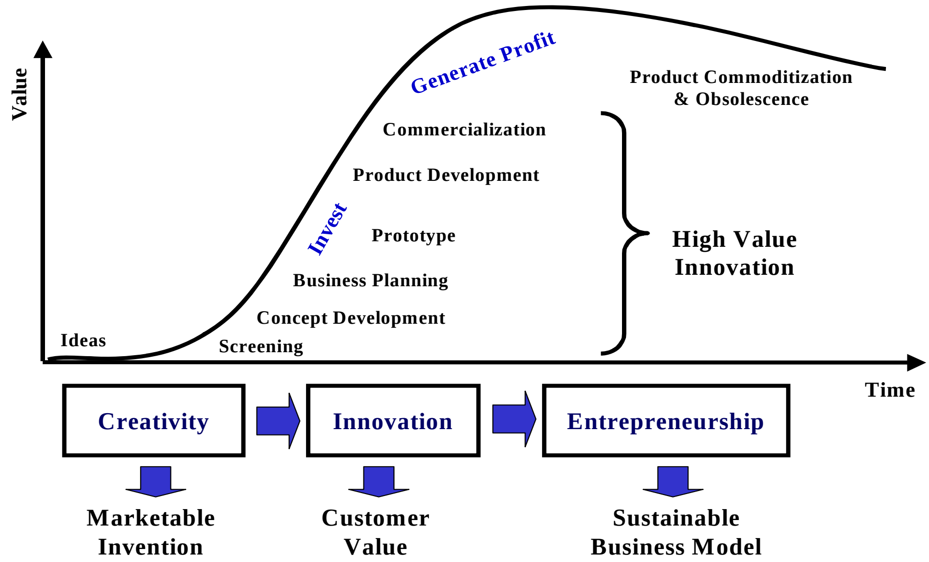


Fig 1 Value Creation

Tell A from B

- Creativity: Something clever
- Invention: Something novel reduced to practice
- Innovation: Creation and delivery of sustainable new customer value into the marketplace

In the phase of creativity, ideas are the most needed and marketable inventions are the most precious. The second phase is innovation that shall be focus on customer value instead of technological excellence. The last one is entrepreneurship or called commoditization. Economic value of R&D reveals after this phase is reached. The strategic thinking here is how to obtain a sustainable business model.

2.4. Strength and weakness of each party

A solid team of a typical Technology Collaboration Project should consist of the SME, the academia, and the government that create synergy through the contribution of their own uniqueness or competitive advantages.

Table 3 A Brief Comparison of the Three Parties Involved in Technology Collaboration Projects

	Strength	Weakness
SMEs	Commercialization ability Efficiency	Capital input Research ability
Academia/ Public Research	• Human capital, equipment, facilities for R&D	• Market sense/Information • Cost control (time and

Institute	• Overseas networking	money)
Government	Funding Policy guidance/Authorities	Slow management flows Rigidity

2.5. Roles among stakeholders

Tracking back to the industry environment in Korea and Chinese Taipei, from traditional manufacturing export in the 60s, to the technology manufacturing export in the 80s, till the organization and operation of Business Incubators, academia and research institutes have been playing an important role along the way. Those aggregate powers did their best endeavor to start the development for technology industries about thirty years ago. Now research power from academia shows more evidence in pulling the research innovation to the extreme. It is expected to seeing a great success in upgrading the industry by integrating the strengths of all resources from industry, government, academia, and research institutes. The models applied by Korea and Chinese Taipei may be modified into some appropriate models for those SMEs in developing countries and economies of APEC.

Research organizations, academia, and industry are the main elements in a national innovation system. Academia is mainly concerned with basic research, which discovering and disposing the rules and principles in academic disciplines. Research organizations undertake applied research, investigating the discoveries of academia and ascertaining the feasibility of product application. SMEs take the use of the R&D results of the previous two bodies to undertake commercialization activities.

However, it is the interaction among different elements in models of industrial innovation that spurs R&D efficiency. In order to accelerate knowledge creation in universities and research organizations and its more rapid application in industry, it is necessary to enhance the interaction among the three key players. Also crucial is strengthening the joint participation of these three in the process of knowledge creation, and product development at each stage, in order to smooth the whole process.

The industrial innovation activities of research organizations include defining targets based on demand for specific technologies and then implementing the results in industry through R&D and commercialization. Research organizations integrate the efforts of academia, industry, and government as well as foreign organizations in order to form mechanisms of industrial innovation and a smooth operating system.

- **SMEs**
  - Demander of Technology Collaboration activities
  - Be responsible to dig out market needs and turn them into R&D topics
  - Product/service information providers

- Cost controllers
- Major investor of Technology Collaboration
- Receiver of R&D results

■ **Academia/PRI**

- To offer facilities, experts, technology and sometimes even business incubating system
- To integrating multiple resources to lead and to support SMEs in a geographical area
- To stimulate business activities and expand SMEs' market
- Building international networking for Technology Collaboration

■ **Government**

- To create ideal environment for Technology Collaboration activities by means of proper policy making and promoting
- Funding provider (Not all the time)

■ **ITRI Case**

Industrial Technology Research Institute (ITRI) is the major R&D organization to serve SMEs in Chinese Taipei. It is engaging in innovation activities, implementing R&D results and the founding of new industries or aiding in the upgrade of existing ones. The results of the innovation process include products, processes, and services, while the extent of innovation runs from radical innovation on one end of the continuum to systems innovation on the other.

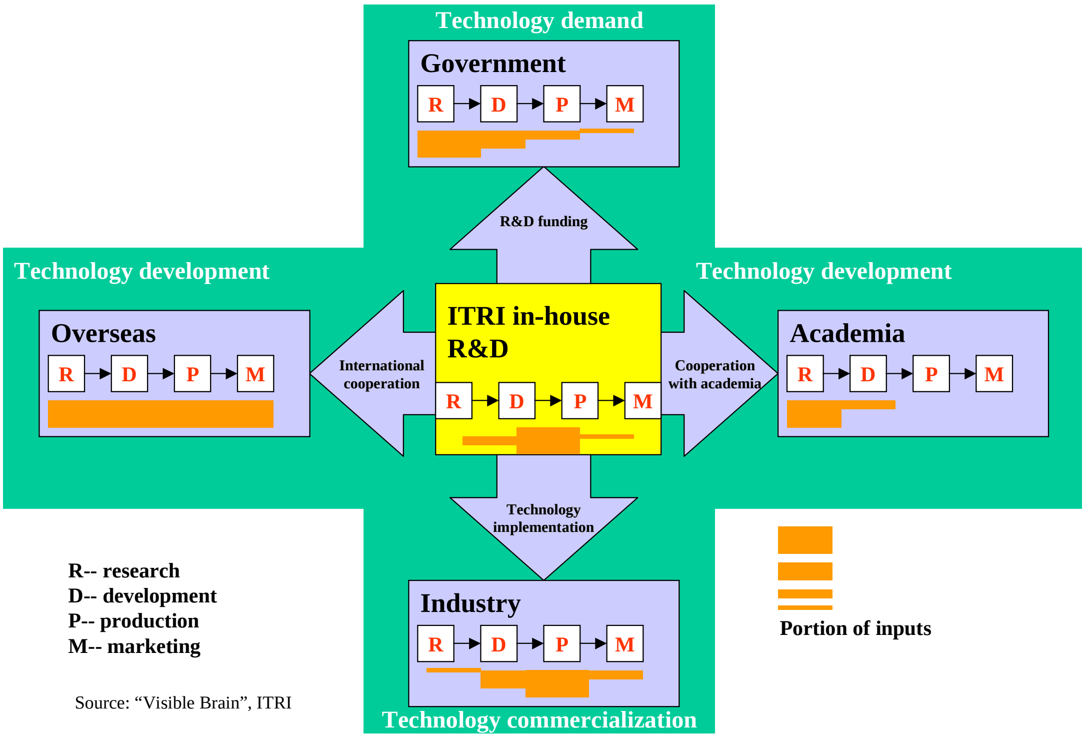


Fig 2 ITRI's Model to Format Industrial Innovation

Relationship between research organizations and government - Technology demand

Government subsidized or contracted research organizations to undertake R&D activities. In the selection of technologies for development funding, the principle is to follow industrial demand. The selection process first is to analyze the present status of domestic industrial development in order to choose a target industry. Then it selects the key technologies of this industry and analyzes their influence on the development of the industry and related industries. The government relies on R&D funding to effectively link government aims with research organization performance.

Relationship between research organizations, academia and foreign organizations - Technology development

After selecting technology for development, research organizations will plan a development process to benefit industry as it undertakes the production activities involved in commercialization. Research organizations propose project execution plans according to the technology to be developed. These plans are comprehensive, covering the content of the technology, manpower, funding, and progress. At the same time, it is necessary to provide outlets for the technology when it is properly developed, as well as ways to transfer the technology to industry. The project leader will divide the tasks specified by the plan among work units. Appropriate personnel at these units carry out the actual R&D activities, which involve the following tasks and operations: in-house R&D, contract research, cooperation with academia, and introducing technology from abroad through cooperation with foreign institutes. Interrelationships among research organizations, academia, and foreign bodies are thus established.

Relationship between research organizations and industrial technology - Commercialization

Technology commercialization indicates that the transfer of research organization technology development results into commercial applications. The transfer process involves applying new technologies in ways that increase economic benefit or production capacity. It also involves transferring relevant specialized knowledge or technology from research organizations to industry, where commercialization takes place. Research organization disseminates information through various means, including the media, result presentation conference, technology symposiums, and visit to enterprises. They also transfer needed technology to the enterprises themselves according to their capacity to accept the technology. Approaches to technology transfer are direct transfer, technology licensing, or help with personnel training. The specificity of the demands of the industry is taken into account and modifications made or new technologies are developed. In some cases, technology and talent will be spun off to establish new ventures. Research organizations establish tight relationships between themselves and industry by means of information dissemination, technology licensing, the spin-off new companies.

The evolution of ITRI's mechanisms of industrial innovation

ITRI was established thirty-four years ago with a not-for-profit legal entity so as to have more flexibility in responding to the dynamic industrial development environment. It has made appropriate and timely adjustments to its developmental emphases and strategies in order to achieve accelerating improvement of industrial technology, help in establishing newly emergent technology industries and upgrade traditional ones, especially to help SMEs to enhance their global competitiveness. For ITRI, both the R&D activities themselves and their implementation in industry are equally important. These two facets interact in the formation of effective mechanisms for industrial innovation and a smooth innovation system. ITRI's industrial innovation mechanisms have three stages: technology demand, technology development, and technology commercialization.

- Technology commercialization (three stages)
  - Technology oriented (before 1990s)
  - Industrial oriented (in early 1990s)
  - Innovation oriented (since late 1990s)
- Technology development

- ITRI-based R&D
- Technology introduction from overseas
- Leveraging external resources
  - Industry cooperation
  - Academic cooperation
  - International cooperation

■ Technology commercialization

- Information dissemination
- Technology transfer
- Patent licensing
- Spin-off of new ventures
- Industrial contract development
- OpenLab (Joint Research/Collaboration Program, Business Incubation)

Characteristics of ITRI's industrial innovation mechanism

- In order to spur industrial innovation, ITRI examines the domestic industrial development situation, and selects interconnected methods of industrial innovation in a timely fashion. The model can be called as "Adaptable Industrial Innovation Model"
- ITRI integrates government, academic, industry, and foreign resources to make the most of industrial innovation. Thus the ITRI model encourages the integration of the national innovation system.
- In the process of industrial innovation, ITRI takes a central position in technology development and commercialization. It has connections with all resources for national integrated innovation. The ITRI model therefore also manages national innovation resources.
- ITRI's role in the national innovation system is that of a bridge between academia and industry. Each sphere—academia, industry, government, and other research organizations—can take advantage of the various mechanisms of industrial innovation through ITRI. The present model thus places ITRI as the strategic operator of the entire national innovation system.

3. Turning Technology into Business Value

Some conceptual figures from SRI International

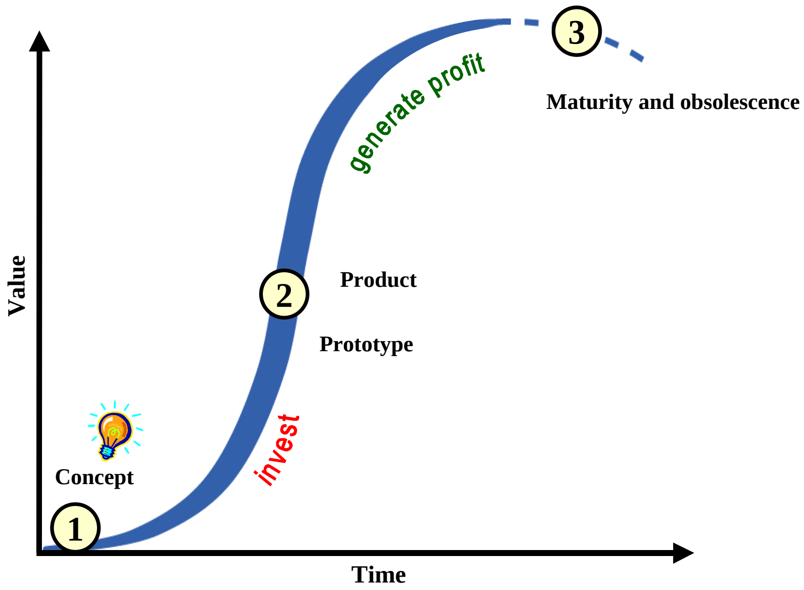


Fig 3 Product Life Cycle

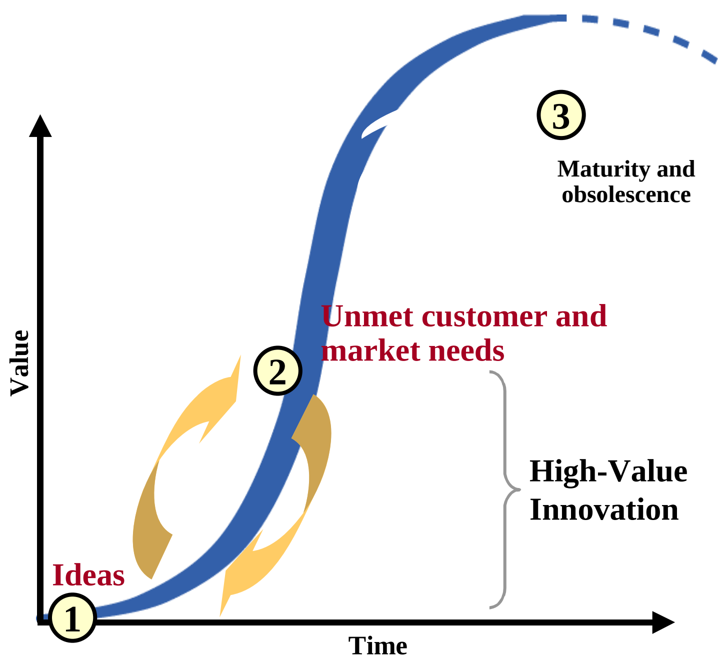


Fig 4 The Best Model (Market pull, technology-enabled)

3.1. Ways to cope with the “the Valley of Death”

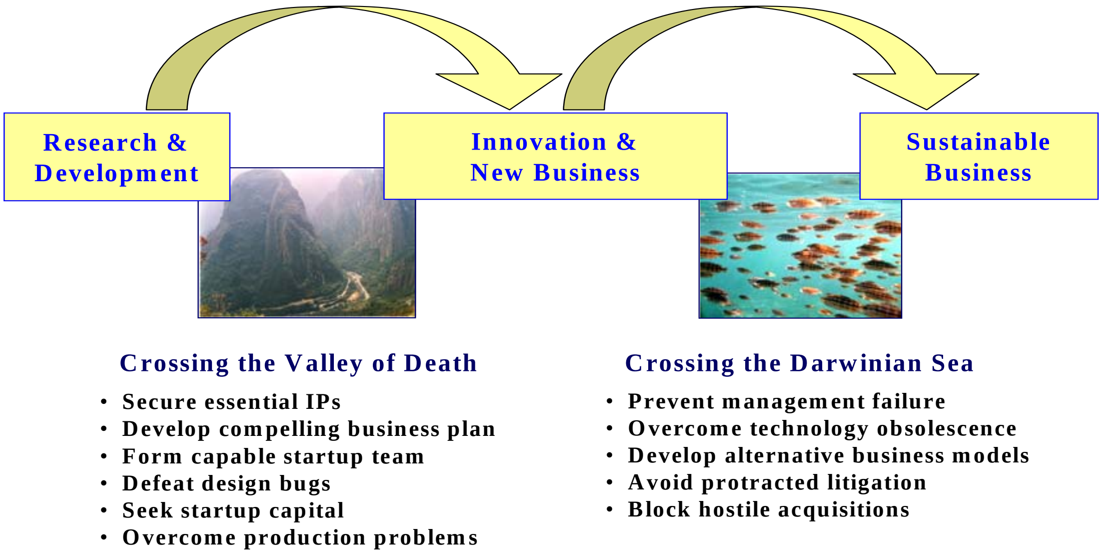


Fig 5 Two Gaps for Sustainable R&D

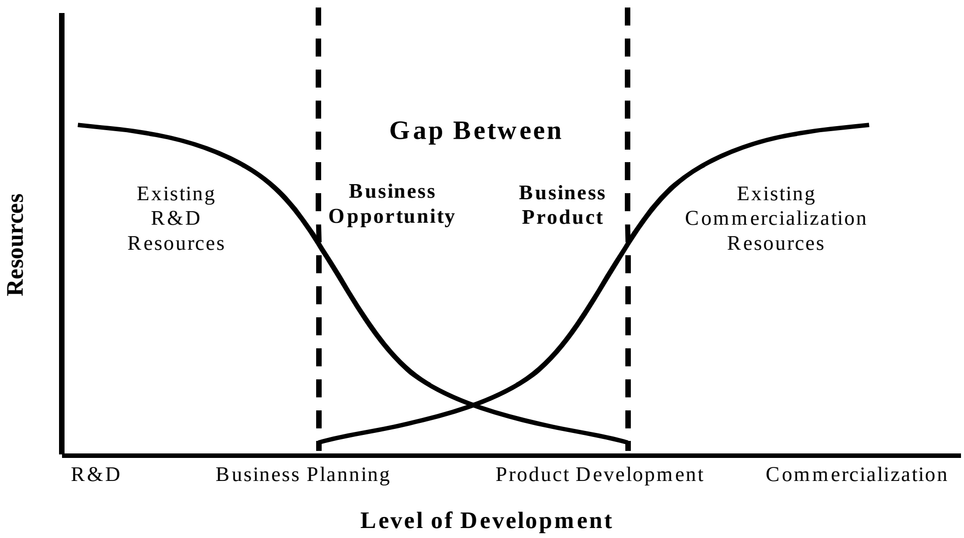


Fig 6 Valley of Death

- It takes two jumps from R&D activities to obtain a sustainable business.
- Many new ventures never cross over the Valley of Death.
  - 18 to 19 out of every 20 new products fail within a year
  - One out of every 5 to 10 ventures succeeds

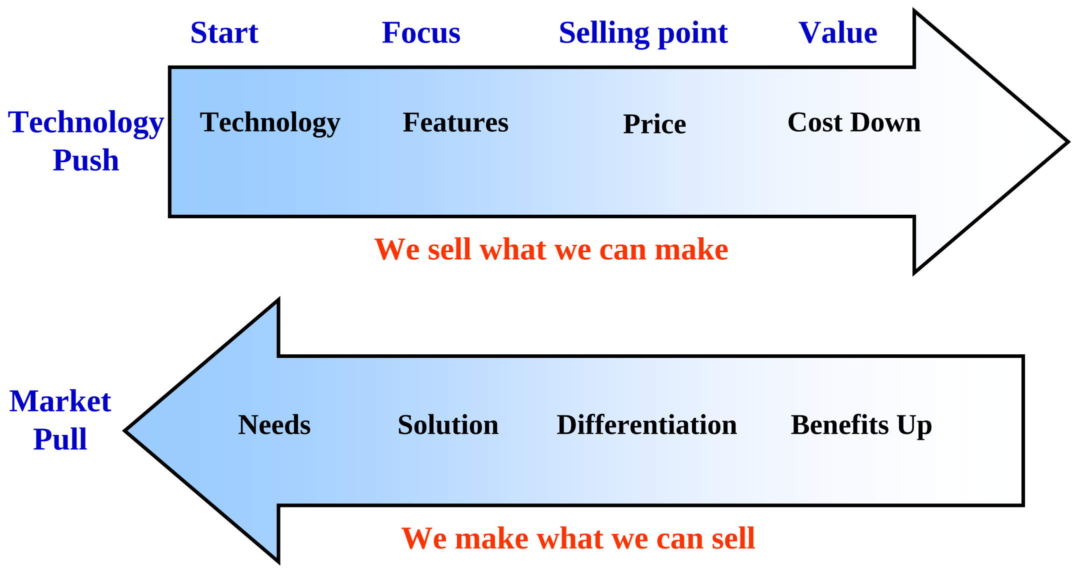


Fig 7 Technology Push vs. Market Pull

3.1.1. How to Choose the Right R&D Topic

Many of the new technologies currently being developed are in fact best suited to SMEs. Unlike their larger counterparts, SMEs can respond more effectively to the short-time-to-market, rapid innovation, flexibility and other characteristics of these new technologies.

Conducting R&D activities but without economic outcomes is a waste of a nation's valuable resources. The choice of a good topic accounts for more than fifty percent of the contribution to a successful R&D activity. One can never be too careful to choosing an R&D topic. Considerations for picking up R&D topics may include:

- Emphasize the further growth of both production volume and production value
- Appropriate technologies instead of high/new technologies
- Higher "Chain-effect" or "Derivable-effect" for the industry
- With development niche along the value chain of economic activities
- Budget/supporting system
- Balance between benefits and risks

- Apply "Red Ocean Strategy" and "Long Tail Theory"

■ **Red Ocean strategy**

- Compete in existing market space
- Beat the competition
- Exploit existing demand
- Align the whole system of a company's activities with its strategic choice of differentiation or low cost

■ **Blue Ocean Strategy**

- Create uncontested market space
- Make the competition irrelevant
- Create and capture new demand
- Break the value/cost trade-off
- Align the whole system of a company's activities in pursuit of differentiation and low cost

■ **The Long Tail Theory**

Σ of Long Tail ≧ Σ of Body

3.1.2. Team up

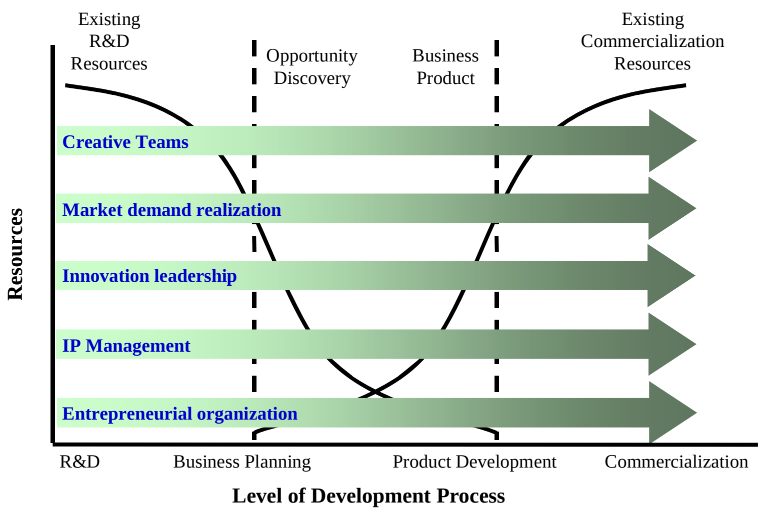


Fig 8 The Level of Development Process

Organizational capacities for crossing the Valley of Death

- Analyze the trend of industry and market; set the technology position and market strategy.
- Command the core technology of an organization; forecast the development of the technology.
- Plan R&D strategies with proper methods and paths for new technology and product development.
- Manage the intellectual property; create R&D value.
- Propose a feasible R&D project plan based on R&D strategies for new technology and product development.
- Analyze, compare, and evaluate proposed R&D plans to determine their feasibilities or select the best option.
- Implement action plans of R&D projects; monitor, manage and control the R&D resources and activities; ensure R&D projects go smoothly.
- Determine the value of R&D output; market and promote R&D output for sale.
- Make budgets for R&D projects; manage R&D expenses and revise budgets as necessary; keep R&D project budgets under control.
- Organize and manage R&D human resources; motivate the creativities of R&D staff; create the environment for R&D innovation.
- Design the structure of an R&D organization; build the performance management system and HR development.
- Coordinate interdepartmental R&D functions and projects; manage the interface of cooperation and communication.

3.1.3. Funding

Funding is almost everything to a Technology Collaboration activity. Only by proper funding planing, the collaboration can move forward on schedule. The sources of R&D funding may come from government subsidy, bank loan, paid-in capital, or venture fund.

One of the most complicated problems associated with funding of collaborative R&D is the allocation of patent rights. This allocation should be a complex determination controlled by laws, executive orders, regulations, and policies of related government agencies.

Measures of Financial Supporting for SMEs in Chinese Taipei

- SME Credit Guarantee Fund
- Culture and Creative Industry Loans

- Digital Content Loan
- Loans for Buildup of R&D Environment
- SME Innovation Research Award
- Business Start-up Award

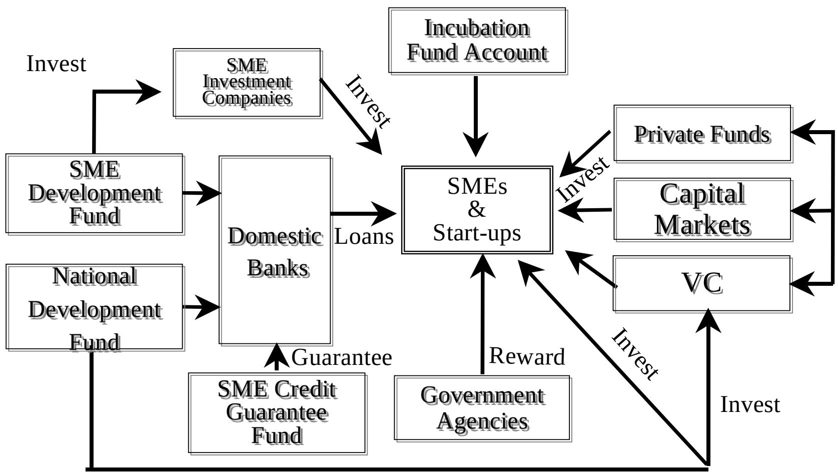


Fig 9 Chinese Taipei's Model of Government Policy for SMEs' R&D Funding

3.1.4. Leveraging outside resources

Obstacles of SMEs' long-term development may include

- Technology applications/Technologies for upgrading
- Capital
- Critical human resource for development
- Distribution channels
- e-applications (internet, computerized, ...)
- Market information
- Networking ability
- Core competencies
- Modern management
- Coping with threats from globalization trend

How to access to outside/overseas resources has turned out to be more and more critical for SMEs' development.

3.2. Suitable technology transfer models for SMEs in developing economies

An investigation by SRI International indicates that:

- 18 to 19 out of every 20 new products fail within a year
- One out of every 5 to 10 ventures succeeds
- 80% of new jobs come from new companies

Technology transfer models for SMEs in developing economies should possess several of the features below:

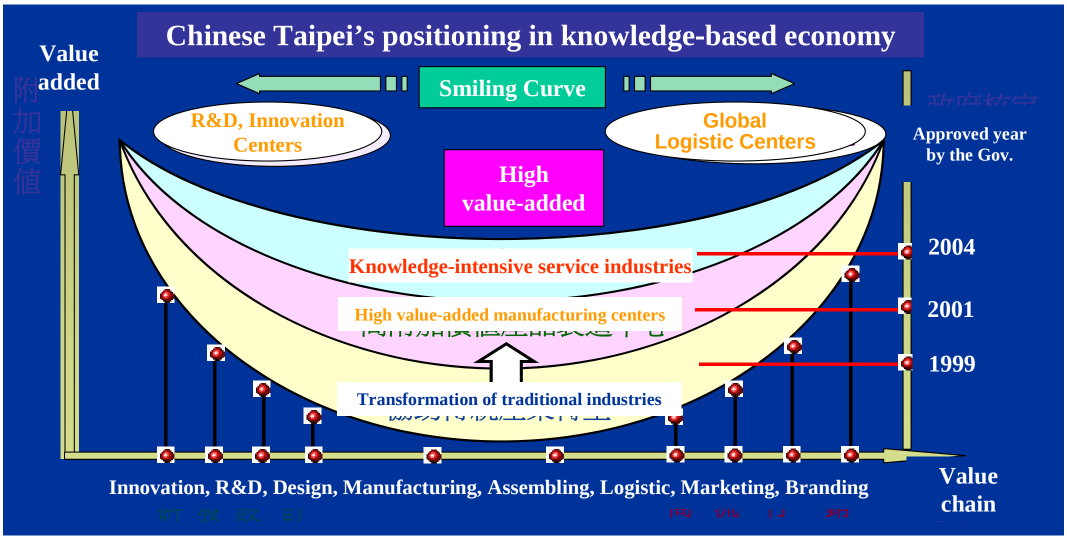
- Sufficient government support
- R&D alliance formed by local SMEs to receive technologies
- Start with easier tasks

4. How to Enhance SMEs' Technology Power: Government Policy and Firms' Practice

4.1. Identify a Country's Stand in Global Value Chain and Shift of the Smiling Curve

The purpose of SMEs' R&D activities is for products/services commercialization. The term "Value Chain" can just perfectly describe the whole process of R&D commercialization. Due to its shape, it has a nickname as "Smiling Curve." It is a full range of activities that firms and workers do to bring a product/service from its conception to its end use and beyond. It normally includes activities such as design, production, assembling, marketing, distribution and support to the end users. Activities comprising a value chain can be contained within a single firm or divided among different firms, and products/services can be contained within a single geographical location or spread over globally. The Value Chain has become much more prevalent and elaborate during the past two decades. In today's real world daily operations, firms and workers in widely separated locations affect one another more than they have in the past. Since firms and countries play their own roles based on competitive advantages, how to increase their competitiveness and occupy better positions of the value chain is often an important strategy in policy makers' minds. The Value Chain determines the roles of developed, developing, and underdeveloped countries in global stands of production. Players along the Value Chain normally include designer, material supplier, manufacturer, assembler, distributor, transporter, sales agent, buyer, and end consumer.

It is important for SMEs and policy makers to better understand how the Global Value Chain functions in specific case and to have some tools to help predict how they might change over time. Another issue they shall keep in mind is how to move toward both ends of the Value Chain through innovation and R&D efforts or by means of taking better positions in global distribution and branding. The other is how to shit up to a higher curve and make an aggregate advancement of industries.



By: Dr. Stan Shih, Chairman, Acer Group

Fig 10 Shift toward Both Ends of Smiling Curve

4.2. R&D Input as an Investment: Mission Oriented

SMEs are often facing many kinds of difficulties when they conduct in technology activities such as applying an existing technology to a new application, applying a new technology or business model to an existing application, improving an existing technology or product upon various aspects. Each activity consumes the limited, insufficient resources owned by SMEs. Therefore, how to leverage outside resources efficiently and turn that activity into business value has become a critical issue for SMEs. Among APEC members, many successful stories can be found and revised into learning materials.

For most SMEs, R&D is a costly activity with a purpose for a better future. Any R&D input should be treated like an investment. It takes qualified R&D managers and competencies to perform qualified R&D activities.

- Mission-oriented R&D project
  - Must be concrete from the beginning
  - Will be reviewed at a predetermined time
  - A targeted approach and a centralized formation is suitable

- Achievements are mainly evaluated by whether they meet the targets and in terms of durability, reliability and economic sense.
- Outcome of the project is evaluated by whether it has created new products or industries.

■ R&D Project Evaluation

- Can be classified into four types:
  - Ex-ante evaluation—be conducted before a project starts and its purpose is to select a project or projects
  - Interim-evaluation—be conducted after a project has started to judge whether revising a project plan is necessary and whether a project is worthwhile to continue
  - Ex-post evaluation — conducted at the end of a project to evaluate final achievements, to analyze factors of success and failure and to reflect evaluation results on project formation and project management henceforth
  - Follow-up evaluation—be conducted five to ten years after a project finishes.

The evaluation aims at clarifying the outcome of R&D projects in both economic and technological terms.

Table 4 Competencies of R&D Managers

Knowledge	Skill	Attitude
• Knowledge of industry • Market information • Technology forecast method • Technology evaluation method • Technology strategy • Patent knowledge • R&D human resource management • R&D human resource development • Organizational behavior • Organization design • Financial management • Project management	• Focusing on customers • Planning and execution • Enabling results • Enhancing performance • Focusing on quality • Managing Process • Building partnership • Resolving conflicts • Expressing and communication • Coaching and mentoring • Innovation • Enabling changes • Logic reasoning and analysis • Problem solving • Strategic thinking • Collecting information	• Achievement oriented • Committed • Relationship building • Team player • Team leadership • Influential • The awareness of organization • Proactive • Flexible • Self confident

Table 5 Overall Ranking of R&D Management Competencies

Difficulty from high to low		Importance from high to low	
Skill	Innovation	Attitude	Team player
Skill	Enabling change	Skill	Focusing on quality
Knowledge	Technology strategy	Skill	Innovation
Knowledge	Technology forecast method	Attitude	Team leadership
Skill	Strategic thinking	Attitude	Proactive
Skill	Enhancing performance	Skill	Problem solving
Attitude	Team leadership	Knowledge	Market information
Knowledge	Patent knowledge	Knowledge	Technology strategy
Knowledge	Technology evaluation method	Attitude	Self confident
Skill	Planning and execution	Skill	Planning and execution

4.3. The Direction of SME's R&D in Developing Economies

R&D activities in developing countries by nature are different from those in developed economies. Seeking for high-technology development can easily turned to be a castle in Spain. Knowing a nation's ability and position is the lesson one for its R&D activities.

Direction suggestion

- Focus on international instead of domestic market/technology source
- Select items with potential development niche
- Intensive resource input on few topics
- Solid fundamental works
- Learning by doing with advanced counterparts
- Localization

Planning for technology development

Step 1: Define core business

Table 6 Weighting Core Business Definition

The Best Description of Core Business	CB1	CB2	….	CBn	Average	Weight (100%)
The most affordable product/service						
More attractive product/service to customers than competitors' in the market						
The most profitable/satisfied product/service						
Best selling product/service						
Product/service that create the most stable income						
The most resource-consumption product/service						
Product/service that creates most derivable effect						
The fastest growing product/service						

Table 7 Distribution and Identification of Core Business

Product Line **The Best Description of Core Business**	**Weight (100%)**	**1**	**2**	**3**	**…..**	**n**
The most affordable product/service						
More attractive product/service to customers than competitors' in the market						
The most profitable/satisfied product/service						
Best selling product/service						
Product/service that create the most stable income						
The most resource-consumption product/service						
Product/service that creates most derivable effect						
The fastest growing product/service						

Step 2: Inventorying technology abilities for core business

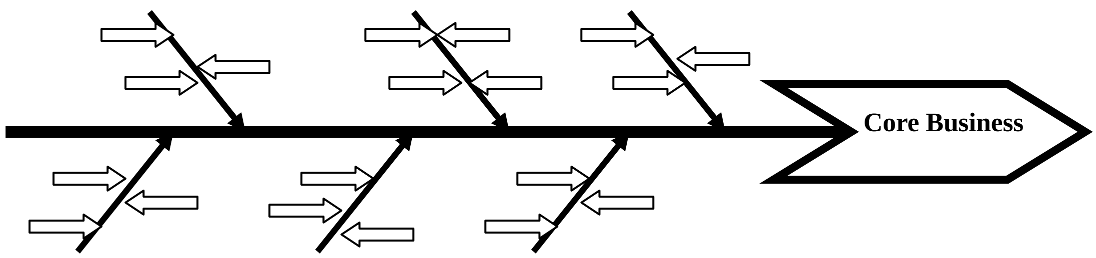


Fig 11 A Fishbone Chart for Technology Inventorying

Table 8 A Comprehensive Technology Intensive

Tech Layer 1	Tech Layer 2	Tech Layer 3	Technology owned	Competitors' Technology	Gap analysis	Possibility to enlarge the gap
Product 1	1.1	1.1.1				
		1.1.2				
	1.2	1.2.1				
Product 2	2.1					
	2.2	2.2.1				
		2.2.2				
…..						
Product n	3.1	3.1.1				
		3.1.2				

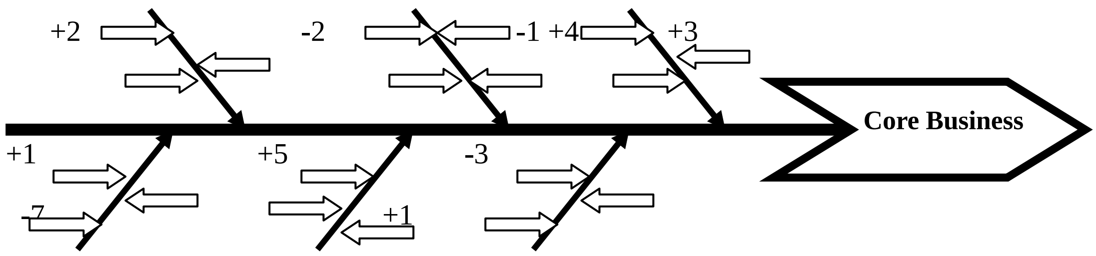


Fig 12 A Comprehensive Fishbone Char of Technology Gap

Table 9 A Sample of Product/Technology Comparison

Competitor	"CP" vision	Main Access gateway	Main Consumer devices	Main Differentiator Versus A Co.	Impact on A Co.'s Connected Planet
Panasonic	Consumers to enjoy whatever they want, whenever they want it, wherever they are	DVD++ Digital TV	Full range: Home Mobile Domestic Appliances	• Portable product portfolio • 1st phase focused on Connected Home and iTV only, not BB connection • SD technology • Focus on creation content	• Hard for Philips to differentiate its CP message to consumer • Panasonic can go to market with a broader portfolio
SONY	A world in which customers can enjoy content and share the content they create anytime and anywhere	PC TV Game Mobile	Full range: Home Mobile	• Cover whole chain • proprietary solutions • Broader (very complete) portfolio including content creation devices • Memory Stick technology	• Sony can go to market with a broader portfolio • On its own: they built own standards: not attractive for partnering
SAMSUNG	Lead the digital convergence revolution worldwide, providing "Digital Freedom" to all.	STB DVD?	Full range: Home Mobile Domestic Appliances	• Building aggressively digital portfolio • Aligning with Microsoft. • Similar level of connectivity as Panasonic (home first) • Memory Stick technology	• Philips seen as less innovative, flexible and open, as CE -> PC • Hard to differentiate CP message • Samsung can go to market with a broader portfolio
DELL	Delivering best customer experience, distribute content via home network to PCs, portable & CE prod	PC	Small range: Home Mobile	• Different (direct) business model • Competes on price (~15% cost advantage) • Not active on standardisation (Wait-and-see)	• Price pressure as Dell drive prices down fast
Microsoft	Software that helps people create & share digital memories & enjoy digital entertainment wherever they are	Media PC software Game Console	Small range: X-box	• Software stake in all product platforms, huge installed base • Healthy financial condition • Set standards • Game console (X-Box)	• Can not avoid working with MS (to some extent) • Microsoft will move aggressively into CE products

1

Step 3: Confirm important technologies

- **Items to check**
  - How important are those technologies?
  - Are our technologies better than competitors'?
  - Possibility and time needed to be reinforced
  - Be effective for how long?
  - Be utilized by other product/business of our company?

Step 4: Select core technologies and technologies to be reinforced most

Table 10 Core Technology Selection

	Core Business 1	Core Business 2	…….	Core Business M	Core Technology/ Technology needs to be reinforced most
Important Tech 1		3	1	3	7 = #2
Important Tech 2	1		1	2	4 = #4
…..	3		3	2	8 = #1
…..		2	2	1	5 = #3
…..	2		1		3 = #5
Important Tech n		1		1	2 = #6

Step 5: Technology development planning

Table 11 Core technology Development Plan

Item of Core Technology Index	1.1.1 XXX	1.1.2 YYY	1.1.3 ZZZ
Adaptable product/service			
Present technology standard			
Competitors' technology standard			
Competitor's technology standard in three to five years			
Our technology standard in three to five years			
Gap			
Accountability			
Resource input			

Table 12 Plan for Technologies to be Reinforced

Item of Technology to be reinforced Index	1.1.1 XXX	1.1.2 YYY	1.1.3 ZZZ
Adaptable product/service			
Present technology standard			
Competitors' technology standard			
Competitor's technology standard in three to five years			
Our technology standard in three to five years			
Channel to acquire			
Risk analysis			
Accountability			
Resource input			

Step 6: Establish a technology roadmap

Technology Roadmap is a form of technology planning which can aid SMEs in a competitive environment. Technology planning is needed to identify and develop the technologies required of the SMEs. Once these technology enhancements or new technologies are identified they can be developed internally or collaboratively with external partners. For both approaches technology roadmap can be used as a tool to plan and coordinate the set of activities involved in the processes.

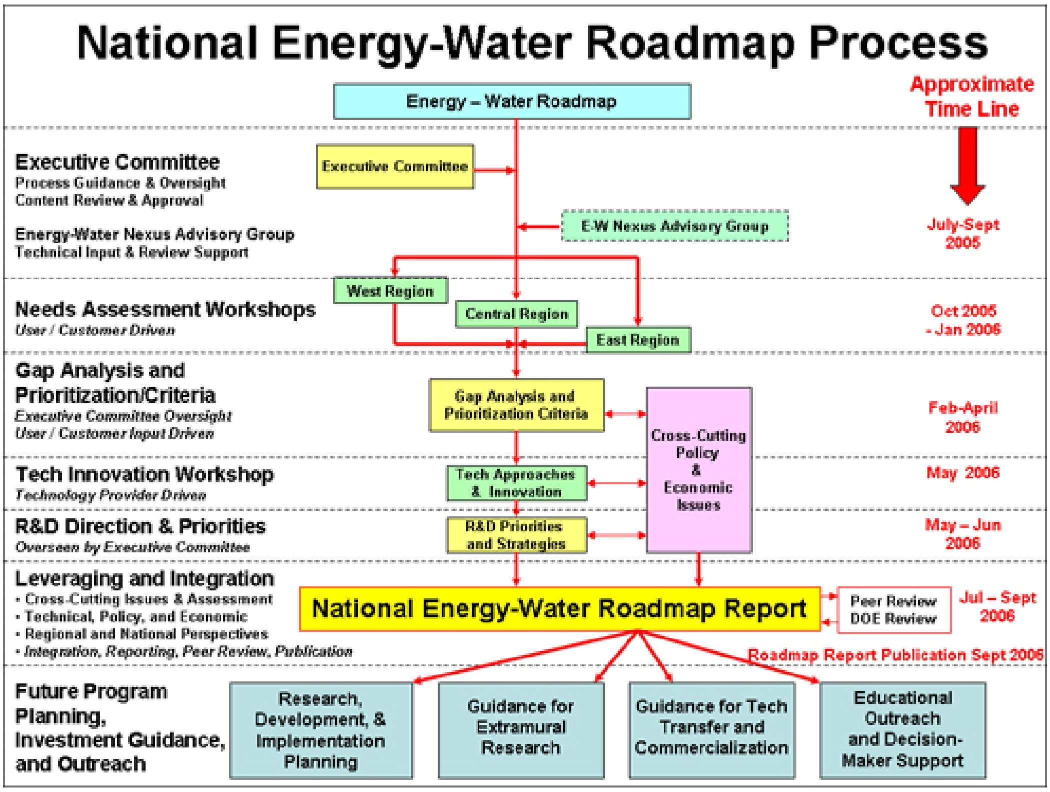


Fig 13 Sample of Technology Roadmap (A)

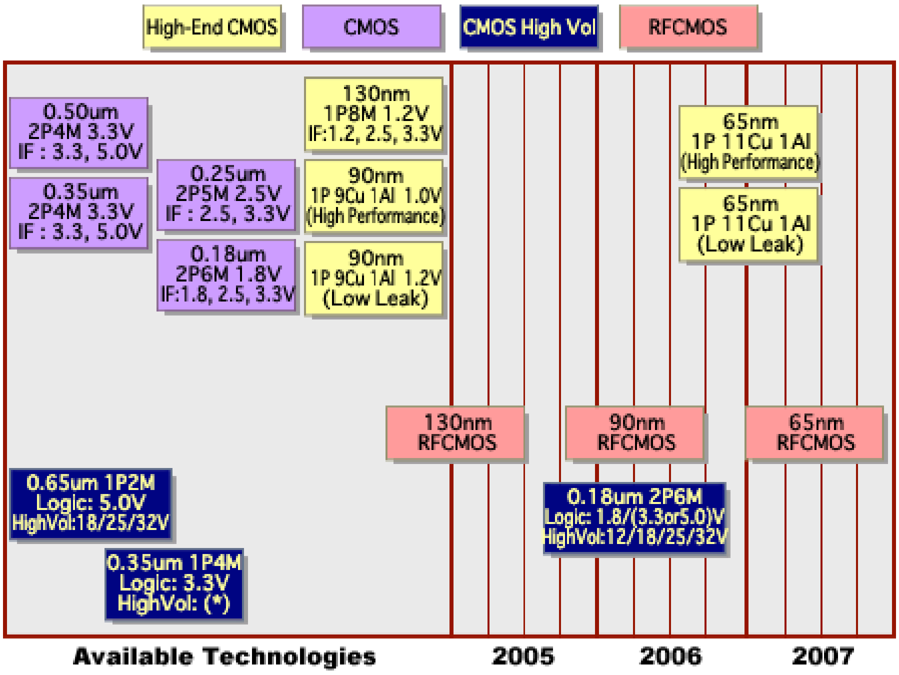


Fig 14 Sample of Technology Roadmap (B)

(Source: Sandia National Loboratories; Fujitsu Co.)

Technology-intensive SMEs often need to internationalize their activities, and especially sales, at a very early stage of their development because of the limited and global nature of the technological market niche which they have been set up to exploit. Many technology-based SMEs are engaged in a range of international networks and internationalization processes, including internationalization of markets, research collaboration, labor recruitment, ownership and facilities location. They reporting high levels of internationalization also differ significantly from which are more national-oriented, for example in terms of size, age, research intensity, university links, and innovation. Internationalization appears to be grounded or embedded in successful local networking and R&D collaboration.

Policy-making is always a complicated process. People who get involved are from different departments with different stands and propositions. The policy maker has to face the music and come up with a consensus through communications and integration.

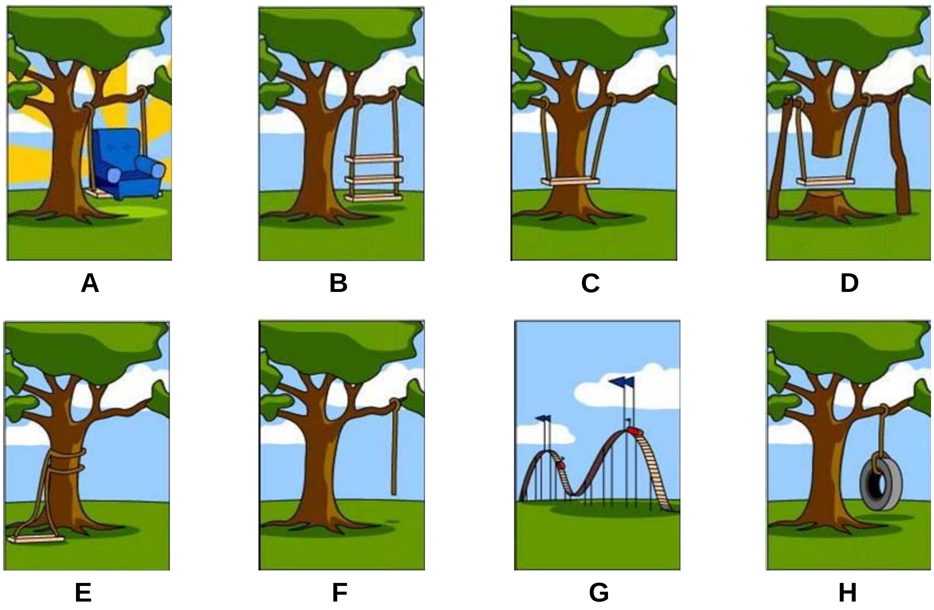


Fig 15 Communication & Integration for Different Opinions in Policy Making

“Technology push vs. Market pull” is a critical issue for R&D activities. Those who believe in “Technology push” tend to be with better science/technical backgrounds. They strongly believe that once a company can produce products/services with better performance, customers will buy the product/service. That is “good products are sold by themselves because of their high performance.” A typical practice is the famous “Moore’s Law” of IC industry. (Exponential Growth: 100% every 18 months)

On the other hand, people who believe in “Market Pull” tend to have better understanding of the market or sometimes less capable in technology development. They are demand-side believers. Which one is correct is subject to the situational changes.

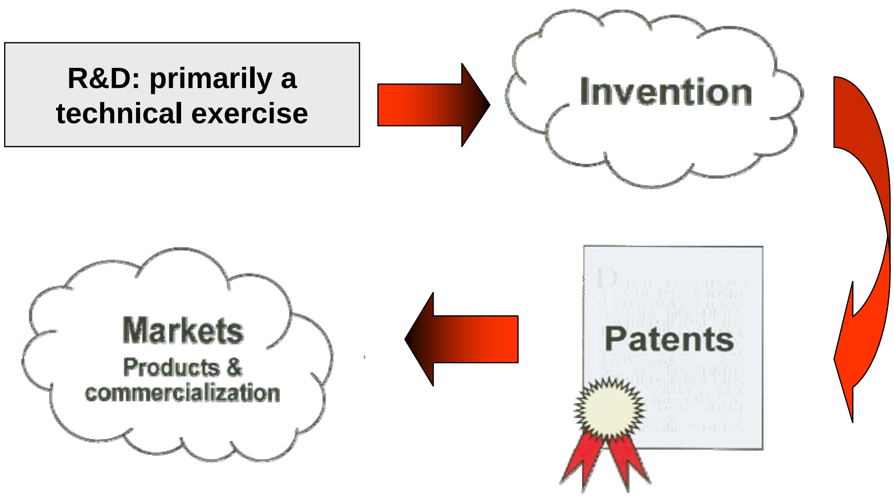


Fig 16 Technology Push Model

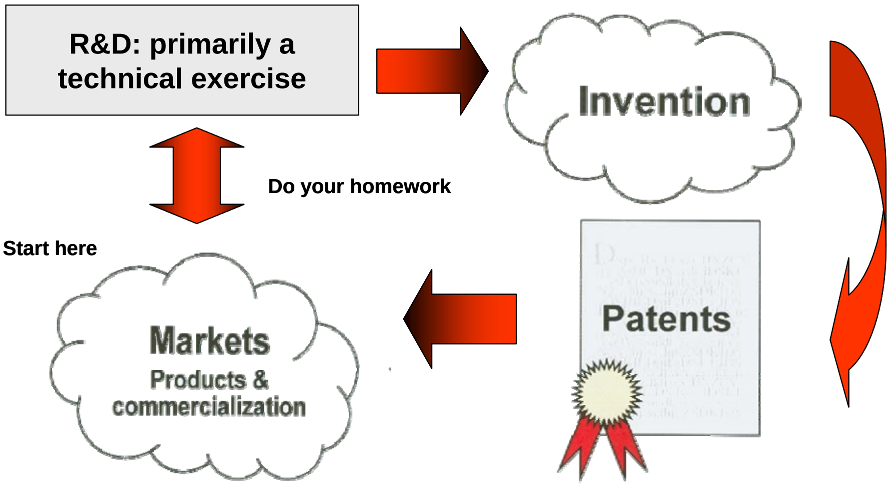


Fig 17 Market Pull Model (From SRI International)

The difference between Fig 13 and 14 is that: "Technology Pull believers" pay less attention to the linkage between R&D activities and markets. They just follow the pure technology development process and commercialize their R&D results into the market. On the other hand, those "Market Push believers" will notice the linkage between R&D activities and the market. They always start with the market surveys and do a lot of homework to make sure that their R&D activities are on the right track to meet the market needs.

4.4. R&D Alliances for SMEs

- A mutually beneficial formal relationship formed between two or more parties
- To pursue a set of agreed upon goals
- Remaining independent organizations
- To acquiring new knowledge is a goal by itself.
- All parties agree to combine their knowledge to create new technologies, products, or services
- For cost and risk reduction
- For the better use of aggregate resources
- Alliance among same or different industries
  - Vertical integration for raw materials, distribution channels
  - Horizontal integration to obtain stable business opportunities for each member
- Co-prosperity Sphere: each member is demander and supplier at the same time (heavily rely on information platforms)

4.5. Project Management for Each Party

- **SMEs**
  - Time to market
  - Stable and reliability of R&D results
  - Cost control
  - More sensitive to market/trend changes
  - Patent strategy
  - Business secret protection
  - Human resource development through the project
- **Academia/PRI**
  - R&D quality
  - Accumulation of R&D abilities
  - Paper/patent as objectives
  - Human resource turnover
- **Government**
  - Budget control (if any)
  - Expenditure status
  - Fairness
  - Project impact to the industry/economy

Table 13 Top Threes of R&D Management Tasks

Most difficult tasks	**1. Analyze the trend of industry and market**	**2. Command the core technology**	**3. Plan R&D strategies for new technology and product development.**
Most important tasks	**1. Analyze the trend of industry and market**	**2. Command the core technology**	**3. Manage the intellectual property**
Best performed tasks	**1. Analyze, compare, and evaluate proposed R&D plans**	**2. Propose a feasible R&D project plan**	**3. Implement action plans of R&D projects**
Worst performed tasks	**1. Analyze the trend of industry and market**	**2. Manage the intellectual property**	**3. Design the structure of an R&D organization**

Industry-academia-PRI collaboration:

Chinese Taipei's experiences as the case study/present

A brief introduction of SMEs in Taiwan

- Small & medium-sized new ventures of hi-tech industry have enjoyed prosperity during the past 10 years
- Arising sense of cooperation
- Moving toward service industry with technologies inside

Table 14 Current Status of SMEs

	All enterprises	SMEs	% of SMEs
No. of enterprises	1,253,694	1,226,095	97.80
Total employments (thousand persons)	9,942	7,648	76.93
No. of employees (thousand persons)	7.336	5,047	68.80
Total Sales (NT$ million) (US$ million)	33,941,857 (1,033,238)	10,000,220 (304,421)	29.46
Domestic Sales (NT$ million) (US$ million)	25,310,936 (770,500)	8,481,397 (258,186)	33.51
Export Sales (NT$ million) (US$ million)	8,630,921 (262,737)	1.518,823 (46,235)	17.60

(Source: White Paper on Small and Medium Enterprises in Taiwan, 2006)

Table 15 Enterprises Ages

units: no. of enterprises

Age	2002	2003	2004	2005	2006		
					Total enterprises	SMEs	% of SMEs
Less than 1 year	91,435	112,154	108,610	125,667	108,673	108,320	8.71
1 – 2 years	94,036	104,183	110,649	108,989	121,466	120,530	9.69
2 – 3 years	77,477	82,234	87,612	96,365	92,503	91,400	7.35
3- 4 years	70,554	69,545	70,895	79,583	84,648	83,272	6.69
4- 5 years	63,851	64,843	61,321	65,055	71,610	70,133	5.64
5- 10 years	233,742	248,300	245,280	249,414	253,746	247,247	19.87
10- 20 years	279,065	283,225	287,444	298,662	299,282	290,121	23.32
Over 20 years	194,546	207,296	218,365	229,959	240,580	233,076	18.73
Total	1,104,706	1,171,780	1,190,176	1,253,694	1,272,508	1,244,099	100

(Source: Collected from Ministry of Finance Tax Data Center Business Tax statistics.)

Eleven guidance programs to assist SMEs

- Finance and Credit Guidance System
- Management Guidance System
- Production Technology Guidance System
- Research & Development Guidance System
- Information Management Guidance System
- Industrial Safety Guidance System
- Pollution Control Guidance System
- Marketing Guidance System
- Mutual Support & Cooperation Guidance System
- Quality Enhancement Guidance System
- Business Startup & Incubation Guidance System

Policies for fostering SMEs and new startups

Philosophy – Service, Minding, Esteem, Awareness

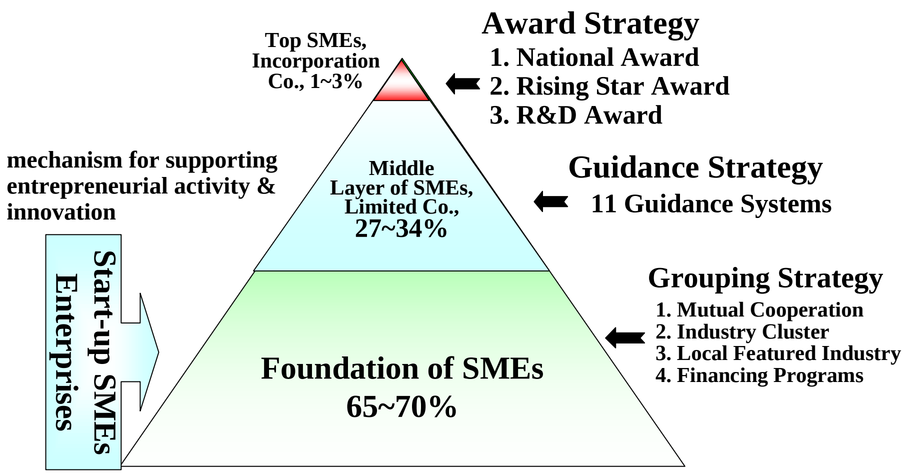


Fig 18 Policies for fostering SMEs and new startups

(Source: SMEA, MOEA, Chinese Taipei)

4.6. Government Policy Tools to Encourage Technology Collaboration among SMEs, Universities, and Research Institutes

Stipulate science and technology basic law

- Taiwan stipulated the Science and Technology Basic Law in 1999.
- Due to the enactment of this law, institutes or personnel who produce valuable outcomes in a government-funded research can retain the ownership and therefore enjoy the benefit generated from it.
- This will encourage universities to attend government-sponsoring industry-university collaboration programs.

R&D programs for industry-university collaboration

- The government launched in 1992 a project to encourage the industrial and academic sectors to jointly form a research team to conduct R&D of innovative technologies.
- The project provides each approved case with R&D fund between 155 and 310 thousand US dollars, and the participating enterprises need to pay for 25% of total research cost.
- In addition to this general project, another project targeting on SMEs has been launched in 2002. This project is aiming to enhance the SMEs' R&D capabilities through practically involving in a R&D project with universities. Both projects require enterprises' involvement in the research.

Industry-academia-government collaboration and incubation value-added project

- Goal
  - To establish Innovative Core SMEs with Global Competitiveness
  - Industries are lead toward an economic development breakthrough.
- Objectives
  - To build up a friendly environment for start-ups and to take root in sustainable development
  - Constructing R&D service and local incubation supporting network, in order to boost up capability of incubation center
  - Enhancing Industry-Academia-Government collaboration to strengthen its influence and support start-ups
  - Incubating 800 start-ups within 2008~2011.

- Project Structure

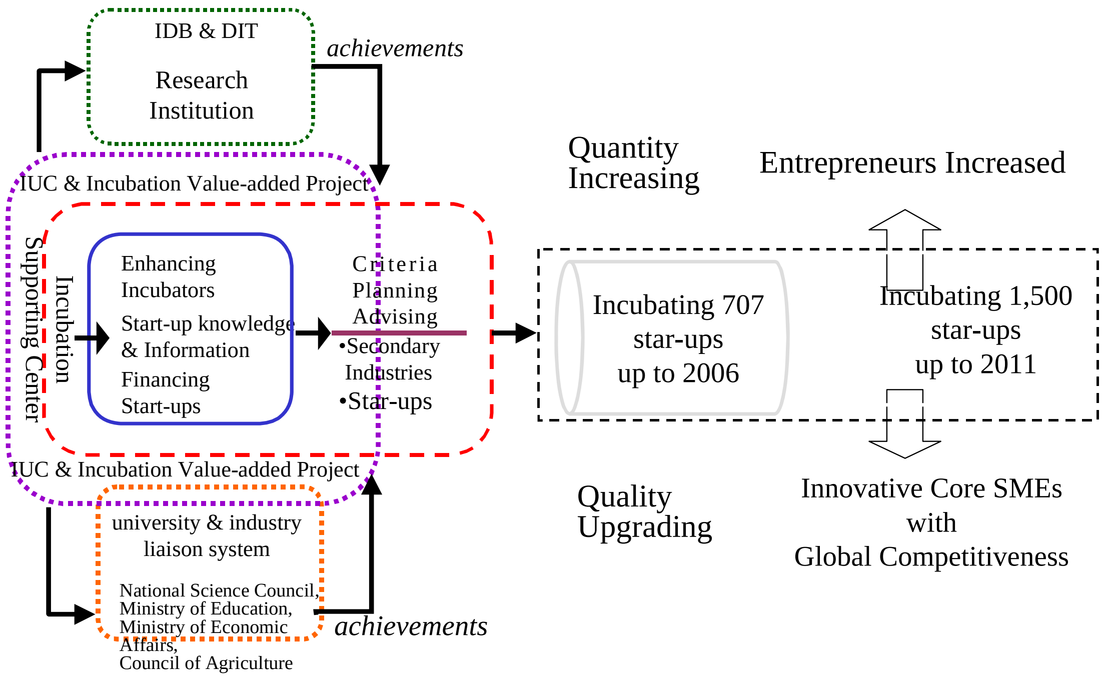


Fig 19 Project Structure

(Source: SMEA, MOEA, Chinese Taipei)

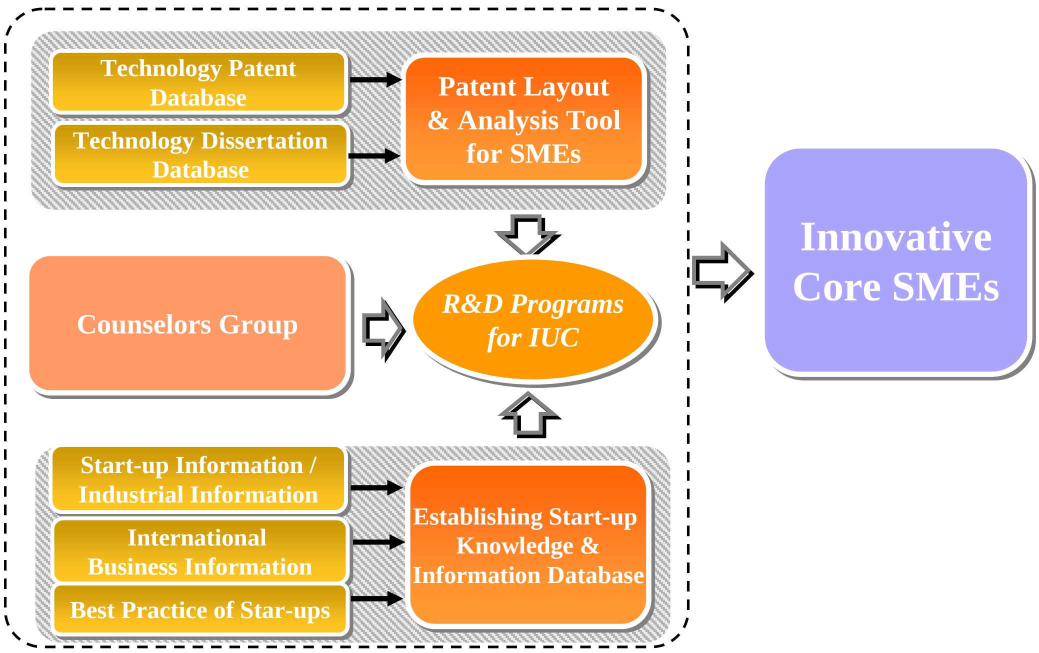


Fig 20 R&D Programs for Industry-University Collaboration

(Source: SMEA, MOEA, Chinese Taipei)

Business incubation service

- Ninety eight Business Incubators , over 85% of which were located in universities
- One of the main functions of Business Incubators is to be an important channel for industry-university collaboration. Through strengthening the interactions between the two parties, the technological level of SMEs can be enhanced.
- Locating incubators in universities will help release the resources of universities to industry, and therefore assist SMEs in innovation.
- Business Incubators in Taiwan have become an important platform for cross-industry collaboration within the national innovation system.
- Functions
  - To reduce risks and expenses of investment and increase successful rate of start-up enterprises
  - To foster new products, new business-model and new technology
  - To provide guidance in commercializing R&D achievements
  - To provide a location for cooperation of academia and industries
  - To provide testing services and speed up the development of products
  - To provide training courses, information and consultation

Incubation supporting center

An incubation supporting center should have complete facilities, experts, technology and business incubating system; and should be capable of integrating multiple resources to lead and to support star-ups in a geographical area. It could stimulate business activities and expand global market.

Four to six incubation supporting centers of green industry, local cultural industry, woman entrepreneurship and global marketing will be established during 2008~2011, and planned in advance in 2007.

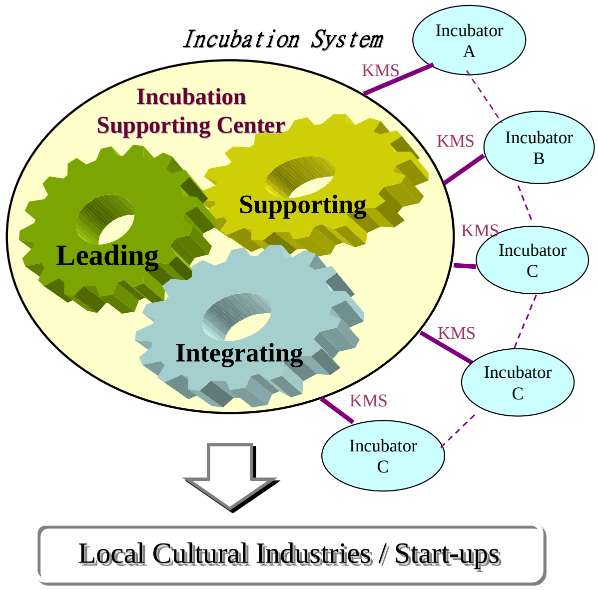


Fig 21 Incubation System

(Source: SMEA, MOEA, Chinese Taipei)

Small Business Innovation & Research Projects

- US$60 million for 1,200 projects (Jan.-June, 2007)

Strategic R&D Alliances for SMEs & Big Enterprises

- A practice of Flying Geese Theory
- US$625k for each alliance

Innovation & Research Promotion Projects for Local Industries

- County/City-based
- US$2 million in 2007, will enlarge project scale in 2008

The manufacturing sector has been the key driving force for Chinese Taipei's economic development. Over the past 50 years, the government and the private sector have been working together to continuously enhance industrial competitiveness and to achieve steady economic growth. As a result of these efforts, Chinese Taipei has become the global center for IC foundry services as well as a manufacturing powerhouse for many high-tech products. In response to the keen competition in the world market stemming from globalization, one of the most significant efforts of what the government has made is to enhance SMEs' competitiveness through the promotion of technology collaboration. It is hoped that industries will continuously develop and strengthen their position in "high value-added" production and services.

4.7. ITRI's Collaboration Program of OpenLab

A dual mechanism for technology collaboration

Over the past eleven years, ITRI's work to help enterprises engage in innovative R&D and assist new start-up companies through its Open Laboratory (OpenLab), which can be divided into Technological Business Incubator and Collaboration Program, has created a healthy environment for creation and innovation. ITRI OpenLab has proved to be a very successful experiment, greatly benefiting the development if Chinese Taipei's SMEs.

In ITRI's main Campus and southern branch, the staff of resident OpenLab companies interacts frequently with ITRIers. As many as 700 to 800 ITRI employees take advantage of business lunches with their industry counterparts to engage in idea- and opinion-exchanges each day. Through such close, interactive relationships, ITRI, is creating synergy between itself and product-oriented resident companies in the OpenLab.

ITRI's cooperation model is tighter than any other research organization and Business Incubator around the island. ITRI's overall environment is more conducive to generating high levels of trust between resident companies and their international cooperation partners.

Since most SMEs are with limited internal resources, ITRI OPenLab provides companies with the support they need most such as industry information, technical transfer services, and industry assistance for obtaining government-led funding and reward projects, and general industry consultancy services. These are combined with outside resources such as finance, venture capital, accounting, intellectual property, legal, equipment leasing and other services to provide resident companies with all the services and assistance they require. This has created a comprehensive 'total solution/one-stop shopping' environment.

To help Taiwan's SMEs compete on an international scale, ITRI is actively encouraging firms to develop various new technologies by means of strategic alliances.

ITRI's research work and the entrepreneurial environment created through its principle of total asset management have created an important hub for the agglomeration of talent. Thus, ITRI's abundant experience and boundless energy in R&D, industrial relations, patents, contracts, legal issues, company start-up assistance, and other areas make it the best possible partner for providing research and entrepreneurial teams with the most effective assistance.

4.8. Lessons Learned

Through years of hard work, the R&D collaboration program has enlarged the opportunities for domestic SMEs to perform innovative research and development, being able to solve problems such as too small a scale and a shortage of development ability. On the other hand, R&D collaborations can stimulate mutual integration across the upstream, midstream and downstream industrial sectors to come up with new products or services, and help the industrial structure of Chinese Taipei based on manufacturing to gradually change itself into a structure centered on high value-added manufacturing. Additionally, the R&D collaboration program has stimulated research and development across different industries, and will effectively improve the industrial competitiveness of our country.

- Engaging in technological research was not enough. Being able to transform research results into a new venture is the true measure of a new technology's real merit. Although new technologies and enterprises are subject to greater levels of risk in the early stages of their development, they are also open to greater opportunities.
- Government policies should follow an open and competitive market mechanism.
- Basic principles for industrial development:
  - Strong market potential
  - Close interrelations among industries
  - High value-added
  - Appropriate technology
  - Low pollution, and low reliance on energy

5. Discussion

- **What kinds of knowledge, skill, and attitude are required in technology collaboration?**
- **Tips for project management**
- **Inventorying key factors owned to success**

6. Conclusion

The key to the success of SMEs-academia-PRI technology Collaboration is to construct the "nodes" linking the three parties. The government may catalyze and provide the cooperative incentives for each party. According to Chinese Taipei's experience, the ways in which government can adopt may include:

- Helping the academia to build Business Incubators, Technology Transfer Centers, and Regional Collaboration Centers as main intermediary mechanisms to promote Technology Collaboration
- Launching vital projects to sponsor the joint research among SMEs, academia, and PRI
- Bettering human resource development by encouraging academia to offer technology/management training courses to SMEs' personnel
- Establishing talent database including the researchers from the industry, academia, research organizations, and overseas.

How to encourage the academia to participate proactively is the most important part to pursue SMEs-academia-PRI Technology Collaboration. Adequate incentive should be provided and some institutional reconstruction or even cultural changes are also necessary.

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Chapter 3. Business Incubation

Rern-jier Sheu[1]

Since the world's first business incubator, the Batavia Industrial Center opened in 1959, the establishment of business incubators is now a common policy among APEC member countries and economic entities. With the purpose to increase the success rate of incubates, business incubators are where individuals or businesses receive assistance to develop and commercialize new products, new technologies, or even new services. Some incubators also help existing firms to enhance their chances of success.

The achievement of Chinese-Taipei's SMEs has been the object of intensive study in other countries. Active participation in the meetings and activities of international economic and trade organizations by both the government and the private sector provides opportunities to share experiences and learn from each other in SME development among countries and economic entities. Chinese-Taipei is ready to share its incubation experiences with other APEC members.

Developed with input from experienced professionals, the course will provide a real-world view into the best practices of incubator establishment and management. Participants will develop skills and gather tools to enhance the success of their incubator policy-making and management.

1. Introduction

1.1. Preface

SMEs have been responsible for creating wealth and jobs worldwide. Globally at the moment, Business Incubators are growing in numbers. Incubator programs have been established in many countries to stimulate creation of technology-oriented and business model-innovated SMEs. They have been shown to reduce the failure rate of SMEs by providing training and guidance to such companies in their initial stages. Businesses being incubated today are at the forefront of developing new technologies/business models, and are producing new products and services to create economic value. Among them, high-technology new ventures have been particularly successfully incubated in APEC members such as the U.S.A., Korea, and Chinese Taipei.

A Business Incubator (BI) is a place where individuals or enterprises nourish their new products, new businesses and new technologies, and engage in enterprise transformation and upgrade. Its aim is to create a better cultivation environment for new enterprises. Therefore, BIs provide SMEs many kinds of integrated services needed for entrepreneurship and innovations. These services include experimental facilities at pilot stage, operation space, technical support, administrative assistance, business services, fund raising service, and other assistance for businesses to make innovations and growth. It aims to help new ventures to survive from the fragile infancy. During the past fifty years, the achievements of Business

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Incubators in helping new ventures have won credits far and wide.

As an engine to drive technological innovation and economic development, high-tech ventures are attracting much more public attention in most APEC member countries. Fostering entrepreneurship and promoting venture creation have become important public issues.

Since incubators' main functions are to foster new technologies and start-ups, they play a critical role in innovation and technological upgrades. In the United States, SMEs have been responsible for half of all innovation and 95% of all radical innovation. But in most cases of the rest of APEC members, SMEs do not have enough capability to conduct successful innovation although they account for the absolute majority of firm number. So how to provide a comprehensive and practical overview of the tasks and responsibilities of incubator management from a government's point of view is critical.

The aim of this course intends to highlight the critical role of incubation industry on the development of the innovation system and, vice versa, the importance of the innovation system for breeding the particular environment for successful incubator network, together contributing a nation's prosperity.

Why this program?

After the training course, trainees are expected to:

- Develop an international perspective for business incubation
- Identify key factors that can turn business incubation mechanism into a more effective tool
- Increase the ability of incubator management both at macro and micro levels
- Steer related business incubation policies in the right direction to meet the needs of national economy development
- Establish friendship as the step stone for further cooperation among trainees

Expected benefits

Trainees will gain practical knowledge to help them:

- Have a clear picture for related policy-making
- Build stronger government, incubator management, and stakeholder relationships
- Provide better coaching to business incubator management
- Help government to bettering resources allocation
- Establish effective projects for business incubator development
- Increase incubators' impact in the country

- Build up an international networking for both incubator management and policy-making

Networking among BIs will be helpful in accelerating growth of managerial abilities and incubatees across country borders. Incubators may be clustered in virtual or physical space, and make better use of resources. It also may provide a good opportunity for the management team of APEC member incubators to further develop skills and knowledge at global best practice levels.

A check list of your needs

Please fill in questions:

1. Did you ever involve in the management/policy making of Business Incubators?

☐ Yes ☐ No

2. How many Business Incubators do you have in your country?

☐ None ☐ Less than 10 ☐ 10~50 ☐ 51~100 ☐ More than 100

(If your answer is "None," please stop answering the following questions.)

3. Your first Business Incubator has been established for

☐ Less than 5 years ☐ 6 to 10 years ☐ More than 10 years

4. The main objective of Business Incubators in your country is

☐ To promote national economy development

☐ To promote local/community economy development

☐ Both

5. The major purpose of most of Business Incubators in your country is (multiple choices)

☐ To increase employment (quantity/quality)

☐ To encourage entrepreneurship

☐ Technology commercialization

☐ New business model development

☐ As test beds for new policies/regulations

6. Legal entities of the majority of your Business Incubators are

☐ Public/State own

☐ Universities/colleges

☐ Not-for-profit organizations

☐ Profit-seeking companies

7. Your evaluation on the performance of your domestic Business Incubators in general is

☐ Need much to be improved

☐ Need to be improved

☐ Fair

☐ Good to excellent

8. Key success factors or major problems of your Business Incubators are:

(Please identify three factors/problems.)

2. Related Theories, International Major Incubators & Policies at a Glance

2.1. What are "Business Incubators"?

When Joseph L. Mancuso started the first U.S. Business Incubator in the small upstate New York community of Batavia in 1958, the concept of business incubators has spread around the world. In nowadays, at least 4,000 Business Incubators have been established around the world. The term "Business Incubator" has become a popular tool for economic development in most countries.

Listed below are some definitions about them.

A Business Incubator can be defined as a controlled work environment designed to foster the growth of new and emerging companies. *(NBIA, 1998)*

The Business Incubator is a physical space or facility that accommodates a business incubation process.

Business Incubation Process is a public and/or private, entrepreneurial, economic and social development process designed to nurture business ideas and start-up companies, through a comprehensive business support program, help them establish and accelerate their growth and success.

The Business Incubation Environment is the wider context which should be conducive to the sustainable nurturing of growth potential and the development of enterprises. *(Mr. Heinz Fiedler, President of SPICE Group, Germany)*

Business Incubators are organizations that support the entrepreneurial process, helping to increase survival/success rates for innovative startup companies or new businesses for existing companies. Entrepreneurs with feasible projects are selected and admitted into the incubators, where they are served by a specialized package of support resources and services.

A Business Incubation Program is an economic and social development process designed to advise potential start-up companies and, through a comprehensive business assistance program, help them establish and accelerate their growth and success. The main goal is to produce successful businesses that will leave the program, in a timely manner, financially viable and freestanding. These graduates create jobs, revitalize communities, commercialize new technologies and create wealth for local and national economies. Critical to the success of a Business Incubation Program is:

- Management that develops and orchestrates business, marketing and management resources and relationships tailored to the needs of the business clients
- Shared services, training, technology support and equipment
- Selection of clients and acceleration process by which businesses become more independent and progress to graduation
- Assistance in obtaining the financing necessary for business growth
- Business Incubation Programs gain added value by providing access to appropriate rental space and flexible leases in an incubator facility.

(The comprehensive definition adopted by the International Summit in Richmond, USA, May 2003)

Resources and services for incubatees may include some diverse items such as provision of physical space (offices, labs, pilot run facilities), management coaching, help in preparing effective business plans, administrative services, technical/technological support, business networking, intellectual property aids, and finding financial source.

A successful Business Incubator shall be based on the integration and synergy by combining human, entrepreneurial components with economic potential and innovative approaches. *(Mr. Heinz Fiedler)*

Concluded from previous successful cases, benefits that result from business incubators may include:

- Local/national promotion of economy
- Creation of job, wealth, intellectual property
- Technology commercialization
- Smoother transition of research results of academia and research institutes to new companies
- Increased international competitiveness and etc.

Table 1 A Comparison of Similar Terms

Type	Physical Scale	Main Function
Business Incubator	From a single building to a	To promote the development of new ventures

	campus Small (some are in virtual style)	
Innovation Center	Small to medium	Technology/new business model development
Research Park	Medium	Technology development Some with incubation function
Science Park	Medium to big	Mass production with high-tech inside Some with incubation function One of the next stop for incubator graduates
Industrial Zone	Big	Mass production, most are non-high-tech One of the next stop for incubator graduates
Technopolis	A town/city	To promote the overall development of a town or city mainly with technological ingredients

Major incubators in the world

Randall M. Whaley Incubator of the Year by National Business Incubation Association (N.B.I.A.) is the highest award for global top incubators with excellent performance. Since 1996, N.B.I.A. established “Incubator of the Year” award beside “Randall M. Whaley Award” to encourage the rest of top incubators. Listed below are those awarded incubators since 1991.

(Incubators with (A) are winners of “Randall M. Whaley Awars”, and (B) for “Incubator of the Year” winners.)

- 1991: Colorado Venture Centers Inc. (formerly Business & Innovation Center) Golden, Colo., USA (A)
- 1992: GENESIS Technology Incubator, (formerly GENESIS Business Incubator), Fayetteville, Ark. USA (A)
- 1993: Brush Creek Enterprise Center (formerly Center for Business Innovation), Kansas City, Mo., USA (A)
- 1994: Austin Technology Incubator, Austin, Tex., USA (A)
- 1995: Rennselaer Polytechnic Institute Incubator Program, Troy, N.Y., USA (A)
- 1996: Advanced Technology Development Center, Atlanta, Ga., USA (A)

  Western Colorado Business Development Center, Grand Junction, Colo., USA (B)

  Omaha Small Business Network, (formerly Omaha Business and Technology Center) Omaha, Neb., USA (B)

- 1997: Technology Innovation Center, (formerly Evanston Business & Technology Center) Evanston, Ill., USA (A)

  Chattanooga/Hamilton Co. Business Development Center Chattanooga, Tenn., USA (B)

  San Francisco Renaissance Entrepreneurship Center, San Francisco, Calif.,USA (B)

- 1998: The Technology & Enterprise Center, Richland, Wash., USA (A)

  Colorado Technology Incubator (formerly Boulder Technology Incubator), Boulder, Colo. USA (B)

  The Denver Enterprise Center, Denver, Colo., USA (B)

- 1999: Entergy Arts Business Center, New Orleans, La., USA (A)

  The Enterprise Center, Philadelphia, Pa., USA (B)

  The Edison Technology Incubator/BioEnterprise, Cleveland, Ohio, USA (B)

- 2000: Software Business Cluster, San Jose, Calif., USA (A)

  Entrepreneurial Center Inc., Birmingham, Ala. USA (B)

- 2001: Ben Franklin Business Incubator Center, Bethlehem, Pa., USA (A)

  CREEDA Business Centres, Canberra, Australia (B)

- 2002: Quebec Biotechnology Innovation Centre, Laval, Quebec, Canada (A)

  Northern Alberta Business Incubator, St. Albert, Alberta, Canada (B)

- 2003: The Business Technology Center, Columbus, Ohio, USA (A)

  Toronto Business Development Centre, Toronto, Ontario, Canada (B)

- 2004: The New Century Venture Center, Roanoke, Va., USA (A)

  University of Central Florida Technology Incubator, Orlando, Fla., USA (B)

- 2005: The Louisiana Business & Technology Center, Baton Rouge, La., USA (A)

  The William M. Factory Small Business Incubator, Tacoma, Wash., USA (B)

- 2006: Industrial Technology Research Institute Incubator Center, Hsinchu, Tawain (A)

  Fulton-Carroll Center of the Industrial Council of Nearwest Chicago, Chicago, Ill., USA (B)

Besides the incubators listed above, there are many other famous incubators locate in China, Korea, Japan, and Europe. Some of them are namely as:

- China: Tsinghua Science Park/Incubator, Shanghai Technology Innovation Center /International Business Incubator, Beijing Zhongguancun Science Park/Incubator, Hong Kong Science and Technology Parks Corporation

- France: Sophia Antipolis

- Germany: Dortmund Technology Park, Technology Centrum Chemnitz (TCC)

- Japan: Kanagawa Science Park, Kyoto Research Park, Tsukuba Center, Kitakyushu Techno Park

- Korea: TBI at KAIST, Techno Parks in Daegu, Chungnam, Gwangju, Gyeonggi, Kyongbuk, Pohang, Pusan, and Gyenggi SME Center
- Malaysia: Multimedia Development Corporation, Kulim Technology Park Corporation
- Singapore: Nanyang Technological University
- The U.K.: Cambridge Research Park, MerseyBIO, Loughborough Innovation Centre

Business Incubators in Chinese Taipei

The business incubator catalyzes the processes of starting and growing companies. Primary goal of the business incubator in Chinese Taipei is to promote the development of technology-based firms, which are mainly, located near universities and science and technology parks. At the end of August 2007, there are totally ninety-eight incubators in Chinese Taipei.

Policies trends

■ **USA**

The incubator policy becomes one of the most powerful tools in the promotion of job opportunities and also improving regional economic development of the United States. Recently, a significant change in its incubator industry is that the industry now helps provide entrepreneurs with a variety of business support services such as complete business training plans, production flow support, product design and development, financial management, human resources management, etc.

Incubators provide business-training courses in a wide variety including corporate marketing strategies to the location of potential investors. They promote and provide opportunities for entrepreneurs, managers and local industry leaders to interact with one another. They also help start-ups from experienced consulting teams to overcome market entrance barriers. Another great change for the incubator industry, with the exception of the traditional mixed-use and technology-oriented incubators, is its development towards more specialized incubators, such as ceramics, carpentry, handcrafts, retailers, green technologies, etc.

Table 2 Main Industry to Promote

Type of Industry	Percentage
Unlimited industry	43%
High-tech industries	25%
Manufacturing	10%
Strategic industries such as biochemical, food, fashion, arts	9%
Service industry	6%
Licensing manufacturing	5%

Others	2%

To promote the development of high-tech and cutting edge technological industries are not the major purpose for US business incubators.

Table 3 Types of Founders

Types of Founder	Percentage
Local not-for-profit organizations	35%
Mixture	18%
Local governments	14%
Universities	13%
Private companies	12%
Others	8%

Table 4 The Average Structure of Revenue & Expenditure

Revenue	100%	Expenditure	100%
Rental	60%	Personals	37%
Subsidy	40%	Facilities	21%
		Utilities, maintenance, training	42%

Source: NBIA

■ **Australia**

With its unemployment rate gradually decreasing in recent years, the management patterns of SMEs have also gradually undergone change from the so called newly creation enterprise pattern moving to product commercialization or the exportation guidance pattern. Incubators of local networks relatively receive more resources and can actively act as an industrial promotion engine in domestic regions assisting the government to understand enterprise demands and providing policy suggestions to enhance the competitiveness of industry.

■ **China**

There are more than 550 incubators with the following different types as compromise technology incubator, specialized technology incubator, overseas scholars innovation park, international Business Incubator, university–based incubator, business incubator network, etc. The advantages for business incubators operation in China include the government support, favorable policies, investment and sponsorship, etc. The challenges for Chinese incubators are how to improve the innovation environment and the information infrastructure, reform the management, and the qualified managers.

The major characteristic of China's high-tech and new service incubators is that they are fully supported by government. Government's supports are from multiple aspects－the number of start-ups, incubator scale or amount of invested fund needed, number of employed, revenue.

- **India**

Due to its promotion of liberalization, the Indian government opened investment to many of its industries and has attracted a great deal of foreign direct investment in its domestic industry. The Ministry of Small Industry (SSI) is responsible for all related regulations to help SMEs and incubator development providing the collection of capital, information infrastructure, laboratories, management practice, and professional training, increase of worker skills, and marketing support of products and services.

The Small-sized Industry Development Organization (SIDO) is responsible for the planning, support, implementation, coordination and inspection of all policies and actual development flows. The National Small-sized Business Company (NSIC) is in charge of the promotion, supporting and nurturing of local SMEs. It also assists the SSI in the conduction of all kinds of programs, making SMEs technology upgrades, offers consultation support and services, business technology nurturing, and the encouragement of international cooperation setting up of small enterprises in other developing countries.

- **Japan**

Incubators along with Technology Licensing Organizations at universities play major roles in the cooperation between the industry and academia. Recent policies stress the establishment of four types of incubators namely as incubators for high-tech industries such as biotech and medical industries, incubators for industrial clusters, incubators to vitalize cities, and incubators for profit-seeking. On the other hand, to increase the competency of incubator managers by training is another focal point of its incubator policies.

- **Korea**

The rapid expansion of Business Incubators in Korea is one of the most important phenomena affecting its high-tech industries. Business incubation expanded very fast after the IMF bailout crisis.

The government strongly supports the development of incubation industry. In the fields of electronics, machinery, game, biomedical, Korean incubators have proven their abilities in incubating emerging high-tech new ventures. Recent policies have some focal points as :

- The establishment of financially self-sustain mechanisms for incubators
- To upgrade the managerial abilities of incubators

- To enhance the supporting systems such as education, professional consulting, marketing
- aids
- To extend supports from R&D and design to manufacturing and marketing

■ **Malaysia**

The National Incubator Network (NIN) was started in 2004 to attract technology entrepreneurs to gather in the Science Park of multimedia technology. Creating cluster effects is the main consideration of the policy. The other hot spot of Malaysian incubation industry is the establishment of Center for Health Innovation & Medical Enterprises (CHIME). CHIME is focusing on healthcare innovation, R&D, and the development for bioinformatics, and telemedicare industries.

■ **Singapore**

At the start of 1980, Singapore's policies were even more focus on the new capital intensive and high-value-added industries, high investment on the infrastructure facilities and construction. The manufacturing and service industries are "twin engines" driving for economic development and the attraction of foreign direct investment, and the upgrade of its industrial structure.

Since the 1990s, Singapore began setting up its research infrastructure and human capital training moving upward towards the top of the value system as it began to focus on the information technology industry. In order to effectively support the incubation system from all directions and aggressively promote its regional enterprises, the Singapore government provided ninety percent of the incubator fees for one year including daily operation fees and the salaries for the managers. Each subsidized incubator was thus in charge of nurturing at least ten companies annually. Each season the government will then conduct performance reports on the subsidized incubators. Funding grants are then decided based on their seasonal performance.

■ **Europe**

The European Community (EC) takes innovation as the starting point for emerging enterprises since it has realized that the commercialization and industrialization of science and technology are weaknesses for its industrial development. There are six major policies can be concluded as EC's recent efforts for incubation industry development:

- The education of entrepreneurship as the keystone of incubation
- Mutual sharing of the environment for the cultivation of small businesses
- The databank establishment of business start-ups incubated
- Financial aids programs

- Promoting by start-ups in emerging markets
- Heavily stressed on the incubation model of technological new ventures

■ **Latin America**

Latino American Association of Technology Parks and Incubators (RELAPI) is the major linkage organization for the incubation development in Latin America. Listed below are some major incubators in this region.

Argentina: More than thirty three incubators and twenty technology parks.

Brazil: With more than three hundred incubators, it has become the hot spot of technology new ventures in Latin America. Most incubators are directed by the Association of Companies Promoting Technology Innovation.

Chile: The establishment of Silicon Valley of Valparaiso has been supported by the government, universities, and some multinationals since 2004.

Peru: At least twenty five technology incubators conduct in the development of new ventures. Among them, UNALM and APESOFT are two of the best. Its incubation industry is still young and needs much more linkage of R&D and innovation.

Panama: Howard Special Economic Area and City of Knowledge are two of the major bases for Panama's incubation industry.

■ **Chinese Taipei**

In 1996 the Small and Medium Enterprise Administration (SMEA) of the Ministry of Economic Affairs (MOEA) took the lead in fostering the development of Business Incubators. The Administration devised three core strategies, focusing on Business Incubators, Entrepreneurial Knowledge and Information, and Financing Support for start-ups. These strategies were to form the basis for the creation of an SME incubation platform; helping its start-up SMEs to obtain the guidance and support their needs in the areas of technology, knowledge, funding etc. The goal was to build up a start-up learning mechanism that would contribute to the development of a knowledge-based entrepreneurial society and to the promotion of the incubator sector.

The Ten Key Individual Plans making up the Challenge 2008 National Development Plan included the Global Innovation and R&D Base Plan. One of the elements in this plan was the establishment of various types of innovation and R&D centers, with a sub-plan for developing Chinese Taipei into an "Asia Entrepreneur Center". The main objective was to build up a high-quality incubator network that would stimulate start-up and innovation activity, strengthen the competitiveness of domestic industry as a whole, and promote economic growth.

At present, the majority of Business Incubators in Chinese Taipei are affiliated to universities.

The MOEA has been encouraging research institutes and the private sector to invest in the Business Incubators, and has drawn up strategies for integrating different resources and strengths of incubators. The overall goal is to provide a comprehensive set of incubation services to cover each stage of the SMEs' development process.

(Source: The Incubation Year Book, SMEA, MOEA, Chinese Taipei)

2.2. Comparison among Major Types of Incubators

Business Incubators strive to promote entrepreneurship. The practices they implement should be based on identifying and addressing the specific needs of their target market of entrepreneurs. There are a number of key factors that determine success in establishing and operating incubators. We may classify incubators by different aspects such as:

- **Key partners involved in setting up Business Incubators**

  National authorities, international agencies, companies, banks, and other private sector organizations, universities and other R&D organizations, community and voluntary organizations

- **Legal status of Business Incubators**

  Public entity, private company, semi-public or others

- **Location**

  Urban, greenfield, rural, other

- **Types of incubator premises**

  New, converted, others

- **Physical space offered**

  Minimum, maximum, average, median

- **Roles and objectives**

  Contribute to competitiveness and job creation, help R&D centers commercialize know-how, help companies generate spin-off activities, help disadvantaged communities/individuals, or others

- **Types of firms origin**

  Start-up, branch of existing firm, spin-off from university or R&D center

- **For profit or not for profit**

  Each incubator around the world has its own historical background. The critical thing is that with what kinds of structure and elements can the incubator fit its mission and meet the performance required.

2.3. Workability Does Matter

The term "workability" here refers to be capable of being done with means at hand and circumstances as they are. Any great project stands only after it has been proven with workability.

Often, the feasibility study is used to determine and document a project's workability. The results of feasibility study are used to make a decision whether to proceed with the project, or dump it. If it indeed leads to a project being approved, it will—before the real work of the proposed project starts—be used to ascertain the likelihood of the project's success. It is an analysis of possible alternative solutions and a recommendation on the best alternative.

Advantages to conduct a feasibility study may include:

- Gives focus to the Business Incubator project and outline alternatives
- Narrows alternatives
- Surfaces new opportunities through the investigative process
- Enhances the probability of success by addressing and mitigating factors early on that could affect the project
- Provides quality information for decision making
- Helps in securing funding
- Identifies reasons not to proceed

The feasibility study is a critical step in the Business Incubator assessment process. After it has been done, a solid business plan for the Business Incubator project can appear.

3. Factor Analysis for Incubator Establishment

3.1. Identify Actual Needs

Incubators are locations for the cultivation of innovative businesses, products and technologies, and for helping SMEs to upgrade and transform themselves. By providing start-ups with resources required, they facilitate the effective integration of resources, helping to reduce the costs and risks that start-ups have to bear in the early stages of business development. With excellent incubation environments, incubators increase the likelihood that new businesses will be successful.

Normally, the objective for incubator establishment is to foster the growth of soundly run, competitive SMEs, and to help existing SMEs to upgrade and transform themselves, re-orienting themselves to the production of high-value-added products. Thus they can make a significant contribution to the local/nation economic development alongside larger enterprises.

But when a new incubation program launched, policy makers have better first identify the actual needs of the incubation program in both macro and micro levels.

Possible needs in macro level may include:

- To increase the employment of a nation both in quantity and quality
- To promote the development of national/local economy
- To enhance SMEs' abilities in technology and management
- To encourage commercialization of technology and new business development
- To test some new policies or regulations

For possible needs in micro level are listed as:

- To reduce the expenses of investment, and the level of risk involved, in the establishment of new start-ups and in the development of innovative technologies and products, thereby increasing the success rate for entrepreneurs and innovators
- To assist in the implementation of industry cultivation plans and in the development of new technologies and new products
- To provide guidance with respect to the commercialization of new products
- To provide a venue for collaboration between industry, universities and research institutes
- To provide testing services to speed up the process of product development
- To provide enterprises with consulting services in the areas of manpower cultivation, financing, information provision and operational management

What are the actual needs of your Business Incubators?

3.2. Goal setting

An incubator is very much like an enterprise; its objectives vary throughout the different stages of development, which require different strategies.

In the starting stage, mainly focused on creating superior nurturing environments to attract and foster new ventures. In the expansion stage, the tactic is building up a comprehensive incubation mechanism to accumulate strength for long-term development. While in the maturity stage, it is proactively bringing academic-industrial collaborative effects into full play to expand the knowledge based value chain. Management should carefully identify the critical resources and capabilities that are lack of and should be developed both internally and externally to fulfill its goals.

SMART for goal setting

- **Specific**—Goals must be specific.
  - Narrow down
  - 5 Ws + 1H—Who? What? Where? When? To whom? How?
- **Measurable**—Be able to measure progress towards goals.
  - Resources required
  - Planning
- **Attainable**—Goals must be something that can be actually attained.
  - Take an honest look at oneself and abilities
  - Determining actually wants
  - Find ways to get the
  - Start by setting smaller goals
- **Realistic**—Goals must be realistic, given who you are.
- **Abilities**
  - Be willing to accept the costs
- **Tangible**—Goals must be something can be experienced.
  - Mind and motivation
  - Visualize how it will be when goals have been reached.

3.3. Resources Overview

Inventorying both your available tangible and intangible resources, to see whether they can meet the requirement to fulfill ideal services provided by your Business Incubators below:

- **Space and facilities**
  - Provision of office space and facilities
  - Provision of shared laboratory equipment, machinery, instruments and public facilities
- **Business support**
  - Provision of operational consulting services
  - Specialist training, including practical, hands-on training
  - Assistance with public relationship, exhibitions and advertising
  - Provision of financing information and introductions to venture capital firms

- **Administrative support**
  - Provision of shared secretarial and administrative services
  - Assistance with company registration, business registration and factory registration
  - Provision of guidance for business plan preparation
  - Assistance with applications for guidance programs
  - Assistance with the drawing up of contracts and agreements
  - Software/hardware management and maintenance
  - Building security management.
- **Technology and manpower support**
  - Provision of high-quality, expert manpower
  - Technology transfer services
  - Arranging collaboration and alliances with technology development institutes
  - Technical manpower support
- **Information support**
  - Arranging the provision of specialist consulting services
  - Provision of information and advice regarding government guidance systems and government policies
  - Assistance with the collection of industry, market and technical information
  - Facilitating collaboration with industrial associations, specialist academic associations, local industry promotion associations and other organizations
  - Promoting the formation of strategic alliances, and encouraging collaboration between start-ups in the areas of marketing, market development, distribution, financing etc.
  - Promoting the development of collaborative relationships with local industry
  - Provision of information relating to science-based industrial parks and industrial districts, including application procedures, to help start-ups establish themselves in a science-based industrial park or industrial district after “graduation” from the incubation center

If you do not have enough resources, which is in most cases, you have to develop some reliable networking and outsourcing abilities to make your Business Incubator attractive enough to meet the purpose of establishment.

3.4. Development Strategies

Innovation is a continuous process of collaboration and learning for SMEs. Facing new prospects in the age of the knowledge economy, SMEs must not only enhance their value-added R&D innovation, marketing service and technology/new business model development. They also must establish a production/service deliver organization model that can adapt to more variety, less quantity, better creativity and stronger characteristics, to deepen their knowledge-based competitiveness.

The role of Business Incubators will become more important in the future as they are the hand that rocks the cradle of the birth of new ventures. They have to vigorously enhance the technical innovations and operational capacity, improve the quality of manpower, and promote the flexible use of knowledge in order to create the prosperity of industries and open the new horizon of national economy by fueling up the capacity for all-round economic development.

The foci of the continual development of Business Incubators may include:

- ■ To form the incubation industry by expanding the guidance capacity of Business Incubators by
  - Encouraging private investments in the incubation industry
  - Encouraging corporate entities to participate in the work of Business Incubators
  - Combining local industrial development
  - Diversifying the fund sources of incubated enterprises
- ■ To display the resource advantages of Business Incubators of different natures
  - To encourage Business Incubators to posit their areas of specialization

In the age of the “Innovation Economy,” the core value of a business is determined by its ability to innovate. Innovation is the power that pushes a business to growing, the fundamental motivation behind a society's development, and the spirit at the heart of a nation's advancement. Through a serial process of inter-functional teamwork or division of labor and skillful management, and the continuous integration of resources and application expansion, it reaches the market and in turn creates social and economic values.

However, in such a globalizing economy, SMEs can no longer stay with the traditional model of purchasing and selling, but must turn to being Internet-dependent composite, chain groups. As the development of the Internet speeds up the flow of information, business functions now not only cover the traditional transactions of commodity and service, but also involve the searching, exchanging and sharing of information. It is the crucial task and mission of Business Incubators to assist enterprises upgrade and transform.

3.5. Implement Timing

Timing is everything! This old saying can be applied to many complex situations.

Some tips of timing in conducting a Business Incubator project:

- Internal and external environmental scanning
- Market analysis (Incubation industry, new venture market, technology trends…)
- Stage of the life cycles of competitors/partners
- Construction scheduling
- Reduce lead time
- A stitch in time saves nine
- To be a bird or a worm—Early birds eat early worms

3.6. Backup Plan

Murphy's Law

The Murphy’s Law broadly states that things will go wrong in any given situation, if one gives them a chance. It can be derived some tips below:

- "If there's more than one possible outcome of a job or task, and one of those outcomes will result in disaster or an undesirable consequence, then somebody will do it that way."
- "Whatever can go wrong, will go wrong."
- "If anything can go wrong, it will, and usually at the most inopportune moment."
- Backup plan is not a plan for failure. It is a plan to make you be more confident in dealing with obstacles.
- Sometimes the Plan B is a good idea.

Unless God, any given planing is always hard to meet one hundred percent accuracy of realities. Being a Business Incubator planer, one shall keep in mind that different backup plans are required to fit different stages of a Business Incubator’s establishment and operation.

4. Case Studies on the Best Practice

4.1. Case Demonstration—Technology Business Incubator at KAIST HTVC

In Korea, about 350 incubators are in operation. External networking and outsourcing are significant components Korea since most of incubators are not self-sufficient in providing services and support to incubatees.

The case of the Korea Advanced Institute of Science and Technology (KAIST), Technology Innovation Center (TIC)/Technology Business Incubator (TBI) is presented as one of the most successful Business Incubator in Asia Pacific area.

Essential of TBI, KAIST

- Started in 1994 with the support of the Ministry of Science and Technology
- The first and the largest business incubator in Korea
- HTVC hosts more than 130 high-tech new ventures and some companies for supporting fund raising, advertisement and education.
- More than140 new ventures have left HTVC.
- Among those new ventures, 51% successfully graduated, and 4% are in KOSDAQ.
- HTVC offers consulting services to its tenants by employing 5 business consultants who offer service at HTVC once in every two weeks.
- To join HTVC, a company should be a high-technology start-up and donate 1% of its equities to KAIST.
- A start-up company can stay in HTVC up to 6 years (3 years of incubation plus 3 years of post-incubation).
- There are many technology transfers and joint research projects between KAIST and HTVC companies.
- HTVC companies can easily access to KAIST equipment.
- KAIST has been the source of knowledge, new technology and distinguished manpower in Korea and will serve as the center of venture network.

Excellent environment for technology-based venture business

■ **KAIST**

- KAIST is a research-oriented university founded in 1971 by Korean Government.
- With 400 faculty members, 4,000 graduate and 2,500 undergraduate students.
- A top ranking university in Asia.
- The main campus is located at Daeduk Science Park in Dajeon, another campus hosting a business school is located in Seoul.
- Most of the funding for R&D at KAIST comes from the government, and about 20% from the industry.
- It has emphasized the development of innovative technologies and entrepreneurship. More than 300 technology-based ventures founded by KAIST graduates, and some of them are the most successful venture companies in Korea.

■ **Daeduk Science Park**

- Founded in 1971 as a research park in Dajeon.

- 68 research organizations in Daeduk Science Park including 20 national research institutes, 25 industrial research centers, and 4 universities.
- Encompasses more than 700 technology-based venture companies, which are mainly spin-offs from its research organizations.

Strength and weakness of the venture environment in Daeduk

- Easy to cooperate with research institutes.
- Good universities such as KAIST provide excellent graduates.
- Pleasant living environment.
- Daeduk Science Park is not close to Seoul in which major market is located.
- There is no world-class industry in the neighborhood of the park.

Korean government strongly promoted high-tech ventures in 1998 to overcome the difficulty in the economy, and supported HTVC to incubate additional companies. Now there are about 30% of HTVC companies are from KAIST and 70% are from outside.

Since 1998, SMBA started to give certificate to qualified-ventures (such certified-ventures have some benefits in taxation, funding, etc.), and 50% of HTVC companies were certified by SMBA.

Services provided by HTVC

■ **Space**

Two independent buildings (10,000 ㎡) for companies, the rental fee for incubation is about 50 per cent of outside buildings (market price).

■ **University facilities**

Libraries and gym can be used without extra charge.

Computer network is provided with a minimal change.

University research equipment can be used at actual expense

■ **Consultation and support**

Free consulting services.

HTVC provides its companies with some funds for technical consultation and for joining an exhibition.

■ **Education**

Venture business experts present once in every two months.

The graduate school of management at KAIST offers the Advanced Venture Management (AVM) program.

■ **Supporting companies**

Venture investment, advertisement, and cyber-education

KAIST Venture Network (KVN) connects about 800 KAIST-related ventures.

HTVC Brain Network (HBN) consists of outstanding business consulting companies.

To help HTVC companies obtain valuable information about marketing and management

Key success factors

- **Strong government support**

  HTVC provides with its companies various cost-free services and furthermore some funds for consultation and exhibition.

- **Technical cooperation with KAIST and other research institutes**

  Collaboration between HTVC companies and research organizations in Daeduk Science Park has helped develop new products.

- **KAIST graduates**

  Many KAIST graduates joined HTVC companies.

  KAIST has been a source of outstanding manpower.

  (Source: KAIST)

If several ministries are involved with the business incubation, always as the result, there has been duplicating investments. It will be better for one ministry providing support for the business incubation.

4.2. Criteria for Being an Excellent Incubator

Seven most important factors for the effective operation and management of Business Incubators:

- Clear goals and operating strategies of Business Incubators linked to local demands
- Well-defined policies and procedures for screening and supporting activities
- Expertise of Business Incubator managers and staff members
- Organizational structure such as decision-making process and roles of board
- Size and sources of budget and degree of self-sufficiency
- Contents and effectiveness of services
- Entrepreneurial network with external experts and financial sources

What make an excellent Business Incubator?

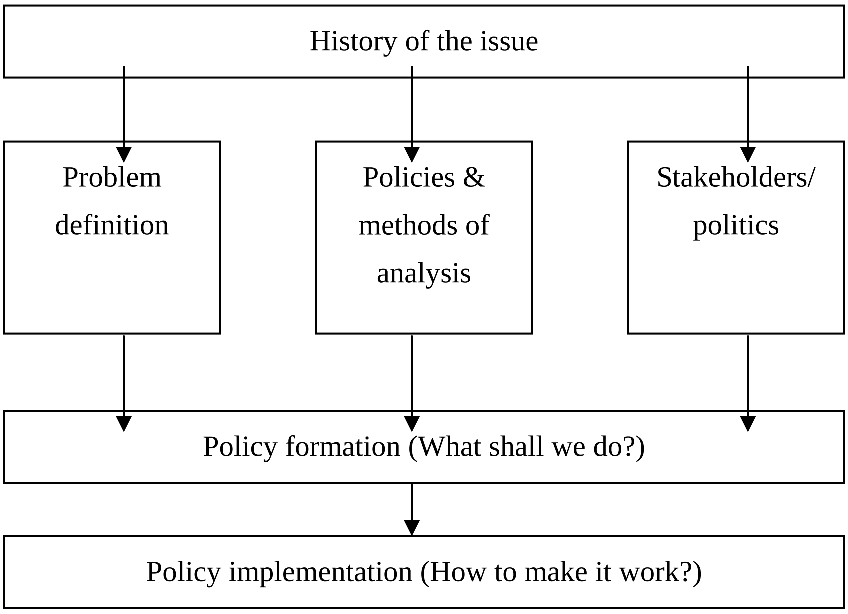
- An effective incubator is based on legitimate feasibility studies and business plans.
- An incubator is not a building, it is a service program.
- Best incubators are well managed. They provide appropriate salaries and benefits to their employees and shareholders.
- Stress on flexibility and commitment to service.

- Incubator managers are proactive in the provision of services.
- An incubator knows its mission. Its management, board, and staff clearly understand and work to support that mission.
- The best incubators are integrated into their community networks, resources, and economic development plans and strategies.
- An incubator's management time is focused primarily on serving clients rather than managing buildings, raising money, or conducting in political activities.
- Incubator managers engage in continual learning since business incubation is only a few decades old.
- Incubator managers are committed and idealistic. They take actions to fulfill dreams.

(Source: Ms. Dinah Adkins, President & CEO, National Business Incubation Association)

5. Focal Points of Policy Making

5.1. Value Creation through Policy Making



A typical process of policymaking

There is no question that effective policy-making requires lots of process. But in the end, it requires decisiveness too. While stakeholders value the opportunity to participate, they also expect efficiency in the process of analyzing issues and bringing them to resolution.

Every Business Incubator pursues specific strategies to achieve its mission and objectives. Here are three critical factors to be kept in mind in the policy making of Business Incubation:

1) Adding value to the community

- What kind of companies should be incubated? (What are incubatees' target niche markets?)

- How much should be done to incubate them? (With what level and type of responsibility the incubator will assume to help and work with target markets.)

Issues:

- Degree of responsibility for creating and managing resources critical for incubation—Inactive, Selectively Reactive, Active, Proactive.
- Industry/Market Focus—The desirable group of incubatees
- Service emphasis on individual or group of firms—on an individual or collective basis

2) The business incubation process

- Using practices that address entrepreneurial needs
- Incubation relationship with incubatees is a delicate balance between support and pressure

3) Incubation program structure

- Incubation process may be differentiated from incubator to incubator on the basis of the specific entrepreneurial needs they address and the practice they use.
- There are many works to be done to clarify the particular strengths and weaknesses of different types of Business Incubators.

Conceptual building

Please identify features of a Business Incubator:

- An answer to solve all problems
- A tool to foster innovation
- A process supporting economic as well as social and technological development
- A mechanical apparatus
- Merely a building for new ventures' residency
- Shall be based on its adaptability to local needs and potentials

Business Incubators' main components are:

- Entrepreneurship
- Innovation
- Markets
- Networks

- Partnership and cooperation

5.2. Select & Focus

There is no individual or organization with abundant resources without limit. For a Business Incubator, it always has to face too many expectations from stakeholders. Therefore, it must learn how to make the better use of its available resources. A common error for project planners is that they know addition and multiplication of the four fundamental operations, but they seldom know how to utilize subtraction and division. To learn how to select few but critical targets and then put most resources on them is a must. After that, to establish effective platforms are always required to make things happen. Below is a practice from Chinese Taipei for reference.

To establish an SME start-up and innovation development mechanism under the Asia Entrepreneur Center framework, the SMEA of Chinese Taipei has set three major strategic objectives:

- To establish an incubator network that would strengthen the incubation of start-ups in Taiwan
- To build up a start-up knowledge and information platform that would stimulate the development of a knowledge-based entrepreneurial society
- To establish sound, effective financing channels to stimulate investment in start-up activity

It was anticipated that the creation of first-rate innovation and start-up mechanisms would facilitate the cultivation of innovation-oriented enterprises, provide entrepreneurs with access to the resources they need at different stages during the business development process, and make possible the development of a high-quality start-up incubation environment.

5.3. Build up Effective Mechanism

Definition of mechanism

※ The arrangement or relation of the parts of anything as adapted to produce an effect.

Business incubation is a dynamic process of business enterprise development. Incubators nurture young firms, helping them to survive and grow during the startup period. Although many incubators are quite successful in terms of the success rate and the growth rate of tenant companies, their contributions to the sponsoring entities, however, are still not satisfied in general. It is found that behind the glorious records there are still some barriers impeding the development of an efficient incubator. By applying a new model integrates merits of different types of incubators can be useful for the improvement of incubator performance. Beside the promotion of economic development, a successful incubator shall earn profits/surplus not only for its own financial sustainability but also for generating significant equity return to its founder in the long run.

Major services provided by incubators may be as follows. It can be called as the seven Ss to start, survive, and succeed:

- Space for working and growing – it should be affordable, flexible, and modular
- Shared facilities such as office equipment, receptionist, conference rooms
- Services for improving – counseling on marketing/finance, information, promotion
- Skills development for tenants in business planning and management development
- Support for accessing university faculty, facilities and students, professional networking
- Synergy to do cooperation-competition through tenant interactions, clusters, and spin-offs
- Seed capital such as in-house revolving fund, access to credit, royalty, and risk capital. Many studies were carried out to identify success and failure factors

(Dr. Lalkaka, 1997)

Those services should be arranged as a portfolio/package to serve incubatees. An effective mechanism of a Business Incubator heavily relies on how to properly allocate and deliver these services.

6. Build Up Efficient & Effective Management Teams

6.1. Functions Required

An efficient and effective management team of a Business Incubator shall have ten functions to perform as an A-class business.

1) Comprehensive business assistance

The value-added services that characterize a successful incubation program are broad. The ability to coalesce these services into a comprehensive business assistance program designed to successfully nurture emerging ventures must be the ultimate objective of a best practice incubator. The assistance program shall follow a logical progression of steps.

First, the management team of a Business Incubator shall be able to identify client needs in an ongoing process. The role of needs identification is to provide a benchmark for screening new applicants, allowing staff to assess if the ventures are ready for incubation and if the incubation program has adequate value-added services to fulfill the applicants' needs. The role also has to clarify actions to be taken and resources to be mobilized by clients as well as incubator staff during coaching and facilitation activities.

Secondly, the management team shall play the role of coaching and facilitation. The team shall be able to provide incubatees with outside perspectives of their businesses, and allow for strategic thinking that principals might neglect due to the pressures of dealing with the daily operation of the businesses. A mechanism for continually assessing and fulfilling clients, needs, the timely mobilizing of resources, and support and oversight to ensure that the full benefit is delivered from each resource are also required.

The third one is to monitor client progress. The management team can measure progress in terms of specific milestones that reflect the evolution of a new venture as well as the mission of the incubator. Roles of monitoring client progress are to provide focus to both incubatees and incubator actions, thus ensuring that both they attains their goals, and to ensure that the incubatee is committed to launching the venture and graduating from the incubator.

2) Professional infrastructure

The pool of professionals supporting a Business Incubator will ultimately influence the incubator's integrity. Professional infrastructure is a combination of three basic resources listed below.

The professional network is a collection of experts from the incubator's region who are willing to provide services to incubatees at no cost or at reduced rates. They are typically consist of professionals such as CPAs, attorneys, venture capitalists, university professors, technology specialists, marketing specialists. A business incubator shall focus on developing pool of individuals who are recognized as experts in particular areas.

The second ones are mentors. Typical mentoring program draw on a pool of experienced entrepreneurs who have been successful with their own ventures and who wish to share this experience with others. The mentoring program can also expand the number of stakeholders interested in supporting the incubator.

The third are advisory boards. Most new ventures lack an effective board of directors during their early stage of development. A Business Incubator may provide such incubatees with a temporary or "shadow" board to serve in this function before a formal board of directors is established. The advisory board can provide clients with an organizational framework for building the business early in the development process. It can also expand the number of stakeholders interested in supporting the incubator.

3) Capitalization and financing for incubatees

Since only few new ventures can finance growth from revenue generated from sales, the capitalization and financing for incubatees is always a critical issue for the management of a Business Incubator. The cash flow to a business is like blood to a human body. If everything else is in place, a lack of capital will force even the most promising new ventures to miss opportunities for competing. Normally, capital can come from equity, debt or some hybrid of the two. Sources of quality capital are normally include individual/corporate investment, venture capitalists, government fund, "angels", or the incubator. On the other hand, the sources of debt capital may include Capital Networks and Brokers, In-House Capital Funds, Seed Capital Funds, Tenancy-Contingent Financing, Loans from the government, etc. (As in the USA)

4) The establishment of incubatee networking

Majority of economists, industrialists, experts, incubator managers, policy makers, and venture capitalists recognize the importance of entrepreneurship in contributing to the development of local wealth as well as competitiveness. On the other hand, "Stand-alone" incubators are considered to be less effective than those integrated into a broader network of incubators, funding and infrastructure providers.

One of the significant benefits of business incubation programs is the synergy that develops from incubatee networking. There are three types of benefits that incubatees realize through their interactions and relationships:

- <u>Psychological benefit</u> represents the moral and psychological support the incubator provides incubatees and incubatees offer to each other.
- <u>Instrumental benefit</u> is related to the work or tasks of operating a business. For examples like sharing equipment, co-bidding and the availability of computers, laboratories and other business and technical resources.
- <u>Developmental benefit</u> involves the process of increasing the firm's and entrepreneur's abilities by acquiring skills and generating new ideas.

Gregg Lichtenstein characterizes eight factors that influence incubator interactions as: Types of businesses, Personal characteristics, Stage of development, Space, Forums, Critical mass, Norms and attitudes, and The incubator manager.

5) The abilities to assist in technology transfer and commercialization

■ **Technology transfer:**

- Linkage to universities, research institutes, and overseas
- Mechanism of technology evaluation, licensing, and dealing with other IPR affairs
- Access to government subsidy R&D projects
- R&D alliance

■ **Technology commercialization**

- Overcoming cultural impediments
- Providing financial incentives
- Developing comprehensive support for commercialization

6) Academia linkage

There are only very few incubators in the world obtain full capacity to serve their clients. With proper linkage to external resources, a Business Incubator can easily broaden its services to incubatees with relative low costs. Listed below are some common resources can be obtained by academia linkage:

- Technology transfer
- Access to facilities and equipment for R&D
- Student interns and employees
- Professional consulting in both technology and management fields
- Access to R&D financing (such as the SBIR project)

7) Basic facilities

From incubatees' perspective, facilities of an incubator may offer value in image, operational efficiency, responsiveness, and supports from other incubatees. For facility considerations/specifications may vary from case to case, but there are still some items in common. Some are suggested in siting a new facility or evaluating existing ones. They are:

- Zoning
- Building codes
- Location
- Traffic and parking
- Space for lease
- Security
- Insurance
- Access to shared facilities
- Material flow
- Hazards
- Staging areas
- Floor loads
- Telecommunications
- Heating, ventilation, and air conditioning
- Electrical
- Plumbing and sewing system
- Storage
- Shared or common test/production areas
- Flexibility
- Interaction
- Financial sustainability
- Special features and other considerations

8) Governance and staffing

Business Incubators must embrace the same standards as their incubatees' strength, tenacity and adaptability of internal leadership and organizational framework. Both should have adequate abilities in raising capital, adapting to changing markets, responding to technology advances, rolling out a product and executing the business model. Here are some issues to be considered:

- Tax Structure:
    - For-profit
    - Not-for-profit organization
- Board of Directors:
    - Legal responsibilities
    - Providing strategic direction and leadership and supporting Incubator Managers in performing their duties (Include individuals with different characteristics and skills)
- Management Team:
    - Incubator Director, Manager
    - Facility Manager
    - Administrative Assistant
    - Receptionist
    - Volunteers from the community

The role of governance and staffing may include:

- Ensures tax status required to meet the organization's agreed-upon mission
- Ensure that both board and management achieve consensus on a mission
- Promotes acquisition of management with the skills necessary to meet the mission and help new ventures grow
- Ensure optimum return on investment on limited but valuable resources
- Promotes retention of quality staff

9) Incubatee screening and graduation

To be a successful incubator, it has to be very carefully in selecting incubatees and conducting graduation policy. The screening process shall be customized to meet its mission. We may conclude some criteria in selecting incubatees as innovative ideas, patent protection, product feasibility without undue risk, market niche, technical knowledge and edge, potential to growth, job creation potential, sufficiency of startup funds, community benefits.

When making a graduation policy, at least three criteria shall be considered. The first one is called “Time limits”. They should be customized by type of business and depend on the actual status of incubatees. The second one is “Resource commitments” by the incubator. The last one is “Value affordable by the incubator.” When incubatees have progressed beyond the incubator’s capacity to provide sufficient value, it is time for them to graduate.

10) Evaluation of incubation program

For any proper evaluation of incubation program, the process should be manageable in terms of time and resources. Incubation programs should be compared only with others of similar type and mission. To do otherwise is to compare apples and oranges. Listed below are some criteria in evaluating the performance of an incubator for reference.

General goals:

- Diversifying local economies
- Revitalizing a distresses neighborhood
- Building/accelerating growth of local industries
- Generating income and benefits for sponsoring entities
- Retaining businesses in the local community
- Encouraging specific entrepreneurship

Specific goals of technology:

- Technology commercialization/industrialization
- Increasing employment of high caliber researchers/engineers
- Developing a technology infrastructure for specific industries
- Providing job opportunities for target groups
- Providing real-life learning experiences for college students

(Revised from:: Chuck Wolfe, Dinah Adkins, Hugh Sherman, “Best Practice in Action”, NBIA 2001)

For NBIA’s evaluation of the Incubator of the Year, it may be referred to ITRI’s case as mentioned.

6.2. Job Distribution

Board of directors

The member of the board of directors of a Business Incubator are normally consist of investors, local/community industrial leaders, professors, government officials (if sponsored by the government), professionals (CPA, lawyers, business advisers and others). Each director shall run for the optimum benefits of the Business Incubator by his or her domain knowledge, influences, and linkages to outside resources.

Better networked incubators perform better. Incubators that can provide the incubatees with effective internal networking (such as alliance among incubatees) and sufficient external networking as well (such as technical support from outside experts, professional assistance from outside consultants, support from the central and local governments, etc.).

Encouraging networking among incubatees is an important success factor for incubators.

Manager & staff

In a daily incubation practice, it takes a lot of efforts to meet incubatees' needs and wants. Essential practices for a Business Incubator can be divided into four categories as Business Concept, Physical Resources, Core Competencies or Skills, and Market. The following table may be applied to develop/define the incubator manager and staff's practices. Base on the matrix next page, job distribution, workloads of incubator managers and staff can be specified.

Table 5 Treatment Matrix: Business Incubation Practices Organized by Incubatees' Needs

Entrepreneur Resources **Resource Accessibility Obstacles**	**1. Business Concept**	**2. Physical Resources** Supplies/Raw Materials Office/Lab/Production Space Equipment/Plant Money/Capital	**3. Core Competencies /Skills** Managerial Technical/Operation Marketing & Sales Financial Legal Administrative Higher-Order Skill	**4.Market** Product/Service Customers Distribution Channels Transportation
a. Availability				
b. Visibility				
c. Affordability				
d. Transaction Barriers				
Entrepreneurial Capacity Obstacles				
e. Self-Awareness				
f. Accountability				
g. Emotions				
h. Skill				
i. Creativity				

Source: Gregg A. Linchtenstein & Thomas S. Lyons, 1996

6.3. Personality & Experiences: Put Right Men on the Right Job

Personality is made up the characteristic patterns of thoughts, feelings, and behaviors that make a person unique.

Incubator managers must first be able to diagnose problem by identifying the necessary resources, existing problems and entrepreneurial need, and then know which practices they can employ to help the entrepreneur meet that need. Incubator staff members must be entrepreneurial and non-bureaucratic and recognize that they are in a service industry. Besides to help clients develop management team, they also have to get the mail out on time. They are asked to hold a special relationship with their clients—both leader and servant—and only those types of personalities are appropriate for the staff of a business incubator.

It takes well-experienced staff to operate good business incubators. The staff is always required to be "multi-functional" in serving incubatees. This is not an easy job at all! Putting right men on the right job is a must in any incubator's operation.

6.4. Incentives, Flexibility, and Organizational Culture

Incentive:

Limited budgets and a public/not-for-profit sector lead many incubator boards to offer compensation package that are nor competitive with fair market rates for similar experience and skills. But to attract and retain talents to sustain a successful Business Incubator, competitive and benefits packages are necessary. Possible solutions may rely on outside funding and linkage to a bonus pool of investment on incubatees.

Flexibility:

Incubators should periodically adjust accordingly to adapt to the constant industrial and environment changes. Furthermore, flexibility and creativity should be honed to generate more business opportunities.

- Subject to environmental changes
- Quick/in time response to clients' needs
- Service flows
- Need a consensus among the management team
- Authorized by the Board of Directors

Organizational culture:

- Being passionate
- Being idealistic
- Being innovative

- Mutual trust
- Be willing to share
- Stress on social responsibility

7. Discussion:

7.1. Critical Issues for Incubator Development (by each participant)

- Internal
  - Management team & staff
  - Board of directors
  - Space
  - Facilities
  - Finance
- External
  - Economy situation
  - Government finance/budget
  - Competitiveness in the international market
  - Entrepreneurship of the society
  - Requests from nterest groups
- High-tech or simple-tech
- Manufacturing or service

7.2. How to Promote Incubator Cooperation among APEC Members

- Information sharing
- Visiting
- Conferences
- Establishment of data/information platform
- Training courses and workshops
- International strategic alliance among incubators
- Internship/staff exchange program

8. Case Study/Present

8.1. ITRI Incubator (A full copy of the nomination material for NBIA Award 2006)

ITRI Incubator is the owner of “the incubator of the year” by AABI and NBIA in the year of

2005 and 2006 respectively. Since its establishment in 1996, ITRI Incubators has been proven to be an effective policy tool to promote national economic growth by the incubation of high-tech startups.

It is the first incubator in Chinese-Taipei. This case study will present a complete story of policy thinking, resource scanning, management team formation, financial planing, marketing and promotion strategy, resource leveraging, and outlook.

Incubator name

ITRI Incubator

Rm.101, Bldg. 53, 195, Sec. 4 Chung Hsing Rd., Chutung, Hsinchu, Taiwan 310

http://incubator.itri.org.tw

http://openlab.itri.org.tw

Incubator category

Category 1: ITRI Incubator focuses on nurturing high-tech tenants.

Incubator's mission

- To nurture high-tech start-up companies through ITRI total resources
- To assist traditional industry upgrading by ITRI's R&D capabilities

Year incubation program began accepting clients

ITRI Incubator began incubation program in 1996.

Current gross square footage

Current gross square footage is 14,510 m2 (156,200 ft2).

Incubator tax status

ITRI is a not-for-profit R&D institute. ITRI employees have operated its incubator independently, without any government sponsors.

Incubator accomplishments

1) Business development services

ITRI, Industrial Technology Research Institute, is a not-for-profit R&D institute founded in 1973 with three major functions for creating innovative technology, developing emerging industry and enhancing industrial competitiveness.[1] With an outstanding track record on spin-off high-tech companies, ITRI began to nurture Taiwan's entrepreneurs by operating business incubation in 1996. The ITRI Incubator, the first in Taiwan, operates two kinds of programs, one for nurturing start-up companies (incubation program), and the other for participating in R&D projects with ITRI R&D labs (collaboration program).

- **Stringent review process**

Following lengthy discussion on technology, business models, team members, finance, and stockholders included in the business plan, Incubator manager makes suggestions to tenants for building a lower risk venture. Simultaneously, Incubator manager seeks to integrate ITRI abounding R&D resources into startup companies to create a win-win situation. The following review committee will decide whether an applicant is qualified for incubation or not, an important mechanism for ITRI Incubator. The committeemen, including an ITRI senior engineer, university professor, sophisticated management consultant, and ITRI's venture capital representative will criticize inexperienced entrepreneurs from many aspects to find the best solution for the deficient business plan. They fulfil Incubator's selection criteria "***NIII***, ***N****ew company with* ***I****nnovative technology will make huge* ***I****mpact on existed industry joining ITRI* ***I****n-house incubation program*" to select prominent incubatees. The tenants will modify further business strategies according to the results of the review committee.

The qualified and budding entrepreneurs get assistance in building a new office and laboratory from ITRI Incubator. The Incubator presents 156,200 square feet of R&D space, complete with physical and chemical characterization abilities, an HVAC system, a broadband-wired system, and well-established emission and wastewater facilities. The tenants can build their own laboratory or sign service contracts with the ITRI R&D Laboratory with Incubator's assistance to develop a prototype. ITRI also creates a comprehensive and suitable environment such as accommodation, business hotel, library, cafeteria, and sports facilities for tenants. It can help tenants focus on R&D activities rather than niggling work.

- **Value-added services for tenants**

Business operations help is continuously provided and disseminated in several forms. ITRI Incubator's on-site management team and consultants, such as lawyers and accountants, ensure that tenants receive quality assistance regarding pertinent issues. With proper instruction provided by Incubator, most tenants developing frontier technology can have a better chance to win the SBIR R&D subsidies. The CEO Club, irregularly held by Incubator, invites experienced management executives for meetings, thus increasing network and cooperative opportunities with strategic partners. The surprising results, which frequently occur, make horizontal alliances between tenants. The mentoring program, or Elite Party consists of our consultants, and offers solutions through interviews and discussion by way of carefully designed focus group meetings. Overseas marketing exploration searches for the right situation for tenants, while strategic alliances with the Acer Group and CETRA (China External Trade Development Council) add intense support to marketing services. The official quarterly "Focus OpenLab" reports tenants' status quo, latest technology trend, managerial issues, and the best practices that have been a powerful tool in marketing for tenants.

For educating technology-oriented entrepreneurs in the business domain, the Incubator launched a series of free training courses, known as the Technology Innovation and

Entrepreneurship Forum (TIEF), for our tenants since 2002. It offers courses in a range of topics, often provided by companies prominent in the field who want to develop connections with young start-ups. For example, the accountancy firm Diwan, Ernst and Young provides forums on how to deal with taxes, and Yuanta Core Pacific Securities offers advice on how to list on the stock market. Other courses tell budding entrepreneurs how to read financial reports, apply for patents, get government grants, and manage employees' time.

■ **Incubation with investment function**

The Industrial Technology Investment Corporation (ITIC), owned exclusively by ITRI, is an in-house venture capital fund targeted to seed startups, which visits and reviews clients regularly with Incubator manager.[3] Incubator not only works with ITIC but also helps tenants access other valuable venture capital. The “VICTORY” activity held by ITRI Incubator provides an investment platform to creative dialogue between both venture capital and tenants.

Our international tenants (for example, Telecodia, FESTO, and Corning) are the catalysts to foster internationalization in the ITRI Incubator. Every foreign employee is soon familiar with the ITRI environment and quickly sets up a liaison office with our effort and assistance. To link ITRI abounding R&D capacity with overseas entrepreneurs, ITRI Incubator recently extended its incubation service to North America. Thus ITRI's incubator in Silicon Valley will offer knowledge on how to open a business, technical support and trade consulting services to potential clients, and help them promote the sales of their products to the Asian and Pacific region.

Note:

1. ITRI Website: www.itri.org.tw

2. “Focus OpenLab”: http://www.itri.org.tw/eng/about/publication.jsp?tree_idx=0700

3. ITIC Website: www.itic.com.tw

2) Program results

■ **Overview of tenants**

By integrating different resources into a comprehensive environment, ITRI Incubator attracted a total of 243 firms to garrison. All tenants can be divided into four categories: 1.Incubation Program Tenants 2.Collaboration Program Tenants 3.International Tenants 4.Service Providers. The incubator has more than 13,000 square meters of space for lease, which companies can use for offices or research facilities.

Table 6 The Categories of Tenants in ITRI Incubator in Sep.2005

Categories	Incubation	Collaboration Program	Service	Sum

	Program	R&D Companies	International Companies	Provider	(Companies)
Client	16	25	4	16	61
Graduates	77	98	3	4	182
Total	93	123	7	20	243

From the beginning of incubation at ITRI, 134 new start-up companies have been formed with ITRI's assistance. Ninety-three companies have joined the incubation program; others emerged from the collaboration program. These entrepreneurs built new ventures with limited resources at initial stages. The original capital of startups accumulated about US$136 million dollars. After a two-and-half-year-incubation period, tenants doubled their capital raised from investors or ITIC. All tenants attracted US$1.52 billion in investments in nine years.

The work of Incubator creates jobs. Since 1996, tenants in Incubator have employed 6,650 persons. 90 percent of tenant' employees are researchers and technicians, 40 percent have Master's degrees and higher. Many high-tech client firms also provide more benefit and stock options to recruit ITRI's outstanding employees.

As the above table of Incubator Tenants indicates, 182 firms graduated successfully, and over 80 percent of graduates remain in the Hsinchu area. Thirty-five graduate firms received permission to move directly into the Hsinchu Science Park that is the heart of high-tech industry in Taiwan. Twelve new start-up tenant companies went IPO within the last three years. Five tenants showed their gratitude by contributing to Incubator's bottom line, whether by sponsoring activities, donating valuable services, money or equipment. Until now, Incubator has received US$172,000 dollars, service of parametric test solutions, and a set of wireless Internet access points installed around the ITRI campus.

- **Business development services**

Capital raising activities, known as VICTORY (**V**enture **I**nnovation **C**onvention—**T**aiwan **O**n the **R**ise, ***Y****es*!), take place periodically to help tenants' fund-raising by cooperating with Monte Jade Science & Technology Association. Most tenants are invited to make a business presentation for interested venture capitals, and some invest. Enova Tech. [2], graduated in April 2005, got US$3M dollars from venture capital by participating VICTORY. Sometimes the new-product-fair that is combined with VICTORY gets a sound marketing effect. The CEO Club invites experienced management executives for meetings, increasing network and cooperative opportunities with strategic partners. The Mentoring Program offers solutions through interviews and discussion by way of carefully designed focus group meetings.

The ITRI Incubator plays an active role in business education. We invite experienced experts to lecture tenants on management, accounting, finance, etc. These free courses, TIEF, which focus on entrepreneurial training, have lasted for four years. A total of 140 courses have been conducted, and attendees have reached upwards to 5,500 persons.

- **Duplication incubation experience**

By documenting key incubation processes from entrepreneur interviews, reviewing processes, and providing graduation services, ITRI Incubator has developed knowledge management of incubating experiences. It enables ITRI to duplicate incubators around the island. A Nankang IC Design Incubator, affiliated with Nankang SoC Park (Taipei, Taiwan), was established in 2003 for nurturing IC design companies.[3] A Southern Taiwan Innovation & Research Park (Tainan, Taiwan) installed the incubator to help entrepreneurs develop new ventures.[4] ITRI Incubator assisted the feasibility study, and the regulation and incubating system of the above two incubators. The two incubators operated by an ITRI employee had been categorized as part of the ITRI incubation system. With the successful accomplishment of incubation in Taiwan, ITRI has begun to extend incubating service to North America. ITRI Incubator, North America, will assist overseas entrepreneurs in venture creation and development by linkage with ITRI's resources.

The ITRI Incubator was just awarded the "AABI Incubator of the Year 2005" in May. The award is presented to ITRI Incubator as the highest score-holder among eight Asian incubators in six major assessment categories -- *the management of the incubator, the range of services, the current state of incubated businesses, results of incubation efforts, financial conditions, and successful graduate businesses*.

Note:

1.VICTORY Website: www.mjtaiwan.org.tw/2005vc/01.htm

2.Enova Technology Corp. Website: www.enovatech.net

3.Nankang SoC Park Website: www.nspark.org.tw

4.Southern Taiwan Innovation & Research Park Website: http://sirdp.org.tw/sirdp/

3) Financial stability

- **Full commitment from the top**

ITRI is a primary R&D center for industry and its revenue composition is unique. Government partnership provides about half of ITRI's income. The other half comes in the form of research and service contracts from the private sector. This "half-half" situation allows ITRI to pull from a wider variety of resources than either public-only or privatized R&D facilities. Over a decade ago, the government funded ITRI by the Technology Development Project, in the amount of US$ 70M, to construct the Innovation Plaza, which is designed as a multi-function building. Since then, ITRI Incubator has to pay nearly 43 percent of the rent revenue to the government as payment for the use of its building. The total floor space in the Innovation Plaza is 1,504,800 m^2, including the space of laboratories, offices, cafeteria, parking lot and public areas, and most of that is utilized by ITRI Labs. In the beginning of operation, Incubator occupied up to 20 percent of the available labs and offices in this building for nurturing ventures. With the increasing scale of ITRI Labs, ITRI Incubator decreases the operation area which less than 10 percent of the Innovation Plaza space.

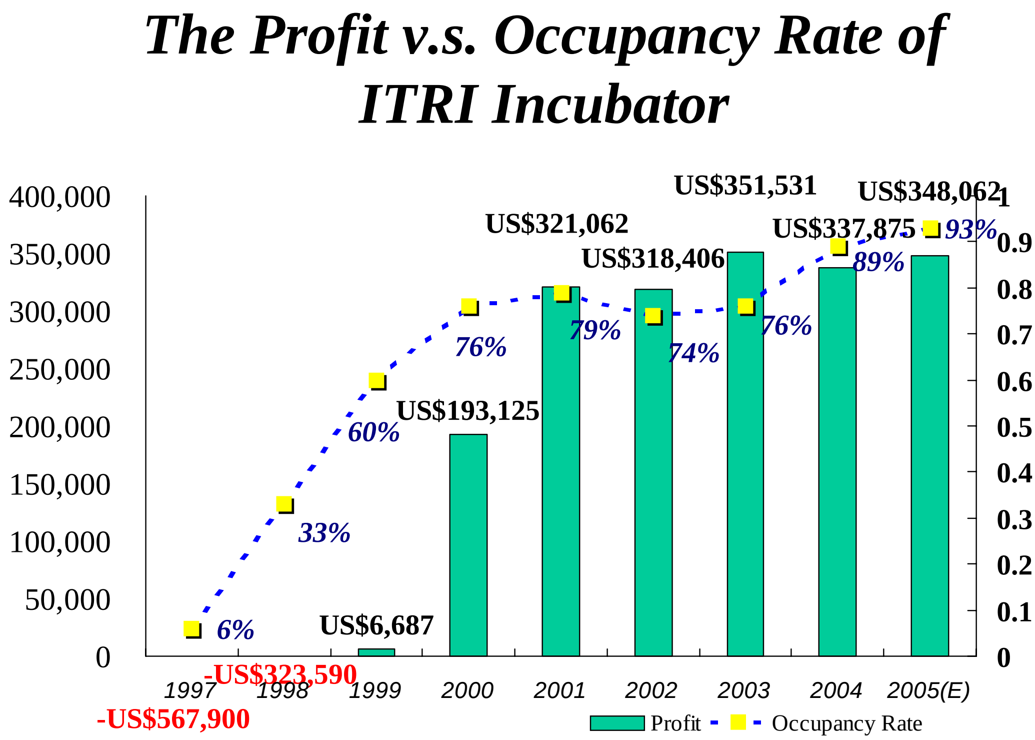
ITRI Incubator was started with high hopes as well as high-level support from ITRI top management. A low occupancy rate was a major reason the ITRI Incubator lost nearly US$1 million dollars in the first two years. Determined to carry on, Incubator management personnel leveraged ITRI's abundant resources to serve tenants. With a full-time crew of just five people, Incubator made a modest (US$6,687) profit without government subsidy in its third year of operation. More satisfied tenants' graduate and more occupancy rate increase. The brand name of ITRI Incubator are forming and attracting the new comers to cause the increment of occupancy rate.

■ **The structure of incubator's revenue**

Revenue is derived from several sources. 80 percent of the revenue is from the rent, and the remainder may come from utility charges, accommodation fee, conference room fee, donations, etc. Although incurring a deficit in the first two years, Incubator made a profit the third year. With an increase in occupancy rate, Incubator achieved financial breakeven at the seventh year. In 2004, the revenue of ITRI Incubator reached US$1,445,438 dollars, and US$1,205,195 dollars came from the rent. ITRI Incubator has achieved self-sufficiency that requires no external subsidy to cover operating expenses.

Currently, Incubator benefits from over a 90 percent occupancy rate. The high occupancy rate guarantees cash flow, and offsets the fact that Incubator pays the Government 43% of the rent as payment for the use of Innovation Plaza. The payment has accumulated to US$ 4.25M for nine years. Compared to the initial cost of construction, Incubator keeps the beneficial investment for the government. In 2004, payment to government was US$ 525,313 dollars.

Five tenants spontaneously donated US$172,000 dollars to show gratitude to ITRI's assistance in past years. Contributions to Incubator help make possible new incubating activities and events.



Source: ITRI Incubator

Fig 1 The Profit vs. Occupancy Rate of ITRI Incubator

■ **Various incomes derived from tenants**

Some tenants seek to cooperate with ITRI R&D departments by collaborating contracts after they meet the problem in new product development. This in itself brings ITRI a steady income.

ITRI reserves the right to hold between 5 - 10 percent of the shares for each start-up company that participates in the incubation program. The Incubator staff plays a vital role in investigative dues of tenants. With careful screening, ITIC has invested over US$15M dollars in nearly thirty incubatees and made profits of US$18M dollars. It shows that the value of new star-up companies has been created through ITRI incubation.

4) Success stories

■ **Phison Electronics Corp.** (http://www.phison.com)

Phison, currently ranking No.2 worldwide in flash memory controller providers, reached an EPS of 9.7 last year. Phison was established during November 2000, at the ITRI Incubator. The founders were five young graduate school students excelling in USB flash controller technology and related NAND flash applications. In May 2001, Phison successfully developed the world's first USB flash removable disk - Pen Drive. Now, Phison has developed into one of the most competitive hi-tech firms in Taiwan.

- Foundation: Nov.2000 at ITRI Incubator
- Incubation Period: Two years
- Core technology: USB flash controller technology and NAND flash related applications
- Employees(2005.5): 155 persons
- Grant & Award
- – Received 3 SBIR subsidies
- – Received top "Gold Medal" award out of nearly 200 companies in Taiwan Incorporation Competition (TIC) organized by the Ministry of Economic Affairs
- IPO: Listing on emerging stock market in 2004
- Revenue: $121M(USD) in 2004
- Donation: Accumulated NT 2.5M to ITRI

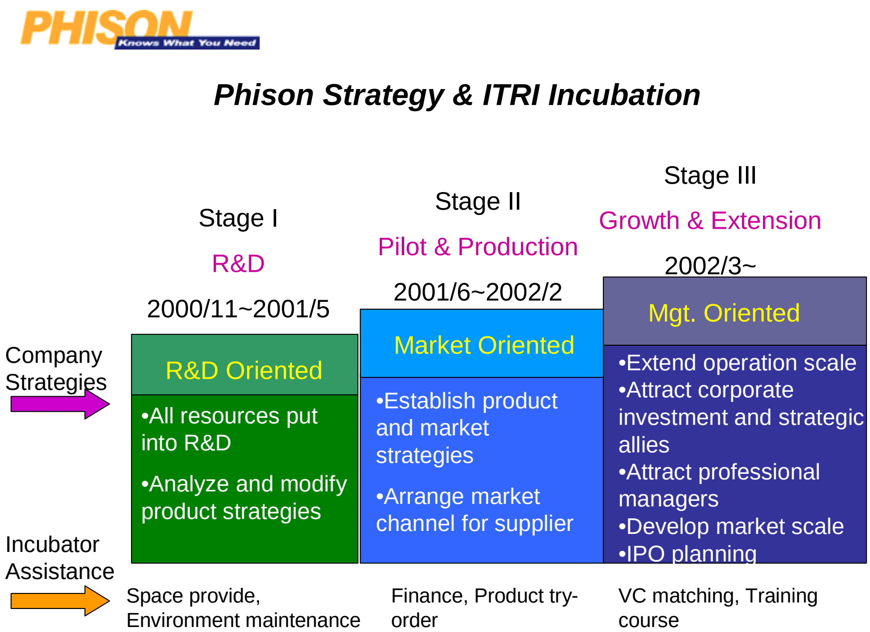


Fig 2 Phison Strategy & ITRI Incubation

Source: ITRI Incubator, 2005

During the early marketing stage, Phison’s products were heavily promoted by ITRI’s industrial networking. The multi-pronged strategy paid off. Fujitsu, Siemens, and ASUSTek have approved Phison’s products. The continued orders garnered from these companies have made for exponential growth. Phison was the champion of the 2002 Taiwan National Innovative Business Award.

- **Prolific Technology Inc.** (http://www.prolific.com.tw/)

Prolific Technology Inc., a leading IC design-house and ASIC design services provider. Established by a highly experienced group of ITRI specialized technical engineers, Prolific entered ITRI's Incubator in August 1998. The CEO, C. T Chang, was ITRI alumnus. He says, "Prolific was nurtured and grew entirely by ITRI's support!" The management team's extensive network of contacts made during their time at ITRI came into play when Prolific was established. In the initial stage of Prolific, Chang's former boss at ITRI facilitated the first order to help overcome the crisis.

According to the outstanding performance of Prolific, they got several awards in recent years, like "*A promising IC design house, ranked as the most competitive fabless company in Taiwan by Merrill Lynch*," "*Ranked as No. 22nd in "Taiwan Technology Top 100" by Business Next Biweekly*," etc.

With continuing cooperation with ITRI Labs to complement their R&D capacity, Prolific grow and development in the platform of incubation. Prolific actively joins CEO Club, Mentor Program, and TIEF training course to reduce learning curve. These are the main assistance that ITRI Incubator provides for Prolific. Prolific donated the sum of NT$2M dollars to ITRI in 2003 and 2004.

Prolific's sale revenue reached US$40.6M dollars last year. For more information about olific's financial report, please access the webpages: *http://www.prolific.com.tw/eng/investors.asp*

5) Best practices

- **Utilization of ITRI advantage**

ITRI's own core competence rests with a strong R&D capacity. The advanced technologies owned by each organizational unit can be accessed by Incubator participants. The timely assistance in other areas, such as funding, is a key reason why Incubator participants usually complete their mission in less than two years, and acquire fast access to today's markets. In short, Incubator serves two purposes: technical cultivation and business investment.

Companies that take advantage of joining ITRI Incubator benefit in a unique way. ITRI's resources are augmented by its abilities in capital funding and planning, consultation on legal and intellectual property, accounting and financial advice, personnel training and recruitment, industrial networking, and the leasing of facilities. This integrated business approach covers all aspects of business daily life, and, in doing so, allows companies to focus on their own further development.

- **Concept of ITRI incubation model**

ITRI Incubator owes many people for its current level of success. The positive practices in place that are the underpinning of the Incubator derive from the concept of **TAM** (Total Asset Management). Indeed, Incubator's utilization of this system gives participating client companies a far-reaching ability to acquire resources. TAM allows client companies to obtain the maximum amount of resources at a minimal cost – a way of thinking and acting that can help any business meet and exceed its potential.

- **Unique selection criteria**

In addition to operation management, Incubator also promotes two other business principles: **NIII** and **CCC**. NIII is an acronym used to assess the qualifications of Incubator applications: N (newness), I (innovation), I (impact to industry), I (in-house incubation). If a prospective company is new, innovative, has the potential to impact industry, and would benefit from access to Incubator resources, the company is a prime candidate for Incubation Program. CCC functions as a guideline for the operating principles governing the Collaboration Program. Through **C**ollaboration, **C**ommercialization, and **C**ontribution to industry, both Incubator and our participant companies can thrive in this incubator setting. In other words, Incubator works closely with industry to develop and commercialize products and technology with lasting impact.

- **Striving for the future**

ITRI Incubator has evolved from the ground up in just nine years. In the future, we will constantly strive for new and innovative management models to achieve more challenging goals. Incubator also has a unique "learn by doing" attitude that allows us to adapt to Taiwan's fast-changing business landscape. Five full-time staff serve participant companies by acting as one-stop contact windows. These dedicated managers are liaisons between the companies and ITRI, and provide external resources for our tenants. A dynamic platform for value-added and streamlined services, such as the VICTORY activity and TIEF training courses, serve to add value and make working with Incubator a comprehensive win-win situation. Treating the incubation experience as the result of knowledge management will enable ITRI to export this kind of business to assist those who want to deploy an incubator.

- **ITRI Incubator**

<u>Income Statement</u>

Jan.1~Dec.31, 2004

Operating Revenue	**1,445,438**
Agency revenue	

Rental	1,205,195	
Utilities charge	167,493	
Accommodations service	57,757	
Internet service	14,994	
Other operating revenue		
Governmental funding	0	
Operating Expenses		**1,098,188**
General & administrative expenses		572,875
Payroll expense	88,551	
Travelling expense	4,323	
Maintenance	95,573	
Advertisement expense	46,875	
Insurance expense	12,500	
Utilities expense	33,063	
Office supplies	137,500	
Entertainment expense	6,255	
Professional service fees	46,875	
Other general & administrative expense	101,360	
Depreciation of buildings (paid to government)		525,313
Net Income before income tax		**347,250**
Income Tax		**9,375**
Net Income		**US$337,875**

Notes: 1.US$1 dollar=NT$32 dollars

2.The operation of ITRI Incubator has been financial self-sustain since its opening on July 5, 1996.

3.The estimated net income of 2005 is US$ 348,063 dollars.

6) Extra information

■ **News clippings**

a. ITRI Incubator to be honored as best incubator in East Asia

TAIWAN Journal

ITRI Incubator to be honored as best incubator in East Asia

Publish Date: 06/10/2005

Story Type: Economy;

Byline: Graham Norris

Turning a bright idea into a business used to require a lot of time or very rich parents. Now budding entrepreneurs can get financial and technical help from business incubators, such as the one operated by the Industrial Technology Research Institute's (ITRI) Incubator.

Since it opened in 1996, the incubator has helped hatch more than 130 companies, including 5 that have since gone through initial public offerings. According to ITRI, these high-tech start-ups have created more than 15,000 jobs[1] and their accumulated capital has reached US$1.4 billion. The incubator now even makes a modest profit, after suffering a loss in its first two years of existence.

The incubator's success has been recognized by the Asian Association of Business Incubation (AABI), which will name it the best incubation center in the region at a ceremony in Seoul, South Korea, in August. It beat competitors from eight other regions and countries, including the Hong Kong Science and Technology Parks Corp. and the Shanghai Technology Innovation Center.

"The incubator, based on the 'OpenLab' model and ITRI's considerable resources, has built an impressive record in fostering high-tech companies," said one of the AABI judges. "The incubator offers a wide range of services and, impressively, has achieved self-sufficiency within three years." The ITRI was the first in Taiwan to set up a business incubator after the government began a program to promote the development of small and medium-sized enterprises in 1995. Now there are more than 60 business incubators across the country, the vast majority of which are run by universities.

Even before it opened the incubator, the institute had accumulated a great deal of experience creating companies. United Microelectronics Corp. and Taiwan Semiconductor Manufacturing Co. Ltd., the world's two largest made-to-order chipmakers, were both created in the ITRI.

While research continues to be the main focus of activities at ITRI, business incubation has become an important part of the institute's operations, and the incubator's 16 current tenants occupy two large buildings at ITRI's tranquil campus in Hsinchu County.

To attract talent to this somewhat remote location about an hour's drive from Taipei, the campus offers tennis courts, a kindergarten, a dormitory, a clinic, postal and banking services and a cafeteria that can seat 2,000 at a time. But it is the range of business services and support that is the main attraction for entrepreneurs looking for help in starting a company.

The incubation center has more than 13,000 square meters of leasable space, which companies can use for offices or research facilities. The institute offers a 25 percent discount on rent in the first year of occupancy, falling to 5 percent in the third year. Companies must move out after three years, and many relocate to the nearby Hsinchu Science Park, where they can set up production facilities, which is not possible at ITRI.

As well as providing space for companies to set up research facilities, the incubator allows companies to take advantage of ITRI's 13 research laboratories. Companies can either send their own staff to conduct research in the laboratories, or they can ask the institute to provide researchers.

Developing a product is only half the story, however, and the incubator also goes to great lengths to help companies develop the business skills needed to expand. It offers courses in a range of topics, often provided by companies prominent in the field who want to develop connections with the young start-ups.

For example, the accountancy firm Diwan, Ernst and Young provides forums on how to deal with taxes, and Yuanta Core Pacific Securities offers advice on how to list on the stock market. Other courses tell budding entrepreneurs how to read financial reports, apply for patents, get government grants and manage employees' time. Last year nearly 1,500 people attended 40 courses.

Another key component of building a business is networking, which makes it easier for companies to raise funds, hire qualified people, develop cooperative partnerships and, of course, find customers.

Besides offering access to consultants in the Hsinchu Science Park, the key research facilities of National Chiao Tung University and National Tsinghua University and ITRI's own facilities, the incubator encourages interaction between its tenants and established businesses through seminars with experienced senior executives and management consultants. Moreover an ITRI overseas marketing exploration team helps tenants find opportunities overseas.

To increase the visibility of the entrepreneurs working in its incubator, ITRI holds the Taiwan Incorporation Competition 100 every year. Another key networking event is the "Victory" convention, which is held annually to provide entrepreneurs with ideas on how to develop their businesses. This year more than 700 people attended the convention to hear speeches from venture capitalists and intellectual property rights experts. They also looked at case studies of 45 young companies.

Tenants can also get on-the-spot legal and financial advice and even plane tickets from lawyers, stockbrokers and a travel agent who have set up offices in the incubation center.

The in-house venture capital fund, Industrial Technology Investment Corporation (ITIC), can also provide key assistance in raising funds. In addition to investing in promising companies that are short of money, the ITIC helps tenants develop business plans to apply for small business innovation and research subsidies from the government. Between 1999 and last year, companies in the incubator received grants worth US$7.7 million to invest in facilities, people and products.

But all this help is not available to just anyone, and the entry requirements are stringent. Companies must have been in existence for less than 18 months, have a capitalization of less than US$2 million and employ fewer than 20 people. The business plan must demonstrate that the products are innovative and will have an impact on existing industries, and must take into account market conditions and potential competition.

One company that met the requirements is Aphelion Communications Inc., which makes mobile wireless technology equipment. It moved into the incubator last June, and within six months had secured a US$190,000 government grant and was named one of the top five best start-up companies by the Small and Medium Enterprise Administration of the Ministry of Economic Affairs.

"If we had not moved in here we wouldn't have known about the competition or the opportunity to apply for subsidies," said Aphelion Chief Executive Officer Gary Chiu.

Aphelion's five founders were attracted by ITRI's research facilities, which they had used occasionally at their former company. The space they rent at the incubator includes offices and a small laboratory, and for more difficult research they use ITRI's facilities. The institute also allows them to deploy their product for testing around the campus.

The company now employs 22 people and released its first product in April, samples of which have been sent to distributors around the world. U.S.-based Sprint is one of the companies testing its product, and Aphelion has begun working on WiMAX--worldwide interoperability of microwave access--technology which will offer wireless broadband communications over large areas.

Chiu said the incubator's staff had helped his company with issues big and small, ranging from finding new sources of capital to working out the best way to provide health checks for the company's employees.

"They want us to get out after two years, but we want to stay as long as possible," Chiu said, adding that the university atmosphere of ITRI's campus would be more attractive to the researchers they want to hire.

Communications companies make up more than a quarter of the companies in the incubator, with others involved in integrated circuits, chemical materials, optoelectronics and biotechnology. After graduation, the survival rate is around 70 percent. Six graduates have been acquired by larger rivals such as Broadcom Corp. and Accton Technology Corp.

Phison joined the incubator in November 2000 and developed the Pen Drive, the world's first

USB flash removable disk. The company is now the world's second-largest maker of flash memory controller devices, has had 40 patents approved and employs around 100 people. Revenues came to more than US$100 million last year.

Phison spokeswoman Bonnie Chiu said ITRI's incubator was particularly helpful in finding sources of investment and providing networking opportunities, which helped the company secure orders from Fujitsu, Siemens and Asustek.

"Without the incubator's help in the early stages, Phison would not have been able to grow smoothly," Chiu said. "It was a new company with no credit, and they helped us find trading credit with a bank. They also introduced us to many important partners to create business opportunities." The company was so appreciative of the help it received that it donated US$48,000 to ITRI when it moved out of the incubator. "Basically, they helped Phison to solve all its problems, just like a babysitter," Chiu said.

Incubator Note:
1: This number means that all start-ups companies indirectly create jobs instead of the number of employee when they garrisoned in Incubator.

■ **AABI Award**

ITRI Incubator Centre named as best of its kind in Asia

The Incubator Centre of the Hsinchu-based Industrial Technology Research Institute (ITRI) has won the annual award of the Asian Association of Business Incubation (AABI), called the AABI Award, for this year, an ITRI official said on May 23.

The ITRI centre is scheduled to be bestowed with the title of the best business incubation facility in the region at an award-presentation ceremony in August in Seoul, South Korea, the official said.

The AABI, founded in 2002, is the Asian branch of the world’s largest business incubation organization – the National Business Incubation Association of the United States, and the largest of its kind in Asia with nine members from nine areas in the region, including Taiwan, South Korea, Japan, Malaysia, Singapore, New Zealand, India, Hong Kong and China.

The AABI Award, the organization’s key annual award activity aimed at promoting regional business incubation, is presented to the highest score-holder in six major assessment categories – the management group of an incubator, the range of services, the current state of incubated businesses, results of incubation efforts, financial conditions, and successful cases. The ITRI incubator won the award with a total score of 689.7 points.

According to the latest ITRI statistics, the ITRI incubator centre has helped create 133 technology-based businesses since it started operations in 1996.

■ **ITRI sets up incubation center in California**

2005/06/29 20:19:30

New York, June 29 (CNA) Taiwan's Industrial Technology Research

Institute (ITRI) recently opened a talent incubation center in Silicon Valley, California, via its North American base -- ITRI International Inc. -- to offer comprehensive services to people interested in starting a new business. With abundant researchers and brilliant technical services to corporations, ITRI's business incubation center in Hsinchu, northern Taiwan, has been chosen as the best center of its kind in Asia by the Asian Association of Business Incubation (AABI) this year.

ITRI President Johnsee Lee said on his recent visit to the United States that Taiwan can become a springboard for talented people in Silicon Valley to enter the Asian market, and the newly established North American incubation center can help such efforts. ITRI's incubation center in Silicon Valley will offer knowledge on how to open a business, technical support and trade consulting services to potential clients and help them promote the sales of their products to the Asian and Pacific region.

In addition to offering technical support to corporations, the ITRI also badly needs high-tech experts from abroad. ITRI's talent-search program from abroad last year received a warm response, and the organization will continue the program in search of high-tech experts with more than five years' work experience in North America.

To strengthen Taiwan's competitiveness, Lee said he hoped that ITRI International, Inc. can forge cooperative relations with noted U.S. universities, research organizations and corporations. Currently, ITRI has long-term cooperative projects with Rockwell Scientific, Co., Stanford University, the University of California at Los Angeles, Corning and Dow Chemical, and has established strategic alliances with SRI International, UC Berkeley, and Carnegie Mellon University.

In 2004, ITRI successfully introduced 211 U.S. patents related to digital imaging ICs to Taiwan, ushering in an era of digital television, LCD television and the digital imaging industry in Taiwan, and the company will keep securing U.S. patents for Taiwan to upgrade the technical level of the island.

(By Elisa Kao)

Source: http://english.www.gov.tw/index.jsp?action=cna&cnaid=11115

8.2. Benchmarking and Application Practice

Please point out:

- What are key success factors of your Business Incubators?
- What can be learned from the case?
- What are possible solutions to cope with the existing difficulties you face?

Conclusion

Entrepreneurship and innovation is the locomotive of economic growth, nurturing infinite potential and possibilities. The installation of the entrepreneurship and innovation incubation platform will directly stimulate these activities, helping to internationalize future innovation perspectives and business opportunities. Business Incubators play a significant role in extending the industry chain and upgrading industrial structures. In addition to setting up more Business Incubators and improving the function and quality of services, we must continue to work towards better “innovation,” “speed” and “value,” and strengthen the role of Business Incubators as the pivot of resources. The asset of each Business Incubator of a nation should be integrated according to their different specialties, realize the concept of equal theory and practice, and provide incubation services to SMEs at different stages of their development, from idea conception, innovation to entrepreneurship.

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Chapter 4. Research and Business Development

Kyung Suk Han[1]

This course presents the concept of R&BD, SBIR (Small Business Innovation Research) of the United States, BUNT (Business Development using New Technology) program of Norway, R&BD instances of Korea and the method for a small and medium enterprise to touch upon the sustainable success. Since R&BD (Research and Business Development) is the concept that R&D is combined with marketing, R&BD is called the 4th generation R&D (William L. Miller & Langdon Morris). Ushering new era of competition, a new approach is needed to successfully implement innovation and R&D, which is the fourth generation R&D, to cope with the new challenges.

1. Introduction

This course presents the concept of R&BD (Research and Business Development) that is next generation R&D strategy that focuses on business-related R&D to provide sustainable benefits for SMEs (Small and Medium Enterprises). In the R&BD program SMEs consider the business or marketing strategy from the early stage of R&D. This course also introduces R&BD programs including SBIR (Small Business Innovation Research) program of the United States, SBRI (Small Business Research Initiative) program of United Kingdom, SBDC (Small Business Development Center) program of each State in USA, BUNT (Business Development using New Technology) program of Norway and R&BD instances of Korea. Eventually it will discuss the methods for a small and medium enterprise to touch upon the sustainable success.

Since R&BD is the concept that R&D is combined with marketing, R&BD is called the 4th generation R&D (William L. Miller & Langdon Morris). Ushering new era of competition, a new approach is needed to successfully implement innovation and R&D which is the fourth generation R&D to cope with the challenge of sustainable businesses. The most important objective of this course is to make innovation-oriented SMEs sustainable with the sufficient amount of profit and to help them establish the business-oriented strategy from the early stage of R&D. R&BD is a critical part for SMEs' development in the APEC member economies.

1.1. What is R&BD?

What is R&BD program? R&BD program is next generation R&D strategy that focuses on

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[1] Professor, Soongsil University, Seoul, Korea

business-oriented R&D from the early stage of R&D to provide sustainable profits for SMEs. It is considered as good strategy for SMEs to obtain funds from financial institutes including venture capitals. R&BD links R&D with marketing and other business function, which means that marketing and commercialization will be considered from the planning stage and new business will be developed accordingly.

As the R&D cycle is getting faster, R&BD (Research & Business Development), research undertaken with commercialization in mind from its planning stage, is now coming to the fore. In addition to this, high-speed networking and cutting-edge research infrastructure such as supercomputers that can deal with high capacity information rapidly have become very important. In R&BD, the process of commercialization of technology becomes the most important process among establishment of corporation, development of products, manufacturing, and logistics.

R&BD activities are about how the innovative product can meet the market needs and create competitive advantage for those enterprises who implement R&BD program. Through R&BD program, SMEs can have knowledge about creating and providing opportunity for their R&D capabilities by starting a new technology to increase the size of the market and exploit the new market opportunity. R&BD is also expected to increase the enterprise's productivity and increase the product quality which may impact the increase of GDP and good quality of life. Without R&BD, it is very difficult for Small and Business Enterprises (SMEs) to survive in the business competition for a long-term.

1.2. Related Theories, R&BD Programs and Policies at a Glance

Most well-known R&BD programs include SBIR (Small Business Innovation Research) Program of the United States, SBRI (Small Business Research Initiative) program of United Kingdom, SBDC (Small Business Development Center) program of each State in USA, BUNT (Business Development using New Technology) program of Norway and R&BD programs in Korea. Main goal of those governmental policies is to provide sustainable benefits for SMEs while helping SMEs consider the business or marketing strategy from the early stage of R&D.

SBRI (Small Business Research Initiative) is designed to help Small and Medium Enterprises (SMEs) gain greater access to publicly funded Research and Development (R&D) contracts. SBDC (Small Business Development Center) also has each purpose in each State in USA, for example SBDC in The Wharton School, University of Pennsylvania, usually called WSBDC (Wharton Small Business Development Center). The WSBDC provides free consulting services to entrepreneurs as well as educational workshops for which we charge a nominal fee. The WSBDC is strongly committed to help small businesses in Philadelphia area.

In Small Business Economics, the SBIR program was created by the Small Business Innovation Development Act of 1982 (Small Business Economics, 2003, Vol.20, Iss.2, page 137-151). The Act mandated that each Federal agency with an extramural R&D budget in excess of $100 million designate a certain percentage of this budget for awards to small businesses. The set-aside was initially set at 0.2 percent of an agency's extramural R&D budget, with a legislated growth to 1.25 percent in 1987. This level continued through 1992. On October 28, 1992, the program was reauthorized through FY 2000 and Congress maintained the growth in the set-aside by directing that the percentage increase to 2.5 percent by FY 1997 and stay at that level through FY 2000. In December 2000, Congress reauthorized the SBIR program through 2008, with the set-aside percentage to remain at 2.5 percent throughout the period. Under the program criteria, ten Federal agencies must currently participate in the program. Total obligations for the program in 1999 were about $1.1 billion.

The program was established with a three-phase structure that promotes progress towards commercialization:

- Phase I awards of up to $100,000 are funded for six months for research projects to evaluate the scientific and technical merit and feasibility of an idea, and to enable the funding agency to assess the quality of the recipient firm and its project.
- Phase II funding is provided for the Phase I projects with the most potential to further develop the proposed idea. Phase II funding is for one or two years, and most awards are $750,000 or less.
- Phase III is when commercialization takes place, when private sector investment and support brings an innovation to market. Phase III may also involve follow-up production contracts issued by a Federal agency. SBIR funds are not used for Phase III activities.

The broad purpose of the program, as stated in the 1982 Act, is to strengthen the role of the small, innovative firms in federally funded research and development, and to utilize Federal research and development as a base for technological innovation to meet agency needs and to contribute to the growth and strength of the Nation's economy. The legislation listed the following more specific purposes:

- To stimulate technological innovation;
- To use small business to meet Federal research and development needs;
- To foster and encourage participation by minority and disadvantaged persons in technological innovation; and
- To increase private sector commercialization of innovations derived from Federal research and development.

These goals have been maintained throughout the program. The 1992 SBIR reauthorization bill placed added emphasis on the commercialization objective and made more explicit the objective of increasing the small business share of federally funded R&D. The 2000 reauthorization does not alter these main objectives of the program. A unique feature of the SBIR program is the fact that it embraces the multiple goals listed above and that it maintains an administrative flexibility that allows very different federal agencies to use the program to meet their needs. While this complexity has been a key to the success of the program, it has also led to misunderstandings about the program. The following discussion is intended to help clarify the program's goals, mechanisms, and rationale (Small Business Economics, 2003, Vol.20, Iss.2, page 137-151).

SBA faces several important administrative challenges to continued improvement of the SBIR program. The SBA's Office of Technology is currently working on improvements in the following areas:

- Improving program monitoring and evaluation. SBA's Office of Technology is developing an on-line reporting system for the SBIR and STTR programs that will utilize Tech-Net - a web-based system linking small technology businesses with Federal technology program opportunities. The new on-line system is designed to collect essential commercialization and other impact data, and to minimize the reporting burden on participating firms.
- Preparing awardees for commercialization. New mechanisms for providing assistance to awardees and other applicants are being explored. These include training or referrals and means of providing SBICs and other venture and angel capital funds with up-to-date information on SBIR firms seeking Phase III financing.
- Providing federal seed funding for commercialization. The SBA is assessing a prospective pilot SBIR Phase III seed capital program to provide funding and support training and assistance for SBIR firms.
- Expanding outreach assistance. The SBA's Office of Technology is administering the new Federal and State Technology Partnership program, supports full financing of current outreach grants to States, and is promoting greater support for partnering.

Also in Small Business Economics, public policy towards business has gradually shifted from viewing the role of SMEs through the static lens towards the dynamic framework (Small Business Economics, 2003, Vol.20, Iss.2, page 129-135). For example, the United States Congress enacted the Small Business Innovation Research (SBIR) program in the early 1980s as a response to the loss of American competitiveness in global markets. Congress mandated each federal agency with allocating around four percent of its annual budget to funding innovative small firms as a mechanism for restoring American international competitiveness.

The SBIR provides a mandate to the major R&D agencies in the United States to allocate a share of the research budget to innovative small firms. Last year the SBIR program amounted to around $1.2 billion. The SBIR consists of three phases. Phase I is oriented towards determining the scientific and technical merit along with the feasibility of a proposed research idea. A Phase I award provides an opportunity for a small business to establish the feasibility and technical merit of a proposed innovation. The duration of the award is six months and can not exceed $70,000. Phase II extends the technological idea and emphasizes commercialization. A Phase II Award is granted to only the most promising of the Phase I projects based on scientific/technical merit, the expected value to the funding agency, company capability and commercial potential. The duration of the award is a maximum of 24 months and generally does not exceed $600,000. Approximately 40 percent of the Phase I Awards continue on to Phase II. Phase III involves additional private funding for the commercial application of a technology. A Phase III Award is for the infusion and use of a product into the commercial market. Private sector investment, in various forms, is typically present in Phase III.

Under the Small Business Research and Development Enhancement Act of 1992, funding in Phase I was increased to $100,000, and in Phase II to $750,000. The SBIR was an offshoot of the Small Business Investment Company (SBIC) program, which provided more than $3 billion to young firms between 1958 and 1969. During this period this amounted to more than three times the total amount of private venture capital. The SBIR represents about 60 percent of all public SME finance programs. Taken together, the public SME finance is about two-thirds as large as private venture capital. In 1995, the sum of equity financing provided through and guaranteed by public programs financing SMEs was $2.4 billion, which amounted to more than 60 percent of the total funding disbursed by traditional venture funds in that year. Equally as important, the emphasis on SBIR and most public funds is on early stage finance, which is generally ignored by private venture capital. Some of the most innovative American companies received early stage finance from SBIR, including Apple Computer, Chiron, Compaq and Intel. Through the Small Business Innovation Research (SBIR) program, the National Institutes of Health (NIH) awarded $266 million in grants to small firms for medical and biopharmaceutical research. It is expected that the SBIR program at NIH will exceed $300 million in 1999. In addition to the NIH, the United States Department of Defense also uses the SBIR program to fund biotechnology firms. Between 1983 and 1997 there was more than $240 million in SBIR awards for biotechnology companies from the Department of Defense. Phase I accounted for $47 million and Phase II accounted for $194 million (Wessner, 2001).

To evaluate the impact of the SBIR on the commercial activities of SMEs, a large, comprehensive survey was undertaken by the U.S. National Academy's division on Science, Technology, and Economic Policy (STEP) (Wessner, 2001). In addition, case studies were undertaken on the basis of detailed interviews with the founders, owners and employees of over fifty firms (Scott, 2001; Link, 2001; Link and Scott; 2001). All of the case study firms had received SBIR assistance. They are dispersed across the United States and span a broad range of technologies, products and industries. While some are new startups, others have a proven track record of success. These case studies examined the impact of the SBIR in a broad context. In particular, the results from evaluating the SBIR suggested that the benefit of the SBIR extends beyond the impact on the individual recipient firm. The social rate of return, which incorporates this external positive impact, exceeds the positive rate of return. There was no evidence of a negative rate of return associated with the SBIR. There is compelling evidence that the SBIR program has had a positive impact on developing the U.S. biotechnology industry (Small Business Economics, 2003, Vol.20, Iss.2, page 129-135). The benefits have been documented as:

- The survival and growth rates of SBIR recipients have exceeded those of firms not receiving SBIR funding (Lerner and Kegler, 2001)
- The SBIR induces scientists involved in research to change their career path. By applying the scientific knowledge to commercialization, these scientists shift their career trajectories away from basic research towards entrepreneurship (Feldman, 2001 and Audretsch et al., 2001).
- The SBIR awards provide a source of funding for scientists to launch start-up firms that otherwise would not have had access to alternative sources of funding.
- SBIR awards have a powerful demonstration effect. Scientists commercializing research results by starting companies induce colleagues to consider applications and the commercial potential of their own research.

In Research Technology Management, success in technology development depends increasingly on speed to profitable commercialization. This calls for a new type of technology development management (Research Technology Management, 2004, Vol.47, Iss.3, page 16-26). As projects move from opportunity creation through market entry through commercial takeoff, the technology manager needs to perform nine integrative roles at three distinct levels: the venture level, where the business-building is taking place; the championing level, where resources are secured in the internal competition for staff and funds; and the heat-shielding level, where the issues of project legitimacy are resolved. The nine roles range from creating options to keeping venture teams focused.

Competitive success today demands business-building programs in which technologies generated in the lab are rapidly converted into deployable capabilities and speedily commercialized and diffused into new markets. The leader of a technology development program, therefore, needs to assume a much more comprehensive and integrative role than the traditional R&D manager. No longer can technology be developed in silos in which R hands off to D and D hands off to market development, which in turn hands off to business development. Instead, companies need innovation programs focused on moving an evolving technology through the commercialization cycle as a continuous chain of interrelated processes. In this study, we describe an approach to technology development that focuses not so much on developing technology as on business-building, which connects technology creation to the market. For example, consider how Aventis approaches linking technology and markets. Its executives start by seeking to identify unmet medical needs. Then they focus on opportunities that are scientifically and technologically feasible. They have replaced traditional R&D with a three-phased development approach that focuses their discovery and development efforts on drugs that will have a competitive label and are therefore differentiated from those currently in the market. The unit of action is no longer the scientist within a silo, but a team comprising multiple disciplines. The focus is on the patient, not the technology.

Companies that manage to create a successful business-building program develop a set of relatively simple, but consistent, management processes that cover the entire life cycle of activities associated with the new business start-up: from concept to market entry to business takeoff. When these processes are either not handled or mishandled, we observed progress to be slowed. When processes were missing, business-building efforts often failed. The successful management processes that we have observed are integrated and drive growth through the three stages listed in Table 1. For the sake of keeping our discussion focused, we describe these stages sequentially, but stress that they often do not unfold in an orderly, linear way and that a thriving business-building program would have different activities at each stage:

- Identification and screening of opportunities.
- Introduction of fruitful opportunities into the market.
- Managing the takeoff of the businesses.

The first set of activities involves processes that create an opportunity pipeline, or register-like an inventory of potential opportunities. A successful business-building program requires a large inventory of potential opportunities and a process by which to select a few excellent ones for market launch. Crucial activities here involve creating the conditions for the discovery and recognition of opportunities, together with a disciplined screening process that winnows them for investment in development. Among technology-intensive companies, this is often the process through which ideas from the technology development arena are introduced to business development managers for possible development, or through which problems in the marketplace are posed to the technologists to identify a solution (Research Technology Management, 2004, Vol.47, Iss.3, page 16-26).

The next set of activities, which we refer to as market entry activities, involve offering new technologies and business concepts to the market. Sometimes, this exposure is experimental, intended primarily to find out what the real and appropriate applications might be. Sometimes, this is a more aggressive and direct business launch, intended to create a substantial new business. In either case, a crucial challenge is managing learning-learning about the market and learning how the firm's offerings perform for that market. Following market entry, the third set of activities involves investing in and growing those opportunities that are gaining traction in the market. These activities require significant attention to timing and patterns of investment. Recognizing when growth should be aggressive and when it can be brought forward more slowly is a key skill here. Given multiple opportunities, the focus is also a key factor, otherwise a program may over-extend managers' energy and resources, diluting their ability to make a substantial impact in any one arena.

Table 1 Nine Processes for Sustaining a Healthy Business-Building Program

Level	**Opportunity pipeline**	**Market Entry**	**Takeoff**
Venture	Create options	Redefine : launch and experiment	Cope and build routines
Champion	Select and screen	Mesh venture and firms need	Redirect resources
Heat-shield	Create climate	Path clearing	Maintain focus

There are three levels and nine roles to concern, within each of these sets of activities, different individuals within the organization assume different roles, which partially reflect the level of action of the role. Depending on the company, a single person can take on more than one of these roles, but for explicative purposes we break these roles into three different levels of challenge: Venturing, Championing and Heat-shielding. At the Venturing level, people's primary jobs involve those tasks that are needed to do the entrepreneurial work of building new businesses. These people have the job of finding out what customers need and how the company might address those needs profitably. Their goal here is to form a set of stable transactions between the new entity and customers, suppliers, distributors, employees, and others necessary to forming the new business.

The Championing level of a business-building program involves a set of tasks having to do with making sure the emerging new business is not damaged by other parts of the firm. At this level, resources must be allocated to new business development, plans must be established and monitored, rewards determined, and the often political and informal process of supporting new businesses carried out. At the heat-shielding level, a different set of tasks becomes important. Here, goals are broader. A key task at this level is the establishment of what we call a ballpark, or overall framework, for determining which types of new ventures are desirable and undesirable. A climate that encourages new business development is created and led, and processes that ensure external and internal support for ventures are established. At this level as well, major resource allocations are determined. In addition, this level of the program establishes company-wide cultural norms, such as how failures are handled, and what gets prioritized. Combining the three levels with the three stages of activities yields nine roles associated with a healthy business-building program (Research Technology Management, 2004, Vol.47, Iss.3, page 16-26).

In creating opportunity pipelines program, effective business-building companies are characterized by widespread enthusiasm for identifying opportunities and making them happen, as well as widespread understanding of what to do with a bright idea once it has been articulated. For the heat-shielding challenges level, there is climate creation role that creating an innovation-friendly climate poses two challenges. The first is to heat-shield by establishing a climate of positive acceptance for the legitimacy of your program throughout the rest of the organization. You need to demonstrate to the players in your company that the firm as a whole is committed to business-building. The second climate-creation challenge is to delineate a powerful, compelling and coherent direction for your business-building program to follow and build commitment in your technology program to follow it.

In create organizational legitimacy, particularly in organizations in which business-building has been an on-again/ off-again endeavor, people will understandably look for evidence that this time around there is firm-wide commitment to business-building. Otherwise why should they bother? "This too shall pass-I'm going to stick to my silo." And people in the rest of the organization will view your efforts to create a business-building program with attitudes ranging from skepticism about its usefulness to the firm to active resentment at the resources you are usurping, which they feel they could legitimately employ in the existing business. In creation of legitimacy involves two sets of actions, the first is securing commitment from senior management that they mean it with business-building. We discuss the form of this commitment below. The second is to develop with senior management a coherent and compelling direction by specifying a convincing ballpark for your innovation activity.

In create a ballpark, while it is important to encourage plenty of innovative ideas, it is also essential to have an overall coherence to your innovative activity. People need to know what type of innovations to pursue. For an innovation program to be coherent and directed, the technology development manager needs to establish what we call a "ballpark" or directive framework specifying the types of arenas in which the firm seeks to compete. You, as technology development manager, will be asked to strike a balance between encouraging great variety and many opportunities and the need for an underlying coherence that will allow your firm to develop deep capabilities that can be deployed to maximum effect. We call this difficult task, specifying the innovative ballpark-delineating a large arena in which to pursue many types of innovation, while at the same time delineating limits beyond which people should not be seeking opportunities that don't fit the firm's strategy and capabilities (Research Technology Management, 2004, Vol.47, Iss.3, page 16-26).

Consider 3M, respected as one of the exemplars of innovation. When Jim McNerney took over in 2000, 3M was struggling to build profitable growth while coping with an array of 60,000 products, creating huge problems for operational efficiencies and drags on the balance sheet and return on investment. McNerney and his senior managers have been wrestling with the articulation of a new ballpark. At the corporate level, he has articulated a high-level ballpark that is designed to drive growth in profits by delineating the large array of businesses into three types: mature diversified businesses that will grow profits by creating scale, growth-potential businesses that will grow profits by innovative organic growth and premier technology businesses that will grow by business development. Although these are still early days for the strategy, 3M's people seem to be responding favorably, as is the investor community.

In create commitment, specification of a directive ballpark is a powerful organizer of a company's innovation direction. The technology development manager also needs to provide impetus to that direction. This means demonstrating sustained commitment to pursuit of the ballpark. To create a business-building climate you need evidence of commitment from senior management and you need to display commitment to the people who depend on you. Hard evidence of commitment is easy to detect by the people who report to you; it comes from positive answers to the following questions:

- Is business-building a priority item on the senior management's agenda? On your personal agenda? Or is the real emphasis on short-term results? Not just once or twice, but at every meeting, week in and week out, month in and month out? If business-building is not a recurring high-priority agenda item, people are likely to assume that it isn't all that important to you and turn their attention back to the lab bench or to other, easier things (often with a sigh of relief!).
- Are requested business-building initiatives receiving care and attention disproportionate to their small size? If you and your senior executives pay the most attention only to those initiatives that are well developed, people will read this as a lack of genuine interest in newer ventures. Just as babies need more attention in their early years, so too do new businesses demand more, relative to their size, than

grown-up ones.

- Do the business-building ventures get the resources that they need-or does the funding always go to the established business when resources are tight? Are the best people allocated to business-building initiatives? If the business-building group becomes the purgatory from which people's careers never return, good people will quickly figure out that they should avoid such initiatives like the plague.

Your ability to get agenda, attention, resources, and staff when needed is an important heat-shielding function that not only secures the necessary resources, but also builds legitimacy in the eyes of the rest of the firm and the commitment of your people to join the battle to build. It is important to recognize that this commitment is not made with impunity. Whatever resources your business-building projects get are diverted from the ongoing business. If the base business is not healthy enough to sustain its activities without being weakened by resources going into innovation, it is highly unlikely that innovation alone will be sufficient for organizational renewal. Making the choice to divert such resources is a decision with considerable potential impact. One lesson is that the time to start a business-building initiative is when the base business is healthy and generating solid cash flows, not when it has already begun to falter (Research Technology Management, 2004, Vol.47, Iss.3, page 16-26).

For the championing challenges level, in "Tough-love" selection role the ballpark's, somewhat generic specification needs to be translated at the championing level into decisions about whether to select and allocate resources to specific projects. The processes by which this is done are critical contributors to the success of a business-building program. In successful companies, the presence of uncertainty is recognized. This is quite a contrast from companies in which all management resource allocation processes (such as budgeting and planning) are done in the same way, using the same process irrespective of the uncertainty. The logic is simple: when a business is fairly predictable, one can comfortably use conventional heuristics, such as management by exception for monitoring, and discounted cash flow for valuation. When a business is unpredictable by virtue of its novelty or uncertainty, disciplines that recognize that uncertainty are far more beneficial. Although this would seem like sheer common sense, we continue to be astonished by the tendency of companies to apply "one size fits all" management to both established businesses and new ventures.

The first difference between conventional project selection and selection of projects under uncertainty is that the latter are best thought of as "real options". Real options reasoning suggests that you make low-cost investments with substantial future upside, but that you are also preserving the right to discontinue the investment should certain assumptions not be validated. Among the best practices in this area are spending your imagination instead of money by assembling a staged, incremental investment plan, releasing each subsequent funding only after the previous one has delivered knowledge to justify further investment. The theory here is that the smaller each incremental investment is, the less you stand to lose in the event that things don't work out. With real options reasoning you concern yourself far more with how to keep failure costs low than with how many failures you have. After all, you can afford hundreds of failures if each of them is inexpensive. Using such real options reasoning is a mindset that you can easily bring to highly uncertain ventures, since most of their value lays in the future opportunities they open up (Research Technology Management, 2004, Vol.47, Iss.3, page 16-26).

The ballpark specifies what kinds of ventures are desirable. At the championing level, the characteristics of the venture should be made very clear. Among the approaches we have observed to work well are disseminating screening statements, consisting of widely disseminated criteria that will be used to evaluate ideas. The more clear and widely disseminated these screens, the more they help everyone to make intelligent choices about which opportunities to pursue, ideally resulting in both a more focused search for new opportunities and an ability to self-screen. We like to look at screens in two passes: first, a process through which screening-out occurs-those criteria that disqualify a venture completely if they are not met. Next, we look at criteria that suggest venture attractiveness as they accumulate. So the "screen-out" criteria are go/no-go while the screen-in criteria are cumulative.

At DuPont, for example, venture teams we are working with have adopted a variation on this idea, specifying first "no-go" criteria in their screening process, then providing guidance as to what they call "where and how" growth should be built. The DuPont groups have incorporated these principles in scoring documents, which help make the criteria explicit so that they are well understood, and so that different projects can be examined in a consistent manner. The DuPont scorecards draw on Six Sigma technology, making a clear distinction between extremely attractive and less attractive opportunities. Table 2 is an example of such a scorecard. Note that it is not the scorecard that is the magic; rather, it is the thought process lying behind it, the discussion of ventures' features that it precipitates and its consistent use that creates results.

Finally, although it is in theory a great idea to develop screening criteria so that everyone understands which ventures are desirable and which are not, an uncomfortable part of this job is informing those proposing or otherwise involved with a new project that it has fallen short of a screen. The wrong way to communicate these decisions is through a subordinate, a phone call or (worst of all) some impersonal medium like email. What is needed here is evidence of a careful, but rapid decision process, coupled with detailed feedback to facilitate learning in the organization. If ideas are rejected, a champion should always explain why and demonstrate the logic. It is a way of helping the whole organization learns how to pursue better, more strategic, opportunities.

For the venturing challenges level, in running launches and creating options role, the main activity in the opportunity pipeline space consists of creating options for further business development. Contrary to many popular business publications, finding opportunities is seldom the problem. Quite the contrary-for many companies, the real challenge is capturing the ideas in some systematic way, sorting them into different categories with respect to whether and when they might be pursued, and creating the process through which they receive assessment and attention. Ironically, one of the most important challenges you can face at the venturing level consists of recognizing the uncertainties intimidating your team and reducing their impact. Some call this "absorbing" uncertainty. If you are running a venture, you need to be telling your people what to focus on and what to ignore, which you can do only by essentially creating an artificial feeling of certainty when in fact you are still dealing with many assumptions (Research Technology Management, 2004, Vol.47, Iss.3, page 16-26).

Sometimes this requires a bit of bravado, for instance when Steve Jobs of Apple declares a particularly uncertain new venture to be an "insanely awesome" product that everyone can throw their weight behind. Sometimes it is more mundane, as when the leaders behind P&G's Spinbrush electric toothbrush venture declared that the target competition for their electric toothbrushes was a $5 conventional brush, rather than the $50 versions then dominating the electric brush market. In either case, the job of a venture leader who wishes to free the team from the paralyzing effects of uncertainty is to create a confidence that the cost of failing or being wrong will not fall on them.

Options thinking have implications for the quantity of ideas to be considered. That's because the whole concept behind options is to skew the distribution of potential outcomes-limiting the downside risk while uncertainty is still high, and making sure that the potential upside is substantial. One implication is that at the opportunity development stage, you want to be able to consider many options-many more, in fact, than you could possibly develop given your resources. The concept at the venturing stage is to pursue many ideas, recognizing that most of them will be discarded or redirected as resource commitments to them become more substantial. Think of this as a funnel, with many ideas at the beginning that will be narrowed down to a few very robust ideas over time. 3M's McNerney has used this idea as a cornerstone of his organic growth strategy, pushing the company to deliver what he calls 2x/3x performance in venturing-twice the number of ideas considered, three times the number pushed through to development. At the venture level, this translates into operationally considering many opportunities.

Table 2 Scored for Evaluating and Screening Opportunities (Conditions in each cell decide the score to put in the last Colums, and the total score of all the colums is used for comparisons with the scores of alternatives project

Dimension	Exceptional	Acceptable	Unfavorable	Score
Strategic intent	If this opportunity takes us exactly where we want to go in term of our strategy, score it a 9.	If this opportunity is not inconsistent with our strategy, but offers no engine to drive it, score it a 3.	If this opportunity, even if we can succeed, is inconsistent with our strategy, score it a 1.	
Build competitive advantage	If the idea builds both short-term revenue streams and long-term competitive advantage, score it a 9.	If the idea has either long-or short-term benefits, but not both, score it a 3.	If the idea provides only short-term benefits, and may interfere with a long-term opportunity, score it a 1.	
Build knowledge capabilities	If the opportunity will help us enhance our capabilities significantly, score it a 9.	If the opportunity will let us build new capabilities, but only in very limited areas, score it a 3.	If the opportunity will not lead us to extend our capabilities in any meaningful way, score it a 1.	
Use of existing assets	If the opportunity requires no investment in new assets, score it a 9.	If the opportunity does required some investment but takes advantage of assets in place, score it a 3.	If the opportunity will require entirely new investment in assets, score it a 1.	
			Total Score	

In market entry program, very few projects work out exactly as expected. Most of the time, you won't really know what customers are looking for until you receive their feedback. Moreover, even the customers often don't know what they want until they have experienced an offering. The uncertainty of this process creates challenges. The goal in the market entry stage is for the company to engage in continuous experimentation to convert assumptions into knowledge at the lowest possible cost. Key objectives are learning and redirecting while uncertainty is still high (Research Technology Management, 2004, Vol.47, Iss.3, page 16-26).

For the heat-shielding challenges level, in path clearing role, there is a typical high-tech opportunity usually has some potential to upset an existing status quo (otherwise why bother with it?). This potential for upset can create widespread perception of risk among potential customers, perceptions of threat from those whose jobs might be changed as a consequence of a venture's possible success, wariness on the part of potential supply chain partners, and so on. Overcoming the risk-averting resistance to a new venture's success is a critical heat-shielding challenge you may have to address, and your obligation as the technology development manager may be to clear the path of resistance via support of senior managers, lest your team's venture stumbles in the absence of such path-clearing. The first path that needs to be cleared for a new venture is often internal. Managers in established businesses frequently withhold time, talent or resources from something new. Worse, new ventures are often forced by the parent firm to go to market in the same way as existing businesses, which can completely undermine them.

One of our clients, for instance, is attempting to start a venture that will move the company beyond an established customer base of corporate IT managers who buy specific products from them to a solutions-sale at the enterprise level. Among the challenges facing the venture teams is the presumption at the corporate level that they will use the same marketing and distribution channels for both the new and existing businesses-a potentially fatal problem, because the new business appeals to a different level in the target companies and offers benefits that extend beyond the sphere of a typical IT manager. The technology development manager needs to reach a senior level to clear away that particular obstacle-by giving the venture team permission to develop an alternative channel and managing the accompanying channel conflict (Fortunately, this problem has now been recognized and the appropriate paths are being cleared.). Similar conflicts and obstacles need to be addressed with outside parties. Even great products and services can meet with resistance from customers, who are rightly concerned with the costs versus benefits of trying something new. To heat-shield, assurances need to be given that the company is deeply committed to the offering, that it is prepared to support it, and that the risks to customers are manageable.

For instance, in the global new elevator construction business, Finland's KONE Corporation developed a radically new elevator technology that eliminated the need for a separate machine room, creating substantial cost and design advantages for customers. Before this innovation could grow, however, an enormous amount of external path-clearing needed to take place. Not only did the new technology have to run a gamut of demanding regulatory approvals, but nervous prospective customers needed to be assured of its safety and reliability. In an appropriate series of heat-shielding moves, KONE management created enormous focus and drive around this activity, with its most senior leaders making sure that the obstacles to the adoption of the new technology (based on a patented innovation called the EcoDisc®) were removed, enabling five years of rapid growth based on that innovation. Sometimes, other members of the supply chain-distributors, suppliers, joint venture partners, and so forth-are needed to facilitate the new business launch. All too often, ventures have failed either because of resistance from these essential collaborators or because they were not adequately prepared. The standards battle between Circuit City's Divx technology and the technology that is now commonplace in DVD players is an interesting example (Research Technology Management, 2004, Vol.47, Iss.3, page 16-26).

Circuit City's sponsored Divx technology was an attempted replacement for video-store rental. Consumers would pay the price of a regular video rental to bring a disk home and view it within 48 hours, then either throw it away or pay an additional $15 to keep it permanently. Circuit City, however, failed to create critical mass around the new technology and only three manufacturers agreed to produce Divx disks. At the same time, other retailers flatly refused to carry the Divx product because of Circuit City's sponsorship, while video store rental outlets accelerated their move to offer DVD rentals because they viewed the success of Divx as a threat to their traffic. Circuit City ended up terminating the Divx venture at a reported loss of $375 million. Regardless of the merits of the technology, clearly an inadequate job of aligning key stakeholders was done. For publicly traded firms, a final constituency that needs to be attended to is a firm's stockholders and the analysts who assess its prospects. Failure to properly manage expectations while at the same time signaling growth potential can lead firms to suffer in the assessment of the market.

This all sounds straightforward, and so it is, if the technology development manager can persuade senior executives to make a significant commitment to launching a new venture. The dilemma is that this judgment typically needs to be made well before the potential risks and gains from a project are well understood. Waiting to get absolute confirmation of a venture's potential, brings about paralyzing delays. But jumping in too early can do enormous damage as well-witness the years of disappointing launches for personal digital assistants, which led to ridicule and brand-image damage to the firms leaping too early in the market. This will naturally lead senior management to be skittish about requests to "bet the ranch" before they have evidence that the risk is worth the bet. Your challenge as a technology development manager will be to find convincing evidence that the upside potential is there and the downside risk can be contained. Real options reasoning is useful in making this judgment, because it mandates limiting downside exposure until the upside potential of a venture is demonstrated.

For the championing challenges level, in meshing venture and firm needs role, as a venture team begins to gather resources to enter the market, finding the right resources and getting them to the right places involves more than making sure budget lines are approved. Team members with the right mix of process and content experience need to be recruited from existing operations, and the managers of these operations will not necessarily be delighted to release their valuable employees. The venture needs to be designed and launched in a way that meshes with the parent firm's policies and its strategy. Organizational politics need to be considered one problem is that the resources going into a new venture are often both coveted and needed by managers of established businesses. You may have to champion the political process of securing their release from powerful incumbents in the existing business (Research Technology Management, 2004, Vol.47, Iss.3, page 16-26).

A second integration challenge involves negotiating realistic terms under which the venture can operate. Attracting team members means providing them with appropriate incentives to join and grow the venture. Rules must often be bent to get a new venture going-for instance, rules about hiring, about job titles or hierarchical positions that are perfectly appropriate for a large mainstream business typically make no sense for a small team working on a new venture. When you think about it, most large and complex organizations are full of rules that are there for good reasons, but which can choke the momentum of a small venture-everything from building use policies, to internal corporate "taxes," to human resource restrictions. It falls to the champion to decide which rules should be heeded and which rules need re-negotiation. Often, internal accounting policies like corporate expense and asset allocations seriously and unrealistically distort venture performance unless you champion their removal.

A particular challenge for champions engaged in the integration task is that to succeed they must influence decisions at both the venture level and the senior management level without being in formal control of either. This can be immensely frustrating, as seemingly vast amounts of time are consumed by the delicate processes of negotiating agreements, keeping the necessary parties informed of progress and making sure that senior leaders are sending the right signals. Managing both "up" and "down" in the organization requires some skill, but even more a willingness to dedicate time and thoughtful planning to the task.

For the venturing challenges level, in redefinition and pruning role, market entry can seem paradoxical at the venture management level. On the one hand, venture managers must be ruthless in breaking down obstacles to the venture's success. On the other hand, market entry usually reveals lots of new information, which can suggest that a venture's path forward needs to be redirected. We would argue that the first set of behaviors is the most appropriate when uncertainty has to some extent been reduced, or the goal is to break into a clearly defined market quickly. The second, involving the capacity to redirect and change the venture is essential when uncertainty is high and a clear business model does not yet exist. In either case, venture launch is facilitated by the extent to which a team concentrates on identifying a few critical customers who will provide huge amounts of information about what is truly needed in the market. Launch is further facilitated by the use of a discovery-driven process that identifies the key assumptions underpinning the venture proposition, and then insists that key assumptions be tested at clearly defined milestones. Funds are then released at each milestone, contingent on re-planning and redirection that take into account new knowledge revealed at that milestone (Research Technology Management, 2004, Vol.47, Iss.3, page 16-26).

One of the great dangers in this part of the venturing process is falling victim to what psychologists call the "confirmation bias." This is quite simply the natural human tendency not to take in new information that calls strongly held assumptions into question. When a venture team has formed a set of beliefs, it will be very difficult to shake those beliefs, even in the face of disconfirming evidence, unless the venture leader makes it clear that even cherished assumptions are up for challenge. Our examination of great venturing flops revealed a pattern in which teams fix early on some guiding assumptions and never look back to re-examine them. The frenzied bidding by telecommunications companies for so-called 3G UMTS spectrum licenses fits this pattern-every bidder assumed that spectrum would be scarce and that operator would move rapidly to deploy the new networks. Despite challenges to this assumption, and some pointed observations from firms electing to bid, the dominant assumptions about the benefits of these 3G networks were not really questioned until some time after the bidding concluded, leaving many firms such as Deutsche Telekom with hugely expensive assets that at least in the near term do not show promise of generating new profits.

This is one of the places where the technology development manager must exercise the critical but highly unpopular role of pruning. As soon as it becomes clear at a major milestone that the assumptions are flawed and that there is no reasonable prospect of redirection you must shut the venture down and redeploy your team members to programs where they are needed. It is so difficult but so important to do this-to build an image that uncertain ventures will often be disappointing and that we need to try, to learn, and to move on to better things. How you handle such (increasingly frequent) disappointments that accompany increasing uncertainty will fundamentally imprint the spirit and motivation of those involved in business-building. This is complicated by the fact that it makes no sense to reward foolish failure. You need to have a process in place that assures a sound post-mortem and then celebrates by assignment to exciting new projects those team members who made good decisions but experienced bad luck, without rewarding those who made poor decisions.

In takeoff program: managing business-building, when the venture takes off and begins to generate accelerating revenues, project performance begins to impact the firm's overall performance for the first time. This can have unexpected consequences for the rest of the firm-positive and negative. At the same time, the nature of the venture's problem set fundamentally shifts; instead of the relatively few tough challenges of learning and transaction generation, operational problems now multiply as demands increase on facilities and people. Often, the managers who are best able to secure those tough first few transactions are not good at handling growing numbers of urgent problems. As technology development manager, you need to be able to anticipate and prepare for this new set of challenges (Research Technology Management, 2004, Vol.47, Iss.3, page 16-26).

For the heat-shielding challenges level, in maintaining focus role, one of your technology development manager tasks in this phase is to make sure that the venture team stays focused despite enormous distractions and associated temptations to cut corners. Insisting that quality, service, reliability of supply, and customer satisfaction remains high, for instance, can counterbalance the temptation to short-cut these conditions in the interest of expediency. Absent a focus on sustained high standards, high growth provokes rapid competitive entry into the vacuum created by declining standards, and competitors capitalize on the distractions created by growing operational challenges to the venture.

Together with focus, you need to be prepared to find and release financial and staffing resources-fast-for the growing operations of the new business. In some cases, the growth of a new venture requires a complete rewrite of the venture and even the company's budget and staffing plans. In one case we studied of a rapidly growing financial services venture, the explosion of accounts receivable essentially sucked up all available free cash flow in the business. At a corporate level, money had to be found from wherever it could be released-necessitating complete budget reviews with every company division to find ways in which to free resources. That year, the organization nearly imploded as the success of the new business overwhelmed the cash flows of the company. Obviously, decisions to re-budget and re-staff are not popular, and because they often have to be taken to senior levels of the company fast and decisively, you need to be able to anticipate this unpopular move and take it to higher levels before the venture starves from lack of resources.

For the championing challenges level, in redirecting resources role, it is highly likely that the venture team embroiled in a takeoff will be so distracted that it will have difficulty being proactive. As technology development manager, you need to be on the lookout for indications that the pressures and distractions of takeoff are not letting the following problems develop: Production capacity, for instance, may suddenly become scarce. If the new venture is operating with common capacity with existing businesses, tensions can erupt into deep internal conflict as the established business managers hold on to their "rightful" share of the line. Good people become scarcer than ever, creating enormous pressure on staffing plans and heavy workloads for support operations such as training, customer service and human resources. Quality can become strained, as capacity under pressure precipitates a drop in quality that is then baked into your product, which creates competitive vulnerability. Inability to supply the burgeoning demand can cause distributors or value chain partners to become disgruntled, again creating an opportunity for competition. Somewhat more subtle are the decisions involving which customer receives deliveries or services and who doesn't. The wrong way to ration capacity is first-come-first-served. The right way is through some system that customers find fair but which aligns strategically important customers and distributors.

Among the most subtle processes to try to anticipate proactively are requirements for training. This might include training in customer service operations, training for people who actually work with the offerings or even training for customers and outside supply chain partners. Because training is not an instantaneous process, failing to anticipate the need for it can become a huge setback. Similarly, recruitment (ahead of need) of operations and service staff and qualified middle managers is often left to chance, and then managed haphazardly unless someone is proactively leading the charge. Companies also often overlook the problem that their rapid growth can put enormous pressure on their suppliers-in which case all the difficulties of proactive anticipation apply to the supply chain as well. A lack of quality or efficiency on the part of suppliers can lead to problems in your offerings that were not anticipated. Finally, you need to put in place processes that anticipate and counteract competitive attack. A golden rule in strategy is that all attractive markets attract competition, and visible, rapid growth markets do so dramatically. You need to be sure that your venture team anticipates these attacks and is able to mount an effective counter-strategy (Research Technology Management, 2004, Vol.47, Iss.3, page 16-26).

For the venturing challenges level, routine-building role, even as the venture team copes with the pressures of growth, those operating the venture need to begin thinking about making it "a permanent fixture." An emergent venture must start putting into place the processes and systems (or routines) necessary for it to become a real operating business. The more that growth challenges can be addressed by making certain activities routine or systematized, the less has to be invented on the spot and the more effectively the challenge will be met. Thus, at this point you should start to push for standardization of some activities, for the development of organized systems for customer service and production, and the installation of policies and procedures. Standardization, not invention, begins to become important, and the infrastructure on which the later business will be built needs to start being developed.

One frequently overlooked aspect of this process is that the person with the skills to initiate a new business and launch it into the market may not be the right person to create the processes and systems to smoothly handle rapid growth. The very rule-breaking, innovative qualities that are crucial when the chief task is initiation can become liabilities when the job is to bring order to a turbulent situation. With many organizations, the reward for starting a venture is to be given the opportunity to run the business that emerges from it-unfortunately, this has often been exactly the wrong person to run the business, and often they don't want that role anyway. If this is the case, your technology development program could lose a rare and valuable start-up manager who leaves in disgust or disgrace because of your lack of insight. Technology development managers need to be sensitive to this possibility. Often, the solution is to bring in a different manager or management team to handle the challenges of growth. Alternatively, you need to spot when the time has come to introduce such skills into the management team and bring in people who have appropriate experience. Coping with growth, therefore, often means a transition in the management skills that are most needed and may imply a transition in management. All the techniques of effective change management come into play here, as the entire organization goes through a series of often-wrenching changes in people, processes and systems.

The goal during this phase of the venturing process is no longer to create a new business but to build a proven commercial proposition into a solid new piece of the firm. Effective venture managers thus begin to focus on standardization, quality and reliability. The right people for this task are able to define a set of core key priorities and manage the details of the business. It is then time for you to orchestrate handoff to the established organization and get on to the new opportunities in your technology development program. Over ten years of observation and study of the evolving challenges facing those charged with the development of firms' technological assets has led us to conclude that the winning firms in the technology game will be the ones that forge technology development programs focused on business-building rather than R&D. This suggests that more traditional technology management positions will give way to a new executive responsibility which we call technology development manager. Effectively filling this executive position is no mean task-managers charged with converting the silo-oriented R&D mentality to one of business-building face many challenges. The challenges can be perceived in terms of nine major roles for the technology development manager, encompassing the major sets of activities (pipeline-building, market entry and takeoff) attacked at three levels of challenge (venturing, championing and heat-shielding). We have outlined in some detail what each of the nine major roles entails, based on our observations of managers and companies that have succeeded in their struggles with business-building (Research Technology Management, 2004, Vol.47, Iss.3, page 16-26).

2. Introducing R&BD Programs including Korea

What is SBIR (Small Business Innovation Research) Program of the United States? SBIR is a highly competitive program that encourages small businesses to explore their technological potential and it provides an incentive to profit from commercialization (http:// www.sba.gov/SBIR). The Small Business Innovation Research (SBIR) Program is a highly competitive three-phase award system which provides qualified small business concerns with opportunities to propose innovative ideas that would meet the specific research and R&D

needs of the Federal Government. Congress designated 4 major goals of SBIR as follows (The followings are four major goals of SBIR designated by the Congress):

- Stimulate technological innovation
- Use small business to meet federal R&D needs
- Foster and encourage participation of minorities and disadvantaged persons in technological innovation
- Increase private-sector commercialization innovation derived from federal R&D

Small Business Technology Transfer (STTR) program together with SBIR is a program for fostering technology transfer between small business concerns and research institutions.

There is also a program named SBRI (Small Business Research Initiative), program of United Kingdom (http://www.dti.gov.uk/innovation/sbri/index.html). What is SBRI program of United Kingdom? It is a program which designed to help small and medium Enterprises (SMEs) gain greater access to publicly funded Research and Development (R&D) contracts. It does not give grants but it does provide a alert service about government procurement opportunities. The SBRI aims to provide opportunities to those existing small firms whose businesses are based upon providing R&D - by increasing the size of the market, to encourage other smaller businesses to increase their R&D capabilities and capacity - to exploit the new market opportunities, to create opportunities for starting new technology-based or knowledge-based businesses. The initiative is open to all businesses. However it is particularly beneficial to SMEs. An SME is classed as a business that has fewer than 250 employees; and either an annual turnover not exceeding about £34m (€50m) or a balance sheet total not exceeding about £29m (€43m); and when determining whether thresholds are reached, it is necessary to take into account the same data i.e. number of employees, annual turnover, (balance sheet total) of 'partner' and 'linked' enterprises. Charities, university spin-offs, individuals and groups are eligible to participate if they fulfill the above criteria.

Another well-known program is BUNT (Business Development using New Technology) program of Norway (Hakon Finne, Morten Levin and Tore Nilssen, 1995). What is BUNT program of Norway? It is a program experiencing success of this policy type and gaining popularity as bench marking work for the other nations. Research Council of Norway established BUNT program to close ‘technology gap’ between the available technology in the research institutes and small and medium-sized enterprises (SMEs). The target group was industrial production companies facing competition, with over 20 employees. BUNT was to stimulate an increase in the demand for new technology by identifying technologies that would fit into the strategic plan of companies, rather than through the old model of finding companies that might adopt particular technologies. It was important that investments in new technology should be motivated by commercial considerations. A working methodology was developed, in which specially trained consultants were to take on the task of disseminating strategic thinking to participating companies.

In the BUNT program 120 experienced Norwegian consultants were trained to work according to this model. The training was quite extensive. The consultants were to carry out strategic analyses in individual companies, aided by a tool kit developed for the purpose. These analyses were to form the basis for action plans for the implementation of prioritized measures. The American-type strategy model of BUNT program emphasized that for each product market combination the company must choose whether it wished to focus most on price, quality or other aspects. Then the company had to draw up action plans with measures (technological, financial, organizational, etc.) which supported the strategy. Besides the strategic analyses in individual companies (which eventually numbered over 300), many individual projects were planned. Such projects were to take up special themes and could be experimental in nature; the portfolio of experimental projects had great scope. The BUNT program itself has generally been judged successful (not just by the evaluators), and the BUNT concept -including, to some extent, the developed evaluation model- has become something an export commodity. The BUNT program currently infuses several business development programs in Eastern and Western Europe.

3. Case studies on R&BD Programs

3.1. Ministry Of Industry and Energy, “Northeast Asia R&BD Hub Construction” Propulsion

Korea tries to overcome the sandwich situation between Japan and China using R&BD. Korea also wants to sustain a world-wide competitive power while establishing 'Northeast Asia R&BD hub' which specially focuses on the research and development concerning the marketing and commercialization.

In order to implement 'Northeast Asia R&BD hub' the Ministry of Industry and Energy will establish a few major policies as follows:

1) To improve R&BD environment to the level of developed countries such as that of Silicon Valley of USA.

2) To make plans based on SWOT (Strength, Weakness, Opportunities, Threat) analysis

3) To upgrade man power, research facility, technology development programs

3.2. Policies for Promoting Innovation-oriented SMEs in Korea

Published in KDI 36th Anniversary International Conference On “Financing Innovation-Oriented Businesses to Promote Entrepreneurship: Experiences of Advanced Countries and Lessons to Korea,” April 26, 2007, [Session 4] Government Policies to Promote Entrepreneurship and Innovation

1) To increase the number of Innovation-oriented SMEs up to 30,000 until 2008

2) To expand R&BD investment including governmental institutes

3) To support more R&BD projects

4) To guide SMEs to develop new markets

5) To establish the infrastructure for R&BD SMEs

6) To activate M&A in the market

7) To help R&BD get more fund from the financial market such as KOSDAQ and venture capital

3.3. A Case of R&BD SME in Korea

Yujin Robotics was established in 1988. Its main items include vacuum robots, home robots and industrial robots. The amount of its net income becomes US$1.5 million during the 1st quarter of Year 2006. The amount of investment is about US$12 million and 30 employees accomplished the project successfully.

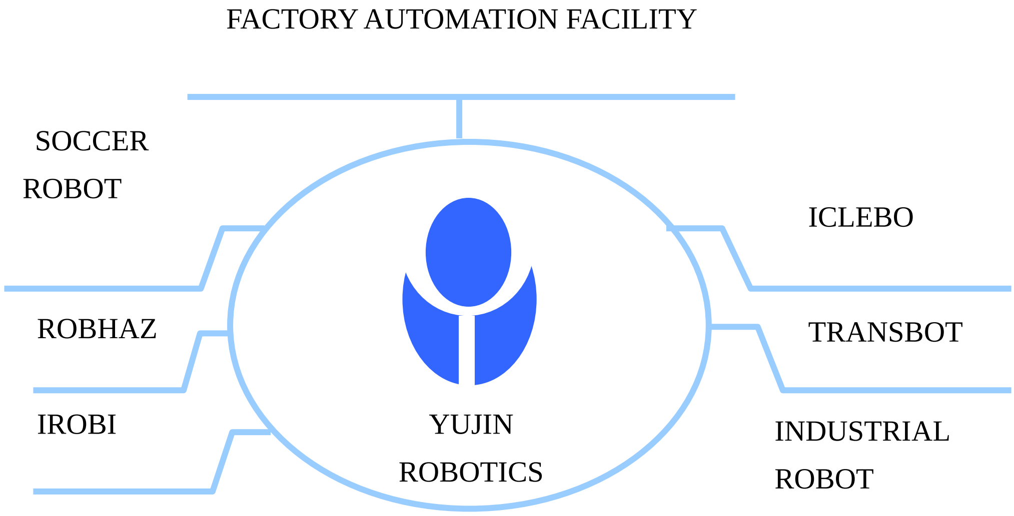

Fig 1 R&BD Products of Yujin Robotics

3.4. A Case of Market Orientation, Innovativeness, Product Innovation, and Performance in Small Firms

In Journal of Small Business Management, it is accepted widely that market orientation has a positive influence on the performance of firms (Journal of Small Business Management, 2004, Vol.42, Iss.2, page 134-154). This relationship not only has been established firmly for large companies but also has been found in research on small and medium-sized enterprises (SMEs) (Pelham 2000). This study contributes to this matter by developing and testing a model of the relationship among market orientation, innovativeness, product innovation, and performance in small firms. In this context, the small firm is defined as one that is run and is controlled under the direct supervision of the owner. This article is structured as follows. First, the concepts and notions on market orientation and innovation relevant to this research are reviewed. Second, market orientation and innovation for small firms are specified, and a model is proposed that expresses the relationship among market orientation, innovation, and performance in small firms. Hypotheses on these relationships are presented. This study's model is tested on a specific type of small firm: rose growers in The Netherlands. Finally, managerial implications of the results are discussed, and suggestions for further research are made.

The specific resources and capabilities of small firms have consequences for market orientation as defined by Kohli and Jaworski (1990). In small firms, resources for market intelligence generation are scarce, and there is no room for a marketing specialist. In fact, market intelligence is based mostly on secondary data (from trade journals, sector research, conferences, and professional magazines) or on personal contacts (with suppliers, customers, or bank employees) (Smeltzer, Fann, and Nikolaisen 1988). When small firms sell a differentiated product in a local or regional market, they can use market intelligence more effectively. Advances in information technology (IT) will be helpful in this respect. Intelligence about suppliers and colleagues is very useful for small firms in order to innovate processes, products, and services. The dissemination of market intelligence is not a relevant issue in small firms where the owner makes the major decisions. However, the dissemination of market intelligence to other people in the firm might increase employee motivation. In fact, Ruekert (1992) showed that market orientation is related positively to job satisfaction. Small firms run by the owner can respond with alacrity and flexibly to market intelligence because decision making is non-bureaucratic and because the decision-maker is able to oversee the whole production and marketing process (Carson et al. 1995; Nooteboom 1994). On the other hand, their responsiveness is constrained by limited financial and technical resources.

Limited resources and capabilities, as discussed, prevent small firms in many industries from conducting in-house research and development activities. Many innovations by small firms are based on off-the-shelf technologies, concepts, and/or resources offered by supplying industries. As a result, new inputs are a very important source of innovations for small firms. Networks of small firms can establish collective research and development (R&D) programs as a basis for product innovation of network members. Cooperative competencies (Sivadas and Dwyer 2000) of participating firms seem important for the success of such programs. Small firms that produce differentiated products also can innovate individually by adapting products to the needs of the target group of customers.

This study's results confirm that, in line with the growing amount of evidence about the positive impact of market orientation on company performance, customer market intelligence is related positively to company performance of small firms. Customer market intelligence probably is helpful to perform better in terms of quality, service, or timing, which results in better RPP. Consequently, customer market intelligence about the augmented product such as intelligence about quality and service requirements offers opportunities to become a preferred supplier. Future research should elaborate on how small firms differentiate their products based on customer market intelligence. Our results also show that for small firms in markets with relatively homogeneous products, a market orientation is helpful in the selection of an attractive product assortment. It confirms the value of market information about the generic product for small firms. (Journal of Small Business Management, 2004, Vol.42, Iss.2, page 134-154)

Innovativeness of the owner, one dimension of an entrepreneurial orientation, appears to be an important characteristic of a small firm because it is correlated highly with performance, as measured in these analyses, and it permeates all variables in the model. This result is in accordance with research findings from the past, which stress the entrepreneurial skills of farmers as the decisive variable in the success or failure of a farm business (Zachariasse 1974). Moreover, the effect of customer market intelligence on innovation depends on the owner's innovativeness in a specific domain. Exploring other dimensions of entrepreneurial orientation seems worthwhile to increase our understanding further of the impact of customer market intelligence for owners of small firms with different entrepreneurial orientations. This study's results show that customer market intelligence provides value to customers through product innovation by small firms. Keeping in mind that small firms largely depend on secondary data for customer market intelligence, an effective infrastructure for conducting collective market research is important for product innovation and the competitiveness of small firms. Customer market intelligence about the newest products that are accessible for small firms will stimulate the production of new products that offer value to customers. To stretch the value of collective customer market intelligence, entrepreneurs should be trained in making effective use of such data (Smallbone and North 1999).

These results demonstrate the value of a mixed population of small firm owners with respect to innovativeness and market orientation. Small firm owners, who are highly innovative in a specific domain, may adopt innovations without clear information about its market acceptance. Market-oriented small firms copy the successful innovations once customer market intelligence becomes available. Moreover, customer market intelligence stimulates small firms that would otherwise lag behind in innovation. Consequently, the innovativeness of small firm owners is a crucial asset, which stakeholders of an industry such as governments and suppliers should cherish. Restrictions on innovativeness, via legislation, or conservative financing may propel entrepreneurial owners of small firms out of an industry, which will deteriorate its competitive position.

3.5. A Case of New Product Market visioning in Small Enterprises: A preliminary empirical study within the Central Technology Belt in England

In Journal of Small Business and Enterprise Development, increasing competition, continuous technological breakthroughs and rapidly changing customer requirements are manifest in today's business world, and contribute to the shortening of product life cycle (Journal of Small Business and Enterprise Development, 2007, Vol.14, Iss.1, page 81-92). Consequently, the pressure on all business enterprises to continuously innovate, so as to enable themselves to develop and launch new products and services, is greater than ever. The successful development and launch of new products and services is fundamentally important to the survival and success of business enterprises, irrespective of whether they are large or small (Wynarczyk, 1997).

The performance and the processes are two of the most heavily researched themes in new product development and launch. However, prior to endeavoring along the new product development processes and then evaluating the performance of the output arising from the processes, it is imperative that the business enterprises concerned need to possess the readiness and capability to visualize a future market, which a new product can be developed for and launched in. We call this "new product market visioning", which is different from the concept of vision or visioning in the subject area of strategy. New product market visioning is all about the readiness and capability to visualize a potentially lucrative future market by recognizing the implications of any new technology externally to the firm, seeing the potential of technologies emerging in one's own research and development laboratory, formulating the still emergent nature of a future market that may be far beyond the current market and that can be developed further, and knowing which direction to move along by bringing all these technological and market insights together and develop new product that can be profitably commercialized.

The only major article genuinely on new product market visioning, written by O'Connor and Veryzer (2001), is an exploratory study on nine large, mature organizations attempting to develop greater understanding of the nature of market visioning for technology-based radical innovation. Four themes emerge from the results of their study. First, vision is established and sustained through a number of mechanisms that may function at the same time or operate one after the other. Second, the "visionary" staff members who participate in creating and evangelizing a vision are playing different roles. Third, to assist in developing visions, the "visionary" staff members adopt a number of tools and methods, yet these are not systematically employed by the organizations concerned. Finally, visions, which may reach out far beyond the current market and customer base, usually need to go through a process of validation and internal acceptance.

However, there are two inherent elements of the nature of the article that severely limits its ability to represent a wider market. First, the article is very exploratory in nature. Although a number of themes have been figured out from the results, these are still in quite a vague state. Undeniably market visioning itself is difficult to be crystallized, yet it is possible to reduce the degree of fuzziness through a more conclusive research design. Second, the companies participating in the study are all large, mature organizations, and therefore any result may not be applicable to small to medium-sized organizations, which form the bulk of the total number of organizations in virtually any country. In the case of the UK, small to medium-sized organizations account for approximately 50 per cent of the national turnover, and represent over 95 per cent of the total number of companies in the country. In the county of the West Midlands, whose Central Technology Belt region is the target of the survey for this study, the number of small to medium-sized organizations approached 300,000 in 2002 and continues to grow. These small to medium-sized organizations may be very different from their larger counterparts in the state of knowledge and practice of market visioning. They are always renowned for their innovativeness, which can facilitate their understanding and implementation of the concept of market visioning. On the other hand, their readiness and capability to visualize a future market can be impeded by their general lack of financial strength. It is therefore academically stimulating to probe into the extent to which small enterprises, given their general characteristics, are grasping and utilizing the concept of market visioning (Journal of Small Business and Enterprise Development, 2007, Vol.14, Iss.1, page 81-92).

Overall results of this study on the small firms in a technology belt in the West Midlands, England, demonstrate that the contexts for new product market visioning for these firms are not satisfactory. Compared to the larger firms, not only are they less able to understand their potential for developing new products, predict market reactions to their new products, as well as forecast what products are the “future products” for them, but they also have devoted less adequate efforts on formally reviewing and informally monitoring their existing portfolio of products, and auditing the market feasibility of any new product they develop. It is understood that smaller firms are more innovative than larger firms. However, innovativeness itself does not necessarily lead to better market visioning of new products. To nurture fertile contexts for new product market visioning, a small firm has to do proper review, audit and whatever is needed in order to have a systematic and comprehensive understanding of where they are and where they can go. Without all this homework, a smaller firm may still be able to launch new products, some of which could be successful. Yet this is more of a hit-and-miss style and therefore results in an unnecessary waste of resources. On the other hand, with appropriate efforts on nurturing the contexts for new product market visioning, coupled with the innovativeness of small firms because of their flexibility and less rigid organizational structure, they can stand a higher chance to achieve an impressive rate of conversion from opportunity product concepts to successful product concepts (Crawford, 2003).

3.6. A Case of Market Driven Innovation

In The Small Business Economy, William Baumol has provided striking evidence indicating that private innovative activity has been divided by market forces between small firms and large, with each tending to specialize in a different part of the task (The Small Business Economy, 2005, page 183-206). Even though the preponderance of private expenditure on research and development (R&D) is provided by the giant business enterprises, a critical share of the innovative breakthroughs of recent centuries has been contributed by firms of very modest size. These radical inventions then have been sold, leased or otherwise put into the hands of the giant companies, which have then proceeded to develop them—adding capacity, reliability, user friendliness and marketability more generally—to turn them into the novel consumer products that have transformed the way Americans live. Baumol has referred to this division of labor as the "David-Goliath partnership," the value of whose combined products clearly exceed the sum of the parts. To the extent that the facts confirm this characterization, it is evident that the small enterprises have made and continue to make a critical contribution to the market economies' unprecedented growth and innovation accomplishments. Without breakthroughs such as the airplane, FM radio, and the personal computer, all introduced by small firms, life in the industrialized economies would be very different today. Moreover, without these breakthrough inventions to build upon, the big companies would be confined to a much more restricted body of ideas to which to devote their development activities.

This study paper seeks to show that the division of innovative labor is no accident. It is the market mechanism that assigns each type of firm to its differentiated job. It is the market mechanism that assigns the search for radical inventions to the small enterprises and their subsequent development to the large. The author describes how the market does so, and how it prevents either group from a massive invasion of the other's terrain. If, as the evidence indicates, the free market is of critical importance for America's unparalleled flood of innovation, and if widely and rapidly adapted innovation is the primary key to that growth, then it will follow from the analysis that small firms are indeed indispensable components of the process and that rapid and sustained growth cannot get along without them. For ease of thinking, it is convenient to divide up inventions into two polar categories: revolutionary breakthroughs and cumulative incremental improvements. Of course, many new products and processes fall into neither extreme category, but are somewhere in between. Still, it will become clear that the distinction is useful. Moreover, there are many examples that clearly fit into one of these categories or the other quite easily. For instance, the electric light, alternating electric current, the internal combustion engine, and a host of other advances must surely be deemed revolutionary, while successive models of washing machines and refrigerators—with each new model a bit longer lasting, a bit less susceptible to breakdown, and a bit easier to use—constitute a sequence of incremental improvements.

The central contention here is that the division of innovative effort between small firms and large is neither accidental nor it easily terminated. On the contrary, strong market forces drive both actors toward these assigned roles and make it difficult for the entrepreneurs and firm managers to act otherwise. The distinction between the two explanations—historical happenstance versus market forces that induce or perhaps even enforce it—is important not only for research and understanding, but for policy as well, because it can help in anticipating whether this apparently efficient arrangement can be expected to continue with no deliberate intervention to preserve it, or whether some policy measures will be required for the purpose (The Small Business Economy, 2005, page 183-206).

It will be suggested here that there are nevertheless significant overall differences in the influences faced by the two types of enterprise, and that these differences can account for the division of innovative labor that one observes between them. Moreover, if these causal attributions are valid, it will follow that the specializations of the two types of firm are not markedly transitory but, on the contrary, can be expected to remain for a substantial period in the future. The heterogeneity of enterprising behavior precludes any universally applicable scenario, particularly one that imposes a uniform response upon the entrepreneurial firms. In this respect, the story differs from that of the innovating oligopolists who, the author maintains, are normally driven in similar ways by powerful market forces toward their specialization in incremental improvement. For the small firm, several pertinent and important influences are also ingrained in the economic environment, but these are rather more amorphous, not stemming from a pure profit calculus or any market-imposed threat to their survival.

The focus here is on three mechanisms that characterize the relation between the market and the entrepreneurial firm. They can be suggestively referred to as: 1) the superstar reward structure; 2) the psychic rewards to innovative activity; and 3) the scarcity and cost disadvantage of large firm competition in the arena of breakthrough innovation. Each will be discussed in turn, but first an observation that relates to them all. As is to be expected, the market does provide clear incentives for entrepreneurs to undertake the hazards of radical innovation. But, paradoxically, each of the three mechanisms to be discussed entails financial underpayment of the average innovative entrepreneur. That is, it entails the expectation of financial returns lower than those to corporate employees with similar education and experience who provide comparable efforts. Thus, in what follows, it will be necessary to account, first, for the comparative paucity of breakthroughs that emerge from the sizeable labs and affiliated facilities of the large, established, and innovative firms. Second, why are a significant group of entrepreneurs and inventors, albeit a comparatively small one, willing to undertake the great uncertainties and the typically enormous personal effort that pursuit of this objective requires? The issue is not why there are so many that do so, but why there is a significant set of these adventurers at all.

Until now a critical role has not been assigned for the market mechanism in eliciting disproportionate allocation of entrepreneurial activity to breakthrough innovation. The market does play such a role. Psychic benefits are a very tangible reward to the recipient but are generally costless to the provider. This implies that an innovative entrepreneur who on average receives great pleasure but meager financial rewards from the activity may nevertheless be richly rewarded overall. But the low financial payment means that innovations obtained from this source are purchased cheaply in financial terms, giving this sector of the economy a marked competitive advantage. That is, the independent innovative entrepreneur will tend to be the economical supplier of breakthrough innovation to the economy. One of the virtues of markets and competition is their ability to move economic activities toward those suppliers who can provide them most economically. In the case at hand, it means that the low-cost psychic reward component of the independent innovator's compensation will make it more economical for the large firm, in considering its make-or-buy options, more generally to acquire its breakthroughs from others rather than seeking to provide them in-house. Firms are forced to do so for fear that if they do not, their rivals will. This, then, suggests one market-based reason (that is not mere happenstance) why a disproportionate share of radical innovation stems from the independent entrepreneur.

The tendency of large firms to be risk averse in their R&D activities is well recognized. As a clear illustration of that attitude and its implication for the innovation process, the author has previously quoted the following observations by a member of management of one of the world's major high-tech enterprises: How then are choices to be made in the allocation of society's R&D resources in this critical arena? Government has little qualification for the task and big business will not do it. It is only the innovative entrepreneur who is prepared to take on the burden. The task is performed largely by trial and error, using what little information and what large doses of experience and intuition are available to the entrepreneur, because there is no other way. And the process entails a heavy cost to many of the entrepreneurs—whose guess is wrong. But the basic point is that in undertaking this task, the allocation of so critical a portion of society's R&D resources, the entrepreneurs make an enormous contribution to the general welfare, often at their own expense. It is a job that needs to be done, no one else will do it, and imperfect though the selection turns out to have been in hindsight, no one else could have done it any better (The Small Business Economy, 2005, page 183-206).

Three attributes of entrepreneurial activity facilitate its role as conduit from the ghettos and other enclaves of poverty. The first and most obvious is that it requires no consent of an employer. At least in the United States, where some minimal licensing requirements are all that impede the process, for all practical purposes, all entry requires is the determination to do so. Second, there are opportunities that require very little sunk capital, and many an entrepreneur has, indeed, started on a shoestring. The third attribute, which seems not to receive the attention it deserves, is its education requirement: virtually zero. The successful entrepreneur obviously needs to be clever and, indeed, sometimes requires some wisdom. But the great success stories are populated by school dropouts and avoiders of advanced education. Both Edison and the Wright brothers were active entrepreneurs and not just inventors. Edison dropped out of school at age 12 and the Wrights never attended high school. Other examples abound, all illustrating that advanced education is hardly an inescapable job requirement or indispensable for good performance as an entrepreneur. This is important because education is time-consuming and expensive, at least in terms of income foregone, even when government pays the bill. Society's islands of poverty are also aggregations of uncompleted education. Lack of education is often a handicap that cannot be overcome by those who seek jobs with any degree of promise for the future in established enterprises. But it does not close the door to exercise of entrepreneurship, and that is no negligible virtue.

This study has gone beyond the observation that breakthrough advance in technology is predominantly a small firm specialty. There is a good deal of evidence that this has been the case for over a century and that it continues to be so today. True, the giant oligopolies provide the overwhelming preponderance of R&D expenditures, but in general those outlays are carefully directed to projects with minimal risk, which are therefore apt to yield non-negligible improvements, but improvements that typically are only incremental. This paper has inquired into the influences that can account for this division of labor and has offered a number of observations that indicate that the phenomenon is hardly an accidental occurrence. More important, the analysis, if supported by the evidence, indicates that this distribution of the task of technological advance can, with a degree of confidence, be expected to continue. This underscores the contribution of the innovative entrepreneurs to the growth of the economy and the welfare of society. Three such contributions are emphasized here. The first, the focus of the article, is the entrepreneur's provision of the radical innovations that underlie the profound changes, since the Industrial Revolution, in the way Americans live. Second, it has been noted that the innovative entrepreneurs as a group carry out the task of selection of the projects to which the resources available for the search for radical breakthroughs are allocated. This is a task critical for the future of the economy, but it is a task from which others shrink because of the great uncertainties it entails. Finally, recalling the evidence that innovative entrepreneurs have often succeeded, and succeeded spectacularly, with little formal education, it has been pointed out that this serves to reduce further the naturally low barriers to entry into the activity. That, it turn, helps to fill a need critical for society: an attractive and promising avenue toward prosperity (The Small Business Economy, 2005, page 183-206).

3.7. A Case of Asia Foundation Experience in Indonesia: Unleashing Small Business Growth

Throughout Asia, small businesses are a critical component of local economies. The Asia Foundation has developed an innovative approach to helping small businesses grow — rather than providing direct assistance to firms, the Foundation directs its activities towards improving the business environment, working with grassroots business groups that advocate market reforms, and providing technical assistance to local institutions tasked with implementing reforms (http://www.asiafoundation.org/pdf/indo_SME.pdf). The Foundation has six years of experience implementing such programs in Indonesia and is a leader in the field of building private-sector engagement in policy reform. This approach complements the efforts of other organizations that provide business development services or financial services to the small business sector. Building on the lessons learned in Indonesia and adapting the framework to suit local needs, The Asia Foundation is in the process of developing significant programs directed at the small business community in Bangladesh, Nepal, the Philippines, and Cambodia.

Businesses employing fewer than 20 people employ roughly 90 percent of the population in Indonesia, a statistic similar to that of other developing countries in Asia. Traditionally overlooked by economic development strategies that emphasized the creation of large and often State-owned companies, small businesses have garnered increasing recognition in recent years for two primary reasons. The first is their ability to generate employment — thereby reducing poverty — with limited capital. As large, well-connected firms continue to founder in the wake of the Asian financial crisis, small businesses have absorbed the unemployed and played a fundamental role in ensuring the economic survival of many families. Small businesses are important for growth, as well. The presence of a dynamic private sector made up of all sizes of business is an important indicator of a healthy economy.

In much of Asia, however, small businesses operate in an environment where State-owned enterprises or well-connected large companies continue to be granted privileged access to resources, procurement contracts, and regulatory concessions. Small businesses, in contrast, face a heavy burden of restrictive regulations, levies, and licenses. They bear tremendous financial costs and must allocate considerable amounts of time to obtain the multiple licenses that are required to operate legally. Moreover, these local regulations are frequently amended, and this constant state of flux leads to new opportunities for corruption. Sometimes the problems are unintentional, but still costly, for small businesses. Poor governance in some countries produces regulations and procedures so obtuse that entire industries of middlemen spring up to expedite the processes. Even when institutions do not formally exclude them, small businesses owners may find themselves on the outside looking in. For example, cultural barriers prevent many from approaching lending institutions, even those that exist to serve small borrowers.

The Asia Foundation is a nonprofit, nongovernmental organization dedicated to the development of a peaceful, prosperous, and open Asia-Pacific region. Working out of 17 offices across Asia, the Foundation sponsors a wide array of programs that support the reform process by strengthening local partners who actively advocate greater openness, greater transparency, and greater participation. These programs fall into the broad areas of governance and law, economic reform and development, women’s participation, and international relations. In Indonesia, the Foundation has been responding to the real and pressing needs of small businesses since 1996. The Partnership for Enterprise Policy Reform program, funded by USAID, works to improve the business environment by broadening private sector participation in government decisions on small business policy. The program is also enabling greater access to credit at the local level through a better functioning financial system. Lastly, the Foundation works to increase the availability of relevant technology and information to and among small and medium enterprises (SMEs).

The Asia Foundation has succeeded in making substantial improvements to small business policy and its implementation. Those policy is about simplified licensing of SMEs through local one-stop licensing and registration, resulting in a dramatic increase in the formalization of small businesses in some areas; Supported the drafting of anti-monopoly legislation that includes State- owned enterprises and continues support of advocacy for the bill's passage; Convened the first independent National SME Owners Congresses in Indonesia in 1997, and supported subsequent congresses in 1998, 2000, and 2002; Facilitated the creation of more than 60 independent, regional small business associations across the country; these associations represent more than 1,500 small businesses in a wide range of sectors; Initiated and institutionalized the mechanisms that incorporate input from these business associations into local policy processes; Identified and reduced special levies and other costs imposed on SMEs; Ensured stakeholder input on a bill to regulate microfinance institutions for the first time; Deregulated the halal certification process (which formally identifies food that is allowable for consumption by Muslims). Advocacy by local business associations led to the retraction of a decree requiring labeling by a monopoly office that was placing an onerous burden on SME food producers; Convened dialogues between the regional and national business associations and big retailers on consignment practices that resulted in new payment practices to better meet the needs of SME producers; Created an advocacy fund to support local efforts to improve the policy environment. The fund has disbursed $80,000 over 4 years to more than 40 business associations; and Conducted an unprecedented 10-city survey of local business environments for SMEs that was designed to reveal the strengths and weaknesses of each city and to promote healthy competition for the best business environment. A second survey, currently in process, has received substantial support from Indonesian companies, which have contributed $20,000.

When the Foundation began its work with small business in Indonesia, existing business associations involved selected groups of well-connected businesses. These business groups, often organized along sectoral lines, usually advocated behind closed doors for advantageous treatment of their own businesses or industries. The Foundation initiated the establishment of the first independent small business associations in 1997. Today, there are more than 60 small business associations serving more than 1,500 member businesses across Indonesia – from Sumatra to Papua – and they have engaged successfully with local and national government on issues ranging from corruption to monopolies, credit, and relations with large companies (http://www.asiafoundation.org/pdf/indo_SME.pdf).

The business associations are initiated by local businesspeople, often after they have enjoyed exposure to other Foundation-supported business associations, and are driven by members' interests. Often run by volunteers, they function essentially as local chambers of commerce, representing the interests of independent small businesses in the principal cities and towns. In addition to their advocacy activities, the associations play an important role in circulating market information and providing networking opportunities. The value of these services is evident in the associations' ability to collect dues: associations receive no operational support from the Foundation for rent or salaries, only technical assistance and grants for policy related activities.

Every two years, the Foundation supports a national conference that brings together the local business associations from across the country. These conferences give national prominence to the needs of small business by applying their collective political weight to issues of common interest in front of prominent officials from the national, provincial, and local governments. More than 100 SME owners from more than 20 provinces attended the third national conference, held in 2000 in Yogyakarta, as did representatives of central and local government agencies, analysts, the private sector, and the media. The fourth conference, in August 2002, enjoyed even greater numbers. In addition to bringing regional concerns to the capital, the national meeting allows businesspeople from across the country to trade information on markets and technology and to share ideas and experiences on organizing business associations.

The Foundation also created and manages an advocacy fund that receives proposals to fund business association activities related to the local business environment. Business associations apply for funds on a competitive basis, and proposals are judged by a joint group of The Asia Foundation and its partners on the basis of their potential impact and demonstration of cost sharing. Activities supported under the fund include: advocacy on unclear bureaucratic procedures for business licensing, advocacy on anti-competitive behavior by State-owned enterprises which reduces opportunities for SMEs, advocacy on unfair business practices by large retailers, and advocacy on illegal levies that have to be paid by SMEs. Over the past four years, approximately $80,000 has been distributed to more than 40 business associations.

Dynamic entrepreneurs are always seeking ways of expanding their operations. This requires access to information regarding consumer demands and alternative production technologies. Usually, entrepreneurs collect this information from the market. But small businesses in remote locations face higher costs in accessing this information, and these costs may be prohibitive, effectively locking efficient producers out of the market. Information technology makes it possible to reach new markets and lower communications and marketing costs. The Foundation is helping SMEs to take advantage of these opportunities. Activities thus far include a survey of eCommerce use by SMEs in Southeast Asia. As in the Foundation's general policy activities, this research formed the basis of policy recommendations that are being promoted in public-private dialogue meetings around Indonesia. While the impact on local businesses was discussed, the regional aspect of the survey also allowed policymakers to see how the regulatory environment and adoption rate in Indonesia compares to competitor countries, such as Thailand and the Philippines (http://www.asiafoundation.org/pdf/indo_SME.pdf).

The Foundation is also supporting the development of an SME web portal that will increase access to critical business information and foster ongoing communication between the business associations and their members. The website will disseminate locally gathered information, including changes to local and national business regulations. Having a centralized source of information will offer businesses the additional advantage of comparing differences in regulation across provinces. This online service will also provide information on areas of interest to SMEs, including the local business environment, contact information for association offices and members, relevant market data, and the product information of members in order to create linkages between upstream and downstream producers.

The Asia Foundation is sponsoring a major marketing effort through the business association offices to build the user base of the website and to encourage participants to contribute information and content. In addition, the Foundation is working with government agencies to formulate a process for posting government data and content. The Foundation is also providing grants to local business associations to support the buildouts of their local portal websites, as well as to purchase computer hardware and Internet access.

3.8. A Case of Innovation and Technology Transfer in Chinese Agriculture

In Journal of Small Business and Enterprise Development, the transfers of scientific and technological achievements in the agricultural sector, despite consistent improvement over the years, remains as low as around 40 per cent (Journal of Small Business and Enterprise Development, 2006, Vol.13, Iss.2, page 242-247). It is estimated to be only half of that of developed economies. The low level of technology transfers has not only wasted valuable resources of science and technology available to the agricultural sector but has also hindered the development of agricultural and urban economy. To meet the requirements of agricultural development and to prepare for competition in the international market after China's entry into the World Trade Organization (WTO), the Ministry of Science and Technology (MST) and the Ministry of Finance (MoF), in conjunction with the Ministry of Agriculture (MoA), the Ministry of Water Resources (MWR), and the State Forestry Bureau (SFB), established in April 2001 the "Fund for the Transformation of Scientific and Technological Achievements in Agriculture" with reference to the relevant clauses in the "Green box policy". In August 2001, MST and MoF jointly issued a series of documents, including the “Guidelines for projects of the fund for the transformation of scientific and technological achievements in agriculture in 2001” and the “Interim provisions of managing projects of the fund for the transformation of scientific and technological achievements in agriculture” and “Appraisal manual”. They also co-sponsored workshops to formulate general plans for the transformation task.

The “Fund for the transformation of scientific and technological achievements in agriculture” is a platform for the Chinese government to channel funding into agricultural science and technology and to foster technology transfer and progression of industrialization. According to the “Green box policy”, there is a pressing need to gear up agricultural restructuring, for the benefits of agriculture in general and for an increase in farmers’ income. In addition, it is an effective tool in the implementation of the “Green box policy” to support agriculture after China’s entry into the WTO. The establishment of the fund was intended to resolve problems in the separation of scientific research and technology development from agricultural production, while taking into full consideration of different characteristics in each region and the fact of agricultural production. So far, the projects with funding from the fund have generated remarkable economic, social and ecological benefits.

The fund focuses on relatively mature technologies. Through regional trial and demonstration, mid-test or commercial experiment, technologies would eventually reach the pre-application stage which allows the science and technology (S&T) achievements to be transformed to actual applications. Depending on the characteristics of projects and organizations, the funding could be used as subsidies for the payment of loan interests, volunteer grant, and capital investment. The establishment of the fund encouraged all regions and relevant organizations to take up the transformation work and to promote positive interactions among agricultural production, education and research. Statistics show that by the end of 2003, local governments and corporations had invested 3.06 billion yuan as match funding, with 0.26 billion from local governments and 2.67 billion from local corporations, thanks to the transformation fund (Journal of Small Business and Enterprise Development, 2006, Vol.13, Iss.2, page 242-247).

Since 2001, local governments at different levels have taken active and effective measures to strengthen the transformation and transfer of scientific and technological achievements in agriculture. Special funds have been established in Zhejiang, Beijing, Jiangsu, Jiangxi, and Xiamen. The governments of Guangdong and Shanghai have promised to allocate money for projects that had been allotted transformation fund by the central government. These have promoted the transformation of local scientific and technological achievements in agriculture. Since the launch of the fund, MST and MoF have regularly published call for tendering at the beginning of each year, including application guidelines. After the call for tendering, the S&T

departments in the ministries concerned and provinces will organize the application process. It allows every eligible organization to apply. After passing through the S&T departments' examination and recommendation, applications are then transferred to MST. MST is responsible for application assessment and selection before passing them to an expert evaluation meeting held in conjunction with MoF. Proposals are judged against such criteria as creativity, feasibility, expected outcomes, the applicant's organizational capability, financial status, etc. In the evaluation process, applicants from the western, minority and frontier regions would be considered preferentially. After the expert evaluation meeting, successful proposals are authorized and announced jointly by MST and MoF.

After three years' operation, the fund now has a well-organized operation and management system in place. First, a coordinated and leading team was set up by the Ministry of Science and Technology, in collaboration with the Ministry of Finance, the Ministry of Agriculture, the Ministry of Water Resources, and the State Forestry Bureau. Its task is to coordinate the major issues and to provide instructions concerning the projects. The project management office was set up as a supporting body to the team, taking care of approving projects and managing specific affairs relating to projects.

Second, a mechanism of working meeting was set up. As a routine, all departments are supposed to attend meetings to discuss specific affairs, such as the focus of annual plan, project guidelines, project report to higher authorities, project assessment and approval, project supervision and examination, annual report, etc.

Third, an approval procedure of "two checks, three examinations and one approval" was adopted, that is, the managing departments of science and technology at the levels of province and ministry give the first check to the applications, and the project management office checks the form of the applications; then experts in technology and finance assess projects from the perspectives of technology, market and finance and make recommendations; and finally the leading team decides whether a project should be financed.

Fourth, a well-organized bank of experts was set up to allow random selection to approve projects. Recommended by provinces and ministries, experts become members of the selection team with their information in the database, which covers all subjects and regions. Experts are randomly selected to form a group. Those from one organization and one region are deliberately separated in order to avoid conflict of interest.

Fifth, in project management, attention is not only paid to "entry" but also to supervision. Management regulations have been introduced to set up a standard system of supervision, check, assessment, acceptance and annual report so as to ensure the smooth implementation of the approved projects. It aims at an incorporation of governmental guidelines with social supervision, which will primarily improve the capital efficiency and ensure the project's successful operation.

Lastly, approved projects are monitored on a regular basis. Ongoing projects are randomly and frequently checked under relevant regulations. In addition, CPA offices, consultancy and assessment centers are invited to check the progression and financial status of the projects. Investigation and analysis show that the transformation of scientific and technological achievements in agriculture plays an essential role in increasing the benefits of agriculture and farmers' income, fostering the adjustment of agricultural structure and speeding up the construction of comparatively well-off villages. In view of difficulties in agricultural technology transfer in China, it is of great practical importance for the government, following the "Green box policy", to put the issue on the top agenda and attract more capital from every walk of society to support the transformation (Journal of Small Business and Enterprise Development, 2006, Vol.13, Iss.2, page 242-247).

3.9. A Case of Technology and Market Objectives in the Internationalization of New Technology-Based Firms

In International Small Business Journal, new technology-based firms (NTBFs) setting up in small countries often have to face problems directly related to the size of the country (International Small Business Journal, 1997, Vol.15, Iss.4, page 14-35). Constraints include local supply and demand of technology. Such firms may have to look abroad for technological knowledge and markets that cannot be found locally. The case of a group of Portuguese NTBFs and the conditions that prevailed, leading them to internationalize their activities, is described, based on empirical research.

New technology-based Firms (NTBFs) created in small countries are frequently confronted with a number of problems derived from the size of the country. Two particularly serious constraints regard the local supply and demand of technology. In fact, the national scientific and technological (S&T) structure may only generate a small proportion of the knowledge and technology the NTBFs require to complement their in-house efforts (Perez and Soete, 1988). On the other hand, the local demand for NTBFs' sophisticated products may not be enough to cover development costs or to enable growth (Kim, 1988). If these constraints prevail in small developed countries (Freeman, 1988; Lemola and Lovio, 1988) they assume even greater proportions in less developed ones. Technology-oriented firms operating in a country whose national system of innovation (Lundvall, 1992) is less complete and integrated are likely to be confronted with serious problems with respect to technology access (Perez and Soete, 1988; Walsh, 1987) and particularly to market expansion (Dahlman and Westphal, 1982; Deniozos, 1994). Therefore, NTBFs created in these environments are faced with greater difficulties to survive and grow as technology-intensive firms (Fontes and Coombs, 1996).

The limitations of the local environment at the level of technology supply and demand may force NTBFs to search abroad for the technological knowledge and the markets they cannot find locally. Studies about small technology intensive firms in less advanced countries, frequently associate success with the ability to internationalize (Ayal and Raban, 1990; O'Doherty, 1990; Valls, 1993)(1). But the process of internationalization is by no means easy for these firms, even if new developments in communications make interaction with distant partners easier (Garnsey and Wilkinson, 1994). NTBFs are young, small firms, with limited resources, both financial and human (Littler and Sweeting, 1990) and a number of `liabilities of newness' with respect to organizational experience and external credibility (Eisenhardt and Schoonhoven, 1990). Moreover, they are often formed by people with a strong technological background but limited competences in non-technological areas (Oakey et al, 1988; Roberts, 1990), which may facilitate technological internationalization but will obviously hinder foreign market expansion. Although these features are shared by NTBFs operating in different environments, NTBFs in advanced economies can more easily compensate for their deficiencies or complement their activities through the establishment of relationships with other organizations (Lawton-Smith et al, 1991; Rizzoni, 1994). Because these organizations are often absent or show lower initiative in less advanced countries (Tsipouri, 1992), NTBFs have to rely much more on their own efforts.

In spite of the importance of foreign technology and markets for the survival and growth of NTBFs created in small countries, these two aspects are rarely addressed simultaneously when their internationalization is considered. On the whole, the literature about the internationalization of small technology intensive firms is scarce and, with rare exceptions (Garnsey and Wilkinson, 1994; Valls, 1993), it either addresses the process of foreign market expansion (Ayal and Raban, 1990; Coviello and Munro, 1995; Lindqvist, 1997) or discusses issues related to foreign technology access (Fourcade, 1993; O'Doherty, 1990; Rothwell and Dodgson, 1989). However, in our view, the two issues are likely to be closely intertwined in NTBFs strategies. The coincidence of technology and market objectives has already been pointed out by other authors as characteristic of small innovative firms’ external relationships (Rizzoni, 1994; Rothwell and Dodgson, 1991). Because foreign relationships are more complex to establish and maintain than local ones (Bridgewater, 1992), it is to be expected that this tendency is retained and even magnified, especially when internationalization takes place in a context where access to technology and to markets located outside national borders are parallel preoccupations.

NTBFs are small firms with limited internal resources but substantial technological requirements. Their success in technology acquisition is often associated with the ability to supplement internal efforts with external technological knowledge and to achieve technological complementarities with other organizations (McGee and Dowling, 1994; Rothwell and Dodgson, 1991). Two main routes were used by the Portuguese NTBFs to establish technology partnerships abroad: (i) through participation on international research projects; (ii) through commercial linkages, with or without a technical component. Only nine NTBFs had already participated in EU-funded research projects. Five were spin-offs from research organizations and the other had good -- although informal -- contacts with the university. Three further firms were planning to submit proposals and two of them were negotiating with larger partners. Subsidiaries of large firms tended to be better equipped to identify the opportunities available and to profit from them: they frequently had one staff member responsible for monitoring ongoing events and for organizing participation, they usually had links with the university and they had resources to co-finance larger projects.

Firms engaging in international projects -- as well as these planning to -- saw participation as strategic for reasons that went beyond the sole technical collaboration. For some firms the research aspect was predominant: the participation in sponsored projects privileging pre-competitive research was seen as the only opportunity to engage in this type of research. It was also seen as a window into the evolution of pre-market technology, especially by firms without the direct channels provided by a close link to a research centre. To some extent these projects represented a defense against peripherality, permitting the access to inputs that NTBFs in more advanced countries might find locally. The financial element was not negligible either, although the synergies achieved through co-operation were considered more relevant. But a basic feature of such participation was that it gave firms visibility to potential partners and credibility in international forums, often regarded as more important than the actual project output. On the other hand, it could also be a first step towards market internationalization, a 'side effect' searched by several firms. A maybe unanticipated outcome was that the actual experience of working together lessened the bias against Portuguese firms, becoming easier for them to be accepted as technology-competent suppliers or partners.

The second route involved securing technology partners on the basis of commercial contacts -- as clients, suppliers or agents. Some relationships with suppliers -- e.g. involving complex inputs that needed to be tailored to the client's needs -- were a good example of this. Starting as mainly commercial relationships, they ended up assuming forms close to technical collaboration. Another interesting case was that of firms which, by venture of their client-supplier relationships with foreign MNEs operating in the Portuguese market, were able to gain contacts abroad, both in the MNE itself and in other firms through its network. But only a few firms had been able to establish partnerships with foreign firms in similar fields. Such achievement was often associated with the NTBF attempt to enter foreign markets, or with the foreign firm's interest in the Portuguese one. Most technological relationships achieved through the processes described above were largely informal, but firms put some hope on their evolution.

The use of local intermediaries to substitute or complement the firm in the foreign market was based on the assumption that these intermediaries have a better knowledge of the market and easier access to the local clients. It included: (i) use of agents or distributors, whose relationship sometimes evolved to situations of cross-licensing or cross-agency using; (ii) partnerships, entailing participation in the capital of existing firms or creation of new firms; (iii) nonpermanent association with local companies for a particular purpose (e.g. submitting a tender).

Finally, because a number of firms mentioned the role of linkages with market-related complementary assets, this particular case deserves some attention. With very few exceptions, although a relationship was searched, the NTBFs did not favor partnerships with large firms. They were aware of their weaker position and of the chances of being 'swallowed' by the more powerful partner, a situation that is indeed frequent (Lawton-Smith et a4 1991). The example of the few firms which have been able to capitalize on their linkages with larger companies seems to suggest that a preferential but arms-length relationship -- where the small firm is important for the larger one, but does not depend on it -- is the most favorable situation for the NTBF9. One of the reasons why the NTBFs studied found it easier to overcome the difficulties concerning technology access was exactly because they were able to build channels to the sources of the required knowledge and technology, wherever they were located. With time, they became relatively proficient in identifying and accessing the technological inputs relevant for their activities, making the best possible use of the sources available at country level and resorting extensively to foreign ones. As a result, several NTBFs have achieved some degree of technological internationalization, ranging from the establishment of privileged relationships with suppliers of sophisticated inputs, to the integration into the international networks where the tangible and intangible knowledge relevant for their domain circulates.

The degree of integration into international technology networks and the extent to which they became established in foreign markets varied greatly among the firms interviewed. This was related with: (a) their relative need to internationalize; (b) the opportunities open to them in this area -- particularly evident with respect to the market, with some firms being confined to the national market or constrained in their internationalization efforts by the nature of their local clients' demand; (c) their ability to achieve it -- firms had diverse resource levels, adopted different strategies and were more or less able to obtain externally the assistance and/or complementarities that could leverage their individual efforts. The results presented in this paper can be seen as preliminary, being based on a relatively small sub-sample of

Portuguese NTBFs. The methodology adopted permitted an in-depth analysis of the strategies and practices of the firms interviewed which resulted in the identification of important aspects of NTBFs' behavior in this area. But the conclusions reached should now be tested upon the wider population of internationalized or 'internationalizing' Portuguese NTBFs. Also, it would be interesting to return to the NTBFs studied and examine the evolution registered in their strategies, as well as the outcome of their then very preliminary efforts with respect to market internationalization.

The conclusions reached are, to some extent, consistent with these of other studies about NTBFs' internationalization behavior. But they also call the attention to the particular problems and bottlenecks of NTBFs originating from a less advanced country, both these related to their local environment and these deriving from their attempts at moving beyond the national constraints. These conclusions may therefore be useful to other countries (especially European countries, whether or not part of the EU) in a similar economic situation. Further research in such contexts is necessary in order to identify common problems and eventually provide the basis for common policies (International Small Business Journal, 1997, Vol.15, Iss.4, page 14-35).

3.10. A Case of Market versus Corporate Structure in Plant-level Innovation Performance

In Small Business Economics, a study examines the effect which market and corporate structure have on the extent of innovation for a sample of circa 300 manufacturing plants located in Scotland (Small Business Economics, 1999, Vol.13, Iss.2, page 97-109). Innovation is defined as the introduction of a commercially significant new product at the establishment level. The theoretical model of Geroski (1990) is extended to incorporate plant-level variables such as size, multiplant operation, the presence of R&D facilities and external/indigenous ownership. A distinction is made between the direct and indirect effects of these variables. Negative binomial estimations indicate that corporate structure influences are more important in determining the number of innovations than market structure and barrier to entry variables. Plant size, foreign ownership and the presence of R&D are all positively associated with innovation. Direct effects greatly outweigh indirect effects. Tobit estimations on the number of innovations per employee support the findings of Acs and Audretsch (1988) that smaller enterprises are more innovation intensive than larger enterprises, at least up to a limit of around 1200 employees. The positive effect of R&D arises principally from increasing the probability of a plant becoming an innovator, rather than from making a plant more innovation intensive. By contrast, the importance of size lies principally in encouraging further innovations among plants which are already innovators, but less than proportionately with the increase in employment size.

There is now a substantial economics literature which examines the factors determining innovation, with particular emphasis being placed on the role of market power (e.g. Kamien and Schwartz, 1982; Levin et al., 1985), and on establishment size (Acs and Audretsch, 1988; Brouwer and Kleinknecht, 1996). A second strand of literature examines the link between corporate ownership structure and innovation, but with little attempt to model formally the relationship, or to see these factors in the context of more general economic determinants of innovation (e.g. Oakey et al., 1980; Goddard et al., 1986). This study attempts to bring together these two elements, and to add to them in three distinct ways. First, instead of the industry analysis often employed in the industrial organization literature, we employ establishment-level data within a clear theoretical framework. This allows a closer analysis of how elements of corporate structure affect innovation than is permitted by industry-level analysis. Secondly, instead of regarding innovation in simple dichotomous terms (i.e. whether or not firms innovate), this paper examines the determinants of the extent of innovation, thus allowing for the fact that while many firms do not innovate, some innovate a great deal. Finally, we explicitly distinguish between the direct and indirect effects of the explanatory variables on innovation; that is between the effect which is not mediated through post-innovation profits, but arises for any given level of post-innovation profitability (the direct effect) and that effect which occurs via the impact which the explanatory variables have on the size of post-innovation returns (the indirect effect). This distinction has rarely been made in the literature on innovation (Small Business Economics, 1999, Vol.13, Iss.2, page 97-109).

There are several specific firm and plant-level characteristics repeatedly identified in the literature as being important for innovation. These include establishment size, multiplant operation, the nature of the ownership and control of local establishments, and the related presence or absence of key functions such as R&D. The direct and indirect effects of these variables are generally implicitly conflated in the regional economics literature. For example, Oakey et al. (1988) suggest several Schumpeterian reasons why large firms may be more innovative than small firms. Large firms will probably experience scale sensitive advantages in R&D itself and will also benefit from non-technological, scale-intensive activities which support innovation, such as production, marketing and finance: such firms will also be better able to finance a range of innovative projects, allowing them to spread risk. These may be characterized as indirect effects of scale, which act to raise the post-innovation price-cost margins of larger firms. But Oakey et al. also note more direct advantages of scale, such as greater division of labor permitting the maintenance of specialized departments such as patenting and specialist libraries. The ability to maintain contacts with external organizations will also increase with size if pressure on management time in smaller firms leaves little room for this. This is supported by Freeman (1982), who notes that one of the factors which discriminated between success and failure was the ability to maintain contact with specialized centers of excellence.

The effects of multiplant operation and external control are highly interlinked, and there is no attempt in the literature to distinguish between direct and indirect effects. For example, Thwaites (1978) suggests some grounds for belief in a positive association between external control and innovation, particularly in the context of "mobile plants", i.e. those which were encouraged to move to the peripheral areas (of the U.K.) because in situ growth was constrained by legislation prohibiting expansion in the South East. In the first instance, such plants will have been part of a growing firm and probably a growing industry, with the possibility that the propulsive force behind growth was innovation. Secondly, externally-owned plants are, in the majority of cases, part of larger commercial organizations, and they may therefore gain by access to the parent's resources. Such resources may be technological, for example, access to larger scale R&D facilities operated by the parent, or to proprietary knowledge developed by the parent (Oakey, 1979; Brugger and Stuckey, 1987). Branch plants may also benefit from contacts with external research establishments maintained by the parent, or they may be the direct recipients of innovations developed elsewhere in the group. Alternatively, access may be available to a wide range of non-scientific resources such as finance, a national or international marketing organization through which new products can be diffused, patenting and other support functions. Finally, branch plants may be of a sufficient size to support innovation because of the market area served and, in particular, may be larger than indigenous counterparts.

The results of the empirical analysis indicate that, when set within a formal model of the determinants of innovation, these factors are indeed of some importance. Large plants have more innovations, but fewer innovations per employee, at least until some limit. The importance of size lies principally in encouraging further innovations among plants which are already innovators. However, this may not be a simple linear relationship. The results of size on both number of innovations and innovations per employee suggest that larger size does encourage more innovations, but less than proportionately with the increase in employment up to a limit of c.1200 employees; thereafter, the increase in innovations induced by increasing size is more than proportionate. Because plants with more than 1000 employees represent a tiny fraction (0.5%) of manufacturing plants in Scotland,10 for most practical purposes smaller plants are indeed more "innovation intensive" than their larger counterparts. By contrast, the presence of R&D and, to some extent, foreign ownership helps firms to become innovators, but does little to increase the number of innovations among innovating plants. R&D, but not foreign ownership, also helps to increase innovations per employee.

Finally, the results suggest that, although the profits proxy is imperfect, direct effects are the dominant element of the overall effects of corporate structure influences on innovation. One implication of these findings is that contrary to the hypotheses developed in much of the literature - external control is not necessarily inimical to innovation within the manufacturing sector of the regional Scottish economy. Indeed, there is a slight positive effect of foreign ownership, although not of intra-U.K. ownership. However, this is critically linked to the R&D issue, where it is clear that plant-level facilities are of great importance in making a plant an innovator, but play a much less important role in enhancing innovativeness once the initial threshold has been overcome. Since externally owned branch plants are less likely to have in-house R&D facilities than their indigenous counterparts, this conclusion supports the suggestion of Ashcroft et al. (1995) that policy initiatives to encourage inward investing multinationals to set up research facilities in Scotland would be worthwhile.

Such an initiative would, however, do nothing to encourage innovation among indigenous concerns, which must be the principal concern of government. Given the relative innovation-intensiveness of smaller plants, it would appear that the U.K.'s policy stance of providing innovation support mainly for SMEs is sensible. However, recent research by the present authors and colleagues (Roper et al., 1996) suggests that U.K. firms are less likely to innovate than their German counterparts, and Scottish-based firms particularly unlikely to do so. The key, therefore, would appear to be finding some method of helping smaller indigenous concerns overcome the hurdle of the initial innovation.

4. Focal Points of Policy making for successful R&BD Programs

One of the focal points of policy making for successful R&BD programs is to get the benefits out of the programs. Expected benefits which trainees may receive by learning this subject will be as follows:

- Trainees will have an idea that R&BD (Research & Business Development) is more focused on the commercialization and marketing which generate funds for the reinvestment and on-going enterprises.
- This is the reasons why R&BD can be a course suitable for SME innovation policy training
- R&BD is the fruit (result) of SME innovation.
- Trainees will have knowledge how R&BD can transform an innovative product that can meet market needs and customer satisfaction. Trainees are also can study about customer culture and environment to avoid failure in meeting market needs.
- Trainees will have an idea about organizing an effective and efficiency R&BD programs for SMEs in order to minimize risk management. It includes cost management, human resource management, and time management.
- Trainees will have knowledge in increasing innovation for SMEs to drive the competitive advantage.

- Trainees will know that R&BD can help SMEs to survive from the business competition for a long term.
- Trainees can support SMEs in analyzing the appropriate technology to produce the innovative product.
- Trainees will have ability to analyze the problem in R&BD for SMEs and try to solve that problem properly.
- Trainees will have ability in guiding the R&BD for SMEs to ensure consistency in decision making to ensure the correct focus on customer (market) requirements.

To create competitive success today demands business-building programs in which technologies generated in the lab are rapidly converted into deployable capabilities and speedily commercialized and diffused into new markets. The leader of a technology development program, therefore, needs to assume a much more comprehensive and integrative role than the traditional R&D manager. Its executives start by seeking to identify unmet medical needs, and then they focus on opportunities that are scientifically and technologically feasible.

If we add how workshop participants may utilize the training materials about a specific subject to make their own policy prototype, we can insist that the workshop will provide participants with the idea for the actual implementation of participants' R&BD programs among APEC region. Other focal points of policy making for successful R&BD programs is to change the SMEs CEO mind from simple engineering mind to business mind through the innovation education by government.

5. Discussion Points: Sharing ideas among APEC members

The reason why R&BD (Research & Business Development) became one of the training courses suitable for SME innovation policy training is that R&BD is more focused on the commercialization and marketing which generate funds for the reinvestment and on-going enterprises. In order to make the program successful participants may share their ideas including the following discussion points:

- How did your economy establish R&BD program in your own environment?
- What kind of problems can you expect in your economy?
- How did your government support the program such as funds, risk management, etc?
- What is the first step you can choose to implement R&BD program?
- How does the cooperation work among SMEs, government, research centers and universities?
- How does the innovative product can meet the market needs? What is the best

solution if the innovative product failed to meet the market needs?

- In R&BD human resource management, which one is better for SMEs between external recruitment of experienced staff or training staff internally?
- Does the increase of market change can affect the increase of innovation?
- Does the effective innovation program can result competitive advantage?
- What are the success and failure factors for such interventions and resultant innovation effectiveness in SMEs?
- How could SMEs manage innovation effectively and efficiently through optimizing organizational structure?
- The small enterprises have made and continue to make a critical contribution to the market economies' unprecedented growth and innovation accomplishments. Is it true that small enterprises critically have a better idea for innovation than the large companies?
- Some of the enterprises consider the outsourcing for R&D activities, because of some enterprises do not have a good capability and experience in R&D activities. Is that issue having a positive impact to the enterprises' performance, especially for small enterprises?
- An enterprise which creates an innovative product for the market needs must move on quickly to create another innovative product, because there will be many other companies are following those innovation that has been created. Therefore, they are both the leader and the follower, and sometimes the follower creates a differentiation from that innovative product. Is there any strategy to avoid this issue?
- Is there any solution to reduce that R&BD cost since the cost of R&BD activities is very expensive? Or is it possible that one enterprise is sharing R&BD activities with other enterprise when they have a similar concept of innovation in order to reduce R&BD cost for each other and become a win-win solution for both of those companies.
- How could you help SMEs create one consistent perception in the cooperation among R&BD, Marketing, and Manufacturing divisions? Those three divisions are always get involved in innovation strategy, but sometimes all of them might have the different perceptions.
- Small firms have been rated lower in the ability and efforts on a number of possible indicators for new product market visioning than the larger firms. How could you help SMEs overcome the gaps?
- Development processes are identified to satisfy the needs of new customers using their current technologies. However, managers need to empower cross-functional teams to evaluate new technologies with an ever-increasing number of pioneering partners in order to sustain the R&BD activity. How could you help SMEs sustain

the R&BD activity?

- Technology transfers in agriculture play an essential role in increasing agricultural productivity as well as farmers' income, fostering agricultural re-structuring, and speeding up the construction of comparatively well-off villages. Is it a great practical importance for the government to put the issue on the top agenda and attract more capital from every walk of society to support the ongoing transformation?
- The process of innovation in organizations covers people, process and technology. Therefore interventions in the form of innovation improvement programs often require high levels of complexity. This complexity is compounded in SMEs, where issues such as scarce resources and skill shortages must be recognized. How could you help SMEs overcome the complexity?
- SMEs, which have high levels of innovation improvement, adopted a broad process-based approach to innovation rather than using a narrow technical definition of innovation. These SMEs also developed a process of critically reflective action learning to ground the innovation in organizational practice. How could you help SMEs improve the innovation?

6. Conclusions

R&BD (Research and Business Development) that is next generation R&D strategy that focuses on business-related R&D to provide sustainable benefits for SMEs (Small and Medium Enterprises), while SMEs consider the business or marketing strategy from the early stage of R&D.

There are some conclusions that have been made based on the Research and Business Development theory and case studies:

- Small firm owners, who are highly innovative in a specific domain, may adopt innovations without clear information about its market acceptance. Market-oriented small firms copy the successful innovations once customer market intelligence becomes available. Moreover, customer market intelligence stimulates small firms that would otherwise lag behind in innovation. Consequently, the innovativeness of small firm owners is a crucial asset, which stakeholders of an industry such as governments and suppliers should cherish. Restrictions on innovativeness, via legislation, or conservative financing may propel entrepreneurial owners of small firms out of an industry, which will deteriorate its competitive position. (Journal of Small Business Management, 2004, Vol.42, Iss.2, page 134-154)
- There are seven items, which are postulated to contribute to a better understanding

of the contexts encouraging or discouraging new product market visioning. Those seven items are as follows :

- Feasibility audit of new products in the marketplace

- Understanding of what products will be demanded in two years period

- Understanding of what products will be demanded in five years period

- Understanding of our potential for developing new products

- Ability to predict our customers' reaction to our new products

- Regular monitoring of the success of our different product ranges

- Critical review of our portfolio of products in the past year

It is understood that smaller firms are more innovative than larger firms. However, innovativeness itself does not necessarily lead to better market visioning of new products. To nurture fertile contexts for new product market visioning, a small firm has to do proper review, audit and whatever is needed in order to have a systematic and comprehensive understanding of where they are and where they can go. Without all this homework, a smaller firm may still be able to launch new products, some of which could be successful. Yet this is more of a hit-and-miss style and therefore results in an unnecessary waste of resources. On the other hand, with appropriate efforts on nurturing the contexts for new product market visioning, coupled with the innovativeness of small firms because of their flexibility and less rigid organizational structure, they can stand a higher chance to achieve an impressive rate of conversion from opportunity product concepts to successful product concepts. (Journal of Small Business and Enterprise Development, 2007, Vol.14, Iss.1, page 81-92)

- The transformation of scientific and technological achievements in agriculture plays an essential role in increasing the benefits of agriculture and farmers' income, fostering the adjustment of agricultural structure and speeding up the construction of comparatively well-off villages. (Journal of Small Business and Enterprise Development, 2006, Vol.13, Iss.2, page 242-247)
- The drivers of innovation in small manufacturing firms are: culture, leadership, process innovation and company strategic orientation. Innovation activities consist of developing new ways of working and incremental product innovations. SMEs have advantages over large firms such as being close to customers, a flexible and informal environment. Additionally, they have a risk-taking attitude and welcome

change in particular in relation to new ways of working. SMEs' main drawbacks are customer dependency, lack of knowledge and skills, training, networking as well as lack of financial resources. (Journal of Small Business and Enterprise Development, 2006, Vol.13, Iss.3, page 363-380)

- Innovation is a broad concept involving people, process and technology and studies must be careful of organizational concepts based solely on technical innovation. Innovation studies in SMEs must be highly contextualized, where SMEs are treated as a phenomenon in their own right rather than scalar versions of large organizations. Treating innovation as a process within the SME context has merit as a basis for such studies provided the wider definition of innovation is used rather than being limited to that of technical issues. Using this process, the SME's were able to more readily incorporate and link people, process and technology aspects of innovation in a progressive manner. The process of innovation within SMEs as aided by learning interventions can be studied using Critical Action Learning, where resource and skills limitations for learning by rote can be addressed. (Journal of Small Business and Enterprise Development, 2007, Vol.14, Iss.3, page 385-403)
- The challenges for the technology development manager can be perceived in terms of nine major roles, encompassing the major sets of activities (pipeline-building, market entry and takeoff) attacked at three levels of challenge (venturing, championing and heat-shielding). [Research Technology Management, 2004, Vol.47, Iss.3, page 16-26]

Finally, participants are supposed to make innovation-oriented SMEs sustainable with the sufficient amount of profit and to help them establish the business-oriented strategy from the early stage of R&D with practical governmental policies. R&BD is a critical part for SMEs' development in the APEC member economies.

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Part II

Financing Support Promotion

Chapter 5. Financing Policy for Innovative SMEs

Woosung Lee[1]

Innovative SMEs in an economy suffer from financial constraints in the market due to information asymmetry problems, lack of collaterals and difficulties to collateralize technology and IPRs. These financial problems are critically associated with each development stage of innovative SMEs and with successful commercialization of SMEs' new technologies. Moreover, due to inefficient financial market institutions in most of developing economies, governments in developing economies have every reason to intervene in providing direct and indirect financial supports, in the form of loans or capitals. The financing policy course can be a channel to acquire the essential parts of implementing government financing policies in the developing economies through lectures on the theoretical backgrounds, practical case studies, and in-depth roundtable discussions. Through the course, the trainees can be equipped with capability to develop more articulated and customized financing policies in a developing economy context.

1. Introduction

1.1. General Description

Innovative SMEs suffer from financial constraints in market due to information asymmetry problems, lack of collaterals and difficulties to collateralize their own technology and IPRs. These financial constraints can be raised up in each development stage of innovative SMEs and also in the procedure of commercialization of SMEs' new technologies. Due to inefficient financial market institutions in the most of developing economies, developing economies' governments have every reason to intervene in providing direct and indirect financial supports, both in loans and capitals. This 'financing policy' course can be a channel to acquire several essential parts of implementing financing policies in the developing economies by learning theoretical backgrounds, practical case studies, and in-depth roundtable discussions. Through this course, the trainees can be equipped with capability to develop more articulated and customized financing policies in a developing economy context.

The theme of the workshop is "Linkage of technology development to marketing." The theme of the workshop indicates the final goals of this workshop are to learn how to transfer the technological achievements of SMEs to market success. In order to achieve successful transfer and commercialization of new technologies, financing is an essential ingredient. Innovative SMEs encounter different financial requirements for stepping up each stage of

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growth. For the start-up stage, personal savings of entrepreneurs, their relatives and friends are the common sources of setting up a firm. However, almost all the firms in this start-up stage experience years of negative earnings before entering into breakeven point. Thus, soon after depleting entrepreneurs' own sources of finance, outside funding is indispensable for on-going technological development and commercialization. In this early stage of growth, start-up companies, in general, suffer from low profitability and short business record. Start-up companies are also difficult to obtain loans in commercial banking system without solid collaterals due to information asymmetry and uncertainty problems. Venture capitals and equity investments should be indispensable capital for these young start-up companies before IPOs.

Small start-up companies have to face this funding gap between necessary financial needs of start-up companies and financial provisions of financial institutions. There exists a financial rationing to these start-up companies due to substantial asymmetric information problems. Given this funding-gap in financial life-cycle of start-up companies, governmental interventions are necessary to solve the problems, which are originated from market failures, such as information asymmetries and uncertainties. Government can intervene in market by providing direct finance to start-up companies in early stages of growth or by solving information asymmetry problems with better information communication in market such as technology information, technology evaluations, venture certification, technology guarantee programs, or technology transfer intermediaries.

These rationales are more demanding in the context of developing economies because of inefficient financial markets and financial intermediaries in their developing economies. Developing economies' governments are required to play more important roles in providing adequate finance to SMEs and innovative start-up companies. Indonesia proposed the requirement of financing policies: "In general, SMEs are having difficulties in accessing banking credit, due to asymmetric information (scale, formalization, information), lack of collateral and, thus, they are unable to make business plan. Innovative SMEs with high risk need special Financial Institutions for their supports. In order to help SMEs access to financing, the followings are required: 1) Providing Productive Financial Program to micro and small enterprises through saving and loan cooperatives, and revolving mechanism; 2) Central Bank measures to promote small and medium enterprises access to banking finance, which are a) a Linkage Program between Commercial Banks and Rural Banks, b) Increasing the role of Credit Insurance, c) Adjustments in banking regulations, d) Capacity Building, e) Promoting Venture Capital for innovative SME's development. In order to develop Innovative SMEs, especially related with financial support, Indonesia needs some measures, such as promoting venture capital development.

1.2. Objective and Expected Benefits

The target trainees for this course will be middle-management policy makers in charge of SME financing policy, managers of supporting organizations, and researchers in APEC developing member economies, especially in the area of public financing for SMEs. The course requires 3 hours time period, which consists of 1 hour of lectures, 1 hour of case studies, and 1 hour of discussions.

The objective of this course is to support policy-making capabilities of developing economies' government officials by learning an effective policy instrument in the area of public financing programs. More specifically, the trainees are expected to 1) apprehend comprehensive instruments for financing policies, 2) understand characteristics, diversities and differences of advanced and developing economies' financing policies through international comparison, 3) develop a capacity to apply equity-based financing programs in practice, and 4) develop a capacity to apply loan-based financing programs in practice.

The trainees will be benefited from this financing policy course in such aspects that: 1) the trainees will have a better understanding of financing policy instruments, and their differential aspects and effects in promoting SMEs' innovation, 2) the trainees will have a better understanding of what are the other APEC member economies' financing programs, and their status, and their operational aspects of financing programs, and 3) the trainees will have an in-depth practical understanding about good practices of the loan-based technology financing and the equity-based financing programs, which may possibly be implemented in their economies' own financing policy programs.

1.3. Methodology and Assessment

The subject of "Financing Policies" course will be divided into three steps of implementation. During the first 1 hour of the lecture time, the trainees will be provided the theoretical backgrounds of SMEs' diverse financial demands, financial market failures and government' financing policy instruments, which are effective in promoting SMEs' innovations in developing economies. The diverse examples of financing policies among APEC member economies are examined to compare the differences of diversified financing instruments. Through the 1 hour-lecture on this subject, the trainees will have a clear understanding of what would be the differential effects of diverse financing policies in promoting SMEs' innovation.

During the second 1 hour of best practice case studies, trainees are expected to learn practical operation aspects of financing policies. Through Australia's COMMET program, the trainees will have an in-depth understanding of the equity-based programs. Through Korean technology financing case study, the trainees will have an in-depth understanding of loan-based programs' practical management in promoting SMEs' innovation. Through these case studies, the trainees are expected to be able to utilize loan-based program and equity-based program for implementing their own effective financing policy programs.

In the last step of the 1 hour roundtable discussions, the trainees will discuss about the status of their economies' financing policies: what would be the implications of the advanced economies' financing programs to their economies' innovative SMEs; how to implement these programs into their economies' public financial support structures; and what would be obstacles and expected problems in incorporating financing policies for innovative SMEs.

The success of the financing policy course can be assessed by examining several aspects of the course outcomes: 1) what extent the trainees apprehend comprehensive instruments for financing policies, 2) what extent the trainees understand the characteristics, diversities and differences of financing policies through the comparisons of APEC economies' financing policies, 3) in the medium term, whether they develop a capability to apply equity-based financing programs in practice, and 4) whether they develop a capacity to apply loan-based financing programs in practice.

1.4. Scope and Structure

The structure and scope of this course can be divided into five differentiated contents as follows: 1) government intervention rationales, financing lifecycles of SMEs and diverse death valleys, 2) instruments of financing policies and their theoretical background, 3) comparisons of financing policies among APEC member economies and European countries, 4) equity-based financing programs, and 5) loan-based financing programs.

In the first section of "government intervention rationales, financing lifecycles of SMEs and diverse death valleys," the diverse financial needs of SMEs from the stage of R&D to the stage of mass-production and the market failure in providing adequate finances to SMEs in each stage will be discussed. In the section of "instruments of financing policy: theoretical background", diverse financial instruments, which can be utilized for government intervention in death valleys, their differences and their own strengths/weakness will be discussed. In the section of "comparisons of financing policies among APEC member economies and European countries," diversity of financing policies among APEC economies, Germany and EU will be discussed and the reasons behind these apparent diversities in intervening in financial market failures will be also discussed.

In explaining “equity-based financing programs,” diverse examples of equity-based programs in APEC and EU will be discussed in details. Australia provides Innovation Investment Funds (358mil$) in order to promote commercialization of R&D results. Canada operates indirect tax incentives to VCs, which covers 10% of total VCs in 2005(BDC, FCC Ventures, EDC VC Funds). Japan has a long history of operating ‘SME Business Investment & Consultation Companies’ to provide capitals to innovative SMEs. Korea also recently established ‘Funds of Funds’ in order to inject government capital investments. In explaining “loan-based financing programs,” diverse examples of loan-based programs in APEC, Germany and EU will be discussed. The Japanese government sponsored financial intermediaries, providing 10.3% of total loans to SMES in 2003. JASME, which was established in 1953, provides long-term capital with fixed low rates to medium-sized companies. NFLC, which was established in 1949, provides seed loans to small companies. Shoko Chukin Bank provides loans to member companies. Moreover, government- sponsored credit guarantee corporations, which operates 52 offices throughout the country, was established in 1953. The Korean government offered the public debt financing, which amounted to 2,75 trillion won in 2006. The SME Credit Guarantee Fund established in 1976, and the Technology Guarantee Fund established in 1989, also provides guarantee and credit/technology evaluations services to SMEs.

2. Theoretical Background of Financial Subsidy Policies

Why needed financial subsidization to small but highly innovative technology firms? Theoretically, economic literature suggests two explanations: 1) spillover effects of technology development, and 2) solving information asymmetries in market. The subsidization to technology development of small and medium firms would lead to R&D spillovers to overall industries. Because of this external spillover-effect of technology development, the actual R&D level in market will be below the socially optimal level of R&D investment. Number of studies have identified these spillover effects of technology development and concluded that social returns of R&D investments will be higher than private returns of R&D investment in general (Griliches 1992). In this regard, government should involve in subsidizing technology development of firms. And why are SMEs? Several studies suggest that “spillover problems are particularly severe among small firms, which are often unable to effectively defend their intellectual property or to extract most of the rents in the product market” (Gompers and Lerner, 2004).

The other rational for government financial policy programs is based on the certification effect. Between high-technology SMEs and potential investors, there exist informational asymmetry problems. High-technology SMEs, which are usually without high profile of past performances and experience difficulties in raising external capitals, in most cases, are even precluded from financial market's investment consideration. This is originated from the argument that financial intermediaries such as venture capital funds, technology evaluation institutions may provide adequate monitoring and screening effects, eliminating informational asymmetry problems. However, total new start-up companies far more outnumber handful recipients of venture capital investments. Since venture capital funds cannot provide adequate monitoring for the 'whole range' of new start-up companies, governmental awards of financial assistances and subsidization to certain promising high-technology SMEs can effectively certify firms to external investors.

However, there could be political distortions in financing programs. Government involvement in financial assistances could be distorted by active interest groups to maximize their own private benefits instead of maximizing public spillover effects. The theory of regulatory capture, which were originated from Peltzman(1976) and Becker (1983) with explicit modeling, explains that "direct and indirect subsidies will be captured by groups who stand to gain substantial benefits and whose collective political activity is not too difficult to arrange (i.e. when free-riding by coalition members is not too large a problem). As Stigler (1971) points out, even very small firms (which have historically dominate industries such as trucking and the licensed professors) can organize to benefit from public largesse" (Gompers and Lerner, 2004). These problems could be more manifest where government corruption is prevalent and the efficiency of public service cannot be guaranteed.

2.1. Financing Life Cycles and Government Financing Policy[2]

Innovative SMEs encounter different financial requirements for stepping up each stage of growth. For the innovative start-ups, R&D funds are needed for further deepening of technology development. However, the high risks are associated with investments in this stage of firms' growth, and only seed capital by government or business angels, who are wealthy individuals providing not only sufficient funding but also consultation and their expertise, can intervene in this first and second valley of death for R&D investments and technology commercialization funds. After successfully developing engineering model and production model, start-up companies need to in-source further injection of capital for building up manufacturing production lines and further R&D investments, which are the third valley of death. However, in this early stages of start-up companies with low profitability and short record of business, if without solid collaterals, debt financing are difficult to obtain in commercial banking system. Venture capitalists can provide indispensable capital for this young stage of firms before IPOs. Unlike commercial banks, venture capitalists intensively

[2] The section 2.1, 2.2, 2.3 and 2.4 are drawn from APEC report "A Research on the Innovation Promoting Policy for SMEs in APEC: Survey and Case Studies (SME 01/2006)", which were conducted by the APEC SME Innovation Center of TIPA(Korea Technology and Information Promotion Agency for SMEs).

examine and evaluate growth potential of these young start-up companies and the values of their technologies before providing capital. The venture capitalists closely monitor firms' management even after capital injection, alleviating the problem of information asymmetry and uncertainty. When these start-up companies are successful in IPO or M&A deals, venture capitalists can exit the investments, reaping huge profits. The facilitation of exit mechanism in the market is a necessary condition for viable venture capital markets.

Governments' roles are two folds: 1) facilitation of efficient financial market through establishing better regulations and rules, and 2) provisions of direct financial supports to SMEs either by direct financing or by infrastructures and public services. Since this course only focuses on the direct intervention roles of government SMEs innovation policies, the second role of SMEs financing policy is only considered. There exist two venues for direct financing to SMEs and start-ups: 1) equity financing and 2) debt financing.

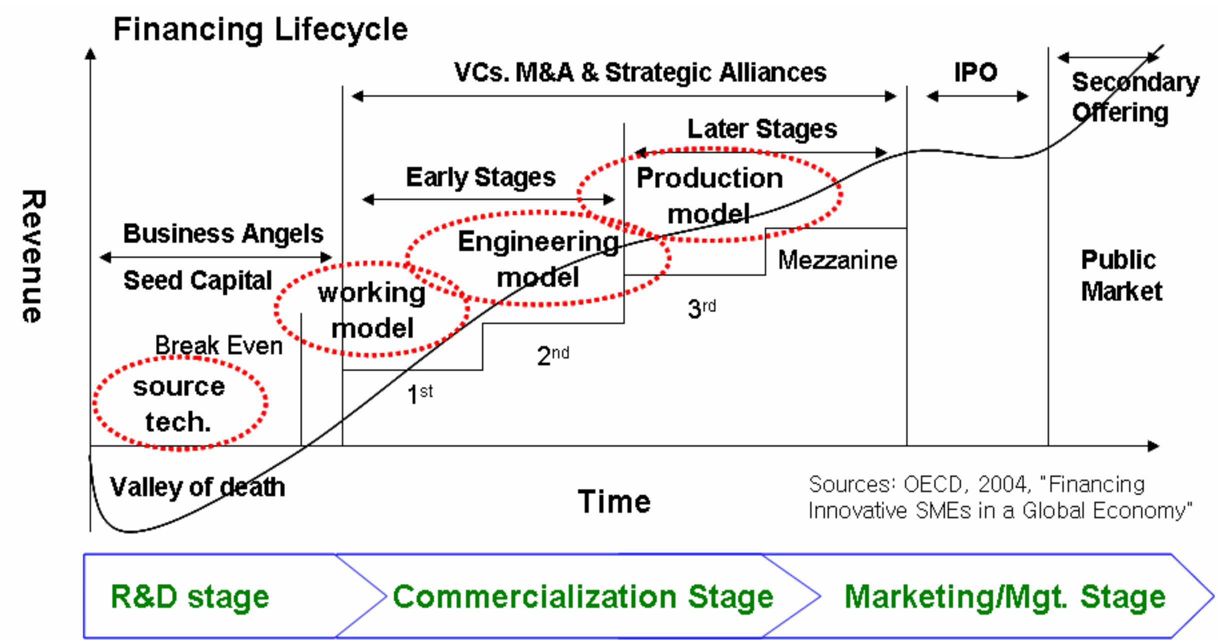

Fig 1 Financing Lifecycle and the Stages of SMEs growth

Sources: OECD, 2004, "Financing Innovative SMEs in a Global Economy"

2.2. Equity Financing

Government equity programs

For the first stage of a valley of death, governmental R&D investment financing can be provided to emerging new technology developments. Furthering technology development, commercialization R&D and establishing manufacturing capacity can be supported by government direct equity program. Government can participate in direct equity investment through establishing direct funds for innovative SMEs with technological capabilities. These special-purpose funds obtain equity shares of innovative start-ups mostly below the entrepreneurs' shares proportion. Some APEC member economies has established governmental venture capital investment organizations with the purpose of direct investment in venture firms or participating as a limited partner.

However, the experiences of governments' direct equity programs were relatively negative in their effectiveness promoting innovative venture firms and start-ups. Since the government equity programs have unexceptionally ill-equipped with the suitable incentive structures for fund managers, they tend to lack in proper monitoring and due diligence of selection of potential leapfrogging venture firms. Government officials, who operate governments' equity programs, often lack the essential expertise in financial markets and fund management. Inefficiencies in dealing with venture firms naturally lead to increases of venture firms' failures and investments loss. Often hybrid-funds, which are venture capital firms with injections of public equity investments, are established in order to allocate public financial supports for venture firms, using professional fund managers to act upon equity investment. However, even in this case, establishing proper incentive structures for fund managers are essential in successful equity investments on venture firms.

Networks of venture capitalists: Business Angel Networks (BANs)

Angel financing plays the pivotal roles for the first-stage of financing death valleys for innovative SMEs. Business angels mostly face the lack of investment opportunities while entrepreneurs complain about the lack of opportunities receiving technology assessment and financing. These can be identified as one of the market failures, which are originated from lack of information flows in the financial market. The information asymmetry and separated marketplace between business angels and early stage entrepreneurs call for the government intervention in this area of inefficient financial market.

Business Angel Networks (BANs) are highlighted among policy makers as an alternative to direct equity financing for innovative SMEs. BANs bring together business angels, venture capitalists, investors and entrepreneurs, who, being equipped with highly innovative technology, look for financial sources. BANs provide communication channels among potential demanders and suppliers of capital for technology development and commercialization. These policy initiatives are cost effective without substantial deadweight sunk cost on the part of government, and are estimated to have been successful in promoting venture capital market, compared to any other government financial schemes. However, this policy can not reap the fruits of venture firms' success. Government only participates in

BANs as sponsorship for maintaining overall business angel networking. Moreover, international BANs can be further to in-sourcing international venture capitals and to sharing with advanced knowledge and expertise.

2.3. Debt Financing:

Direct loan programs

Government can establish direct loan programs for innovative SMEs and technology-based venture firms. Most governments provide these loan programs for SMEs with relatively favorable interest rates and low commission rates in order to support innovation activities of SMEs. These programs are operated by government-owned and special-purposed commercial banks or are operated in cooperation with private banks. When cooperating with private banks, loan guarantee programs should be provided for the compensation of possible defaults loss of loans to SMEs. However, the most of direct loan programs are not viable solutions for financing innovative SMEs and technology-based venture firms in the long-term perspective. Government lending' interest rates are fixed at low rates while the defaults risks are very high with young venture firms and SMEs. Since these loans are provided without collaterals, the financial losses of direct loan programs are clearly inevitable. Since these direct loan programs are established to share the downside risk of SMEs and venture firms while 'abstaining' from high returns of successful investments, the financial losses are inevitably expected. In long term perspective, this continuous and rather-purposeful loss in direct loan programs is not viable and is not cost-effective in promoting SMEs innovation, but rather create the problems of moral hazards among loan recipients.

Loan guarantee programs

Loan guarantee programs are mostly combined with governmental direct loan programs. Governmental loan guarantee programs provide guarantee to SMEs either by collecting guarantee insurance fees from SMEs or by executing technology-evaluations. With these governmental guarantees, private commercial banks provide loans for innovative SMEs and venture firms. Since governments assume the downside risks of venture firms and SMEs through government direct loan programs, proper guarantee insurance fees and authentic technology evaluations are indispensable for efficient operations of government loan guarantee programs. Especially technology evaluations are important because these evaluations reduce the problems of information asymmetries about the possibilities of venture firms' technology success. Technology evaluations mean the evaluations of net present values of technology with the analysis of technology development, possibility of commercialization and market demands. These technology evaluations can be utilized for venture capital investments, debt financing, M&A and technology transfers.

2.4. Certification of SMEs

Needs for certification programs for venture firms or SMEs

SMEs typically face the information asymmetry problems in financial market. Since SMEs are mostly in the early stages of development with little credits and financial market reputation, and sometimes even without market sales records or manufacturing facilities, SMEs can not easily earn outside credibility for their growth potential or business attractiveness. Because outside investors possess insufficient knowledge about SMEs or venture firms, entrepreneurs could have incentives to pursue private benefits or to show opportunistic behaviors. Because of this market failure in the form of information asymmetry between the insiders of SMEs and financial market participants, there exist needs for the government's intervention to solve this problem. Besides the problem of information asymmetry, venture firms and SMEs possess high uncertainty and risk regarding their future business. Moreover, SMEs typically lack in physical and tangible assets, which can be used as collateral for bank loans. However, most of commercial banks strictly require physical collateral for their lending. Even in the US financial market, especially in the venture capital market, which is the most developed one, investments or loans to the early stages of venture firms are also rare and overall too low to provide adequate financial supports to venture firms' technology development and commercialization (Lee, K. et al., 2003).

These market failures, which are faced by the early stages of SMEs and venture firms, especially in the areas of financial markets, call for government intervention in certifications. Government certification programs can provide adequate information and credibility about SMEs and venture firms' technology and business growth potential, which can solve the problems of information asymmetry to outsider investors, mostly venture capitalists.

Certification hypothesis and government failures

Lerner (2002) proposed a certification hypothesis about government's certification effects. If a promising start-up venture firm does not finance adequate funds for their technology development, it means that there exists market failure even though the NPV (Net Present Value) of their technology project shows positive. Then, through the government certification of venture firms or SMEs' technology projects, the government can signal to financial market about the significance and success potential of SMEs' technology projects. Outside investors can provide sufficient funds to the venture firms or SMEs, trusting the government certifications. Lerner (1999, 2002), and Gompers and Lerner (2001) provided the empirical evidences about the positive effects of government certification on SMEs and venture firms' performances.

However, there could be possibly government failures in these certification programs. De Meza (1992) questioned the government's abilities to discern promising venture firms or SMEs with high growth potentials and innovative technologies. The certification programs could be more inefficient than private financial markets. Moreover, government certification programs can face severe political pressures and lobbying from various interest groups. The SBIR programs of the US are evaluated to be successful because of the decentralization of decision making procedures (Lerner 1999). Venture capitalists or private market players should play the role of screening and monitoring SMEs' technology projects. Since venture capitalists mostly invest in the early stages of venture firms before IPO, these venture capitalists are the most demanding groups for the certification programs of venture firms' technology projects. The venture capitalists should possess industry expertise, which can discern and screen successful technology projects, and should follow up close monitoring after investment to venture firms or SMEs.

Table 1 Elements of Financing Policy

Element	Sub-element	Contents	Notes
Equity Financing	Government equity programs	- Establishing governmental sponsored special-purpose funds, which provide direct equity financing to innovative SMEs or venture firms - Participating in private hybrid funds specialized for investment in innovative SMEs or venture firms	
	Networks of venture capitalists: Business Angel Networks (BANs)	- Providing communication channels to business angels, venture capitalists, investors and entrepreneurs looking for financial sources with high potential innovative technology	
Debt Financing	Direct loan programs	- Providing direct loans to innovative SMEs or venture firms with favourable interest rates or often with long-term fixed rates	
	Loan guarantee programs	- Providing official guarantee about SMEs to financial institutions with which loan guarantee institutions compensates the loans loss in the case of the SMEs' default	
	Certification of SMEs	- Providing adequate information and credibility about SMEs and venture firms' technology and business growth potential - Solving the problems of information asymmetry to outside investors or financial institutions	

Source: APEC, "A Research on the Innovation Promoting Policy for SMEs in APEC: Survey and Case Studies (SME 01/2006)," 2006

3. Financing Policies: Country Studies and Comparison[3]

3.1. US's Financing Policy[4]

The US has operated dozens of financing programs over the past several decades and, during some period of times, the amount of government financing programs were so huge even comparable to venture capitals' financial provisions. Table 2 shows the lists of these financing programs in US. It has been evaluated that a number of public programs had strong influences on technology development and industrial growth in several sectors. Among the global companies, which has been rapidly grown up with IT revolution, were there the ones which received these public financial assistances for their early technology development and commercialization, which are, for example, Apple Computer, Chiron, Compaq, Federal Express and Intel. Especially, publicly sponsored funds during the 1960s provided an environment of early experiences of venture capital management, with which many fund managers could result in managing independent venture organizations.

Table 2 US Public Venture Capital Initiatives 1958-1997

Sponsoring Organization	Program Name	Brief Description	Span
Small Business Administration	Small Business Investment Company Program	Provides capital to federally sponsored funds that make debt and equity investments in growth firms	1958-1997
Department of Commerce	State Technical Services Program	Supported various government programs to help high-technology companies (especially new firms)	1965-1969
Department of Housing and Urban Development Model Cities Administration	Venture Capital Development Assistance	Demonstration projects in selected cities financed business begun by residents of targeted neighborhoods	1967-1971
At least 30 states	At least 43 state venture funds or SBIC programs	Make investments into funds supporting new enterprises, which often focus on high-technology firms	1970-1997
Department of State Agency for International Development	At least 13 developing country venture funds	Provided loans to financial intermediaries that made equity and debt investments in new enterprises in over 30 countries	1971-1993

[3] The Australian case, Canadian case, Japanese case and Chinese Taipei case are drawn from APEC report "A Research on the Innovation Promoting Policy for SMEs in APEC: Survey and Case Studies (SME 01/2006)", which were conducted by the APEC SME Innovation Center of TIPA(Korea Technology and Information Promotion Agency for SMEs).

[4] The US case, Germany case, Korean case and EU case are based on the STEPI(2006) research "A comprehensive appraisal of policy instruments for studying firm's technological innovation".

Small Business Administration	Specialized Small Business Investment Company Program	Provides capital to federally sponsored funds that make debt and equity investment in growth firms owned by disadvantage individuals	1972-1997
Department of Commerce National Bureau of Standards	Experimental Technology Incentives Program	Catalyzed new public programs(across agencies) to encourage industrial research and venture capital	1972-1979
National Science Foundation	Federal Laboratories Validation Assistance Experiment	Funded assessments by national laboratory personnel of prototype products and processes developed by entrepreneurs	1972-1975
National Science Foundation and Small Business Administration	Innovation Centers Experiment	Provided assistance to high-tech entrepreneurs through incubation centers, subsidies, and technical assistance	1973-1981
Department of Energy Office of Energy-Related Inventions	Energy Related inventions Program	Provides financing to individual inventors and small firms to commercialize energy-conserving discoveries	1975-1997
Small Business Administration	Small Business Development Centers Program	Funds university-based centers to assist small businesses and encourage technology transfer	1976-1997
Department of Commerce	Corporations for Innovation Development Initiative	Designed to fund state and regional corporations to provide equity financing to new firms; only one such corporation funded	1979-1981
Department of Commerce Minority Business Development Agency	Technology Commercialization Program	Financed minority technology-oriented entrepreneurs, as well as centers to assist such entrepreneurs	1979-1982
At least 15 states	At least 107 business incubators	Provide office and manufacturing space, support services, and often financing to start=up businesses	1980-1996
11 federal agencies	Small Business Innovation Research Program	Provides awards to small technology -oriented businesses (also predecessor programs at 3 agencies, 1977-1982)	1982-1997
Department of Energy Office of Energy Research	At least 6 contractor-organized venture funds	Make equity investments in spinouts from national laboratories (funds organized by prime or subcontractors at laboratories with department's encouragement)	1985-1997
At least 30 states	State Small Business Innovation Research Programs	Makes SBIR-like grant, often in conjunction with federal SBIR awards	1987-1997
Department of Commerce National Institute of Standards and Technology	Advanced Technology Program	Awards grants to develop targeted technologies to firms and consortia; some emphasis on small business	1988-1997
Department of Defense Defense Advanced	Experimental venture capital investment program	Designed to make investments in private high-technology firms in exchange for equity or royalties;	1989-1991

Research projects Agency		program only made one investment	
Department of State Agency for International development	Enterprise Fund Program	Oversees 12 federally funded venture funds investing in Eastern Europe, the former Soviet Union, and Africa	1990-1997
Overseas Private Investment Corporation	Venture capital fund guarantees	Guarantees full or partial return of capital to investors in at least 16 private venture funds in developing countries	1990-1997
Department of Housing and Urban Development Community Relations and Involvement Office	Tenant Opportunity Program	Funds new businesses and other initiatives by public housing residents (other aspects of program had begun in 1987)	1993-1997
Department of Energy Office of the Under Secretary	Defense Programs Small Business Initiative	Provides funding, technological assistance, and national laboratory access to small high-technology businesses	1993-1997
11 federal agencies	Small Business Technology Transfer Program	Finances cooperative research projects between small high-technology firms and non-profit research institutions	1994-1997
Department of Defense Cooperative Threat Reduction Program	Defense Enterprise Fund	Finances and independent venture fund investing in defense conversion projects in the former Soviet Union	1994-1997
Department of the Treasury	Community Development Financial Institution Fund	Invests in and provides assistance to community development venture capital and loan funds	1995-1997
Department of Defense	"Fast Track" Program	Provides 4:1 matching funds for private financing raised by SBIR awardees	1995-1997
Department of Agriculture Rural Business and Cooperative Development Service	Intermediary Relending Program(as amended)	Permits program managers to guarantee returns of investors in rural venture funds	1997

Source: Gompers and Lerner (2004)

The loan financing policy instruments of US SBA (Small Business Agency) are composed of 1) direct loans, 2) indirect loans through commercial banks, and 3) loan guarantee programs, among which loan guarantee programs are most common. As US SBIR program is introduced since the early 1980s, the proportion of direct loan programs are substantially reduced meanwhile the proportion of loan guarantee programs are substantially increased. As the focus of governmental loan programs has been shifted from direct loans to loan guarantee, the role of SBA’s financing policies transferred from loan ‘service to’ loan ‘oversight’.

However, the characteristic of US loan guarantee programs lie on competition-based selection process of 'certified lenders' and 'preferred lenders'. When US SBA provide loan guarantees, US SBA designates some banks as 'certified lenders', which have shown a good record of lending to SMEs with a low rate of guaranteed-loan default, and among these 'certified lenders' are selected 'preferred lenders' banks which have shown best performances. The 'certified lenders' can be delegated for a part of responsibilities for screening guaranteed-loans to SMEs, and the maximum 90% of loans can be guaranteed. The 'preferred lenders' are delegated for the whole procedure of evaluating guaranteed loans to SMEs while the maximum 75% of loans can be guaranteed. Because of these favorable treatments of 'certified lenders' and 'preferred lenders', banks are competitive to receive these certifications, and these competition significantly improve the performance of SBA's loan guarantee programs in essence. With these certification programs, banks are partially responsible for the possibilities of guaranteed loans' defaults. And with incentive systems for better lending to SMEs, the moral hazard problem ca be solved and at the same time the policy purpose of increases of lending to SMEs can be achieved.

The US 'SBIC Program' is an indirect equity-based program, which was established based on the 'Small Business Investment Act' in 1958. Currently, the 20.1% of total US VCs funds in amount, 45.5% in numbers are covered by this SBIC program.

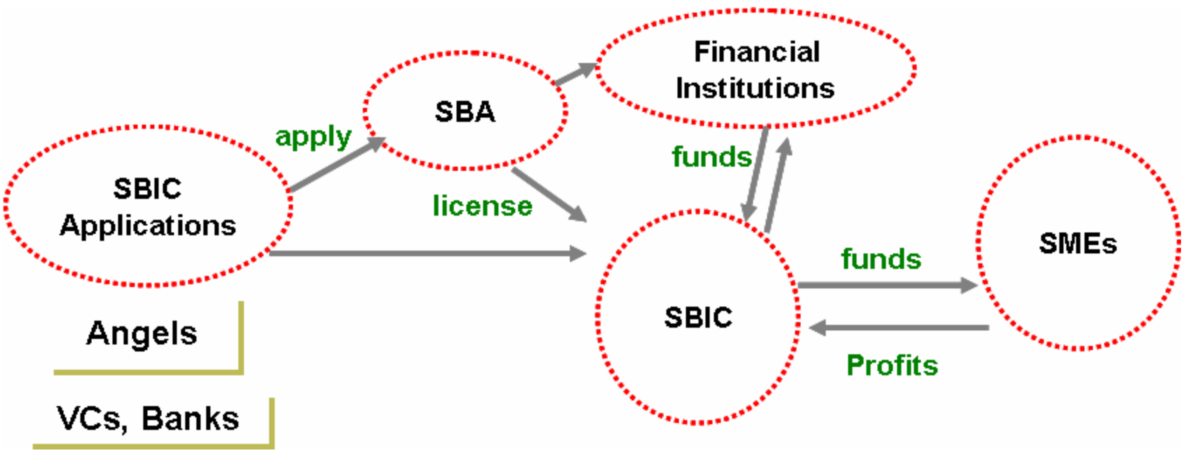

Fig 2 US SBIC Program Procedure

3.2. Australian Financing Policy

Government equity programs

Innovation Investment fund and Pre-Seed fund are available for SMEs in the early stage of development or for the purpose of commercializing innovative products. The Innovation

Investment Fund program is designed to promote the commercialization of Australian research and development, through the injection of venture capital into small, high-tech companies in their seed, start up or early expansion stage. The Australian Government is investing about $221 million, which will be matched by the private sector up to a maximum ratio of two to one. This means that total amounts of funds to support the commercialization of early-stage Australian R&D will total $358 million under both rounds of the Innovation Investment Fund program. Licensed private sector fund managers will administer this pool of investment capital. The fund managers make all investment decisions in relation to their Innovation Investment Fund money. However they are subject to the Commonwealth's license agreement and investor document requirements.

There are now nine Innovation Investment Funds with from $30 million to $50 million, and all states are now directly served by the Innovation Investment Fund -licensed funds. Two Innovation Investment funds, Allen & Buckeridge and Neo Technology Ventures, are specialized in information and communications technology (ICT). Two, GBS and Startup, are dedicated to a bioscience sector. One, CM Capital, has combined information technology and life science expertise. The remaining four, AMWIN, Foundation, Momentum and Nanyang, have a general investment focus.

The government is committing $200 million for a further round of the IIF program to be drawn down over the period 2007-08 to 2018-19. Each fund will be operated over a 10 year period. The Pooled Development Funds (PDF) program, which was started from 1992, provides predominantly new equity investment to eligible Australian SMEs. PDF program provides tax incentives, such as capital gains tax exemption and concessionary taxation treatment on dividends. The PDF program is designed to increase the supply of equity capital for promoting Australian SMEs. The PDFs are private sector investment companies established under the PDF Act which raises investors’ capital and use it to invest in Australian companies. The government announced in the May 2006 Budget that the PDF program will close new registrations after 31 December 2006. It will be progressively replaced by the Early Stage Venture Capital Limited Partnerships (ESVCLP) program announced in the Budget, which is expected to become operational in 2006-07.

3.3. Canadian Financing Policy

Canada is considered as one of the leading economies in equity financing. The government acts as an investor to venture capital companies and supports the venture capital market directly through the ‘Business Development Bank of Canada’. In addition, the government provides tax incentives to those investing in venture capital and provides SMEs with specialized debt financing programs.

Debt financing

The major program designated for SME is the Canada Small Business Financing (CSBF) Program. The purpose of the Canada Small Business Financing (CSBF) Program is to help an important part of the economy — small and medium-sized businesses — get access to adequate financing. The CSBF Program helps fill a gap in the range of financing instruments available to these businesses, which might otherwise have difficulty qualifying for financing or finding financing that meets their needs. The CSBF Program works because the Government of Canada shares the burden of risk with private sector lenders. As a result, lenders are able to increase the amount of financing they extend to small business.

Lenders include some 1,380 chartered banks, credit unions, loan and insurance companies, and caisses populaires. They operate from more than 15,000 locations, providing service to Canadians in all provinces and territories. The Government of Canada shares the cost of losses with lenders and leasing companies by paying 85 percent of eligible losses on defaulted loans and leases.

The CSBF Program supports asset-based debt financing. The maximum loan or lease is C $250,000, and terms of loans and leases are 10 years or less. The program is limited to small and medium-sized businesses with revenues of up to C $5 million per year and is not targeted to any group or region. During the period 2004–05 the total value of loans that private sector lenders made under the CSBF Program surpassed C $1 billion. It should also be noted that there are a variety of other debt financing programs offered at the federal and provincial levels that compliment the offerings of the CSBF Program.

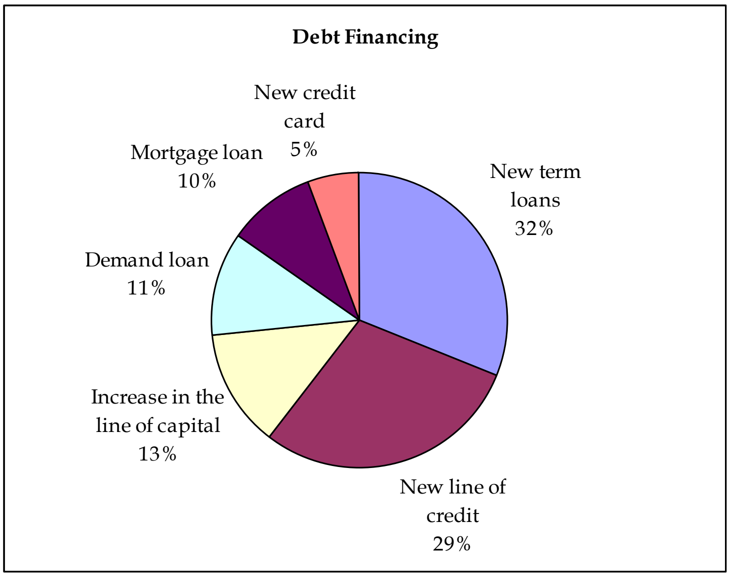

Fig 3 Debt Financing by the Kinds of Credit

Equity financing

Canada has a long history of venture capital. The first venture capital (VC) case is reported in 1945. The tradition of strong equity financing still prevails even though some downturn occurred after the collapse of the dot-com bubble. Between 2000 and 2003, Canada was ranked third among OECD economies for venture capital investment as a percentage GDP (OECD Science, Technology and Industry Scoreboard, 2005). In 2005, there was roughly C $56 billion in private equity capital under management in Canada, 37 percent (C $21 billion) of which was VC activity.

The government's role in encouraging VC is critical. The total VC funding placed in 2005 was C $1.8 billion, which was similar to that in 2004. The basic structure of equity financing initiated by the government is indirect. Government provides tax benefit to those investing in venture capital. Thanks to this benefit, labour sponsored venture capital corporations (LSVCC) have grown rapidly. In turn, the policy caused a high level of VC dependence on individual investors.

Besides LSVCC, the government supports VC through the Business Development Bank of Canada (BDC). The government also provides VC assistance through local non-for-profit organisations. For example, the Ottawa Centre for Research and Innovation (OCRI) receives funding from the government, the private sector, and universities. OCRI provides support to new and existing entrepreneurs and also promotes a venture capital network. In addition, a number of public pension funds invest some portion in VC, and they operate some VC funds directly.

Direct investment through government funds is also increasing the share in venture capital market. In terms of investment amount, this direct investment accounts for 10% of total VC in 2005. Government funds include BDC, FCC Ventures and EDC VC funds, as well as provincial government funds (e.g. SGF, Innovatech). These government funds play an important role in the early stages, as can be seen by BDC whom focuses on technology start-up SMEs. The Financing Policy Division of Industry Canada is working on ensuring that the role the federal government plays in the Canadian risk capital market is appropriate to the industry's state of development.

3.4. Japanese Financing Policy

Government equity programs

Small and Medium Business Investment and Consultation Companies, which were established since 1963, are private companies mostly owned by local governments or financial institutions. The companies provide equity investments to SMEs at the early stages by purchasing new stock issues, convertible bond issues, and warrant bond issues with the capital of not more than 300 million yens in general. Promoting investment to venture business, SMRJ invests into limited partnership for venture capital investment. For the purpose of investing in domestic small and medium-sized venture businesses that are creating new business fields such as the development of new products and technologies, or in an early stage of growth, a Limited Partnership for Venture Capital Investment can be established with a private VC as an executive partner and SMRJ as a member of the Limited Partnership. With the aim of coordinating support in aspects of funding for new business of SMEs having an outstanding idea or skill, SMRJ and companies collectively build the 'Keep it up! SME Fund' with comprehensive support.

Government loan programs

Concerning public support for SMEs loans, there are three agencies involved. First, the Japan Finance Corporation for Small Business (JASME) established in 1953 provides long-term capital with long-term fixed and low interest rate. Second, founded in 1949, the National Life finance Corporation (NLFC) provides small and unsecured loans for very small firms. Third, the Shoko Chukin Bank established in 1936 is a private financial service bank. The JASME provides a high amount of finance for medium enterprises to purchase factories and collateral or guarantee is required. The NLFC provides small loans to small businesses such as stores, which do not require collateral or guarantee. The NLFC cooperates with Japan Chamber of Commerce and Industry (JCC) and the JCC provides teachings for small business managers on making accounting books as well as recommendation for finance for small businesses taught by JCC to NLFC. The finance for small businesses provided by NLFC has the maximum loan amount of 10 million yens with the interest rate of 1.8% per year. Shoko Chukin Bank provides finance for member companies only. The governmental banks, which provide about 10% of total SME finance amounts, complement private banking system.

Table 3 Shares of Government Supported Loans in SME Finance
(As of December 2003, Unit: trillion Yen)

Business Category	Financial Institution Name	Total Outstanding Loans to SMEs	% of Grand Total
Private Financial Institution	City Banks	79.2	39.4%
	Main Regional Banks	66.8	25.78%
	Secondary Regional Banks	23.7	9.1%
	Trust Banks and Long-Term Credit Banks	12.6	4.8%
	Shinkin Banks	41.8	16.1%
	Credit Cooperatives	9.2	3.5%
	Sub-total	233.3	89.7%
Governmental Financial Institution	JASME	7.6	2.9%
	NLFC	9.2	3.5%
	Shoko Chukin Bank	10.0	3.8%
	Sub-total	26.8	10.3%
Grand Total		**260.1**	**100.0%**

Source: APEC, “A Research on the Innovation Promoting Policy for SMEs in APEC: Survey and Case Studies (SME 01/2006),” 2006

Besides the governmental banks’ loan programs, SMRJ and prefecture governments invest support fund, which is called as Business Upgrading Loan, for local government and local industries partnership projects for local SMEs such as building Industry Park, Wholesale Park or Shopping Centers and improving Shopping Mall. The loan interest rate is limited to 0.8% or no interest (for projects approved under special laws or disaster restorations). The loan limit shall not be over 80% of applicable project costs and the repayment period shall not exceed 20 years (period of deferment is not more than 3 years).

Government loan guarantee programs

Supplementing credit capability of SMEs with the credit insurance system and credit guarantee system, the credit guarantee facilities, such as the Credit Guarantee Association and the Japan Small and Medium Enterprise Corporation, assist SMEs without sufficient credit and collateral. The systems aim to contribute to facilitate funding for SMEs through guarantee by the Credit Guarantee Corporations for their loans from financial institutions. Moreover, JASME supplements the risk in Credit Guarantee Corporations throughout Japan through reinsurance.

Credit Guarantee Corporations, a total of 52 independent offices throughout Japan, have been established as certified corporations under the Credit Guarantee Association Law (1953) for the purpose of facilitating access to finance for SMEs by guaranteeing their borrowings from financial institutions. The outstanding guarantee of liability is estimated as 329,739.7 billion yens as of the end of March 2005. Under the Small Business Credit Insurance Law, JASME provides reinsurance of the debt guarantee by Credit Guarantee Corporations and lending them the funds necessary for operations. The contracted amount for underwritten insurance from April 2003 to end of March 2004 is estimated at 14,278.6 billion yens.

3.5. German Financing Policy

The government loan programs for SMEs in German operate solely by loan guarantee programs and the sources of loans originate from the funds of ERP (European Recovery Program). The ERP funds has been utilized for the purpose of loan guarantees for SMEs since 1960s and extended to funding for technology-based innovative start-ups since 1990s. Total budgets of ERP reaches to 12.4 billion euros as of the end of 2003, which are spent for social and environmental infrastructures, financing for SMEs, equity investments for technology-based venture firms and etc. The ERP funds are under the supervision of German Reconstruction Bank (KfW, Kreditanstalt fur Wiederaufbau), which provides refinancing and guarantee funds to public SMEs loan programs. Commercial banks and saving institutions are responsible for operating these public SMEs loan programs. There exists a risk-sharing mechanism in these public SMEs loan programs. German Reconstruction Bank (KfW, Kreditanstalt fur Wiederaufbau) was merged with SMEs Banks (Mittelstandbank) into forming KfW-Mittelstandbank.

German banks that provide direct loans and evaluations of SMEs are called as ‘Hausbank’, which operates in close and long-term relationships with firms often by share-ownerships. There does not exist any direct government loan assistance program, which can be easily found in Japan, Korea and other Asian countries. All the public assistance loan programs in Germany should be administered and lent by ‘Hausbank’. SMEs which apply for public loan assistances for their technological development have to consult with ‘Hausbank’, and final loan-lending decision making accompanying loan evaluations, selection criteria, and the terms of agreements are all solely in the hand of ‘Hausbank’. Because Hausbanks in Germany has accumulated in-depth experiences and vast information about SMEs and large firms through close and long-term relationships, Hausbanks are better positioned to evaluate and screen the qualities and viabilities of firms’ loan applications from solely commercial perspective. With this endowment of screening and evaluation role upon Hausbanks, German public loan assistance programs can substantially reduce the default rates of these public SMEs loan programs, and can effectively provide loans to promising SMEs which have a real potential of commercial success in their technological development. Hausbanks should also take responsibility in providing technical and managerial consulting to these SMEs which received public loan assistances through them. These consulting service provisions after loan lending can nurture and bring up promising technological SMEs but weak in management and commercialization. Hausbanks should take final responsibilities for loan defaults of SMEs but the 40-100% of default loss in these SMEs public lending are guaranteed by German Reconstruction Banks with ERP funds.

There are several other loan guarantee programs, which are operated by private sectors or by state governments. Private guarantee banks, called as “Buergschaftsbanken”, provide loan guarantees to SMEs which cannot receive loans from general lending institutions. There are 24 “Buergschaftsbankens” in Germany, and these are non-governmental institutions, which are established by equity investments and fund contributions from regional business associations of SMEs, regional banks, “Sparkassen” and regional state governments.

German loan guarantee system consists of two layers: the 1st loan guarantee provisions by private guarantee banks, ‘Buergschaftsbanken’ and the 2nd loan guarantee provisions by German Reconstruction Bank and State-Banks, “Landesbanken” under the jurisdiction of state government. Public government loan can be guaranteed up to 80% of total SMEs loans, and the default loss of public SMEs loan guarantee are distributed among these guarantee institutions with the proportion: German Reconstruction Bank, 36%, State-Banks 29% and private guarantee banks 35%. By enforcing private guarantee banks also to take partial responsibility of loan defaults in public SMEs lending, German loan guarantee system ensure the effectiveness of private sectors’ rigorous screening and evaluations of public SMEs lending without moral hazard behaviors.

3.6. Financing Policies of European Commission

The financing policies of European Commission for SMEs can be summarized as 1) loan guarantee programs, and 2) venture capital investment programs. Under MAP (Multi-annual Program for Enterprises and Entrepreneurship), EC support 1) financial assistance programs, 2) EIC network assistances, and 3) policy development programs. Among the financial assistance programs are loan guarantees and venture capital investments, which are ETF-SU, SMEG, SCA and JEV. These programs are operated not directly by EC itself, but by an intermediary financial institution called as “European Investment Fund”, EIF. The targets of EIF financial assistance programs are mostly confined to innovative and technology-intensive SMEs in European Union regions. EIF was established in 1994 with contributions by European Commissions, European Investment Bank, and 31 private financial institutions. In this early stage, the missions of EIF were diverse not only supports for SMEs but even including cultivation of underdeveloped regions in EU. European Commission has driven the strategy of “Growth and Employment Initiative” from the year of 1997 and empowered EIF to add the roles of venture capital investments as the “Funds of Funds”. And in 2000, EC restructured EIF roles and functions to exclusively dedicate on financial assistances to promising and innovative, technology-intensive SMEs in EU regions.

The loan guarantee programs of EIF are furnished with four different types guarantee programs: EC loan guarantee mandate, credit insurance, credit enhancement and structured investment vehicles. EC loan guarantee mandate program is the loan guarantee program, which is commissioned by EC, and called as “SMEG” under MAP. EIF does not provide direct loans to SMEs but provide SMEG loan guarantee to public loans of SMEs, which are screened and evaluated exclusively by private banks. This SMEG loan-guarantee system is basically two tier guarantee system which is originated from German loan guarantee system. EIF select best-performing financial institutions in EU regions to provide public loan guarantees and collaboratively determine public loan programs’ portfolios with these selected financial institutions, meeting diverse loan-portfolio needs of SMEs. The guarantee ratios of these public loan programs are determined disparately according to these loan portfolios, but up to the limit of 50% of credit risks in the SME lending. EIF does not receive brokerage commission fees on these loan guarantee programs from private banks, but only in the case that private banks agreed upon in advance for non-performing public loans.

The other guarantee programs, such as credit insurance, credit enhancement and structured investment vehicles, are based on EIF’ own risks rather than EC’s commissioned programs, which are without any risks on the part of EIF. The basic scheme of these guarantee programs are to provide guarantee for SMEs’ bonds to facilitate securitization of SMEs’ loans. The securitization of SMEs’ bank-loans transfers the default risks of the SMEs’ loans to financial markets, to risk-preferred investors. Since, through facilitation of securitization activities, default risks are successfully transferred to risk-preferred investors, private banks’ lending to SMEs, which are ‘without default risks’, can be significantly promoted. EIF intervenes in this process of securitization to upgrade securitized bonds’ credit grades, thus making these bonds to be more attractive to outside investors. The targets for these credit insurances and credit enhancements are the SMEs-loans with bond grades, A and BBB, which are to be upgraded to Aaa and AAA with EIF’s guarantee programs. This program constructively utilizes financial markets to leverage EIF’s limited funds for facilitating loan lending to promising and innovative SMEs in EU region.

EIF also play the role of “Funds of Funds” to inject investments into EU regions’ venture capital funds for SMEs and start-up companies. These “Funds of Funds” programs are ETF-SU, which provide investments to venture capital funds for start-up companies. Seed Capital Action (SCA) intends to reimburse overall costs of hiring best-performing investment managers from advanced EU economies when establishing venture capital funds in underdeveloped regions in EU. JEV program supports formations of joint-venture partnerships among European member economies.

3.7. Korean Financing Policy

Most of Korean financial support programs for private sector's technological innovation employ the instrument of loan financing combined with loan guarantee programs. As Korean equity financial markets had not been developed to effectively facilitate financial flows to innovative but small firms and start-ups, traditional policy measures of financial support programs had to concentrate on loan provision. In order to solve information asymmetry problems and low collaterals problems in most of SMEs, government established loan-guarantee institutions to promote private banks' lending to technological development of SMEs.

Direct loan program

Financial supports for private sectors' technological development started from the late 1970s by establishing government's special-purposed banks and funds. As the demands for indigenous technological development increased since 1980s, the financing supports for R&D investment and commercialization have been developed. Korean Development Bank (KDB) started the loan program for technology development in 1976, SMBA provided the loan program for SMEs' technology development in 1977. During 1980s, the SME Bank (now Corporate Bank), the Kookmin Bank has started loan programs for private sectors' technology developments. Besides banks' loan programs, diverse special-purposed funds are established to provide adequate loans to promote technology development. Funds for Industrial Developments since 1980 have, in part, been utilized as technology-loan-financing to lend for industrial technology development. In 1990s, the funds for science and technology development, the funds for ICT promotion are newly established for technology loan programs.

Loan guarantee program

The loan guarantee fund is managed by the SME Credit Guarantee Fund and the Technology Guarantee Fund, which were established respectively in 1976 and 1989. The Regional Credit Guarantee Foundation was established in 1999, which operate in 16 cities and provinces nationwide. Moreover, not just indirect bank lending promotion, the governmental agency, SMBA also provides direct loans to SMEs for the purpose of technology development. Loan guarantees are provided to SMEs, which have difficulty in financing, by easing capital shortage and supporting business stability. The purpose of the loan guarantee service is as follows: first, the service evaluates the possibilities of technological development, its commercialization and marketability; second, it offers financial assistance; and third, it intends to foster and develop high-tech SMEs and to promote technology-financing. By combining technology-evaluation with guarantee function, SMBA finances start-up or venture businesses, which have excellent technologies but suffer from lack of collateral.

Equity financing program

With the aim of improving the role of venture capitalists in Korean national innovation system for high-risk, high-return innovative SMEs, Korean government developed a series of venture- fund-related programs in providing financial support for SMEs' technology innovation. In order to promote and secure necessary funds for high technology start-ups and venture firms, government also revised financial-market-related-laws and provided direct funds to inject into venture capital investment funds. The four venture capital corporates, which are Korean Technology Advancement Corporate (KTAC), Korea Technology Development Corporate (KTDC), Korea Development Investment Corpoate (KDIC) and Korea Technology Financing Corporate (KTFC) established during the 1970s and 1980s, are the beginnings of governmental technology financings. In 1986, the law of 'finance corporate' for new technology commercialization was enacted.

The Fund of Funds was created by government in 2005 to promote the establishment of investment funds for SMEs and venture businesses. And 'Korea Venture Investment Corp' was designated as the institution for operating the fund of funds. Until 2009, the total funds of 1 trillion won will be provided for this fund, including 170 billion won in 2005 and 215 billion won in 2006. The direct financial support programs, which targets private firms' S&T innovation, are currently numbered to be 13 programs, involving 9 government ministries, 9 public funds and 4 special accounts in national budgets, in total of 3,500billion won .

Table 4 Public Financial Support Programs for Private S&T Innovation (as of 2005)

Competent Ministry	Supporting Method	Technology Innovation Stage	Project Name	Expenditure in 2005
Small and Medium Business Administration (Small Business Corporation)	Loan	Development & Commercialization	Supporting Development and Intellectual Property Technology Commercialization	92,441
Small and Medium Business Administration (Small Business Corporation)	Loan	Development & Commercialization	Supporting Small and Medium Venture Establishment	428,340
Small and Medium	Joint	Development &	Financing	150,000

Business Administration (Small Business Corporation)	Investment	Commercialization	Establishment Investment Association	
Ministry of Commerce Industry and Energy	Loan	Development & Commercialization	Financing Industry Technology Development	100,000
Ministry of Commerce Industry and Energy	Joint Investment	Development & Commercialization	Financing Parts and Materials Investment Association	3,000
Ministry of Information and Communication	Loan	Development & Commercialization	Applied Technology Development Supporting Project	195,000
Ministry of Science and Technology	Loan	Development & Commercialization	Research Development Financing Project	88,000
Korean Intellectual Property Office	Loan	Development & Commercialization	International Application Promotion	1,173
Korean Intellectual Property Office	Loan	Development & Commercialization	Intellectual Property Transfer Promotion	914
Ministry of Culture and Tourism	Loan	Development & Commercialization	Financing Culture Product Development	21,546
Ministry of Environment	Loan	Development & Commercialization	Financing Fostering Recycling Industry	70,000
Ministry of Gender Equality and Family	Loan	Development & Commercialization	Supporting Women Technician Establishing Firms	10,000
Sum				1,160,414

Source: STEPI, “A comprehensive appraisal of policy instruments for studying firm's technological innovation,” 2006

3.8. Chinese Taipei Financing Policy

Before the 1980s, equity financing in Chinese Taipei was limited, and bank loan were mainly destined. Thus, financial dualism was prevalent in Chinese Taipei with informal financial markets as the major lender for SMEs (Chow 2005). However, since the 1990s equity financing has increased, especially since 1997, while bank loan financing has decreased incrementally. Therefore, the debt-equity ratio has been declining over time. In particular, equity financing rather than debt financing has become the main source of innovative SMEs thanks to the government’s preferential policy.

Nonetheless, debt financing still dominates in Chinese Taipei. The most important financing policy for SMEs in Chinese Taipei is SME Credit Guarantee Fund. SMEs often find it difficult to secure financing from financial institutions because of their small size, concerns about repayment ability, the lack of collateral, or their unsound accounting systems. To help overcome this problem, the government established the SME Credit Guarantee Fund in 1974. The main function of the SME Credit Guarantee Fund is to serve as a financing bridge between banks and SMEs. By providing credit guarantees for those SMEs that are unable to provide sufficient collateral of their own, the Fund helps these SMEs to secure financing.

In 2004, the government formulated a development plan for the SME Credit Guarantee Fund. This plan encompassed five main development and transformation strategies – (1) the expansion of the direct credit guarantee mechanism, (2) the promotion of new appraisal systems, (3) the development of innovative new credit guarantee services, (4) putting the SME Credit Guarantee Fund on a sound financial footing, and (5) enhancing the efficiency of service provision. It was anticipated that the implementation of these strategies would help to improve SMEs' ability to secure financing, open up new financing channels, facilitate the implementation of the government's industrial policy, bring about better coordination of guidance resources, leverage the power of centralized credit databases, and help to improve risk management techniques.

As a part of the transformation program, the SME Credit Guarantee Fund will also be setting up a new risk management department and introducing new performance appraisal systems, so as to gradually reduce the loss. Thus, it can continue to function as an important source of support for Chinese Taipei's SMEs.

3.9. Comparisons of 10 APEC Member Economies[5]

The 10 APEC countries have diverse financial systems and have the different stages of financial market development. The financing policies of each APEC country are in accordance with each country's financial market systems. Roughly speaking, Canada, Australia possess Anglo-Saxon type's financial-market-oriented system. On the contrary, Japan, Korea, and other Asian member economies, which are extensively influenced by German and Japanese financial system, possess banking-oriented loan-based system. However as the global trend has shifted to venture capital and high-tech start-up companies,

[5] This comparison of APEC member economies is based on the APEC report "A Research on the Innovation Promoting Policy for SMEs in APEC: Survey and Case Studies (SME 01/2006)", which were conducted by the APEC SME Innovation Center of TIPA(Korea Technology and Information Promotion Agency for SMEs). The ten member economies of APEC are Australia, Canada, China, Chinese Taipei, Japan, Korea, Malaysia, Mexico, Philippines, and Thailand.

the financial system and the financing policies of banking-oriented member economies is also adopting the elements of venture investments and equity financing policies.

The elements of comparisons in financing policies of the 10 APEC member economies, as being suggested in the theoretical part of financing policy, are 1) Equity program: either direct equity financing program or hybrid-funds with private venture capitals, 2) BANs(Business Angel Networks) policy to promote networks of venture capitalists, 3) Direct loan program, and 4) Loan guarantee program.

Equity investment for high-tech start-ups

The ten APEC member economies share common characteristics in some aspects, and sometimes reflect different governmental philosophies with regard to SME innovation policies. The commonality of financing policies in the ten APEC member economies can be attributed to the recent establishment of governmental equity investment program, especially in strategic high-tech industries. Turning from the 21st century, IT and BT are booming as new technological frontiers with leapfrogging opportunities for innovative SMEs to become global competitors. During this period of pioneering new technological frontiers, SMEs, which experiment diverse technological paths with high risk and high returns, are indispensable. Financial market with venture capital and business angels, which can handle the investment opportunities with high risk and high returns, could be appropriate forms of SMEs' financing instead of traditional banking system.

The ten member economies are generally involved in equity financing program for innovative SMEs in high-tech new industry either directly or indirectly, observing the market failures of immature financial markets especially for the early high-tech start-ups with no sufficient collaterals. However, some economies with active financial venture capital markets, such as Canada, China and Mexico, did not operate direct equity financing programs but indirectly take the roles of connecting venture capitals and new high-tech firms such as BANs. On the other hand, some economies, in which high tech industries are not mature enough to finance innovative SMEs, such as Philippines, direct or indirect equity programs were not yet implemented.

Republic of Korea has established the fund of funds program in 2005, under the guidance of the Act on Special Measures for the Promotion of Venture Businesses. The program designated the private financial company, Korea Venture Investment Corp. to manage the fund for the purpose of providing the seed money to innovative SMEs and venture firms. The program resources are to be created to 1 trillion won until 2009, and so far 385 billion won are created in 2005 and 2006. Chinese Taipei initiated the 'SME Incubation Investment Trust Accounts' in 2003 in order to provide the secured working capital to newly established SMEs less than five years with strong growth potentials. The program is scheduled to be allocated NT$2 billion during 4 years of operations. Malaysia established two venture capital funds of RM 150 million in 2000 in order to encourage the development of new technology industries such as information technology, communications, advanced manufacturing and life science as the engine of economic growth. Thailand raised the OSMEP Venture Capital Fund of THB 5,000 million in 2003, in order to promote investment in innovative start-ups and technological SMEs with high potentials in target industries such as Software and IT, Automotive Parts, Fashion and Design and export oriented business.

Australia started the Innovation Investment Fund program in 1997, which was designed for the promotion of commercialization of R&D through the injection of venture capital to small and high tech start-ups or early expansion companies for the target industries such and IT and Bioscience. The Australian government invests AU$ 221 million in the funds matched by private investors. Japanese government, through SMRJ(Organization for Small & Medium Enterprises and Regional Innovation), also invest into limited partnership for venture capital investment in order to promote investment to venture business. Japan established the private investment company, Small and Medium Business Investment and Consultation Companies, which are owned by local governments or financial institutions, in order to invest in SMEs with less than 300 million Yen.

Canada, Mexico and China do not have explicit forms of direct equity financing programs, but mostly play the roles of investment networks through BANs. Canada does not have direct equity financing program for innovative SMEs, but, venture capital groups are closely linked with local incubators and clusters. For example, in Ottawa an ITA would participate in a local business organization which would review proposals seeking angel funding. Angel funding, which are more broadly based geographically, is estimated to be 1 to 3 times of venture capital funding in Canada. Mexico installed the ‘SMEs Investor Club’, which is a group of private or public businessman with financial resources, in order to promote syndicated investment into productive early-stage SMEs during the courses of the Program of Entrepreneurial Development 2001-2006. China also does not have specific equity financing programs or BANs in central governmental programs. However, as Chinese government pursued the cluster and incubator development strategy for promotion of high-tech start-ups and venture firms, the local incubators have close networks with angel investors and venture capitalists, who can provide investment into highly-promising high tech SMEs and start-up companies in the incubators.

Direct loan programs and credit guarantee

Direct loan programs are traditional tools of providing funds for SMEs, which lack in collaterals and enough credit and thus unable to finance from banking system. Thus, mostly developing member economies and banking-system-based member economies utilize direct loans programs often with credit guarantee schemes. While Japan and Korea are most extensive in their direct loan programs for SMEs, most of Asian member economies such as Malaysia, Philippines and China, and Mexico operate diverse direct loan programs. However, Chinese Taipei only provides extensive credit-guarantee schemes. Australia and Canada, which have market-oriented financial systems, do not operate direct loan programs nor credit guarantee schemes. Thailand also does not have direct loan programs to promote SMEs development unlike other developing member economies and most of Asian member economies.

Japan has three channels of providing direct loans to SMEs: 1) the Japan Finance Corporation for Small Business (JASME) established in 1953 for long-term capital, 2) National Life Finance Corporation (NLFC) established in 1949 for small loans to very small business, and 3) the Shoko Chukin bank established in 1936 for member companies' loans. These three governmental financial institutions have 26.8 trillion yen as total outstanding loans to SMEs, which is 10.3% of total financial loans to SMEs. Besides these direct loan programs, Japan has two institutions for credit guarantee schemes, which are Credit Guarantee Corporations, of which outstanding guarantee is 329,739 billion yen in 2005, and JASME, 14,278 billion yen.

Korean SMBA provides policy loans to SMEs for the purpose of promoting innovative SMEs. The policy fund amounted to 2.75 trillion won in 2006. For credit guarantee schemes, Credit Guarantee Fund and Technology Credit Guarantee Fund were established respectively in 1976 and in 1989. With the budget for guarantee, as of June 2006, the government provided 300 billion won for credit guarantee funds, 600 billion won for technology credit guarantee fund, and 14.5 billion won for guarantee foundations.

Philippines established Small Business Corporation (SB Corp) in 1991, which provide credit financing and guarantees to Philippines SMEs. SB Corp provide wholesale funds with low interest rates to bankable SMEs, credit guarantees for near bankable SMEs and direct loans to non-bankable but promising SMEs. Beside, all lending institutions are required to provide at least 6% of total loans to SMEs.

Malaysian governments allocated a total of RM 555.6 million for direct lending to SMEs, of which RM 100 million was channeled through SMIDEC. And also in 2005 SME Bank was created through the merge of two banks, BITMP and BPIMS in order to provide financial, non-financial services (such as development of entrepreneurial community) and credit guarantee to SMEs. China provide direct loans or grants to innovative SMEs from the Innovation Fund for Small Technology-Based Firms, which was established in 1999, and also from the Funds for SME Development, which was established in 2004, with annual budget of 3 billion yuan in 2006.

Mexico established the Seed Capital Program to operate in 2005 in order to direct financial resources to entrepreneurial projects, which are previously identified, developed and evaluated by business incubator centers. Direct loans are granted based on the technological level of the new business model. The Seed Capital Program had the budget of 100 million pesos in 2005. Besides, National SME Guarantee Program was established under the administration of Ministry of the Economy and two Development Banks, NAFIN and BANCOMEXT. Chinese Taipei does not provide direct loan programs but established the SME Credit Guarantee Fund in 1974 for facilitation of SMEs loan financing. The Fund provides credit guarantees for micro-enterprises start-up loans, for R&D loans of industrial upgrading, and for knowledge economy enterprise financing. In 2004, the Fund provided 265,139 credit guarantees with a combined value of NT$315,658 million, helping 126,457 enterprises to secure financing worth NT$517,037 million from financial institutions.

Typology of financing policies

The ten APEC member economies are diverse in their economic development stages and financial market systems, and thus the methods of financing policies are inevitably various. When comparing financial market sizes of the 10 APEC member economies, Japan, Canada possesses the stock market capitalization more than US$ 1,000 billions, while Philippines, Thailand, Mexico and Malaysia are far behind in terms of financial market size less than US$ 200 billions. Korea and Chinese Taipei shows relatively similar stock market capitalization, which are little above US$ 400 billions. Australia and China Mainland also showed relatively similar stock capitalization, which are around US$ 700 billions.

Even though China Mainland recorded the high volume of stock market capitalization, which is comparable to Australia, the efficiency of Chinese financial market in providing financial capital to companies is quite not satisfactory according to survey data. The average answer to the 1st question of “Stock markets provide adequate financing to companies” is the second lowest next to Mexico among 10 APEC survey. The 2nd question about “Venture Capitals: venture capital is easily available for business development” produces a relatively similar answer, which recorded the lowest among 10 APEC member economies, with the 1st question. Australia, Canada, Japan forms the highest country group in the 1st stock market adequacy and 2nd venture capital availability questions, while China, Mexico, Philippines forms the lowest country group. Thus from the perspective of financial market development stages, Australia, Canada, Japan are categorized as the high development group, and Chinese Taipei, South Korea, Malaysia and Thailand can be categorized into the Medium development group, and China, Mexico, Philippines can be categorized into the low development group.

Table 5 Stock Market Capitalization of 10 APEC member economies

(US$ billions)	2000	2001	2002	2003	2004
Australia	**372.79**	**375.13**	**378.85**	**585.48**	**776.40**
Canada	**841.39**	**700.75**	**575.32**	**893.95**	**1,177.52**
China	**580.99**	**523.95**	**463.08**	**681.20**	**639.77**
Japan	**3,157.22**	**2,251.81**	**2,126.08**	**3,040.67**	**3,678.26**
Korea	**148.65**	**220.05**	**249.64**	**329.62**	**428.65**
Malaysia	**116.94**	**120.01**	**123.87**	**168.38**	**190.01**
Mexico	**125.20**	**126.26**	**103.14**	**122.53**	**171.94**
Philippines	**25.96**	**21.22**	**18.55**	**23.57**	**28.95**
Chinese Taipei	**247.60**	**292.62**	**261.47**	**379.02**	**441.44**
Thailand	**29.49**	**36.35**	**46.17**	**119.05**	**115.40**

Sources: IMD WORLD COMPETITIVENESS YEARBOOK

Table 6 Survey: Stock markets provide adequate financing to companies?(10.0 scale)

(US$ billions)	2000	2001	2002	2003	2004
Australia	**7.71**	**7.79**	**8.18**	**7.64**	**7.98**
Canada	**7.75**	**7.09**	**8.14**	**7.44**	**7.81**
China	**5.05**	**4.82**	**4.94**	**4.17**	**4.53**
Japan	**4.96**	**4.37**	**5.90**	**5.85**	**7.04**
Korea	**6.11**	**5.06**	**5.79**	**5.48**	**5.69**
Malaysia	**6.51**	**6.36**	**7.00**	**6.06**	**6.33**
Mexico	**3.73**	**3.64**	**3.34**	**3.24**	**4.18**
Philippines	**4.22**	**3.60**	**4.14**	**4.76**	**4.78**
Chinese Taipei	**7.03**	**6.94**	**7.35**	**6.78**	**6.80**
Thailand	**5.16**	**5.76**	**7.01**	**6.55**	**6.61**

Sources: IMD WORLD COMPETITIVENESS YEARBOOK

Table 7 Survey: Venture capital easily available for business development? (10 scale)

(US$ billions)	2000	2001	2002	2003	2004
Australia	**5.64**	**5.75**	**5.95**	**5.93**	**6.25**
Canada	**6.42**	**6.10**	**6.59**	**6.26**	**6.52**
China	**2.99**	**2.95**	**3.37**	**2.98**	**2.92**
Japan	**3.20**	**3.33**	**4.08**	**4.68**	**5.53**
Korea	**5.67**	**4.29**	**4.50**	**5.10**	**4.40**
Malaysia	**5.30**	**5.70**	**6.29**	**4.78**	**6.56**

Mexico	**2.36**	**2.46**	**2.20**	**2.62**	**3.38**
Philippines	**3.23**	**3.52**	**3.00**	**3.38**	**3.57**
Chinese Taipei	**6.47**	**6.36**	**6.76**	**6.44**	**6.40**
Thailand	**4.35**	**4.81**	**5.23**	**5.17**	**5.00**

Sources: IMD WORLD COMPETITIVENESS YEARBOOK

The SME financing policies of ten APEC member economies can be divided into two broad groups, while still possessing diversities even within the groups: 1) investment-focused group and 2) loans-focused group. The investment-focused group consists of Canada, Australia, Thailand, China and Mexico. These economies all share the characteristic that government does not provide or provide only small proportion in recent years for systematic direct loan facilities. These economies do not have special banks or credit guarantee institutions for SMEs. But still the diversities remain within the group. First of all, Canada and Australia have most developed financial market system, while Mexico, China and Thailand lag behind. Moreover, while Australia and Thailand governments are directly involved in creating Venture Capital Funds to provide investments for innovative SMEs, Canada, China and Mexico only participates in the network formation of market venture capitalists with start-ups.

The loans-focused group consists of Japan, Korea, Chinese Taipei, Malaysia and Philippines. These economies all share the characteristic that governmental financing programs are centered about bank loans and possess special banks or guarantee institutions to operate for systematic loans and guarantee services to SMEs. However, these economies except Philippines have created equity investment programs in recent years especially targeting for high-tech innovative SMEs. But still the loans programs are the main channel of financing support to SMEs. Japan, Korea, and Chinese Taipei have the longest history of governmental loans programs while Malaysia and Philippines relatively newly established the public loan systems. Chinese Taipei has the uniqueness that it does not have direct loan programs but has extensive loan guarantee systems.

Financial System Stage	*High*	•Australia	•Canada		•Japan •Korea •Chinese Taipei
	Low	•Thailand	•Mexico •China	•Philippines	•Malaysia
		Government equity program	BANs-centered	Loan Only	Loan + VC
		Investment-focused		**Loan-focused**	

Fig 4 Typology of SME financing policies among 10 APEC member economies

Source: APEC, 2006, "A Research on the Innovation Promoting Policy for SMEs in APEC: Survey and Case Studies (SME 01/2006)"

4. Case Studies

4.1. Australia: Technology Commercializing - COMET[6]

The general focus of Australian federal government's SME policies is on improving the flow of finance into business innovation and on stimulating the growth of innovative firms by enhancing Australia's capacity to commercialize research and new technologies. The Australian government recognized that commercialization of technology is essential for an effective Australian innovation system. However, the government finds it difficult for early-staged technology companies with potential high risk to attract capital and to obtain management and business skills. The government has concluded that the good quality research has not been successfully commercialized due to this reason. The COMET (Commercializing Emerging Technologies) program, which provides a comprehensive support measure combining financial assistances and management consulting services to early stage companies, is the best measure to cope with these difficulties.

The COMET program is designed to support early-growth stage companies, spin-off companies and individuals to commercialize their innovation technology. COMET is a merit-based assistance program which provides business assistance through access to private sector consultant Business Advisers as well as access to merit-based financial assistance. It also

6 This Australian case of COMET program is drawn from the APEC report "A Research on the Innovation Promoting Policy for SMEs in APEC: Survey and Case Studies (SME 01/2006)", which were conducted by the APEC SME Innovation Center of TIPA(Korea Technology and Information Promotion Agency for SMEs).

provides business assistance in the following areas: management development including participation in approved management skills development courses; engagement of mentors; strategic and business planning, including export strategy if appropriate; market research; market validity; Intellectual Property strategy; and Proven Technology (including finalizing Working Prototypes).

At 31 December 2004, outcomes include more than $313 million raised in equity capital by COMET customers, over 600 strategic alliances, licenses and agreements, and around 265 manufacturing commencements and products / services launched. COMET has been extended until June 2011 with additional funds of $100 million as part of the Australian Government's innovation statement, Backing Australia's Ability – Building Our Future through Science and Innovation. More than 1,000 companies will benefit from the extended program.

The eligibility for COMET assistance is for 1) early-growth stage companies commercializing their innovation, 2) spin-off companies formed by individuals from either public or private research institutes. The eligibility criteria for application of COMET grant require that 1) innovation has commercial potential, 2) the majority of the applicant's current business activities, employees or assets must be within Australia, and 3) the applicant must be prepared to become an incorporated entity under the Corporations Act 2001, 4) the applicant must have ownership of, or beneficial us of, any intellectual property necessary to commercialize innovation, 5) the applicant companies must be less than five years old, 6) the total turnover for the applicant companies over the previous two years must is less than $8 million, and 7) the applicant must be solvent, 8) the applicant must be prepared to enter into "a success fee agreement."

The merit criteria for assessment of applications are 1) actual or potential management capability to commercialize the innovation with appropriate COMET support, 2) market opportunity and strategy, 3) technical feasibility of the innovation, and 4) demonstrated need for COMET funding. Applications are considered on an ongoing basis, which is assessed by COMET business advisors, and applicants will receive the notification within 14 days of the program delegate's decision.

COMET offers two streams of business services assistance: Tailored Assistance for Commercialization (TAC), and Management Skills Development (MSD). Under TAC, eligible firms work with private-sector business advisers on strategies such as developing a proper business plan, and a product prototype and market analysis to attract and manage capital. TAC provides assistance of 80% of eligible costs incurred under the customer's TAC plan. Assistance averages $50,000 to $60,000 and is capped at $100,000 for exceptional applicants. MSD provides dollar-for-dollar assistance up to $5,000 to enable individuals to undertake courses in relation to management of innovative practices and the financial management of commercialization. COMET assistance is available for up to two years.

The COMET financial assistance for companies is available through a two tier funding structure. In the tier 1 stage, grant value up to $64,000 can be provided. The rate of assistance is available at 80% of the eligible expenditure. In the tier 2 stage, grant value up to an additional $56,000 can be provided. The rate of assistance is available at 50 % of the eligible expenditure. Assistance to individuals is available to develop management skills required to progress their innovation towards commercialization. Grants to individuals are limited to $5,000.

PageUp

PageUp is the computer software service provider specialized in HR management software. In 1997, Melbourne-based PageUp began when Simon and Karen Cariss started building web-browser-based software for various organizations. PageUp focused on providing world-class human resources technology for recruitment and recently became a service provider for Australia's largest employer, Coles Myer.

Since PageUp received an Australian Government Commercialising Emerging Technologies (COMET) grant in 2000, it has won a number of awards and made the BRW's Fast 100 list in 2004. Simon and Karen worked with their COMET business advisor Bob Beaunont to use their $80,000 funds for market research, developing intellectual property and strategic planning.

Over the last five years, PageUp has worked hard to become the clear market leader providing HR services to Australia's top 100 companies and PageUp has grown from six employees to 28 and tripled its turnover to $3 million per annum. In 2004, PageUp was listed by BRW as Australia's 33rd fastest growing small to medium enterprise. It also won the Telstra and Victorian Government Small Business Award for the 20-50 employees category.

Source: AusIndustry

The strength of the COMET program is the focus on the commercialization of scientific research results and on the high-tech start-up companies. The COMET program is the customized and comprehensive services combining financial grants and management consultation for newly established start-ups. Since the market failures in economic growth and job creations are mainly centered about the formation of new firms, the policy focuses on promoting commercialization and high-tech start-up companies is appropriate for Australian SME innovation and economic growth. In this regard, the COMET program played the major role in pursuing the innovation strategy in recent years.

The success of the COMET program is due to the combination of financial support and management advisory services. Often newly start-ups face difficulties in raising long-term stable capital and also difficulties in obtaining managerial talents to handle with business growth. Even if a start-up company can finance their R&D investment from outside capital, they often end up in failing commercialization of their scientific researches because of lack in managerial skills. Thus, with financial assistances to start-ups, managerial advisory and consultation services should be accompanied for the successful commercialization and production of high-tech research results. In this approach, the Australian COMET program could achieve high success in assisting the commercial growths of Australian high-tech start-ups and spin-offs.

4.2. Korean Technology Financing[7]

Korean technology financing programs for SMEs, in which several Korean ministries are involved (MoCIE, MoST, SMBA), are managed mostly thorough establishments of special-purposed funds in the operations of technology-collateral, technology evaluations, credit guarantees and debt financing. Here are introduced two special-purposed funds, ‘Science and Technology Promotion Fund’ and ‘Information and Communication Fund’, which employ not only general collateral-based loan programs but also on technology-collateral-based loan programs.

STPF (Science and Technology Promotion Fund) was established in 1992 for the purpose of promoting science and technology investment under the Comprehensive Plan for S&T Innovation of 1991. STPF provides loan programs for private firms’ R&D investments or commercialization of science and technology developments. The purpose of this loan program is to promote technology developments of small venture firms which has technological capabilities but are weak in material collaterals. The targets of this loan programs are confined to three different types of R&D investments and commercialization: 1) national R&D programs and consequent national R&D programs, 2) R&D investments in future promising technology areas, and 3) basic scientific research or high technology developments.

Table 8 The Assistance Conditions and Coverage of R&D Loan Programs

	General Collateral Loans	**Technology-Evaluation Based Loans**
Administrative Institution	Science Foundation	Science Foundation
Loan lending financial institution	Selected nine financial institutions	Technology Credit Guarantee Fund
Lending interest rates	Inter-bank interest rate in previous quarter – 0.75% (SMEs)	Inter-bank interest rate in previous quarter

[7] Korean Technology Financing cases are based on STEPI report(2006), “A comprehensive appraisal of policy instruments for studying firm's technological innovation”.

Duration of lending	Maximum 7 years (maximum 3 years deferment)	Maximum 5 years (maximum 3 years deferment)
Amounts of lending per project	Max. 2 billion won per project Max. 6 billion won per firm	Max. 2 billion won per project Max. 6 billion won per firm
Coverage of guarantee	Max. 100% of total loans	Max. 100% of total loans
Technology evaluation institute	TCGF and other six technology evaluation institutes	TCGF

Source: STEPI, 2006, “A comprehensive appraisal of policy instruments for studying firm's technological innovation”

STPF employ not only general collateral-based loan programs, but also technology-collateral based loan programs. General collateral-based loan programs involve two stages of evaluation system. In the first stage, seven technology-evaluation institutes including TCGF (Technology Credit Guarantee Funds), KIST, KISTEP involve in loan evaluations. The selected loan applications after the 1st loan-evaluation are recommended to financial institutions which proceed to evaluate these loan applications on the aspect of material collaterals such as real estates, stocks and bonds. The financial institutions involving in this 2nd evaluation procedure are commissioned a brokerage fee, 1% of total loans. However, since this collateral-based loan program is unapproachable by technology-based innovative firms without material collaterals, the purpose of STPF could not be exactly achieved with this general collateral-based loan program. Thus the proportion of collateral-based loan program has been continuously reduced to be nullified completely in 2006. Only technology-collateral-based loan program is now in operation for STPF.

Technology-collateral-based loan program provide public loans to innovative and technology-based SMEs or venture firms, solely with the evaluation of SMEs’ technology values. This program is introduced in 1997. Technology evaluation is operated by TCGF (Technology Credit Guarantee Funds), which provide loan guarantees for selected loan applications. TCGF are commissioned a brokerage fee, 0.75% of total loan provisions. Because TCGF provides loan guarantees which might result in default loss, TCGF would have disincentive to provide these loan guarantees to high-risk SMEs and start-up companies. In order to alleviate this disincentive problems and to prevent the evasion of loan guarantee provisions to highly-innovative but highly-risky SMEs, STPF furnishes credit-default insurance fees, 2.03% of total technology-evaluation-based loan guarantees provided by TCGF. With this risk-sharing between STPF and TCGF, technology-evaluation-based loan programs can be successfully promoted. SPTF provided 1.2 billion won to 3,848 projects of 3,043 firms during 1993-2005. The strength of this loan program is low interest rates with long-term duration of loan lending and the method of technology-evaluation-based selection procedure. However it is criticized that its loan coverage is overlapped with the loan programs of 'Information and Communication Fund'.

Similar loan program, which is called as "Applied Technology Development Supporting Loan Program", is managed by 'Information and Communication Fund'. This loan program started in 1993 with the title of "Technology Development Support Project for Information and Communication Industries" and changed the title of the program to current one in 2002. The targets of this program are the firms which are engaged in the industries of S/W, digital contents, computers and related equipments, information/communication services and IT-related products and services. Especially high-tech SMEs which have difficulties in raising investment funds for their technology developments are the major targets. The purpose of this loan program is promoting entrepreneurship and start-up companies' technology developments in ICT industries.

As like STPF, ICF employ not only general collateral-based loan programs but also technology-collateral based loan programs. The general collateral-based loan programs of ICF also involve two stages of evaluation system, in the first stage of which KISDI involve in loan-application evaluations for policy-conformity, technology values, and commercialization possibility. The selected loan applications after KISDI's evaluation are recommended to financial institutions which proceed to evaluate these loan applications based on material collaterals such as real estates, stocks and bonds. Technology-evaluation-based loan programs are introduced in 2002. The selection and evaluation procedure of this loan program involves the first stage of TCGF's technology evaluation and the second stage of in-depth evaluation. TCGF provides loan guarantees for evaluated technology values, and private banks provide public loans to SMEs or venture firms with this loan guarantees. Total amount of 1.9 billion won are provided for this loan program during the period of 1993-2005.

Table 9 Assistance Performance of ICF's Loan Programs (unit: Million Won)

Year		2000	2001	2002	2003	2004	2005
Total (a)	# of projects	470	575	510	404	503	n.a
	Loan Amount	149,552	179,142	181,665	128,579	218,222	n.a
	amount per project	318	312	356	318	434	n.a
General Collateral loans (b)	# of projects	470	575	317	47	93	n.a
	Loan Amount	149,552	179,142	113,608	11,656	84,812	n.a
	amount per project	318	312	358	248	912	n.a

Technology evaluation based loans (c)	# of projects	-	-	193	357	410	n.a
	Loan Amount	-	-	68,057	116,923	133,410	n.a
	amount per project	-	-	353	328	325	n.a
Ratio of technology-evaluation-based loans in # of projects (c/a)		0.0%	0.0%	37.8%	88.4%	81.5%	n.a
Ratio of technology-evaluation-based loans in loan amounts(c/a)		0.0%	0.0%	37.5%	90.9%	61.1%	41.4%

Source: STEPI, 2006, "A comprehensive appraisal of policy instruments for studying firm's technological innovation"

Figure 5 shows the whole procedure of this technology-evaluation-based loan programs in Korean technology financing. Financial institutions operate diverse portfolios of this loan programs to meet various financial needs of SMEs and venture firms. Among these programs, Korea Development Bank (KDB) technology financing can be a good example of providing adequate funds to SMEs. KDB provides: 1) 'Early technology commercialization funds' (amounts to 30bil.won), which aims at the promotion of commercialization of technology from public research institutions, 2) 'Investment for Venture Firms' (amounts to 70bil.won) for less-than-5-year venture firms' working in R&D and commercialization, 3) 'Credit loans to technology-based firms' (100bil.won), which provide technology evaluations, business evaluations and IPR evaluations, 4) 'KDB Venture Star', and 5) 'KDB Global Star' programs.

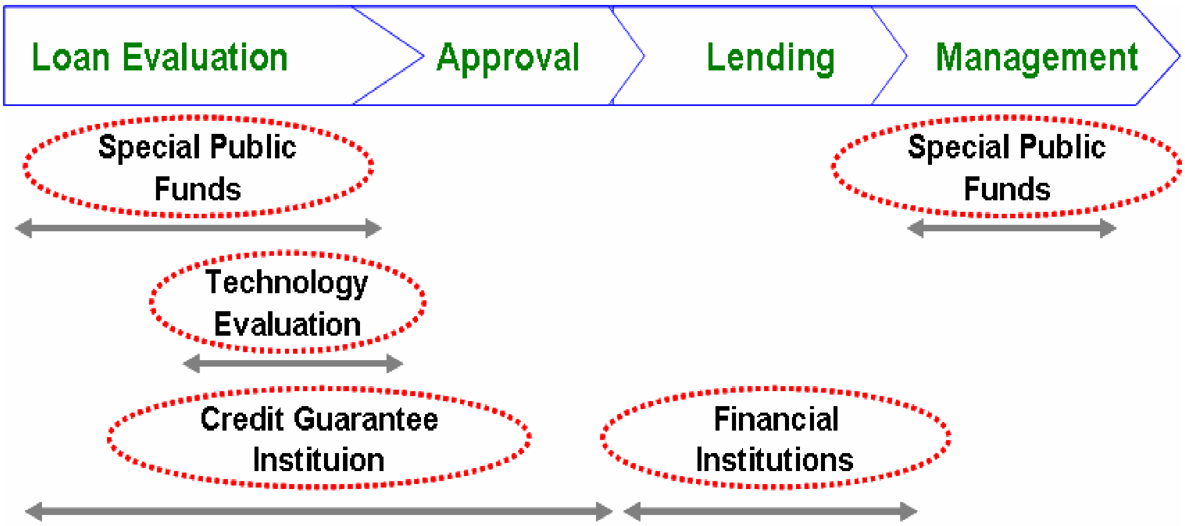

Fig 5 Korean Technology Financing Process

5. Conclusion

5.1. Discussion Agenda

There would be five topics for roundtable discussions among trainees and participants. First of all, all the trainees from developing economies are expected to make short presentations about financing programs of participants' economies. Secondly, roundtable participants will discuss what would be the differential effects between equity-based programs and loan-based programs, or between financial market developments and governmental direct interventions? Thirdly, the discussion agenda will be whether the country's industrial specificities matter for differentiation of financing programs or not. Fourthly, what are the practical problems, which might be faced by each economy's financing programs? And what would be possible solutions? Lastly, are there international cooperation agendas to enhance financial capacity for SMEs' innovation?

5.2. Suggestions for Policy Implementations

The financial support measures for innovative and technology-intensive SMEs have a long history in advanced economies, and even within the circle of developing countries such as Korea, Taiwan and other Asian countries. However differences could be found in the methodologies of providing financial assistances to innovative SMEs. Mostly Anglo-Saxon countries with the tradition of free market trade focuses on equity-investment tools of financial assistances while German and Japanese system in the tradition of common law are found to utilize loan guarantee provisions. Historically even within the tradition of Anglo-Saxon countries, direct loan provisions to SMEs were once employed to fill the financial gap problems faced by innovative-but-low-collateral SMEs. With the development of financial markets and sophistication of banking system in developed economies, Anglo-Saxon advanced economies mostly confined their public financial assistance programs to equity investments while the common-law-based advanced economies mostly restrain their public financial assistance programs to loan guarantees.

The common characteristics of advanced economies in operating financial assistance programs for innovative SMEs are 1) their rigorous preventive measures of moral hazard problems by financial institutions and venture firms, which might show rent-seeking behaviors with these public financial assistances, and 2) their profit maximizing measures while achieving public goals of promoting technology developments of innovative SMEs and entrepreneurship in market. These measures could be called as "market-friendly" measures to facilitate financial market or financial institutions' functions through the intermediary roles of public funds. The public funds provide necessary guarantees or equity investments which solve information asymmetry problems of innovative SMEs with rigorous technology evaluations. Thus if financial markets or financial institutions are developed enough to distinguish these investment or loan lending opportunities, public financial assistance programs could be confined to intermediary functions of loan guarantee or equity investment with rigorous evaluation and screening. However since financial institutions or financial markets of developing countries are underdeveloped not enough to distinguish profitable investments or successful loan lending opportunities in innovative SMEs, the direct loan financing to SMEs are still prevalent in public financial assistance tools.

The developing countries' financial assistance programs, regardless of whether they pursues equity investment strategy or loan lending schemes in promoting innovative SMEs, have to deal seriously with moral hazard problems and with dwindling public funds due to high default loss in their lending or investments in risky start-up companies. While the public assistance programs in developing countries pursue the public goals of promoting innovative SMEs in their economies, if the public measures are not market-friendly in essence, the public financial assistance programs could be ended in with the results of even damaging long-term competitiveness of innovative SMEs and entrepreneurship formation. These are the reasons why, in recent years, Korean government and Japanese government change the general principals of SME innovation policies from helping 'weak and unprotected SMEs' to promoting competition among innovative SMEs.

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Chpater 6. Technology Financing

Sanghoon Kim[1]

This subject is designed to assist policy makers in developing APEC member countries in establishing policies for SME promotion by introducing concept and issues of "Technology Financing." The main purpose of this subject is to promote technology development and commercialization of SMEs, survey several case works previously practiced, and propose viable policies and/or following systems for the future.

1. Introduction

1.1. Technology (general term vs. as a candidate for commercialization)

Even though present life is intertwined with technology, there is yet no universal definition of the term for technology. Various definitions can be made by people with different professional backgrounds that are partial or narrowly focused. For examples, technology can be defined as means for performing industrial arts and infrastructure building from the typical viewpoint of engineer or it can be seen as the things that human create to alter their everyday life-styles from the viewpoint of journalist, whereas it can be defined as a capital good utilized as a production factor for economical growth from the economist viewpoint.

Apart from this type of partial definition, a comprehensive definition is available from graduate level academic textbook. According to the textbook, "Technology" refers to that theoretical and practical knowledge, skills and artifacts that can be used to develop products and services, as well as their production and delivery systems. Technologies can be embodied in people, materials, cognitive and physical processes, plant, equipment and tools. Key elements of technology may be implicit, existing only in an embedded form (like trade secrets based on know-how) and may have a large tacit component (Burgelman, R et al 2004).

All of the above definitions are correct for the special focus group. However, all of the partial as well as comprehensive definitions do not readily lend themselves to be actionable managerial definition for the purpose of performance assessment and resources allocation in an enterprise. Moreover, the definitions are neither universal nor measurable for sound managerial decision-making, which implies the above definitions are not readily useful for everyday decision-making purposes in the enterprises.

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[1] Vice President of EBSI

It is, therefore, suggested that more actionable term of "technology" or "technology-system" needs to be introduced in order to facilitate technology related management in an enterprises. Fortunately, a generally accepted and actionable definition has been developed in terms of evolution of the economic and business factors of production through a series of attempts by several researchers (UN-ESCAP, 1984). According to these researches, "Technology" can be defined as simply human-made help-mate for all economic value addition activities, i.e., application being the essence, technology is a capital good utilized by all economic systems. Considering technology is a critical factor of production, it is possible to isolate the factors which comprise technology as we review the evolution of technology as a crucial factor of economic activities.

1.2. Supporting Tool for SMEs

For policy makers, the survival and growth of Small and Medium-sized Enterprises (SMEs) is a matter of primary concern. The dynamic disposition of SMEs is an interesting factor in the aspects that they invigorate the stagnant economy and are necessary as an infrastructure for large enterprises. Since SMEs are flexible in terms of organization and production structure in general, they are supposed to seize new business opportunities rapidly, thus overcome financial crisis at a lower cost. SMEs also contribute to the stability of society by accounting for a large share of total employment.

In addition, technology is recognized now to be the most sought after human made help-mate, which can be utilized effectively and efficiently as a capital-good for economic wealth generation, all over the world. There is also widespread agreement now that technology management is critically important for the survival and growth of all enterprises in the new world economy, which has become extremely competitive and increasingly interdependent (Sharif, N, 2006).

Technology change and the growing significance of R&D investment, are often cited as the primary driving force of economic growth, and it is widely accepted that social rate of return on R&D expenditure exceeds the private rate. In the absence of policy intervention, the latter may lead to low R&D activity in the society and to a sub-optimal rate of economic growth. The industrialized countries have all, to varying degree, publicly funded R&D projects that are believed to have particularly large social benefits. The total amount of public R&D support is considerable.

For examples, due to assumptions of market failures and the under-investment in R&D and innovation activities, all OECD countries are spending significant amounts of public funds on programmes intended to stimulate these activities. At the end of the 1990s, the share of government funding of the total R&D, in the respective economies, was approximately one third in the US and Europe and one fifth in Japan (OECD 2000). Nearly 10% of commercial firms' R&D expenditures in the OECD are publicly funded.

In this regard, this article is focused on the understanding technology financing for the enterprises (especially SMEs) operating in the present day global economy. Detailed experience in Korea for designing and implementing such a program will be introduced with a focus on guarantee based loan financing with a close relation to technology evaluation.

The objectives of this subject can be summarized as follows: First of all, it is required to develop general definition of "technology" as a candidate for commercialization to lead trainees to have a unified understanding. Then, it is necessary to identify various factors and isolate key factors in commercializing technologies. Understanding the role and process of "technology financing" to promote technology commercialization can be achieved by attempting to understand various types of SMEs based upon growth stage and their technologies, and diverse financial needs of SMEs.

Finally, it is crucial to understand the required infrastructure or resources (i.e. policies, budget, manpower etc) to implement technology financing (through proper technology evaluation). Also, understanding "technology evaluation" as a key factor for "technology financing" is helpful to have macroscopic insight of technology financing system on the whole.

With this article, it is anticipated that this subject assist policy makers in APEC developing member countries in establishing policies for SME promotion by introducing concept and issues of "Technology Financing" as a key factor for SME support, surveying several case works previously practiced, and finally proposing viable policies and/or following systems for the future.

2. Technology Financing (TF) - Status of SMEs

2.1. The Importance and Hurdles of Technology Commercialization for SMEs

It appears that technology based SMEs tend to generate more "profits" and "value added" when compared to traditional SMEs. According to recent survey, the major hurdles which SMEs have been facing in technology commercialization are closely related to financing. However, especially SMEs have experienced great difficulty in attracting capital, especially due to characteristics of business risk. Innovation, which has attracted large attention today, also can represent a disproportionately large financial risk than before. In the next figure, the "profits" and "value added" generated by technology based SMEs are compared with those generated by traditional SMEs.

Considering these circumstances, governmental intervention needs to be rationalized as well as to be required. It is apparent, however, that the fund supported by the government is usually smaller than that required by the SMEs. It is necessary, therefore, to introduce government-lead financing policies and/or systems, in order to achieve more efficient distribution of government aids. An effort to come up with an efficient system can be made by understanding the status of each member economy and caseworks attempted in other member economies.

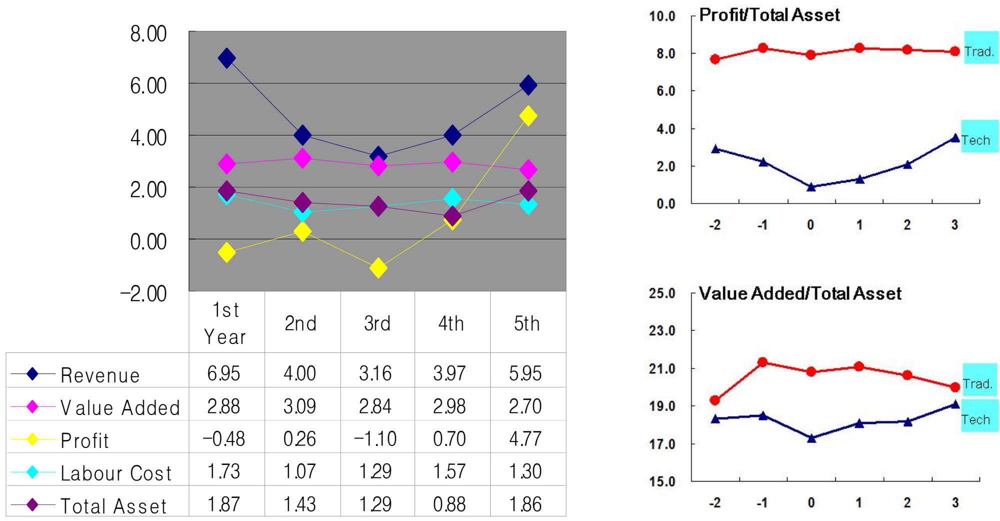

Fig 1 The "profits" and "value added" generated by technology based SMEs

The major justification for the importance of technology financing can also be found from the survey. According to KIBO (formerly KOTEC) in Korea, it was found that most commonly faced problem to SMEs was financing. This is shown in the figure.

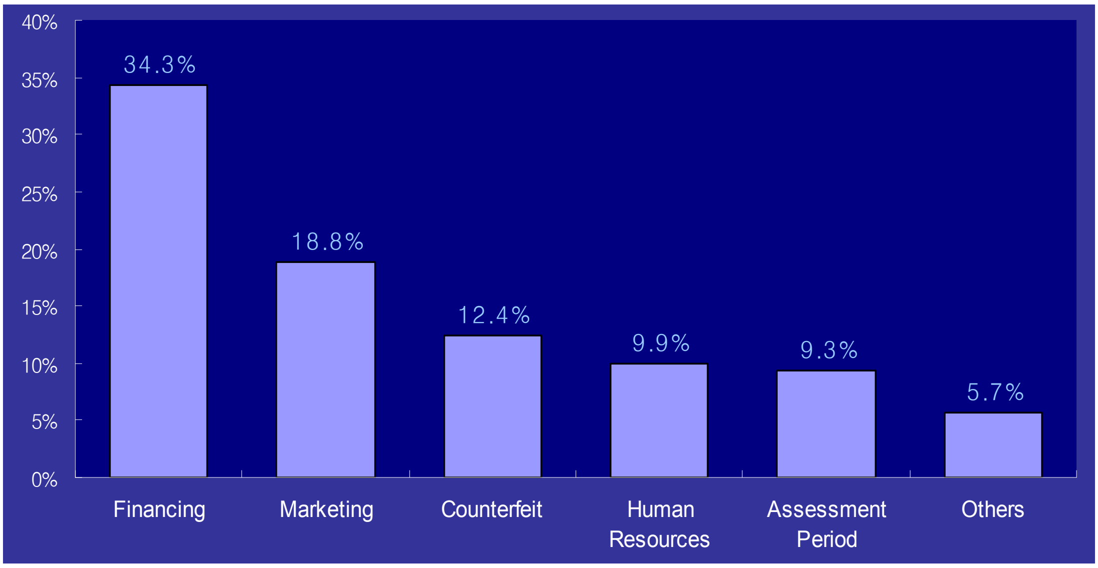

Fig 2 Major Hurdles for SMEs' Business (Questionnaires to SMEs) ('04. 5)

Conventionally, key criteria involved in technology evaluation for the purpose of technology financing composed of four items; the ones related technology, human, market and finance. From the detailed viewpoint of these criteria, it is possible to isolate the main reasons for finance problem and their relation to other reason for different criteria. Through the figure shown below, it is expected that identifying the major purpose of financing, the average financing size required etc can be plausible.

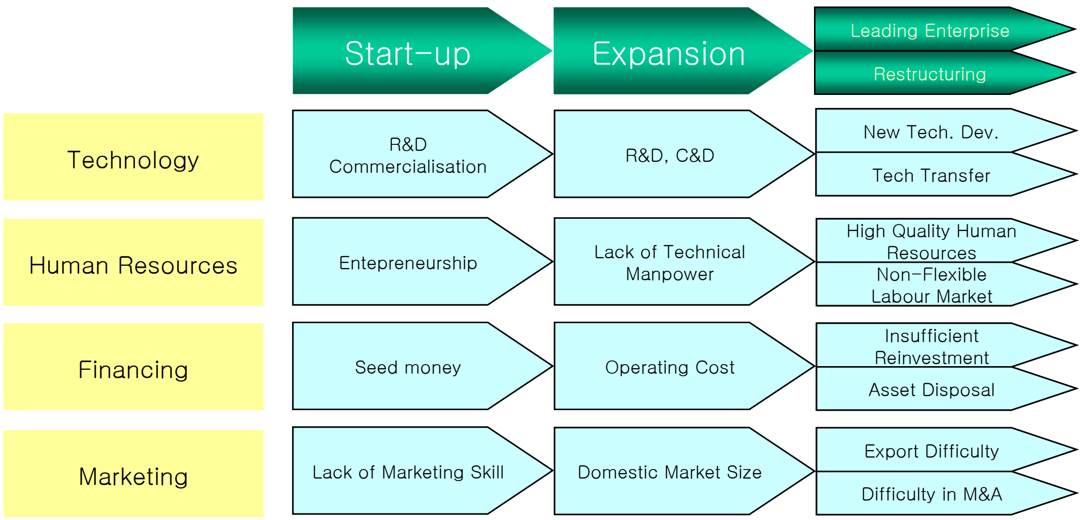

Fig 3 Main hurdles to be overcome for each growth stages of SMEs

In addition, the effort of identifying countermeasures for enhancing SMEs' competitiveness performed by SMBA in Korea shows that financing is critical factor. According to the figure shown below, this factor is more critical in the initial stage from the business start-up. It also appears that the innovative (technology based) firms and small firms are more susceptible to the financing issue.

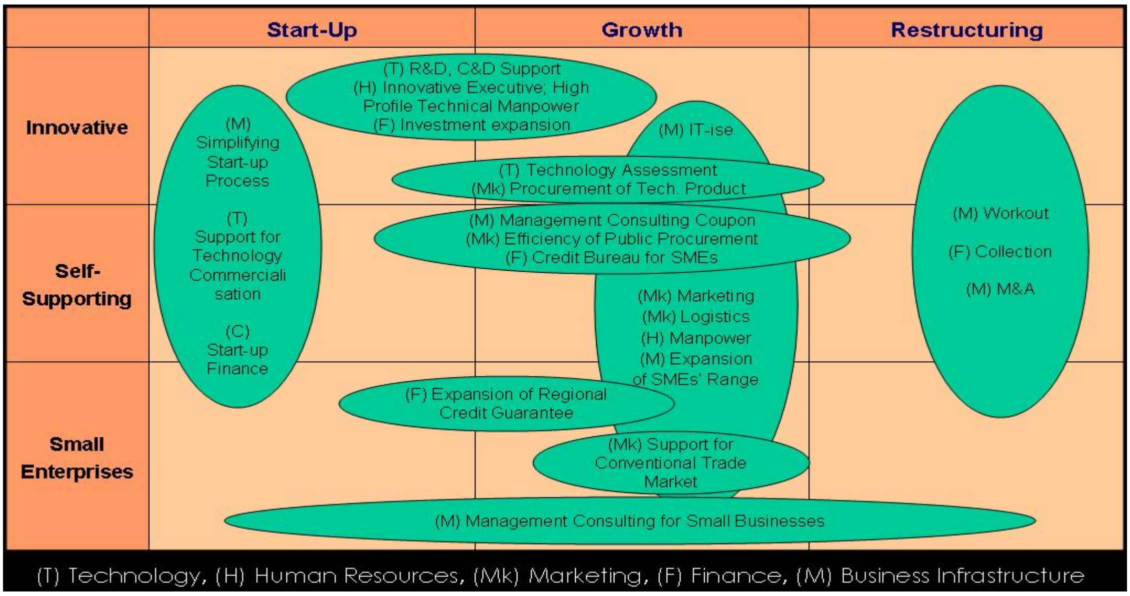

Fig 4 Comprehensive countermeasure for enhancing SMEs' competitiveness

Based upon the consideration described above, it is possible for policy makers to make to classify which types of technologies and SMEs are eligible for government support and financing. During this process, it should be pointed out that potential conflicts of interest between individual objects (such as between the parties of budgeting, policy making, administration, banking institution (government or civilian), investment firms and SMEs themselves) which comprises financial transaction chains may be caused, which requires careful consideration.

2.2. Factors affecting Technology Commercialization

Recent research in strategy suggests that the creation of new technology is an important driver of firm success (Eisenhardt and Martin, 2001). However, not all firms can create technology within their boundaries (Teece, 1982), and even firms that can do so sometimes make use of externally generated technical knowledge (Tripsas, 1997; Cohen and Levinthal, 1990; Chesebrough and Teece, 1995). Such sourcing helps firms to obtain access to new technologies that are valuable to their performance in the market place but unavailable within organizational boundaries. Many observers have commented on the problems that firms experience commercializing new technology created outside of the organization (Teece, 1986; Nevens, Summe and Uttal, 1990), but little empirical research has identified factors that make for the successful commercialization of imported technology (Porter and Stern, 2001).

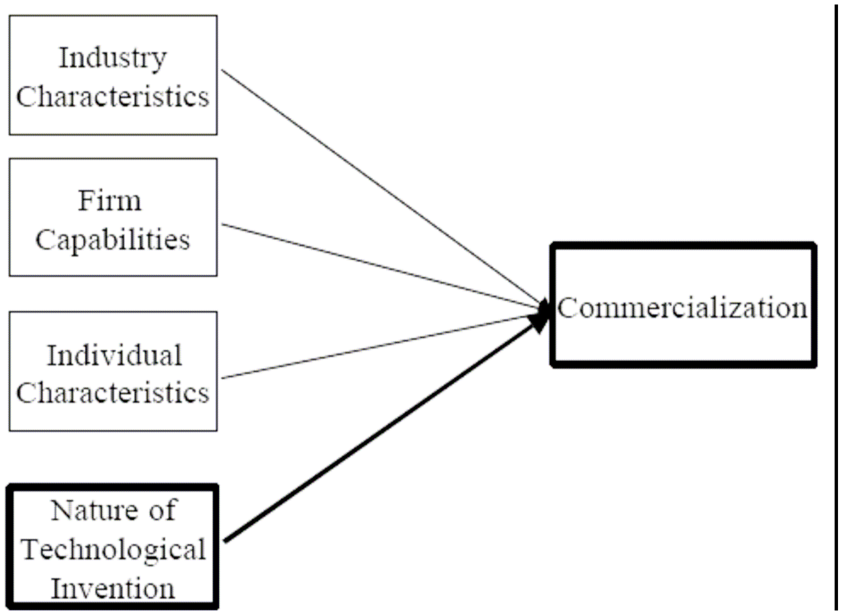

Fig 5 Drivers of Technology Commercialization

The body of literature that documents the importance of new technology commercialization for economic as well as firm growth is extensive (Schumpeter, 1934; Solow, 1956; Penrose, 1959; Nelson and Winter, 1977). Three streams of research are relevant for understanding the determinants of commercialization of technologies sourced from outside of organizational boundaries (Drazin and Schoonhoven, 1996; Schilling, 1998). The first one focuses on the role of communities, populations and the broader environment. Examples of research in this stream include Wade (1996), who examines the effects of new entrants to the industry on the sources and rates of technological innovation in the microprocessor industry; Abrahamson and Rosenkopf (1997) who focus on social networks and their impact on innovation diffusion; and David (1988), who offers network externalities and increasing returns as an explanation for emergence of standards. The primary explanation for successful commercialization is embedded in the environment and manifests itself via social networks, bandwagon effects or network externalities.

The second stream focuses on understanding the capabilities of individual firms in commercializing new technologies, with particular focus on dynamic capabilities that allow repeated success at commercialization (Teece, Pisano and Shuen, 1997). Examples of research in this stream include Dougherty and Hardy (1996), who examine firm resources and processes and their role in sustained product innovation; McGrath, Tsai, Venkataraman and MacMillan (1995), who show that firm competence is a necessary antecedent for innovation success; and Pennings and Harianto (1992) who present evidence that firms with technological networking capabilities are the most successful.

The third stream of research examines the role of the individual in technological commercialization. Scott and Bruce (1996) suggest that leadership, individual problem solving style, and work group relations affect innovative behavior directly, while Howell and Higgins (1990) examine the importance of individual champions in the innovation process. Other research has examined the context of the teams or groups that innovators belong to within the firm. Bantel and Jackson (1989) show that educated top management teams are positively associated with successful innovative activity in the banking industry while Nerkar, McGrath and MacMillan (1996) demonstrate that team satisfaction mediates the relationship between effort and innovative success.

The prior research streams have generally not focused on the nature of the technology itself (Henderson and Clark, 1990 and Anderson and Tushman, 1986 are notable exceptions). Moreover, even when researchers have examined the nature of the technology itself, they have not examined the determinants of commercialization of externally sourced knowledge. While the role of the environment, the culture, the firm and the individual are important factors in explaining the commercialization of new technology, the nature of the new technology needs to be explored in greater detail for researchers to develop a fuller understanding of the commercialization of new technology.

It should be noted that the isolation of more crucial factor is necessary sometimes, although various factors mentioned above interact each other, which makes the factor isolation more complex. In addition, it needs to be reminded that which factor is more crucial is dependent upon each nation’s circumstances (such as education, population, economy and environment atc), and this consequently affect the unique characteristics of policy directions for each country as shown in the figure.

Fig 6 SME policy directions for different countries

2.3. The Classification of SMEs (as a target for TF)

Although it is natural to define SMEs as a beneficiary of "technology financing" in the context of this subject, the general definition of SME is too obscure to be applied to the technology financing. Since the source for funding is limited compared to the SME's demand, certain criteria as an eligible applicant need to be set first. For example, financing seems to be more critical for start-ups as mentioned earlier. Therefore, it might be logical to set criteria for funding to start-ups rather than grown-ups in terms of effectiveness. Similar approach can be made to innovative firms and the others.

The effort to define SMEs, as a target subject for financing, needs to be done. At first, in the aspect of SME classification, required attempts would be to establish definition and classification of SMEs according to the activity and technology type (see table below). It is then possible to identify the potential impact of financing on sustainability of these SMEs and national economy.

Table 1 Example of SME classification setup, eligible for funding

Firm Type	Technology Type	
	Emerging	Mature
Start-ups	Type I (venture)	Type II (differentiated or brave entrant)
Established	Type III (revitalising, or diversifying)	Type IV (incumbent innovator)

The setup of definition and classification of SMEs according to growth stage (see figure below) may also be necessary based upon circumstances (This is the case for many countries including Korea). Since spontaneous income of funding from the market may not be available to start-up and early-stage SMEs, it is sometimes appropriate to set-up target SMEs for government support, to improve promotion efficiency.

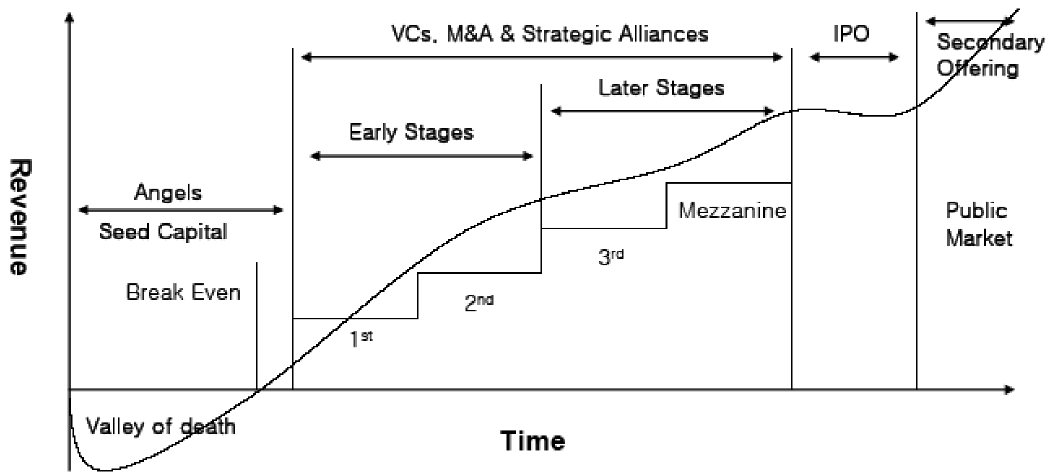

Fig 7 Typical example of revenue vs. growth stage of SMEs

3. Technology Financing (TF) Systems and Policies

3.1. Concept of Technology Financing (Definition and purpose)

Conventionally, technology financing can be defined as all kinds of financial activities including guarantees, investments and loan-lending which are accompanied by a series of technology innovation processes like R&D and commercialization.

There is no doubt that technology based SMEs are crucial for national economies especially nowadays. However, it is often observed that market itself appears to be indifferent to the

SMEs' promotion, especially for start-ups and early stage ones, partly because of the lack of patience to wait for their outcome. Therefore, efficient government-driven technology financing system may be required, in order to achieve the goal of efficient SME promotion.

3.2. Theoretical Background

The theoretical literature on the economic benefits of innovative activities is vast. There is also a steadily growing empirical econometric literature and case studies verifying the importance of R&D and innovation at various levels of aggregation.

The economic-theoretic support for state intervention in R&D activities begins from 1940s, with the researches by Schumpeter (1942), Nelson (1959) and Arrow (1962). The recent endogenous growth model by Davidsson and Segerstrom (1998) differentiate between innovative R&D and imitative R&D. The former produces higher quality products, while the latter imitates other firms' products. Although both types of R&D activities create new knowledge, they find that only innovative R&D subsidies lead to faster economic growth.

A governmental grant regime, stimulating a faster rate of imitation, makes the monopoly profits earned from successful innovation more short-lived. The consequence is a decrease in the rate of technical change, resulting in slower economic growth. Based on data from a typical OECD country, they empirically show that all R&D expenditure increase the level of GDP, but only investment associated with new products for the market, new processes and development of knowledge have a positive impact on the GDP growth rate.

Most industrialized countries have publicly funded research-grant programmes that attempt to funnel public resources directly into R&D projects that are anticipated to have particularly large social benefits. Such research-grant programmes include those that support basic scientific research; R&D aimed at particular technical priorities to the state (eg. Defence, health and environment); 'pre-competitive' R&D intended to generate large spill-over, often with a collaborative component; subsidies especially targeting the new technology based firms and early-stage financing to firms, particularly those in the high technology field. Most of these grant programmes can be assumed to target innovative R&D along the Davidsson-Segerstrom definition.

The assessment of various governmental grant programmes is afflicted with fundamental measurement problems such as: (1) how to measure research output of supported research entities, (2) how to measure the spill-over benefits of funded research enjoyed by entities other than those that are directly supported, and (3) how to measure transformational impacts, whereby public support changes the nature of the research infrastructure, with possible long-lasting effects.

In evaluation studies several different measures of R&D output can be distinguished. First, if the R&D expenditure is aimed at early-stage technology development then the output can be technical and the activities that transform commercially promising innovation into a business plan can attract sufficient investment such that output enters a market successfully (Branscomb et al 1999). Second, when the objective of the R&D efforts is to develop a new science or technology that is protectable, then the best measure of output is patents or copyrights. Third, R&D investment intended to result in the successful entry of a new or significantly improved product into a particular market can best be measured as innovation sales.

A more recent discussion on the impact of state funding considers whether the public funding decision represents an endorsement of a project as being of high quality. The screening of proposals by the likelihood of success is a costly and uncertain process. Non-public sources of funding may piggyback on the public review process, or even if they make their own assessment, they acknowledge that their assessment is uncertain and can be influenced by that of the government experts. This 'certification' or 'halo' effect is believed by research grants agencies in the USA to be an important factor in increasing to total spending of grant recipients (Diamond 1998, Jaffe 2002).

It is also well documented in the literature that firms funded by the government are likely to be among those with best ideas. Thus, they have more incentive to spend their own resources, and are more likely to receive support from third parties than firms not funded. As emphasized by Jaffe (2002), any regression analysis that compares the research expenditure of government supported firms to those that are not supported has to take into account the selectivity problem. A closely related assessment issue concerns additivity versus crowding out phenomenon. While the selectivity problem arises because public funding goes to proposals judged in advance as likely to succeed; the additivity and crowding phenomenon out refers as to whether public funding increases the total spending on research or merely displaces funding from other sources (Busom 2000).

In order to measure the impact of public funded R&D and to reduce the problem of selection bias, many recent assessment studies rely on one or more of the following methods: (1) regression with controls, (2) fixed effects or difference-in-difference models, (3) sample selection models, (4) instrument variable estimators, or (5) matched samples of treated and untreated firms. The treated firms are firms receiving public funds.

In recent years, there has been a surge in econometric works focusing on the effectiveness of public R&D policy at various levels of aggregation in many OECD countries. The following table depicts the common methods used and the main results from selected recent related studies.

The heterogeneous results from different assessment studies, shown in above table, confirm previous findings in the literature. Reviewing the body of available econometric evidence accumulated over 35 years, David, Hall and Toole (1999) conclude that conflicting answers are given as to whether public R&D spending increases or replaces private R&D expenditure. According to recent research by Lööf et al., it was found that there are additive effects of public R&D financing on private research expenditures, but the only beneficiaries are small firms (Loof et al, 2006). It is suggested that a possible explanation to this ambivalent finding in the existing literature would be different and sometimes inadequate research methodologies applied to the data.

It is widely accepted that, in the absence of policy intervention, the social rate of return on R&D expenditure exceeds the private rate, leading to a socially sub-optimal rate of investment in R&D (Guellec and Pottlesberge 1997). The main channels of public support for individual firms are tax incentives, direct government funding, co-operation arrangements between firms, research institutes and universities, and loan guarantees (Lööf and Heshmati, 2006).

Considerable effort has been devoted to the evaluation of the efficiency of public subsidies for R&D. Despite the prevalence of such programmes, there is little consensus about their effectiveness (Jaffe 2002 and Hall 2002), and there remain serious methodological issues about their findings, which are yet to be investigated.

Klette, Möen and Griliches (2000) report that most evaluation studies on governmental subsidies utilizing microeconometric methods are based on the assumption that R&D subsidies, to a large extent, are allocated randomly to firms and projects. If the allocation process is haphazard then the challenging issue is to find sufficient comparative data for firms receiving R&D subsidies as for similar non-supported firms. The difference in performance between the two groups of firms could then be estimated, with public funds as a determinant.

Table 2 Recent studies on the impact of R&D subsidies

Year	Data (Period)	Author	Method	Result
1998	Finish (1985-93)	Toivanen, Niininen	Regression with controls	R&D subsidies have no effect of private R&D for large firms but increase private funding by 5% for small firms.

1999	Spanish (1998)	Busom	Regression with controls	For 2 firms out of three the subsidies increase private funding of R&D by 20%. For the remaining third firms, there would be complete crowding out.
2000	US SBIR (1990-92)	Wallsten	Instrumental variables	The R&D investment would have been made even without subsidies because governmental agencies tend to favour projects with the highest private return.
2000	Israel (1990-95)	Lach	Matched samples & Regression with controls	Using matching methods and a subsidy dummy variable suggest that subsidies add to private funding of R&D. Regression methods suggest that one additional dollar in R&D subsidy would increase private R&D by 41 cents.
2001	German (1994-98)	Czarnitzki, Fier	Regression with controls	On the average, one Euro of subsidy would increase private R&D by 1.3 to 1.4 Euros.
2002	German (1995, 97, 99)	Almus, Czarnitski	Matched samples	Firms in Eastern Germany that participated in governmental R&D schemes increased the private R&D investments with an amount corresponding to 4% of their turnover.
2003	French (1985-97)	Duguet	Matched samples	R&D subsidies add to the private R&D.
2005	Korean (1999-2004)	Sohn, Moon, Kim	Regression and Matched samples	R&D subsidies add to the private R&D.

There is overwhelming evidence that firms do not randomly participate in governmental R&D support programs. On the contrary many studies have concluded that public R&D policy attempts to cherry-pick the winners in programmes (Irwin and Klenow 1996; Lerner 1998). Furthermore, small firms participate less frequently than larger firms in various support programmes and a larger proportion of beneficiaries and users of the support programmes are in the more technologically advanced sectors (Hanel 2003).

If the performance of the supported and non-supported firms ex ante differs systematically one difficulty in this type of evaluation is the potential selection bias. Jaffe (2002) describes a typical case, where firms funded by the government are liable to be those with the best ideas. This implies that these firms have more incentive to spend their own resources and are more likely to receive support from third parties. Hence, in a microeconometric analysis, public funding is an endogenous variable and its inclusion in the list of independent variables will result in inconsistencies.

4. Experience in Korea

4.1. Infrastructure related to SME

Case studies of best practices could be found in Korea for mainly debt financing and guarantee system. Although financing can be performed in the form of either equity financing or debt financing, equity financing is more popular in private sector. In Korea, the most of fund from government is supported usually through loan, more specifically through the provision of guarantee for loan. Most of these financing systems work under the frame of legal system of Korea as shown in the figure.

One of the key features of this structure is related to effort to enhance start-up environment, as backed by enactment of “Support for SME Establishment Act” (May 86). This act has continuously been followed by continuous attempts to ease off restrictions, which resulted in more than 25 times of start-ups so far. Establishing and supporting business incubator centre was another key feature, which resulted in approximately 290 centres nationwide within university and research institute. In this program, providing office, management/technology advice and business information for early stage companies with new idea and high technological potential have been actively introduced. In addition, policies for financial support and tax deduction benefits such as profit tax, corporation tax, acquisition tax etc have been implemented successfully. In general, the main aim of SME related law system can be summarized as follows:

Construction of a start-up and fostering base for SMEs and venture enterprises

Enhancement of a technology innovation system for SMEs

Creation of an environment conducive to viable enterprise management

Improvement of the information system for SMEs

Expansion of domestic and overseas markets for SME products

Fostering of the middle class & expansion of the industrial base

Establishment of an efficient support system for SMEs

Tax incentives toward SMEs and SME-related agencies

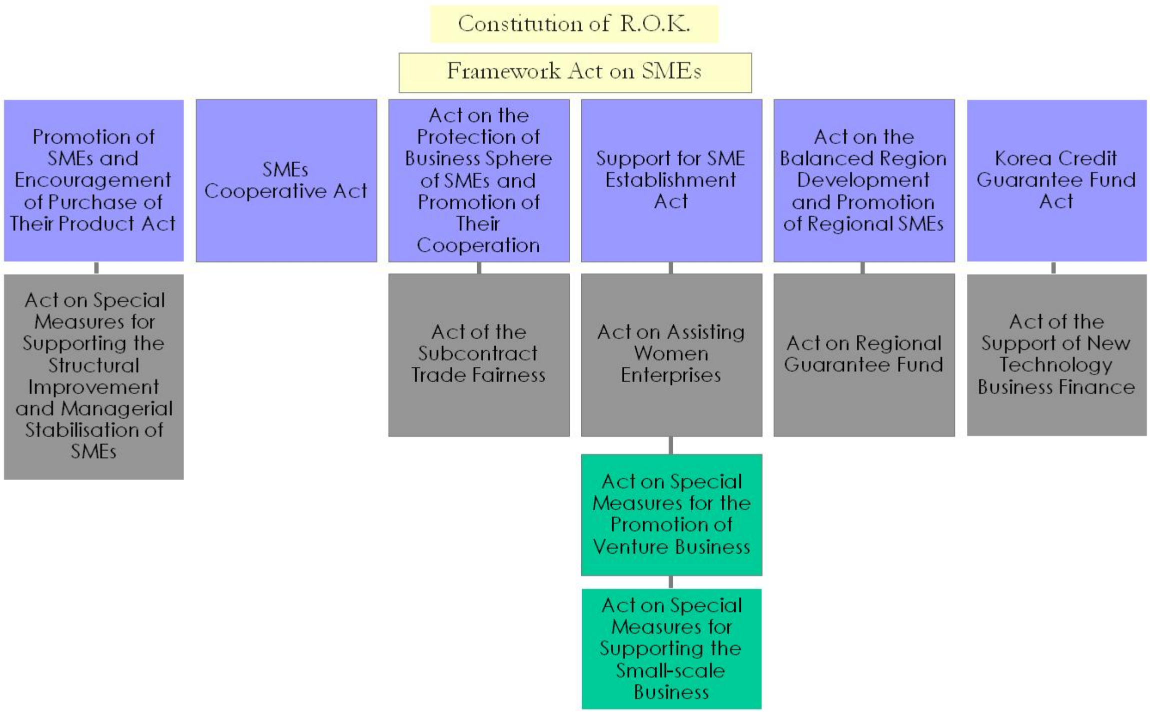

Fig 8 Structure of laws relevant to SMEs

In terms of SME promotion, Small and Medium Business Administration (SMBA) is key governmental organisation in Korea. The major activities and tasks of SMBA are described as follows:

- Look for and prioritize innovative companies

Greater resource needs to be applied to identifying start-up companies that are innovative and have the potential to grow. There needs to be greater emphasis on scanning and pro-active identification of growth companies. This will require a dedicated resource and a wider, more holistic interpretation of innovation, which encompasses product, process and marketing.

- Focus on growth enterprises

SME support should focus support in a more concentrated way, across all sectors, on those companies that have the best prospects for future growth. Other SME company segments should continue to have support relevant to their needs and stage of development, for example, website information, selected business development advice, information on quality standards and training.

- Adopt a more strategic approach in project selection and information dissemination

Priority setting in innovation infrastructure must be future oriented. The support services need a stronger reference to, partially already introduced, criteria like technological level, coherence with strategic core competences of the region, potential for value added, export orientation and, most importantly, global market potential. The impact of business creation and development activities on the local economy in a place and its surrounding region could be used for promotional campaigns.

- Promote business-to-business mentoring

Larger companies can play an important role in encouraging SME innovation and exporting by making available expert managers to SMEs for short advisory sessions. This can be very effective and valuable to many companies at the early stages of their development.

- Foster grass roots innovation

More should be done to encourage innovation in agricultural and food industries, basic industries and services and in smaller, less capital-intensive companies. There are good examples of grass roots interventions which should be considered for replication across a wider group of companies and industries.

- Promote high level innovation

Existing good practice initiatives should be sustained and lessons applied to other industries. Brokering relationships between larger regional companies with latent intellectual property and SMEs with the capacities to use it should be seen as another potential route for stimulating higher level innovation. The smaller company could buy, licence or pay a commission for the intellectual property. The approach requires a public sector agency with in-depth technology and business awareness to scan for such brokering opportunities and to initiate and facilitate dialogue.

- Pilot a high-growth start-up programme

A high-growth start-up programme could be piloted at local level. This would identify start-up companies with a minimum growth potential (based on employee numbers and/or turn-over), co-ordinate public support, provide bespoke mentoring and advice, and assist with the raising of private investment. Such a programme would only focus on a small cohort of start-ups over a two year period (given the size of the economies, perhaps only twenty companies a year would be recruited). This could be particularly valuable in districts where the entrepreneurial climate is close to Federal average but quality issues are evident.

- Narrow the current specialization of innovation infrastructure

The current areas of core innovation competence seem to be too broad in their definition and are followed by many other regions. In order to enable the crystallization of a locally specific global competitive advantage, the development of a more sophisticated cluster approach in activities where the locality and its surrounding region already have demonstrated international success is recommended.

- Identify complementary strategic assets

Although physical infrastructure for innovations seems to be in a good shape, in some locations there are missing or underrepresented components in the broader innovation support infrastructure, like specialist equipment providers and research specialists. Efforts should be made to identify such assets in other locations within Germany or abroad and to create connections with them. A well functioning network including industry experts is needed to conduct a detailed inventory and assessment of local strategic complementary assets. It is important to develop and maintain mechanisms that allow for an acceleration of time-to-market and time-to-money procedures of locally generated innovation.

- Exploit innovation through a wider group of firms

The existing innovation infrastructure should be used more intensively to foster collaboration between HEIs and local companies of all sizes as well as with large companies located elsewhere but with relevance for the local value-chain. Multinational companies located locally or elsewhere represent an opportunity for local economies to accelerate and scale-up commercialization processes because of their strong access to markets. Such links could help to test innovative products and services in market-like conditions and positively influence time-to-market relations. However, attention must be paid to the protection of intellectual property when building value release strategies.

Fig 9 Vision and task of SME promotion policy in Korea

4.2. Status and role of SME

In general, an SME is defined to be an enterprise employing less than 300 personnel and of varying size, sector and type. As of 2004, the number of SMEs in Korea is approximately about 3 million, including 84,000 medium enterprises (with 50~300 employees), 230,000 small enterprises (with 10~50 employees) and 2.68 million micro-enterprises (with less than 10 employees).

As the main component of the Korean economy, SMEs represent 99.8% of the entire enterprises (3 million SMEs), and 86.5% of total employment (10.41 million employees). Moreover, exports by SMEs have continued to grow significantly every year, making up for sluggish domestic consumption and improving Korea's reputation around the world.

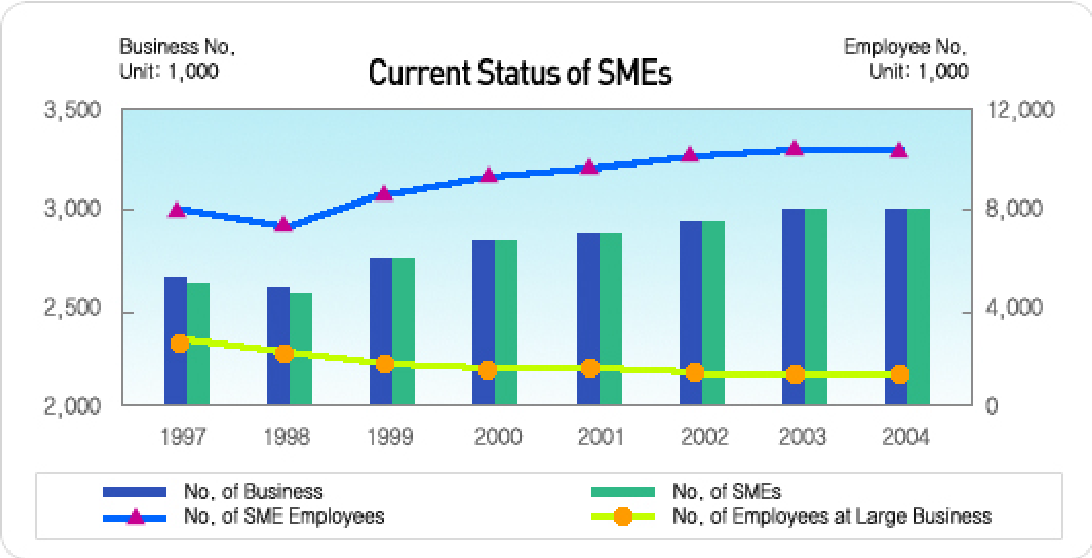

Fig 10 Current status of SMEs in Korea

SMEs in Korea have served as key solution to resolving unemployment. During the period from 1999 to 2004, the number of those employed by large enterprises was reduced by 1.2 million while that of SMEs increased by 1.54 million. As the source of innovation, competition and new ideas, SMEs create a large number of jobs, and are helping ease unemployment concerns.

Table 3 No. of SME employees - annual trend

(Unit : 10,000, %)

	1999	2000	2001	2002	2003	2004
Total employee(A)	1,083	1,153	1,165	1,198	1,204	1,203
No. of SME Employees(B)	887	968	997	1,039	1,047	1,041
Ratio(B/A)	81.9	83.9	85.6	86.7	87.0	86.5

According to the GEM(Global Entrepreneurship Monitor) report prepared jointly by the US Bapson College and London Business School to measure start-up activities of each nation, Korea ranked 6th out of 41 nations during 2000 to 2003, demonstrating Korea's high enthusiasm for start-ups. Under this business climate, enthusiastic young people can help realize their dreams by starting up their own enterprises.

The current difficulties confronting SMEs are not easy to overcome. However, they provide SMEs with new challenges and opportunities as well as enable them to compete on the global stage. The Korean government directs its policy priority towards SMEs. Also, it will assist anyone possessing creative ideas and making strenuous efforts to start up a new enterprise and help an increasing number of the public to fulfill their dreams through SMEs.

4.3. Technology Financing (Credit guarantee)

It is widely recognized that knowledge is one of the most important factors in the era of knowledge revolution and globalization contributing to economic development as well as strengthening competitiveness of a nation. Great efforts have been made in many countries to create or absorb advanced technology from other countries in order to enhance their competitiveness in international markets. Korea along with some other countries such as Finland has proven to be very successful in responding to such changing environment.

Having successfully weathered the worst economic crisis since the 1950s, Korea nevertheless faces numerous structural problems in an increasingly competitive global environment. To manage the transition to a knowledge-based economy, Korea needs to increase overall productivity and open up to international trade and information exchange. This implies a fundamental renewal of government policies in favour of technology and knowledge innovation, entrepreneurship, education and deregulation of markets.

The challenges facing Korea as it draws up a strategy for economic development in the 21st century were described in the publication from OECD/World Bank (OECD 2000) , which warns that Korea's growth prospects may be seriously hampered unless changes are made to an excessively complex system of regulations and an outdated industrial framework, traditionally dominated by the chaebol, the family-controlled conglomerates.

Korea has been investing more in education, information infrastructure, R&D and technology commercialization as a percentage of GDP than most OECD countries. Yet the benefits that it reaps in economic terms are low due to inadequate protection of intellectual property rights, lack of flexibility and misallocation of investments, technology innovation and SME promotion.

Productive entrepreneurship is also crucial to local economic growth, employment creation and innovation. Entrepreneurial activity creates jobs, drives efficient resource use and accelerates the process of generating, diffusing and applying innovative ideas and concepts.

In line with those hurdles, the recent efforts in Korea are aimed at (1) identifying the major factors that have contributed to successes and failures in the process of innovating knowledge and technology as well as turning them into businesses in Korea; (2) creating an environment that will inspire knowledge innovation with regard to turning knowledge and technology into businesses.

From 2004, Korea gives strong emphasis on those efforts among various policies, which are easily noticed by a series of governmental countermeasures and plans where technology financing for technology commercialization is now regarded as the core for overall government policies. Establishment proper technology (or technology intensive corporate) evaluation system, therefore, attracts a strong attention as a pre-requisite for successful introduction of technology financing policy in Korea.

For policy makers and academic researchers, the survival and growth of Small and Medium-sized Enterprises (SMEs) is a matter of primary concern. The dynamic disposition of SMEs is an interesting topic in that they invigorate the stagnant economy and are necessary as an infrastructure for large corporations. Generally, SMEs are so flexible in organization and production structure that they can seize new business opportunities quickly and overcome financial crisis at a lower cost. In addition, SMEs contribute to the stability of society by accounting for large share of total employment.

However, SMEs in common face great difficulties to finance investment due to asymmetric information. The asymmetry in information arises from lack of financial information and standardized financial statements. That is the reason why government intervenes to establish and to enhance collaboration between financial institutes and SMEs through credit guarantee systems in many countries. If credit guarantee institutions are able to inform about the risks associated with the loans of the lenders properly or they manage the risk better then lenders, then credit guarantees can help to overcome SMEs collateral constraints. It will relieve the risks of lending to SMEs and micro enterprises, it compensates for low profit margins, and it produces additionality (Gudger, 1998). Riding and Haines (2001) indicated that loan guarantee programs could be an effective mean of supporting the start-up, growth, and survival of new and risky enterprises. In other words, credit guarantee warrants firms to private investors and settle informational asymmetries that might have otherwise precluded investments.

Korean government encouraged new businesses and support to SMEs to accelerate economic growth and to decrease unemployment rate in the aftermath of the economic crisis in late 1990's. Among many direct and indirect support measures, credit guarantee system is seen as one of the most important instruments to achieve the economic policy goals. The credit guarantee system played an important role in assisting SMEs to raise necessary investment funds from the capital market throughout the economic crisis in the late 1990's and in particular after the collapse of bubble in venture business in early 2000's. Since banks were reluctant to lend to SMEs in the absence of exact risk measures, the amount of credit guarantee increased rapidly as a corrective measure. This was due to their inherent high risk such as high failure rate and lack of collateral, especially for venture business or new technology based firms. With credit guarantee, many SMEs overcame financial distress and achieved their transformation into a competitive constitution.

The roles of technology credit guarantee systems in economic development

Recent paradigm shift suggest the transformation from traditional industrial society into a knowledge-based society which requires the shifts of the source for the value-added from labor and capital to knowledge. Until the foreign exchange crisis, industrial sectors in Korea were stalled at a gridlock of high-cost low-efficiency structure.

The economic crisis, however, gave Korea a rare opportunity to take second look at the widespread problems in the economy such as the rigid production system, opaque corporate governance and inefficiency in business management. Awareness of these problems led to realize the necessity to transform the industry structure into one that fits into the new paradigm for a new take-off of the economy.

Realizing that technological capability is a key factor for securing competitive edge in new era, traditionally underrated contribution of small and medium sized enterprises (SMEs), and the lack of an efficient coordination system that connects conglomerates, SMEs and industries should be regarded as a "fixation solution for inefficiency of the economy".

It was, therefore, necessary to shift the focus of competition strategy from low cost into technology (1) to allocate more resources to the sectors that could lead technology innovations, and (2) to reduce overlapping investment. These measures were expected to help the Korean economy reshape its industries into more technology-driven and high value-added ones. It was also agreed upon that restructuring was needed in all spectrums of the nation to have a more competitive economy that could meet the global standards.

Nurturing SMEs and venture firms was also essential for the Korean economy to take a great stride forward. Given their creativity and dynamics, they could maximize the mechanism of the National Innovation System (NIS)2, and help the nation prepare a new industry structure.

[2] National Innovation System (NIS) refers to a nationwide networking system that interrelates private sector, public sector and institutions. It facilitates a production, transfer and sharing of knowledge

Introduction of credit guarantee system

Since the early stage of economic growth, the Korean government tried to come up with various policy measures. Among other measures, the credit guarantee system turned out to be an effective policy tool not only to support SMEs, but to supplement other economic policies in weathering a difficult economic reality. It is still being used as an effective policy tool of the government.

The objective of the system was to bolster the financial sector that was not mature in various aspects and exposed many problematic factors including collateral-based loan practices, lopsided loan extensions toward large companies, and government-intervening financing. It was also aimed at sweeping away the chronic excessive demands in the loan market and ensuring an efficient distribution of financial resources.

In the 1980s when each economic player wanted more freedom in their activities and technological capability was widely recognized as the best alternative to secure the competitive advantage, a national consensus was reached upon setting up support system for technology-intensive companies. In line with this demand for nurturing technology-intensive SMEs for sustainable growth of national economy, Korean government launched "the Technology Credit Guarantee System" with the enactment of “The Financial Assistance to New Technology Businesses Act” to extend credit guarantee resources to new technology businesses in 1986. Under this legislation, KOTEC (changed to KIBO in 2005 due to CI project) was founded in 1989 as a non-profit guarantee institution for an efficient implementation of the Technology Credit Guarantee System.

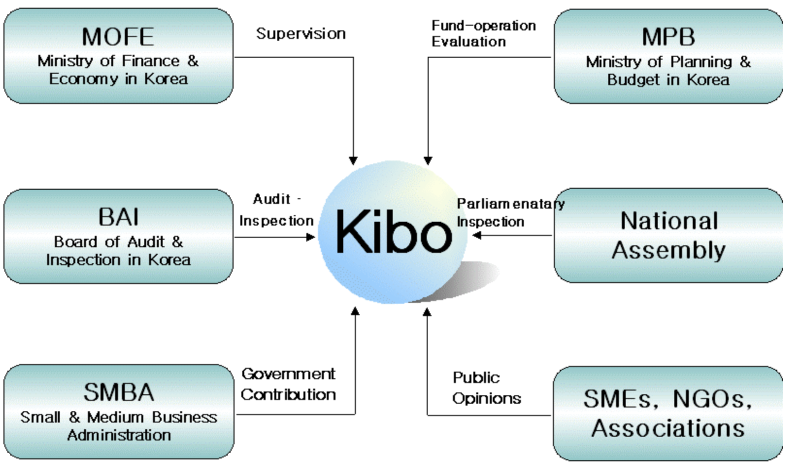

Fig 11 KIBO (KOTEC) as a non-profit guarantee institution

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among the networked participants. It also plays as a core factor to enhance a nation’s collective competitiveness.

The technology credit guarantee system was introduced to offer financial assistance to SMEs that have difficulty accessing financing resources under the old-fashioned banking system. It was also aimed at enhancing the technological innovations of SMEs. the Technology Credit Guarantee System of KOTEC has contributed significantly to expanding financial support to the new technology businesses and strengthening technological innovation of SMEs. Since KOTEC's foundation, its history can be discussed in three distinct stages as shown in Table 4.

Table 4 Development of KOTEC (now KIBO)

	Stage 1: Taking Root (1989 ~ 1997)	Stage 2: Financial Crisis (1998 ~ 2000)	Stage 3: Transition (2001 ~ Present)
Changes in Economic Environment	Weakening competitiveness of SMEs under high cost & low efficiency structure	Worsening liquidity crunch & shrinking business opportunities for SMEs	Changing business environment & support policy for SMEs & venture businesses
Role of KOTEC	Expanded guarantee support & facilitated Technological development for SMEs	Significantly expanded guarantee support & technology appraisal capacity	Established better-quality custom-tailored support programs
Total Guarantees (Cumulative)	USD 18.2 Bil. (USD 18.2 Bil.)	USD 27.8 Bil. (USD 46 Bil.)	USD 35.3 Bil. (USD 81.3 Bil.)
Technology Credit Guarantee (Ratio)	USD 13.8 Bil. (76%)	USD 20.6 Bil. (74%)	USD 29.3 Bil. (83%)

Technology appraisal (see technology evaluation subject) refers to an activity or procedure that make scoring and/or valuation for the technology potentially aiming at commercialization. The appraisal result for the subject technology serves as a good reference in making decisions in connection with the technology transfer, bank lending, investment, M&A and so on. Especially, it helped create a new financial environment where high-tech SMEs can receive loans without secured mortgage through KOTEC's technology appraisal.

As is shown in the following table, KOTEC has offered credit guarantees totaling 67 trillion won, or about 55.7 billion USD equivalents, to around 290,000 SMEs and venture enterprises since its foundation 13 years ago. Of the total guarantee amount, over 80% were first given, via "the Technology Credit Guarantee System", to those engaged in developing new technologies or to those trying to commercialize their technological innovations. KOTEC also introduced the "Technology-Preferential Guarantee System" that features swift guarantee provision with its credit examination focused more on the technological capabilities of the applicants and extends preferential treatment to high-tech enterprises.

Table 5 Technology Appraisal Guarantee offered (No of Cases, USD)

(Million USD, Cases)

		2000	2001	2002	2003	2004
Total Guarantee		8,954	12,233	11,132	11,187	10,021
Technology Credit Guarantee		7,073	10,361	9,451	9,311	8,390
Technology Appraisal Guarantee	Amount	252	454	838	1,044	1,160
	Cases	1,320	1,822	1,835	2,063	3,189

According to a recent research (KBI 2005), KOTEC's macro-economic effects over the last 10 years are estimated at about 56 billion USD, which accounts for 1.5% of Korea's cumulative GDP for the same period estimated at 3,712 billion USD. This estimate proved to be 20 times larger than the government's capital contribution to KOTEC for the same period totaling 2.95 billion USD. It turned out that KOTEC's credit guarantee service contribute to the stability of macro-economic indices such as employment rate, interest rate and commodity prices

In response to the rapidly changing technology environment, KOTEC's technology credit guarantee system incorporating a combination of technology and credit guarantee continuously transforming itself. As shown in the following table, the technology credit guarantee system has evolved into new versions.

Table 6 Development of Technology Credit Guarantee System

	Technology Credit Guarantee Scheme	Technology Preferential Guarantee Scheme	Technology Appraisal Guarantee Scheme
Relative weight of technology factor in guarantee screening	30%	60%	90%
Time Focus	Past	Present	Future

Along with the system evolution, the weight of technology related factors in the guarantee screening gradually increased from 30% all the way up to 90% approximately. In the same context, the growth potential or future value of applicants, rather than sales records or financial standing of the past, gains more importance in connection with the guarantee screening.

In an effort to facilitate swift guarantee provision to high-tech SMEs in need of capital to finance the development or commercialization of their technologies, KOTEC has utilised its in-house technology appraisal capability in the course of guarantee screening procedure and designed the technology appraisal guarantee scheme.

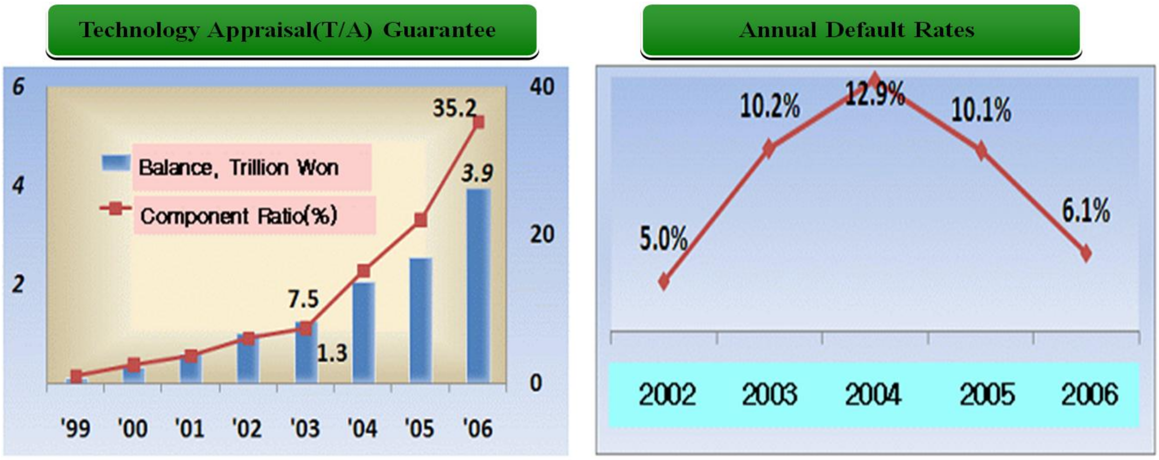

Fig 12 Technology based credit guarantee operated by KIBO (KOTEC)

To be accepted as a general practice in financing sectors in Korea, enhancing credibility and objectivity of the technology appraisal model, including valuation and scoring method, is crucial. KOTEC has been performing re-modelling processes on both valuation and scoring model for each industry/technology area. The details are described in the "Technology Evaluation" subject of this programme. In the figures shown above, the cumulative amount of guarantee and default rate are shown. It should be noted that the default rate has been drastically decreased due to reconstruction of technology evaluation system. This clearly shows the importance of proper technology evaluation system in implementing technology financing. Since then, its steady improvement of its Technology Appraisal systems and aggressive risk management enabled KIBO to strive to improve its managements like setting up its target rates to keep. The target default rate of 2007 is 7.3 %. The overall guarantee flow chart including technology based credit guarantee in the following figure as a reference

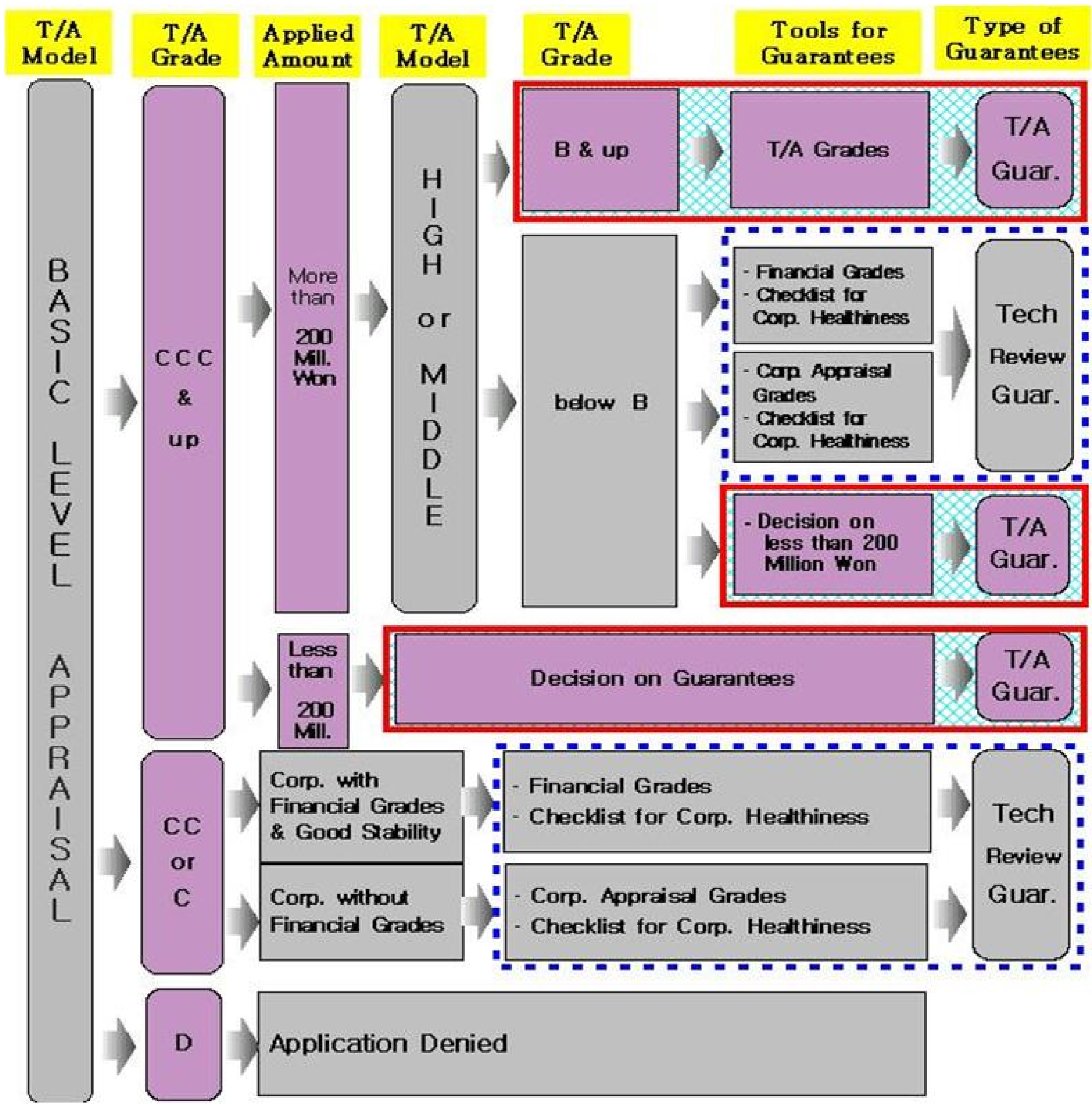

Fig 13 Overall guarantee flow chart including technology based credit guarantee operated by KIBO

5. Policy Matters

The matters concerning technology financing policy are closely linked with SME promotion policies. Since the status of SMEs in different countries can be said unique on its own, there would not be universal solution for the technology financing policy for all the countries in APEC. For example, depending on the direction of financing policies based upon each country's circumstance, the matching programme can be greatly differs.

In spite of this situation, the policy makers are supposed to have basic knowledge on followings to facilitate the technology financing setup process when it is necessary:

- Develop general definition of “technology” as a candidate for commercialization.
- Identify the various factors and isolate key factors in commercialising technologies.
- Understand diverse financial needs of SMEs
- Understand the required infrastructure or resources…
- Understand different methodologies to achieve “debt financing” and “equity financing” (i.e. direct loan scheme, investment fund formation and guarantee scheme etc).
- Understand the role and process of “technology financing” to promote technology commercialisation.
- Identify various factors and key factors in commercialising technologies.
- Understand various types of SMEs based upon growth stage and their technologies.
- Understand various type of financing such as “debt financing” and “equity financing”
- Understand “technology evaluation” a key factor for “technology financing”

For the objectives shown above, the recommended solution would be dependent upon individual economy’s status (such as geography, resources and main industry sector etc), it is noted that the case studies shown are no more than reference. Although there is no absolute answer, the solution seeking process itself is still important, since the arbitrary establishment of this basic concept on their own may induce confusion which results in failure in applying policies. Each economy should set up its own criteria for financing support toward SMEs in order to manage limited fund effectively. This basis and criteria should provide basic framework for applying government-driven technology financing. Once this suffices, the legislation and corresponding budgeting planning could be commenced. The outcome can be measured initially in terms of No. of SMEs supported, supported financing, and the financial indices of SMEs etc. But, it is required to prepare economical impact evaluation tool eventually to accurately measure the performance of newly introduced financing programme.

6. Discussions

6.1. Implications and Suggestions

The discussion agenda are not limited to certain topics and opened to any related matters. Some of the examples would be (1) What are the main issues related to this subject in participating economies? (2) Why does each government want to design and implement technology financing programme? Which kind of outcome they initially expect? (3) What are the differences between different financing system and process? (4) What are practical limitations and/or problems which should be considered? and (5) Are there any chances of building up international cooperation or assistantship?

6.2. Key Issues for Technology Financing

Understanding the relationship between "technology evaluation" and "technology financing" is crucial. The effective technology financing programme could not be progressed without the proper implementation of technology evaluation system. It should be noted that technology evaluation act as a tool which indicates the direction as well as the performance of technology financing programmes. This suggests that they need to be interacting each other dynamically.

When considering financing policies, it is common that various unexpected factors are often neglected not only during the process of setting up policies, but also during the process of operating those policies successfully. These factors may include infrastructure or resources (i.e. policies, budget, manpower etc). In spite of this uncertainty, it is recommended to remind the general structure and flow always, as depicted in the next figure, when policy maker is dealing with either technology financing or evaluation system.

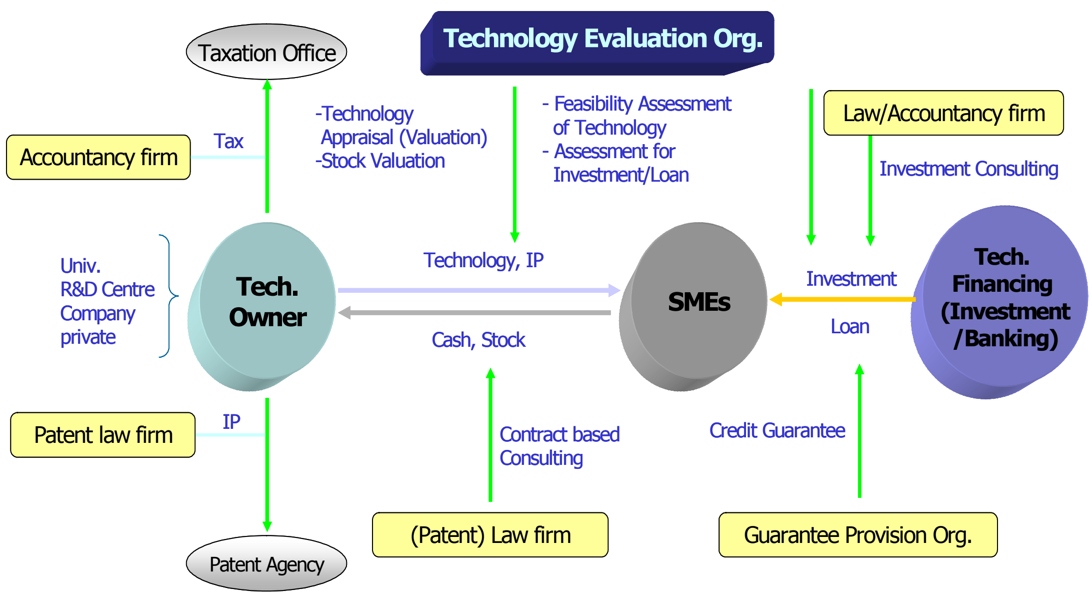

Fig 14 Technology (IP) evaluation and financing processes

In addition, one of the most important factors in expedite governmental policies would be "impartiality," "equality" as well as "efficiency." Since these factors are closely related to the overall reliability of policies, it is crucial to establish a standardized criteria and guidelines for reviewing the technology financing applications. By doing so, it could also have a effect of preventing potential malicious fraud in some extent. It is also noted that this is getting more important as the size of government support increases.

After implementation of financing programme, it could be important issue for government to evaluate whether public funding increases the total spending on research or merely displaces funding from other sources. Given that public resources are raised via socially costly revenue mechanisms, then the total economy will be worse off if society's total R&D investment remains unchanged but public research-grant programmes, by crowding out, replace privately funded investment.

6.3. Final Reminder

After seeking a solution to above, the following questions could provide answers: The first will be "What is difference between financing and technology financing." This question involves general financing process for corporate, then more specifically for "technology-based" corporate. Also, similar and different factors comprising "general corporate financing" and "technology financing" need to be dealt with. In addition, key and non-negligible factors for "technology financing" need to be thought. The second would be "How does technology financing generally work?" This question involves elucidating different types of financing process. After learning various types, "Pros & Cons" for each type of financing process with regard to SME promotion, policy making, and efficiency in practice can be perceived.

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Chapter 7. Technology Evaluation

Sanghoon Kim[1]

This subject aims to assist policy makers in APEC developing member countries in establishing policies for SME promotion. It also introduces concept and issues of "Technology Evaluation" as a key factor for the implementation of technology financing, surveying several case works previously practiced and finally proposes viable policies and following systems for the future.

1. Introduction

For policy makers, the survival and growth of Small and Medium-sized Enterprises (SMEs) is a matter of primary concern. The dynamic disposition of SMEs is an interesting factor in the aspects that they invigorate the stagnant economy and are necessary as an infrastructure for large enterprises. Since SMEs are flexible in terms of organization and production structure in general, they are supposed to seize new business opportunities rapidly, thus overcome financial crisis at a lower cost. SMEs also contribute to the stability of society by accounting for a large share of total employment.

In addition, technology is recognized now to be the most sought after human made help-mate, which can be utilized effectively and efficiently as a capital-good for economic wealth generation, all over the world. There is also widespread agreement now that technology management is critically important for the survival and growth of all enterprises in the new world economy, which has become extremely competitive and increasingly interdependent (Sharif, N, 2006).

Technology innovation, which requires a close interaction between science/technology and industry, has been attracting policy makers' interest as a key for economic growth. However, the linkage between science/technology and industry is complex than it appears. For instances, those who are involved in the process of 'science and technology into product and market (technology commercialization)' consist of various parties from different interests, which include not only scientists and engineers, but also government officials, investors, entrepreneurs etc. Since their major concerns are different from each other, it is natural that individual viewpoint from each party has limitations in communicating with others properly, resulting in forming barriers for cooperation between each party which is meant to be critical issue in 'technology commercialization (Park, H-W, 2006).

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The evaluation of technology (The word ‘evaluation’ in this text is used as a general term for assessment, valuation or audit etc. Therefore, the ‘evaluation’ can be altered with other word when it is more appropriate.) is essential tool for providing opportunities to communicate and thus cooperate between each parties. i.e., people from science/technology, from business, and from finance can learn mutually and share interests through using their own knowledge and technology in valuing technologies.

Moreover, it is true that we cannot manage something that we do not understand fully and to manage something reasonably well, we need to measure it. Therefore, there have been continuous efforts to implement such a measuring system in various countries for several years, which can be used a guide for the prospect of technology of interest. This technology evaluation has been used as a tool to promote technology innovation and financing especially for SMEs which was raised as an important part of governmental policies to achieve sustainable growth of national economy. This technology evaluation has been finding more crucial roles both in R&D activities and SME promotion in public sector, since policy makers recently have more emphasis on business feasibility.

In this regard, this article is focused on the understanding and assessment of all types of technology assets and their evaluation techniques for the enterprises (especially SMEs) operating in the present day global economy. Detailed experience in Korea for designing and implementing such a system will be introduced with a close relation to technology financing. In Korea, systematic research on technology evaluation began with the recognition of its importance for practical use of R&D results through technology transfer and commercialization from the late 1990’s. Also, Korean government has been actively utilising technology evaluation system (or programme) for the public financing of technology commercialization.

With this article, it is anticipated that this subject assist policy makers in APEC developing member countries in establishing policies for SME promotion by introducing concept and issues of “Technology Evaluation” as a key factor for implementation of technology financing, surveying several case works previously practiced, and finally proposing viable policies and/or following systems for the future.

2. Basic Concept and Definitions

Even though present life is intertwined with technology, there is yet no universal definition of the term for technology. Various definitions can be made by people with different professional backgrounds that are partial or narrowly focused. For examples, technology can be defined as means for performing industrial arts and infrastructure building from the typical viewpoint of engineer or it can be seen as the things that human create to alter their everyday life-styles from the viewpoint of journalist, whereas it can be defined as a capital good utilized as a production factor for economical growth from the economist viewpoint.

Apart from this type of partial definition, a comprehensive definition is available from graduate level academic textbook. According to the textbook, "Technology" refers to that theoretical and practical knowledge, skills and artifacts that can be used to develop products and services, as well as their production and delivery systems. Technologies can be embodied in people, materials, cognitive and physical processes, plant, equipment and tools. Key elements of technology may be implicit, existing only in an embedded form (like trade secrets based on know-how) and may have a large tacit component (Burgelman, R et al 2004).

All of the above definitions are correct for the special focus group. However, all of the partial as well as comprehensive definitions do not readily lend themselves to be actionable managerial definition for the purpose of performance assessment and resources allocation in an enterprise. Moreover, the definitions are neither universal nor measurable for sound managerial decision-making, which implies the above definitions are not readily useful for everyday decision-making purposes in the enterprises.

It is, therefore, suggested that more actionable term of "technology" or "technology-system" needs to be introduced in order to facilitate technology related management in an enterprises. Fortunately, a generally accepted and actionable definition has been developed in terms of evolution of the economic and business factors of production through a series of attempts by several researchers (UN-ESCAP, 1984). According to these researches, "Technology" can be defined as simply human-made help-mate for all economic value addition activities. But, since "technology' is as technology does. i.e., application being the essence, technology is a capital good utilized by all economic systems. Considering technology is a critical factor of production, it is possible to isolate the factors which comprise technology as we review the evolution of technology as a crucial factor of economic activities. In a general management context, technological systems utilized by an enterprise for economic wealth generation, can be seen as comprising of four interrelated components, which manifest in one of the following four forms – object-embodied physical facilities (Technoware); person-embodied human abilities (Humanware); record-embodied codified knowledge (Inforware); and organization-embodied operational schemes (Orgaware). More details of these technology components are as follows.

Technoware is the material capital for all organization work: This component is the object-embodied technologies, like artifacts, implements, machines, vehicles and structures.

Technoware represents the physical facilities of technical performance that amplifies human capacities (both muscular and brain related) for producing different kinds of goods or/and for providing services through various types of physical transformation activities (that either systematically converts available inputs to desirable outputs, or uses different platforms to give a service sought by clients). Certain Technoware are also used as specific operations' enhancers for process restructuring and all other management functions (increasing efficiency and effectiveness) in organizations.

Humanware is the talent capital for all organized work: This component is the person-embodied art-of-doing-type technologies, like ingenuity, craftsmanship, dexterity and skills. Humanware is everything which makes people at work do things; which manifests in what people really do with their Technoware by applying acquired qualifications (that comes from their education and training) and experiences (from successes and failures). Most importantly, it is their problem solving ingenuity and creativity. It includes all of tacit knowledge (which is knowledge that is not documented, or recorded, or codified). Humanware is crucial capital for transformation activities and services activities, as well as for managing various processes/functions of organizations.

Inforware is the knowledge capital for all organized work. This component is the record-embodied know-what-why-how-type technologies, like systematized concepts and technical specifications (parameters, diagrams, formulae, theories and manuals). Inforware is the codified (which is explicit and documented) knowledge and data-mine related to work-requirements and work-conventions that are underpinning a technological system for transformation operations, services provisions, or other specific management processes in use (efficiency and effectiveness related). Good Inforware enables quicker skill development and also results in savings in terms of time and resources utilized.

Orgaware is the relational capital for all organized work: This component is the organization-embodied work-operations-schemes-type technologies, like recipes, operational techniques and procedures. Orgaware is the implemented work process for producing quality outcomes by a team, at a particular time with a permissible cost. Orgaware is like a work management routine for a desired team endeavor. Orgaware includes the logic of systematized method for integration and coordination of activities and resources for achieving planned goals of an organization in producing any goods or providing a service. Orgaware also includes actually practiced procedures of value networking and coordination as well as cooperation among various stakeholders.

All of the four components are required simultaneously as part of an integral system, and the four components interact dynamically to produce resultant effect. Each of the utilized technology components, making up a specific system, generally has a wide range of sophistication levels and tradeoff situation. The relative contribution of any technology component in a given system varies by type and over time for any activity and its designed outcome.

3. Underlying Hypothesis

There is no doubt that technology based SMEs are crucial for national economies especially nowadays. However, it is often observed that market itself appears to be indifferent to the SMEs' promotion, especially for start-ups and early stage ones, partly because of the lack of patience to wait for their outcome. Therefore, efficient government-driven technology financing system may be required, in order to achieve the goal of efficient SME promotion.

Prior to discuss possible government roles, it is useful to consider on background and some related practical issues which have been raised. First, since it is usual that the fund supported by government is usually smaller than that required by the SMEs, the introduction of systematic tools for efficient fund distribution is crucial. Second, these tools should have objective and strict criteria measuring technology status and expansion possibility, business feasibility forecasting as well as reflecting national strategy for science & technology development. Third, the failing in establishing proper evaluation system would give a catastrophic result in obtaining reliability and thus authority of technology financing system. Fourth, but not the last, since the number of attempts to introduce evaluation system to introduce the evaluation system have been made in various countries, and some of these attempts appear to be successful.

Considering the background described above has been understood, the followings need to be clarified successively. The first will be is concerned with "What is difference between traditional "technology assessment" for R&D project and "technology evaluation" in this case?" This question deals with traditional technology assessment for selecting R&D project which has neglected business feasibility consideration, many of which lead to commercialisation failures. In other words, it is pointed out that the roles of the corporate which make technologies into businesses should have not been overlooked. The corporate analysis, such as credit analysis for example, would be non-trivial problem in some cases, as well as technology level assessment, because one of the main activities of the corporate is related to finances.

The second questions will be "Which factors does comprise 'technology evaluation' system?". This is the task excavating factors which really makes technology into business, and identifying which kind of extra resources are necessary (such as human resources, IT backbone etc)? in introducing technology evaluation techniques (or tools).

The third will be “Does governmental policy need to care about ‘technology evaluation’?” To answer this question, it is required to understand the relationship between the technology evaluation and the technology financing, i.e., the evaluation is a tool for effective financing system management. In addition, it should also be noted that the most important factors for technology evaluation are impartiality, reliability and standardisation, which also rationalize governmental driven system. It is recommended to understand, after keeping the above in mind, which kind of methodologies and processes are involved in evaluation process.

4. Forecasting the Business Feasibility of Technology

In this text, technology evaluation can be generally referred as systematic forecasting of the business feasibility of technology. According to economic theory, the definition of business feasibility study cab be written as activities / efforts / analysis to measure the cost and benefit of a business project in order to define the efficiency and effectiveness of the project's method and tools.

In many cases, business feasibility studies are performed on case-by-case basis. These procedures are acceptable when the number of technologies of interest for the studies is small. But, in the case of public funding allocation, for example, the number of application for the funding is enormous, conventional case-by-case report is not appropriate in terms of effectiveness.

The technology evaluation, in this case, needs to be standardized with several key performance indices extracted from the factor for technology commercialisation, and this system can be utilised as a quick guideline for the business feasibility forecasting.

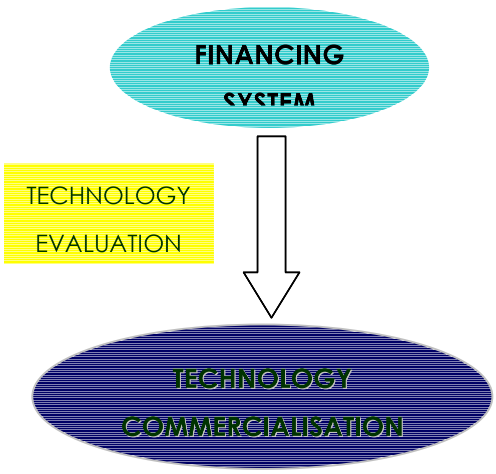


Fig 1 Role of technology evaluation

Recent research in strategy suggests that the creation of new technology is an important driver of firm success (Eisenhardt and Martin, 2001). However, not all firms can create technology within their boundaries (Teece, 1982), and even firms that can do so sometimes make use of externally generated technical knowledge (Tripsas, 1997; Cohen and Levinthal, 1990; Chesebrough and Teece, 1995). Such sourcing helps firms to obtain access to new technologies that are valuable to their performance in the market place but unavailable within organizational boundaries. Many observers have commented on the problems that firms experience commercializing new technology created outside of the organization (Teece, 1986; Nevens, Summe and Uttal, 1990), but little empirical research has identified factors that make for the successful commercialization of imported technology (Porter and Stern, 2001).

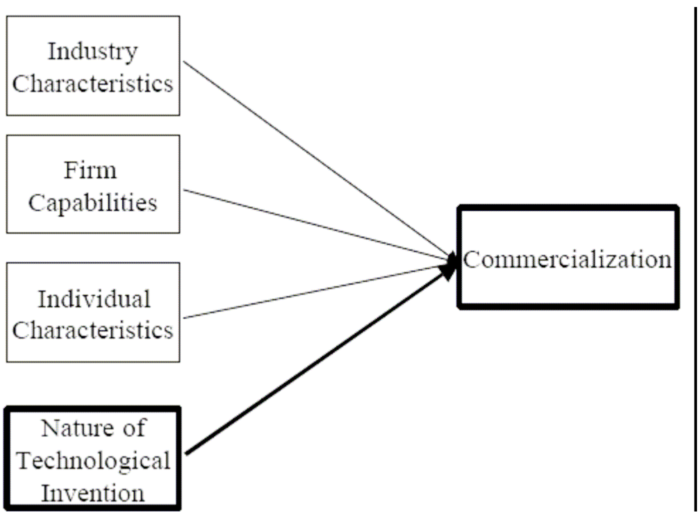


Fig 2 Drivers of Technology Commercialization

The body of literature that documents the importance of new technology commercialization for economic as well as firm growth is extensive (Schumpeter, 1934; Solow, 1956; Penrose, 1959; Nelson and Winter, 1977). Three streams of research are relevant for understanding the determinants of commercialization of technologies sourced from outside of organizational boundaries (Drazin and Schoonhoven, 1996; Schilling, 1998). The first one focuses on the role of communities, populations and the broader environment. Examples of research in this stream include Wade (1996), who examines the effects of new entrants to the industry on the sources and rates of technological innovation in the microprocessor industry; Abrahamson and Rosenkopf (1997) who focus on social networks and their impact on innovation diffusion; and David (1988), who offers network externalities and increasing returns as an explanation for emergence of standards. The primary explanation for successful commercialization is embedded in the environment and manifests itself via social networks, bandwagon effects or network externalities.

The second stream focuses on understanding the capabilities of individual firms in commercializing new technologies, with particular focus on dynamic capabilities that allow repeated success at commercialization (Teece, Pisano and Shuen, 1997). Examples of research in this stream include Dougherty and Hardy (1996), who examine firm resources and processes and their role in sustained product innovation; McGrath, Tsai, Venkataraman and MacMillan (1995), who show that firm competence is a necessary antecedent for innovation success; and Pennings and Harianto (1992) who present evidence that firms with technological networking capabilities are the most successful.

The third stream of research examines the role of the individual in technological commercialization. Scott and Bruce (1996) suggest that leadership, individual problem solving style, and work group relations affect innovative behavior directly, while Howell and Higgins (1990) examine the importance of individual champions in the innovation process. Other research has examined the context of the teams or groups that innovators belong to within the firm. Bantel and Jackson (1989) show that educated top management teams are positively associated with successful innovative activity in the banking industry while Nerkar, McGrath and MacMillan (1996) demonstrate that team satisfaction mediates the relationship between effort and innovative success.

The prior research streams have generally not focused on the nature of the technology itself (Henderson and Clark, 1990 and Anderson and Tushman, 1986 are notable exceptions). Moreover, even when researchers have examined the nature of the technology itself, they have not examined the determinants of commercialization of externally sourced knowledge. While the role of the environment, the culture, the firm and the individual are important factors in explaining the commercialization of new technology, the nature of the new technology needs to be explored in greater detail for researchers to develop a fuller understanding of the commercialization of new technology.

5. Technology Evaluation (TE) – Types and Functions

5.1. Technology as an Intangible Asset of Corporate

The competitive advantage of firms lies in those business activities which the firm knows how to do well. Factories and equipment can always be bought, employees hired, and technology licensed in but unless the firm and its management know how to combine and exploit these resources effectively a viable and competitive business will not be created. The knowledge which the firm possesses, its "knowledge base", thus plays a key role in the survival, profitability and growth of the firm.

Firms possess a number of different types of knowledge including scientific and technological knowledge, knowledge of their markets and customer base, knowledge of sources of supply of materials and components, the knowledge and skills of its employees, etc. Firms need to know how to organise various activities such as procurement, production, marketing, after sales service, innovation etc. and how to combine these to secure the profitable delivery of competitive products to the market. The firm also needs to know how to recruit and develop skilled employees and managers, to motivate them to work effectively and to encourage them to co-operate in the best interests of the firm as a whole.

Some of this knowledge can be purchased in the market place or by investing in activities such as R&D. This knowledge is often codified, that is it can be written down and easily absorbed by someone with the necessary expertise. If not protected by some form of intellectual property rights or by secrecy it can be readily acquired by competitors. In contrast other types of knowledge are only acquired through experience of the business concerned, through 'learning by doing'. Such knowledge is often 'tacit', not easily written down or communicated except by direct human experience, and is not easily acquired by competitors who must create such knowledge for themselves. Much organisational knowledge is of this kind. Tacit knowledge is a major source of competitive advantage for firms.

It is easy to show the role which knowledge now plays in the competitiveness of firms. Many firms particularly in high technology and high value added sectors show a very large gap between the stock market value of the company and the book value of its tangible assets. This reflects the value of firms' intangible assets most of which consist of the stocks of knowledge which the firm has built up or acquired.

The importance of knowledge in firms' competitiveness and economic activity is not new. The craftsmen's guilds of medieval Europe placed great importance on the 'mysteries of their trade' which they were very concerned to protect. However those changes which are making up the transition to a 'knowledge based economy' are greatly increasing the importance of knowledge in economic activity and the competitiveness of firms. They are also changing the kinds of the knowledge which firms need to possess, the way that knowledge is acquired and managed, the way firms are organised and the kinds of knowledge and skills required of their employees.

The increasing importance of knowledge is shown by the fact that in many sectors investments in intangible assets are now much greater than those in fixed capital equipment. Thirty years ago advanced industrial economies were dominated by sectors such as steel, bulk chemicals and power generation which invested large amounts in plant and machinery. By contrast the rapidly growing sectors of the 1990s such as electronics, pharmaceuticals and telecommunications invest mainly in R&D, software and information technology, advertising and training. Some emerging sectors, such as those associated with the Internet, hardly invest in fixed assets at all. Many firms and organisations including the OECD are directing a lot of effort towards improving the measurement both of intangible assets and of the returns to investments in knowledge acquisition and creation such as R&D and training. Some firms are now appointing senior executives with responsibility for 'knowledge management'.

The number of technologies used in the production of a given product or service is increasing and firms need expertise in a greater range of technologies than before. This combined with the accelerating pace of scientific and technological change means that firms increasingly resort to R&D collaboration and out-sourcing to acquire the technologies they need. Development of leading edge science and technology is now undertaken in many more locations and, together with the increasing globalisation of markets, this means that firms must be prepared to seek technology relevant to their business from wherever in the world it is to be found. Developments in information and communication technologies, particularly the Internet, provide radical new ways of doing this.

The nature of technology used by firms is changing as well. Twenty years ago firms in sectors such as mechanical and electrical engineering mainly depended on the skills of their designers, draftsmen, production engineers and craftsmen for their technology. Now the technology of leading edge firms in this sector consists of computer aided design and manufacture (CADCAM) and knowledge of a range of advanced technologies including electronics, advanced materials and software. The various stages of the production process and the interface between the firm and its customers is now managed electronically rather than via engineering drawings. Traditional craft and production engineering skills have been replaced by computer design and the ability to integrate successfully the various elements of a computer controlled manufacturing system.

Such production systems need to be organised in a very different way from traditional mass production. Workers operate in small self organising teams carrying out a range of tasks and need to be multi-skilled. Together with the huge improvements in information processing brought about by developments in information technology this result in big reductions in the number of layers of management. The increasing complexity of technology has increased the extent to which key components are sourced outside the firm and the degree to which firms need to understand the technology of their customers. The firm must be able to use information gathered at all levels within its organisation and from its customers and suppliers and the outside world generally. There is much greater interdependence and communication among workers, firms, their customers and suppliers (Barber 1998).

Managers and workers now need to be much better educated and much more highly trained. The increasing speed of technological and organisational change means that employees need to be much more flexible and require much more training and upgrading of their knowledge and skills during their lifetime. There will need to be mutual commitment between firms and their employees so that firms will have an incentive to invest in training while employees have an incentive to acquire knowledge and skills specific to the firm in which they work. At the same time the firm will need flexibility between what it produces itself and what it sources from outside and therefore in the numbers and types of workers which it employs. The management of these conflicting requirements is a challenge not just for firms but also for society as a whole.

Studies carried out by the OECD show that the Industrialised World is coping with the transition of a knowledge-based economy in a variety of ways and that a solution to the challenges which this transition poses is not to be found in any one region of the OECD. North America, Europe and the Asia-Pacific Region all have something to learn from each other. Such exchanges of knowledge will be a key part of all our economic futures.

From above sections, it is possible for the trainees to understand the role of technologies as a key for creating value-added and have a general consensus that “technology” is an intangible asset in corporate. After having general agreement on the concept of “technology” for commercialisation, the effort to identify the factors which make technologies into business can be made, and through this process the role of “technology evaluation” for “technology financing” can be perceived.

5.2. Comparative Studies with Respect to "Corporate Evaluation"

It may be also helpful to learn the origination and background of "technology evaluation" briefly, since it makes easier to understand the connection between evaluation for corporate and for technology. From the similar pointed of view, it is also helpful to learn the different types of technology evaluation methodologies (such as "assessment or rating" and "valuation") and their practical applications. Technology evaluation is mainly conducted on the technology which comprises the assets of corporate (see above – the definition of technology differs from conventional definition). In this sense, technology evaluation techniques have essentially their roots in corporate evaluation processes in principle.

The corporate evaluation processes are normally classified into two categories. The one is credit rating and the other is business valuation. The brief introduction of credit rating is given in below:

Before you decide whether to invest into a debt security from a company or foreign country, you must determine whether the prospective entity will be able to meet its obligations. A ratings company can help you do this. Providing independent objective assessments of the credit worthiness of companies and countries, a credit ratings company helps investors decide how risky it is to invest money in a certain country and/or security.

As investment opportunities become more global and diverse, it is difficult to decide not only which companies but also which countries are good investment opportunities. There are advantages to investing in foreign markets, but the risks associated with sending money abroad are considerably higher than those associated with investing in your own domestic market. It is important to gain insight into different investment environments but also to understand the risks and advantages these environments pose. Measuring the ability and willingness of an entity - which could be a person, a corporation, a security or a country - to keep its financial commitments or its debt, credit ratings are essential tools for helping you make some investment decisions.

There are three top agencies that deal in credit ratings for the investment world. These are: Moody's, Standard and Poor's (S&P's) and Fitch IBCA. Each of these agencies aims to provide a rating system to help investors determine the risk associated with investing in a specific company, investing instrument or market.

Ratings can be assigned to short-term and long-term debt obligations as well as securities, loans, preferred stock and insurance companies. Long-term credit ratings tend to be more indicative of a country's investment surroundings and/or a company's ability to honor its debt responsibilities.

It is important to note that ratings are not equal to or the same as buy, sell or hold recommendations. Ratings are rather a measure of an entity's ability and willingness to repay debt. The ratings lie on a spectrum ranging between highest credit quality on one end and default or "junk" on the other. Long–term credit ratings are denoted with a letter: a triple A (AAA) is the highest credit quality, and C or D (depending on the agency issuing the rating) is the lowest or junk quality. Within this spectrum there are different degrees of each rating, which are, depending on the agency, sometimes denoted by a plus or negative sign or a number.

Thus, for Fitch IBCA, a "AAA" rating signifies the highest investment grade and means that there is very low credit risk. "AA" represents very high credit quality; "A" means high credit quality, and "BBB" is good credit quality. These ratings are considered to be investment grade, which means that the security or the entity being rated carries a level of quality that many institutions require when considering overseas investments.

A credit rating is a useful tool not only for the investor, but also for the entities looking for investors. An investment grade rating can put a security, company or country on the global radar, attracting foreign money and boosting a nation's economy. Indeed, for emerging market economies, the credit rating is key to showing their worthiness of money from foreign investors. And because the credit rating acts to facilitate investments, many countries and companies will strive to maintain and improve their ratings, hence ensuring a stable political environment and a more transparent capital market.

The business valuation can be understood in following ways: “Fair market value” is defined as the price, expressed in terms of cash equivalents, at which property would change hands between a hypothetical willing and able buyer and a hypothetical willing and able seller, acting at arms length in an open and unrestricted market, when neither is under compulsion to buy or sell and when both have reasonable knowledge of the relevant facts. The fair market value standard incorporates certain assumptions, including the assumptions that the hypothetical purchaser is reasonably prudent and rational but is not motivated by any synergistic or strategic influences; that the business will continue as a going concern and not be liquidated; that the hypothetical transaction will be conducted in cash or equivalents; and that the parties are willing and able to consummate the transaction. These assumptions might not, and probably do not, reflect the actual conditions of the market in which the subject business might be sold. However, these conditions are assumed because they yield a uniform ·standard of value, after applying generally-accepted valuation techniques, which allows meaningful comparison between businesses which are similarly situated.

In order to perform the valuation there are a couple of elements which need to be considered. The first is economic conditions. A business valuation report generally begins with a description of national, regional and local economic conditions existing as of the valuation date, as well as the conditions of the industry in which the subject business operates. A common source of economic information for the first section of the business valuation report is usually published by the national bank of each country. Local governments and industry associations often publish useful statistics describing regional and industry conditions.

The financial statement analysis generally follows a description of the subject company. One of the first techniques that a business valuation professional applies is called “normalization” of the subject company’s financial statements. Normalizing the company's financial statements permits the valuation expert to compare the subject company to other businesses in the same geographic area and industry, and to discover trends affecting the company over time. By comparing a company’s financial statements in different time periods, the valuation expert can view growth or decline in revenues or expenses, increases or decreases in assets or liabilities, or other financial trends within the subject company. Valuation professionals also review the subject company’s financial ratios, such as the current ratio, quick ratio, and other liquidity ratios; collection ratios; and other measures of a company’s financial performance.

The second is normalization of financial statements. The most common normalization adjustments fall into the following four categories: (1) Comparability Adjustments. The valuator may adjust the subject company’s financial statements to facilitate a comparison between the subject company and other businesses in the same industry or geographic location. These adjustments are intended to eliminate differences between the way that published industry data is presented and the way that the subject company’s data is presented in its financial statements. (2) Non-operating Adjustments. It is reasonable to assume that if a business were sold in a hypothetical sales transaction (which is the underlying premise of the fair market value standard), the seller would retain any assets which were not related to the production of earnings or price those non-operating assets separately. For this reason, non-operating assets (such as excess cash) are usually eliminated from the balance sheet. (3) Non-recurring Adjustments. The subject company’s financial statements may be affected by events that are not expected to recur, such as the purchase or sale of assets, a lawsuit, or an unusually large revenue or expense. These non-recurring items are adjusted so that the financial statements will better reflect the management’s expectations of future performance. (4) Discretionary Adjustments. The owners of private companies may be paid at variance from the market level of compensation that similar executives in the industry might command. In order to determine fair market value, the owner’s compensation, benefits, perquisites and distributions must be adjusted to industry standards. Similarly, the rent paid by the subject business for the use of property owned by the company's owners individually may be scrutinized.

Three different approaches are commonly used in business valuation: the income approach, the asset-based approach, and the market approach. Within each of these approaches, there are various techniques for determining the fair market value of a business. Generally, the income approaches determine value by calculating the net present value of the benefit stream generated by the business; the asset-based approaches determine value by adding the sum of the parts of the business; and the market approaches determine value by comparing the subject company to other companies in the same industry, of the same size, and/or within the same region. In determining which of these approaches to use, the valuation professional must exercise discretion. Each technique has advantages and drawbacks, which must be considered when applying those techniques to a particular subject company. Most treatises and court decisions encourage the valuator to consider more than one technique, which must be reconciled with each other to arrive at a value conclusion. A measure of common sense and a good grasp of mathematics is helpful.

5.3. General Methodologies

Technology valuation & Technology scoring (Rating)

As technology develops in a speedy manner, its life cycle tends to be reduced faster and the importance of successful commercialization of developed technology is getting higher. Many small and medium enterprises which have a new technology developed usually lack of funding for commercialization. In order to support such companies, many governments have established various types of technology evaluation so that they can get financial aids from the several financial institutes for technology commercialization. Therefore, accurate technology evaluation is crucial. Use of inadequate evaluation model would jeopardize the entire funding process causing critical loss.

In general, it is said that technology evaluation (e.g. including valuation and assessment) is not a science but an art. The reason may be attributable to the following factors. First, technology is neither visible nor tangible. It is frequently embodied in human knowledge or in physical assets and hence difficult to identify the exact contents and scope. Second, economic value of technology is affected by various non-technical factors and realized only after it is commercialized to market (Tipping et al., 1995; Mard, 2000a; 2000b). Third, evaluation of technology is a subjective activity. Evaluation of technology is very much like the evaluation of beauty that is framed in the eye of beholder (Boer, 1999). Furthermore, technology is traded in a supplier's market and thus hard to reach balanced price through market mechanism.

Indeed, there are a number of traps or pitfalls in evaluating technology that technology manager may encounter (Boer and Traps, 1998).

However, there has been growing recognition that worth of a corporate or a business cannot be gauged without knowing the value of technological assets. Social demands for technology evaluation have increased rapidly. In public side, the government needs to evaluate technology in implementing such policy schemes as national R&D programs, subsidy or loans for R&D, and technology transfer programs. In private sector, venture capitalists, consulting firms, and technology brokers need systematic evaluation methods for making decision on investment, licensing, and strategic alliance (Park & Park, 2003). In response, various evaluation methods, ranging from intuitive judgment to complex options model (Black and Scholes, 1973; Mitchell and Hamilton, 1996), have been developed. Recently, academicians and practitioners on knowledge management (KM) have joined this research area to propose evaluation methods for knowledge or information (Wilkins et al., 1997). Although individual methods may differ one another in terms of criterion and procedure, the results of technology evaluation is expressed in score, index, or monetary value.

These evaluation approaches have their roots to corporate evaluation. For examples, technology valuation is performed when the monetary value is needed, such as technology transfer, M&A process etc. Many of this valuation processes are attributed to those of business valuation, and thus valuation process is similar, except the isolation process of technology assets.

The major approaches for technology valuation are shown in figure 5.1-4. Figure 5.1 presents the major methods for valuing technology, expressed in abbreviated fashion as "cost," "market," and "income", while figures 5.2, 5.3, and 5.4 present brief definitions for each of these major methods, as well as the primary advantages and disadvantages of each.

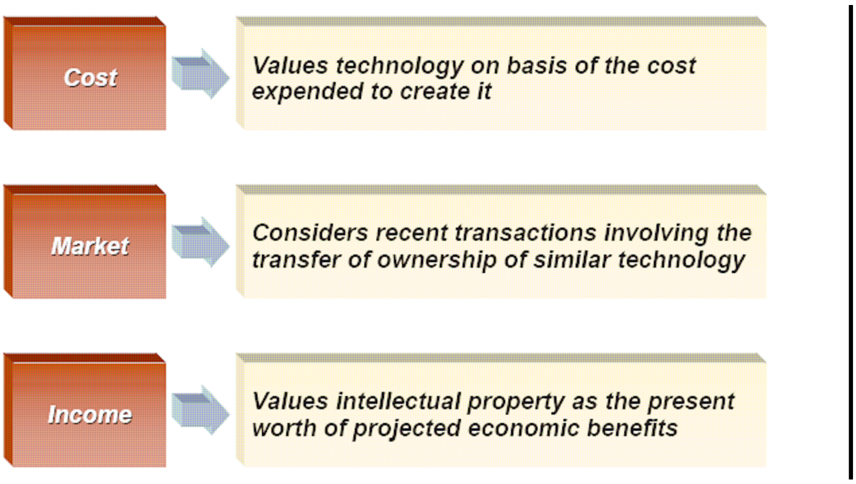


Fig 3 Technology valuation approaches

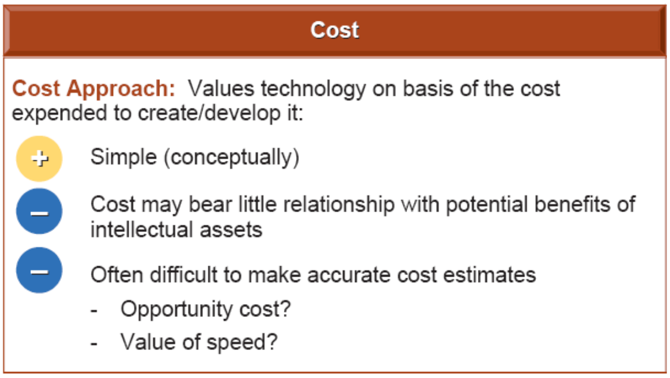


Fig 4 Cost approach.

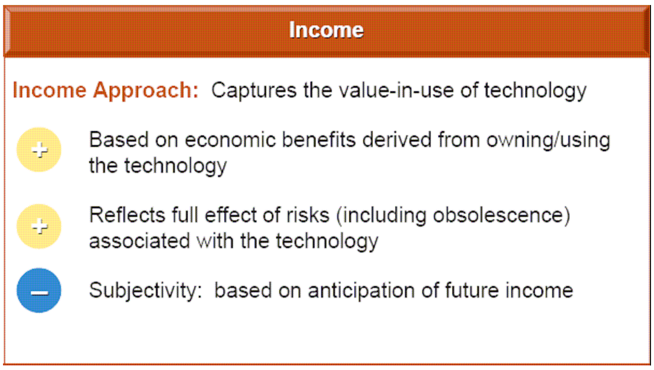


Fig 5 Income approach

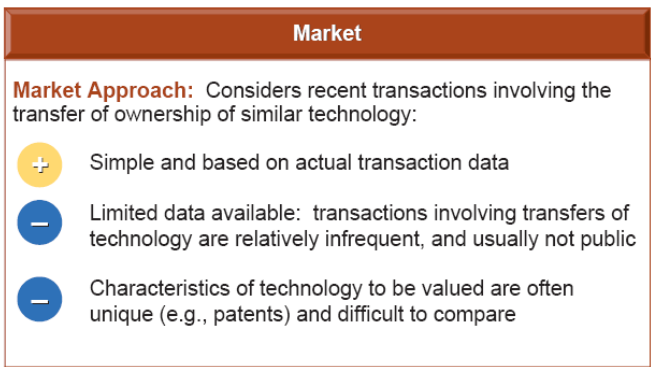


Fig 6 Market approach

In most cases, income approach is generally accepted method since we are more interested in the future of the firm. Although market approach is regarded as an objective approach, this method can only be validated when the firm is listed in the stock market. Cost approach is used when the firm goes into liquidation.

When performing income approach, various types of model are available but traditional NPV (Net Present Value) theory based upon DCF method is still widely used in practice, although decision tree or real option is getting growing attraction for the investment in such as bio-, or IT-industries. The technology valuation based upon income approach can be performed as follows:

Technology Value = NPV x Technology Factor

Where, Technology Factor = Industrial factor × Technology rating

Industrial factor : Maximum contribution ratio of technology asset for commercially viable enterprise values in certain industrial sector

Technology rating : Relative impact factor of a certain technology in business

The Technology Factor is also expressed as follows:

Technology Factor = Contribution Ratio of Technology

× Technology Completion Coefficient

In above equation, the Contribution Ratio of Technology is derived from portion of technology assets in whole assets (i.e., market, and human resources and technology assets etc). The calculation flow for the technology valuation and valuation history are seen in following figures respectively.

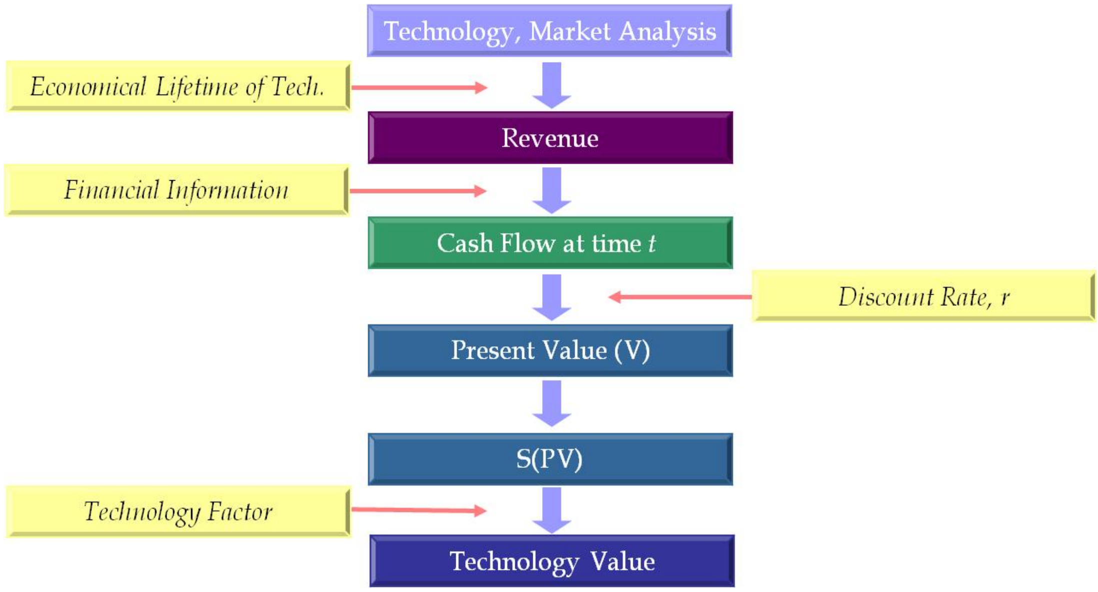


Fig 7 Flow of technology valuation

In practice of technology valuation, how valuable a technology is in the marketplace is a complex question. The evaluation process includes a commercial analysis, the inventor's profile, the propriety position, what stage of development the technology is in and a financial analysis. Specific areas of analysis that must be covered before a technology can be given a value in the market place are:

Defining the product

Assessing its perceived industrial value

Identifying the end user

Determining the size of the market

Identifying the competitive edge or uniqueness the technology or invention will have in the market place

Evaluating how mature the market is

Knowing what regulatory or liability considerations exist

Assessing prospective licensees

Determining the length of the product cycle

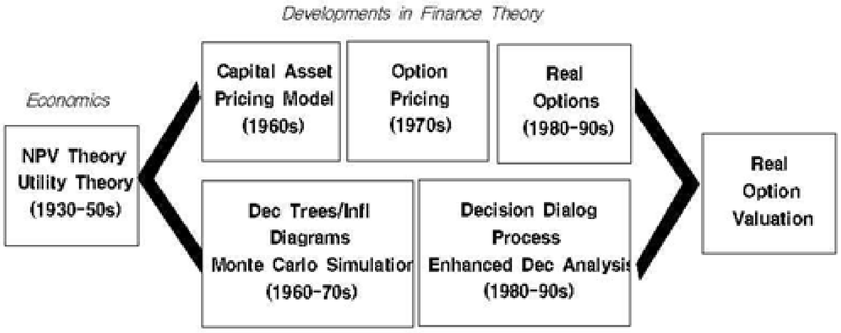


Fig 8 History of valuation

Technology valuation usually obtained by the product of the firm value by the ratio technology asset. Therefore, the isolation process of factors comprising technology asset is important. Considering the asset of the firm is categorised into tangible and intangible assets. The amount of intangible asset can be calculated easily. Then the degree of contribution by technology asset can be obtained by calculating degree of technology asset proportion in intangible asset. The general idea of assets comprising the firm is shown in table in below.

Although technology valuation is useful to assess the business feasibility of technology, it is true this method has inherently ad-hoc property. Since this method is focused on specific time spot rather than time period, this method is essentially lack of business risk consideration.

Table 1 Intangible assets

Asset	Tangible Asset		Current Assets, Investment Assets, Fixed Assets
	Intangible Asset	Intellectual property	Industrial Property Inventions (Patents) Trademarks Industrial Designs Geographic Indications Copyright and Related Rights Copyright Rights Related to Copyright Collective Management of Copyright

		Market asset	Loyalty corporate Image brand name value Customer relationships
		Human asset (resources)	CEO, Organization Structure, Decision Making Process

In the aspect of SME funding to promote sustainable growth, predicting business risk (or uncertainty) is more important than predicting future cash flow. For this reason, scoring model has been widely used. Briefly, scoring model uses a number of evaluation factors and makes evaluator subjectively rate score for each factor. Then the overall score of the technology is computed by addition or multiplication of individual scores (Souder, 1972). The main reason for popularity of scoring model is due to its simplicity and robustness. However, scoring model is subject to critical drawbacks. First, score itself never tells the real meaning of value. It merely indicates the relative preference among alternatives. Second, the relationship between various factors is ignored. It assumes that they are mutually independent and treats them separately in scoring. Frequently, there are certain degrees of correlation between the evaluation attributes and it may cause misleading results.

Nonetheless, scoring method has been a popular choice for many institutes due to its simplicity. In general, an expert committee is formed to assess the score of the technology owned firm in terms of several aspects: ability of management, level of technology, marketability of technology, technology potential and profitability. This again requires scoring of individual attributes of each factor. The evaluation of each attribute considers not only the characteristics of the technology itself but also the characteristics of an owner (e.g. company or research institute) etc. In Korea, it has been found that the bankruptcy or default rate of the companies, which got warranty by this kind of scoring method, has been well predicted by the recently established system. Subsequently, multicollinearity among many attributes was questioned and the demand of revised version of technology evaluation model was apparent.

A technology scoring model typically tries to examine the firms which have the ownership of the technology with many individual attributes. The attributes for the evaluation include not only the characteristics of the technology itself but also the characteristics of an owner (e.g. company or research institute) in terms of the ability of management, level of technology, marketability of technology, technology profitability (or potential). The following figure depicts the differences between technology scoring (rating) and technology valuation.

Rating (Feasibility)	Valuation
• Qualitative	• Quantitative
• vs. Credit Rating	• vs. Corporate Valuation
• Self-Commercialisaition	• Technology Transfer
• Financing Method : Loan	• Financing Method : Investment
• Focused on Sustainability	• Focused on Profitability
• Government Projects etc	• M&A, Licensing etc

Fig 9 Technology Evaluation Methodologies

Criteria for the technology assessment

Recently, the detailed research on the assessment of new technology in UK was reported (Coster, 2003) and the part of this article is introduced as follows: Assessment of new technology reported in the research literature includes assessment of new technology ventures and new technology projects for new product development. The research identifies two approaches to assessment. The process-based approach (Khurana and Rosenthal, 1998) employs established procedures, e.g. for assessing project proposals based on new product development. In contrast, a culturally based approach (Cooper and Kleinschmidt, 1997) is one where there is no formal methodology that all projects are assessed against—assessment is based on the assessor’s experiences both individually and collectively.

The research literature relating to the assessment of new technology ventures identifies the different approaches taken by the main parties active in this area— business angels and venture capitalists. Business angels come from diverse backgrounds ranging from former entrepreneurs to finance specialists (Prowse, 1998). They are inclined to target the less risky proposals compared to those favoured by venture capitalists (Mason and Harrison, 2002) and their assessment focus reflects this. They focus less on assessment of market risk than venture capitalists (Fiet, 1995), and focus more on assessment of the entrepreneurs—their methods also vary in that they use more informal networks than venture capitalists.

Venture capitalists (VCs) use a culturally based approach to achieve a holistic appraisal during their involvement in the early stages of new technology ventures. In contrast, approaches based on decision models (e.g. by actuaries or universities) are essentially process-based to achieve a holistic appraisal in their assessment of new technology ventures.

The benefits for a VC of using a culturally based approach to their assessment of new technology ventures (rather than a formalised process or decision model) are that they are free to adapt to individual circumstances. This suits their mode of operation, as they are often in close contact with many of the different players in a given sector. This may be advantageous although potentially risky in a newly evolving market situation.

It is also a speedier approach to assessment with times of 12 min reported (Sandberg and Hofberg, 1987; Shepherd et al., 2000). Speed is an important criterion to venture capitalists who need to make a quick initial screening of the hundreds of proposals that they receive. From this they select those worthy of further scrutiny, typically less than 1% of the total. Previous studies have shown that decision models can also be successfully used in the initial screening stage (Zacharakis and Meyer, 2000).

The disadvantage of a culturally based approach that has been reported (Zacharakis and Shepherd, 2001) is that of overconfidence. This research into venture capitalists' decision-making highlighted the fact that they make decisions without obtaining additional information to check areas of concern. The use of decision models by venture capitalists is reported to be rare (Zacharakis and Meyer, 2000). However, the mode of operation of venture capitalists (which is based on their closeness to a given marketplace) can be improved by the use of decision models (Shepherd and Zacharakis, 2002).

The assessment of new technology is based on identifying key criteria for analysing high technology ventures presented to banks in the first instance. The order of the criteria given below is one considered appropriate to the nature of this task. VCs would be likely to choose and order that which achieves rapid elimination.

High technology ventures are inherently riskier than other business ventures as they are likely to involve technological and product developments. Research has shown that this risk is increased when innovation involves both technological innovations and market innovations, such that the product capabilities are new to the market (Veryzer, 1998). The promotion of products to the market is also affected by the complexity of a product (Ahearne et al., 2000; Kim and Wilemon, 2003).

Technological uncertainty is recognised in the research literature (McDermott and Connor, 2002) as one of the four dimensions of radical innovation (the others being technical inexperience, business inexperience and technology cost). The product risk increases with the greater number of functions or technologies (Kim and Wilemon, 2003) so the level of complexity of the proposed product requires assessing. In the cases where there is no prototype to assess, there is a need to focus on whether a company can develop its area of competence by developing products with a high market distinction

(Tatikonda and Rosenthal, 2000; Kim and Wilemon, 2003).

The technological and commercial risk in developing and promoting the proposed products or services is one of the criteria used in the assessment method as shown in Table in below

Table 2 Technological and commercial risk

Criteria	Questions to rate criteria
Will it work? How well?	Does a prototype exist? Has it been tested and by whom? What is the nature of the prototype? To prove principles/bench prototype Pre-production single unit Pre-production batch Has it been evaluated by a (or more than one) potential customer? Has any value engineering carried out? Has it been tested in the environment where it will be used? Have the details of manufacturing been worked out? Does this development depend on any key product or service outside your control? If no prototype: What evidence is offered that product will work effectively? (Drawings, theoretical analysis, computer simulation) What IPR exists or could exist?

Many of the business plans that have been assessed are from entrepreneurs who are frequently overly optimistic about their business proposal and have a tendency to underestimate competitors' capabilities. Research shows that this is an important area with reports that ''firm competitive strategies were direct predictors of venture growth'' (Baum et al., 2001) along with a CEO's specific competencies and motivations.

Products can be technically successful but fail in terms of business performance due to a lack of competitive advantage—there needs to be sufficient ''meaningful product uniqueness'' (Stevens et al., 1999). The term ''meaningful'' refers to an identifiable market requirement for the product (not just an interest by the technology developer). The level of product innovation is one of the criteria used in the assessment method as shown in the following Table.

Table 3 Level of product innovation

Criteria	Questions to rate criteria
Is it better than the alternatives, if any? The unique selling proposition (USP)	What are the nearest competitive products and who produces them? The unique selling proposition (USP) (Large/small companies, imports, well established dominant supplier) What is your USP (unique selling proposition)? (Single most important advanced improvement) What are your competitive advantages? (Cost, function, size, appearance, range of application . . .)

The importance of the potential size of the market as a criteria for affecting the business performance of technology innovation is well recognised (Rosenkranz, 2003). The market characteristics that improve the chance of success of new product developments include a fast growing market (Zirger and Maidique, 1990 in Loch, 2000).

For high technology products the criteria that are important to customers in their buying decisions can change during the product life cycle (Waarts et al., 2002). This life cycle is referred to as the adoption life cycle. How the proposed products or services will satisfy the market is one of the criteria used in the assessment method as shown in Table.

Table 4 Market criteria—how it satisfies a market sector

Criteria	Questions to rate criteria
How does it satisfy a sector of the market?	What problem does it solve? What does the target market sector use at present? Why will they change to your solution? Will your customer have to rely on you? (What risk to the customer if your product fails to meet his needs)

The market opportunities for a high technology venture are dependent on various market characteristics. Research in Australia of the criteria used to assess breakthrough products has been reported (Shepherd et al., 2000):

. Competitive rivalry;

. Timing of entry;

. Lead time;

. Key success factor stability.

Predictions of market forecasts are not easy to establish. The difficulty of predicting the market opportunity is due partly to being unable to conduct market research to assess customers' reaction. Further, the development of complementary technologies is yet to occur and these will affect the market reaction (Rosenberg, 1994; Deszca et al., 1999). Timeliness is one of the market criteria used in the assessment method as shown in Table 5.

Table 5 Market criteria—Timeliness

Criteria	Questions to rate criteria
Timeliness?	Has there been a recent change or new development which makes the product attractive to users? (powerful PCs, new chips, Internet developments, associated products, government legislation, EU directives, industry standards or trends etc.) Is the market ready for the product? (Could it be premature or too late?) Could the product become obsolete? (What timescale?) Can you launch the product quickly enough to catch the market?

The potential for re-using technological and product developments is of importance to high technology start-ups. A high technology venture has to put more resources into developing products than most other ventures. To maximise the returns on this investment it is desirable to have a product that will lead to repeat purchases (rather than a one-off purchase).

A similar aspect is the usable lifetime of the product. This is dependent on the nature of the product, e.g. a fashion product may only be acceptable to the market for a short period of time. In contrast, a product that provides a basic function is likely to have a long lifetime (e.g. providing a basic function such as lighting). These aspects are one of the criteria used in the assessment method as shown in Table 6.

Table 6 Product extensions—longevity/repeat orders

Criteria	Questions to rate criteria
Longevity/repeat orders?	What is the usable lifetime of the product? Will there be repeat business? (Replacement, servicing?) Is there a fashion or fad element?

Once a new venture has won customers then there is the opportunity to sell related products. For example, a customer may have requirements for a product of similar functionality but a different capacity—either larger or smaller. It is easier and less costly to sell additional products to these existing customers rather than trying to win new customers. How the proposed products or services will fit into a family of products in the market is one of the criteria used in the assessment method as shown in Table 7.

Table 7 Product extensions—family of products

Criteria	Questions to rate criteria
Does it fit into a future family of products?	Is there enough potential business for this product alone? (Saturation, marketing problems) If a single product company is proposed, is it reasonable to build a business on one product? (Distributors may not open an account for one low cost product.) What is the potential for added value to this product line? (Accessories, larger/smaller units, lightweight/ heavy duty . . .)

An entrepreneur's background has been established as very important in the literature (Jo and Lee, 1996) along with their strategic focus and the strategic direction that they bring to a new venture (Bantel, 1998; Daily et al., 2002). Studies into the extent of business planning in small firms indicate that many small firms do not prepare written plans for the various functions (Perry, 2001). This is part of the difficulty in trying to appraise the business and management capabilities of a technology venture. For this reason the past record of the people in the venture is used as the basis for assessing the competence of personnel.

Studies into the criteria assessed by venture capitalists (Shepherd et al., 2000) have identified two aspects relating to entrepreneurial background:

. Educational capability;

. Industry-related competence.

Research has shown that start-ups with key staff having attributes of creativity and inventiveness need also to be working to business disciplines (Stevens et al., 1999). The entrepreneurial background is one of the criteria used in the assessment method as shown in Table 8.

Table 8 Entrepreneurial background

Criteria	Questions to rate criteria
Previous record of technical innovation?	Any previous successful products? Previous experience of manufacturing? R&D? Design? Marketing? Quality assurance? What areas of required functional expertise are not represented amongst the applicants?

How the proposed products or services will be protected in the market by means of patents is one of the criteria used in the assessment method as shown in Table 9.

Table 9 Protecting competitive advantage

Criteria	Questions to rate criteria
Do you have any patents, registered designs or any other form of protection?	Did you employ a patent agent or other professional assistance? If the patent is provisional, when do you have to decide to pursue the application? What coverage has been sought? Barriers to entry to the market can be mentioned in this section.

To improve the reproducibility of the assessment method a scoring method has been developed. The benefits of using this approach are that the assessments are more objective and there is less reliance on the individuals undertaking the assessment.

In order to attach a realistic assessment to each criteria, a word description is employed. The best fit determines the number, intermediate numbers being used as necessary. The scales were developed by identifying the two endpoints, i.e. the least credible position of an early stage venture (for a score of 1) and the best conceivable (for a score of 10). The scale for the midpoint (a score of 5) was set to represent the median state of a new technology venture when seeking funding. The scoring system relating to these criteria is given below.

Criteria 1: Technological and commercial risk

Aim: to assess will it work?

1. Idea only, little evidence of practicality or manufacturability.

3. Prototype exists—principles established—internal evaluation only.

5. Manufacturing preparations well advanced, but no customers yet.

7. Recently launched—early reports from customers good.

10. Established product, satisfied customers, good order book.

Criteria 2: Level of product innovation

Aim: to assess the Unique selling proposition, USP

1. No innovation—other factors contribute to viability.

3. Some distinct, probably minor, improvements over existing products.

5. Innovative but could be difficult to convert customers.

7. Obviously innovative and easily appreciated advantages to customer.

10. Very innovative satisfies a well-known market need.

Criteria 3: Market criteria—how it satisfies a market sector

Aim: to assess how it satisfies a market sector?

1. No specific market sector has yet been identified.

3. Preliminary investigations indicate that there is potential customer base but quantification is not yet possible.

5. The market sector can be defined in general terms. There is limited feedback from customers, which is encouraging.

7. There is a clear market demand and it is possible to demonstrate that some customers will be satisfied with the product (prototypes/test marketing).

10. There is a strong demand from a well-defined sector of the market. The product can be demonstrated to meet the requirements of customers fully.

Criteria 4: Market criteria—timeliness

Aim: to assess the market timeliness

1. (a) The product anticipates a demand but customers are not yet buying such products since they are not aware of availability or benefits.

   (b) The market is already supplied with many products of the type proposed and shows signs of saturation or decline.

3. (a) Some customers are seeking and purchasing such products, but an expanding customer base is not yet proven (highly specialised interest area at present).

   (b) There are alternative established products and establishing a new product may be difficult. Not strongly differentiated from existing products.

5. There is some discernible activity in the area of the innovation indicating potential but the evidence is not yet firm.

7. There is definite growth in the area of the innovation which will support establishment of a new product.

10. Recent developments/innovations which support the product show strong growth curves. The product fits closely in this scenario and would be expected to benefit from this growth.

Criteria 5: Product extensions—longevity/repeat orders

Aim: to assess whether it fits into a family of products to permit company establishment/development?

1. Product is a single member of what would normally be regarded as a product group—e.g. special drawing instrument, office product, injection moulded product. Would need complementary products to gain a foothold in the market, but not viable as a single item.

5. Viability as a single product is questionable. Difficult to see how modest profits could lead to successful business growth (‘living dead scenario’).

10. A viable business may be built on a single product initially. Further added value or complementary items are clearly identifiable for future growth. Other members of the product family exist.

Criteria 6: Product extensions—family of products

Aim: to assess the Longevity of product or product line?

1. Only one purchase per customer likely for the product. Could be a fashion or a fad for a limited time period.

5. The market for the product exists but not necessarily firm. Demand may be variable. Success depends on whether this market becomes more stable.

10. Similar products satisfying this market sector have been established for a period of years and will definitely be required for the foreseeable future. Once established the product may lead to repeat purchases.

Criteria 7: Entrepreneurial background

Aim: to assess the previous record of technical innovation

1. No previous successful product. Background of applicant(s) does not provide confidence that their knowledge is state-of-the-art.

5. Some evidence of successful innovation. but not necessarily a financial success. Applicant(s) provide some confidence that technical expertise exists.

10. Strong record of innovation from more than one product—as business venture or as part of a larger organisation (spin-off). Applicant(s) very knowledgeable about the area of development.

Criteria 8: Protecting competitive advantage

Aim: to assess the Intellectual property rights

1. No patent possible. None proposed. Unpatentable.

3. Provisional patent only. Patent possible (unpublished).

5. Full patents applied for but not yet granted. Coverage in appropriate market areas.

7. Apparently strong patent position although could be contested by identifiable major player.

10. Full patents granted with good coverage. Possible successful prosecutions for infringement.

Not all the criteria are considered to be of equal importance or independent of one another. Weightings were assigned to each of the criteria to reflect the levels of importance as shown in Table 10.

Table 10 Weightings applied to assessment criteria

Criteria	Weighting for criteria
Criteria 1: Technological and commercial risk	x3
Criteria 2: Level of product innovation	x2
Criteria 3: Market criteria—how it satisfies a market sector	x1
Criteria 4: Market criteria—timeliness	x1
Criteria 5: Product extensions—longevity/repeat orders	x0.5
Criteria 6: Product extensions—family of products	x0.5
Criteria 7: Entrepreneurial background	x1
Criteria 8: Protecting competitive advantage	x1

It should be noted that this assessment process shown above has a strong focus on technical issues rather than financial factors or the personal qualities of the management team. This is because the technical appraisal (evaluation) reports are intended for investors who already have extensive knowledge and experience in these other areas. But, if this report is intended for various type of users at the same time, financial factors can also be strongly focused.

The determination process of criteria and their weighting factors for criteria may vary. To obtain these criteria, the BSC (Balanced Scorecard) or Delphi methods have been widely adopted. Kaplan and Norton (1996) suggested the BSC that gives corporate managers strategic and corporative vision as the substitution for the conventional finance measurements.

Among non-financial measurement criteria, customer satisfaction, internal business process, and organizational innovation are included in the Balanced Scorecard. But, comparing the actual performance results seems to be difficult, when we use these non-financial measurements. Thus, we suggest general criteria for each measurement index based on the BSC, then induce the aggregated measurement criteria by calculating the priority weight of each index. The Analytic Hierarchy Process (AHP) method is used to calculate the priority weights. This AHP has recently been attracting more attention in building BSC more effectively.

Experiences in Korea

In Korea, the scoring model based upon BSC and Delphi was initially implemented. This initial model was used by many public institute to select the firms which will benefit public funding or certification. After using this model for more than 5 years, the criticism has arisen on the effectiveness of the model.

It has been found that the many beneficiaries of this model appeared to fail in their business. The rate of failure seemed to be large than government initially intended. The demand for the re-design of the model had increased. As a result, several taskforce teams in the government were formed to tackle the problems. Although there has been unsolved argument yet, the main reasons which caused the problems were clarified. One of these is the discrepancy between the model and real world. The model is focused on strategy, technology level, impact on national economy and government philosophy etc. Unfortunately, these focuses are not always represents business success in certain amount of time period (which is usually 3 years in Korea). In other words, the model may only represent ultimate goal for the ideal firm which does not account time period, but this approach does not correspond to the real world. Since the model deals with the firm's (static) state rather than its (dynamic) path, it could not account for the characteristics of industry sector, growth stage and technology area etc. In addition, many private banking institutions are essentially indifferent to what the firm is doing. They are rather interested in the firms' stability based upon financial status, and transaction history etc., for which credit rating is traditionally employed. This discrepancy also put the policy makers as well as the SMEs in dilemma.

Therefore, it was suggested that the initial model needs to be restructured in accordance with the requirements described above. From this section, the experiences of technology evaluation system build-up in Korea will be explained. Korean government (especially Ministry of Finance & Economy/MOFE, Ministry of Commerce, Industry & Energy/MOCIE, and Small

& Medium Business Agency) have had a leading role in implementing technology evaluation system (TE) to be used for SMEs in Korea. The main purpose of this TE has been set to support the programmes or firms which are related to the technology commercialisation. The proposed demand of government-driven technology evaluation system in Korea is shown in next figure. The technology evaluation scheme facilitates variety of business like technology appraisal guarantee, loan on credit, M&A, technology transfer, direct investment and support on policy fund and so on.

Before explaining the implementation process, it should be noted that the ultimate goal include utilisation in private sector as well as public sector. With the strength of fairness, objectivity and reliability which is based upon the authority of government, the government seriously anticipate that this system (or policy) would be widely used in private sector as corporate credit analysis. Although technology evaluation is used initially for the government funded programmes, this system can be used as valuable information for investment, loan, technology transfer and consulting etc. Moreover, this system can be very forceful tool for overcoming information asymmetry problems facing most of countries, especially developing countries.

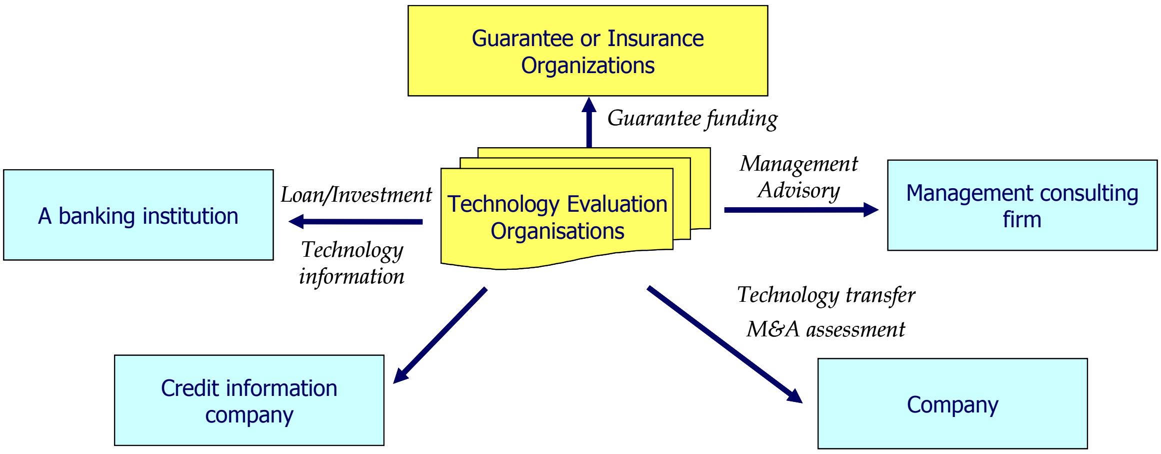


Fig 10 The estimated demand of technology evaluation in Korea

In Korea, the TE was initially employed by each governmental institution separately until late 1990s. Because of separate system operated by different institution, compatibility has been a major concern. From early 2000s, the necessity for the integrated system has been pointed out, which triggered action from the President’s Office in 2003. This action formed taskforce team out of MOFE, MOCIE, SMBA and governmental institutes, where the first effort of building nationwide integrated system was started.

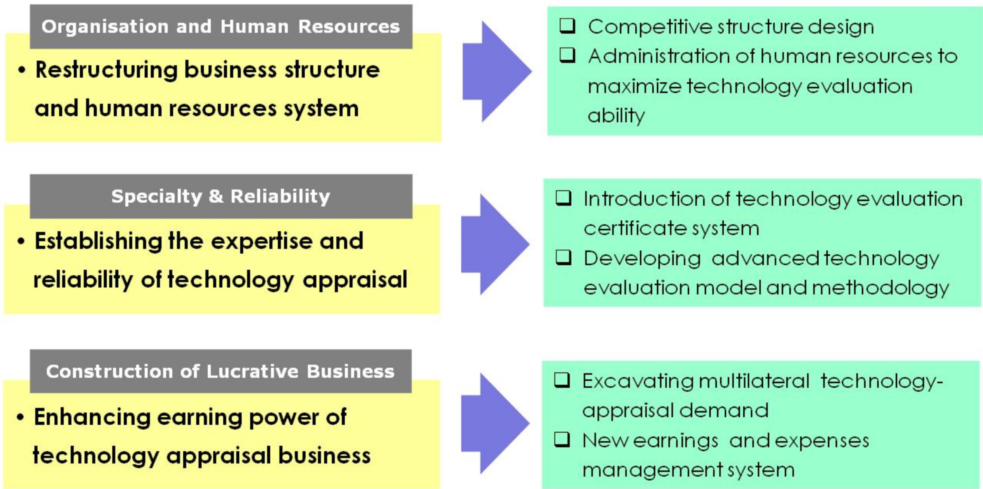


Fig 11 Main Directions of Restructuring "Technology Evaluation"

The main directions of the integrated technology evaluation system are shown in above figure. According to the figure, main directions can be summarized as follows. The first is setting up infrastructure for the programme. The technology evaluation requires high level of specialty in the field of technology itself (most of science and engineering area), market analysis, finance, accounting, intellectual property, law and other business related area. Therefore, the requirements for the human resources and the continuing education are highly demanding and crucial. The second is building up reliable technology evaluation model. The model is required to have reliability along with universality. These requirements apply to both evaluatee (the firm) and evaluator (government and bank etc). In order to meet these requirements, several attempts have been made, which will be explained in detail later. The last is establishing self-supporting business out of technology evaluation programme. By doing that, independency and thus authority of the evaluation can be guaranteed. All the three issues are cross-linked and should be considered simultaneously. For example, Korea is currently adopting "technology evaluation (appraisal) certificate" programme using the recently updated model. This programme is operated by Technology Appraisal Division in KIBO (non profit institute under the MOFE), which has almost 150 specialists in various field (PhD in Engineering, Certified Accountant and Patent Attorney etc). The following diagram shows flow of Technology Evaluation Certificate process.

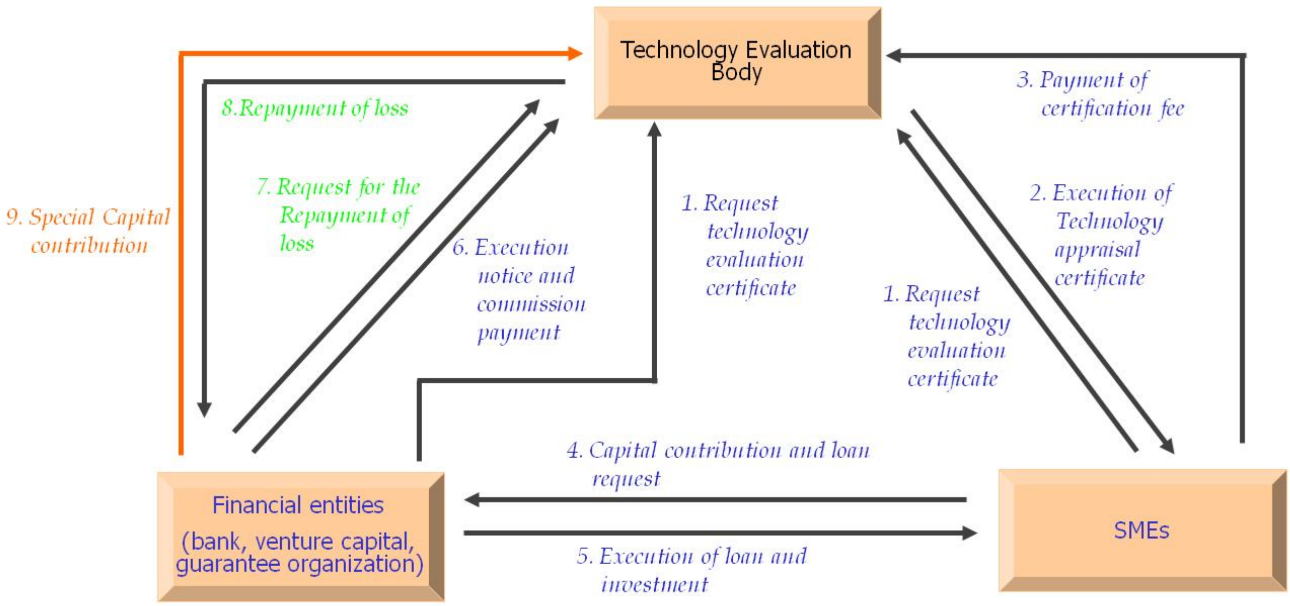


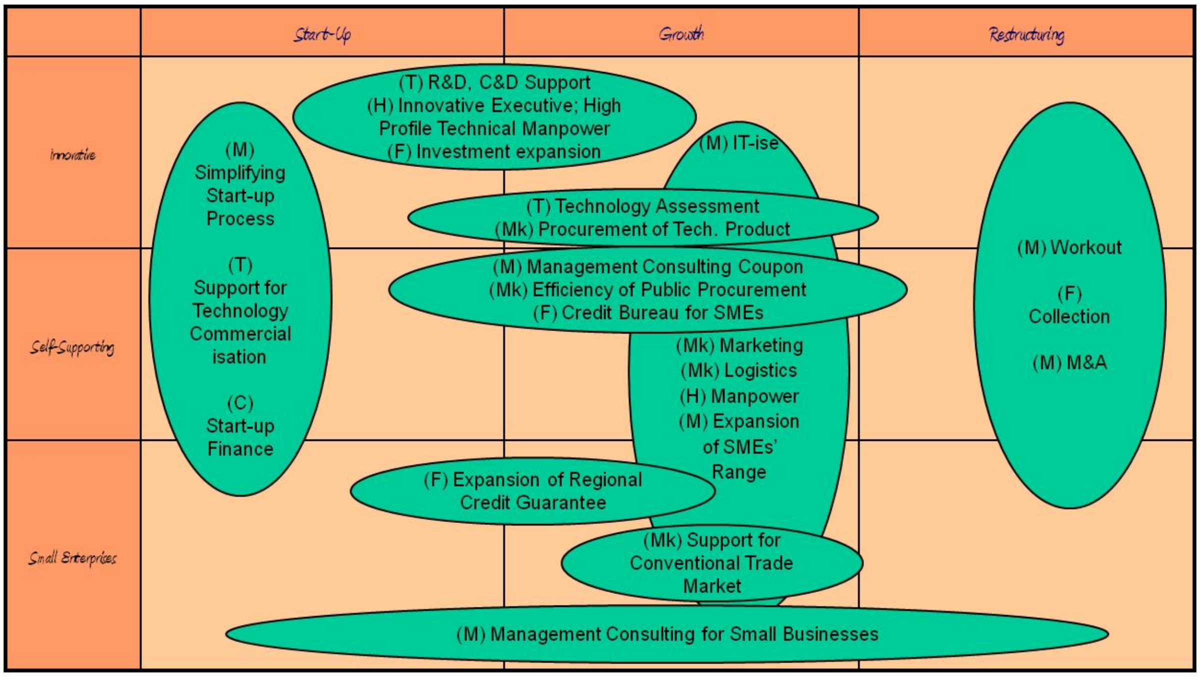
Fig 12 Flow of Technology Evaluation Certificate Process

(Evaluation Model)

In the respect of government, it is desirable to support the start-ups and venture enterprises with the focus of the prospective growth rather than past performance since they are more technology-oriented and more equipped with intangible assets than tangible assets. Therefore, the model needs to be focused in this respect.

It should be noted that the technology evaluation mentioned in this text is mainly for SMEs and/or start-ups. Since the technology evaluation (in Korea, “technology appraisal” often used in some organisations such as government institutes, which has same meaning as “technology evaluation” in this text) plays an important role for the public benefit by selecting the right enterprise to assist financially and technologically, this should insure the efficient distribution of the limited financial resources, and enhances the quality and efficiency of government policies/financial system for supporting promising SMEs and venture enterprises. Principally, high rating should be possible according to this system, even for early stage businesses in their early stages, if their technologies are original and competitive.

Since the main reason of technology evaluation scheme introduction is to enhance SMEs’ competitiveness, it is critical to set the overall direction and concept based upon criteria which help the competitiveness. The next figure shows countermeasure for enhancing SMEs’ competitiveness for various SME categories.



(T) Technology, (H) Human Resources, (Mk) Marketing, (F) Finance, (M) Business Infrastructure

Fig 13 Comprehensive countermeasure for enhancing SMEs' competitiveness

In Korea, the technology evaluation model used for business feasibility consideration had its basis on the BSC method. The original core criteria initially included in the model were based upon Technology, Marketability, Human Resources and Financial History. These criteria still apply to current model in broad spectrum. The next figures show the traditional core criteria and recent core criteria consisting the technology evaluation respectively.

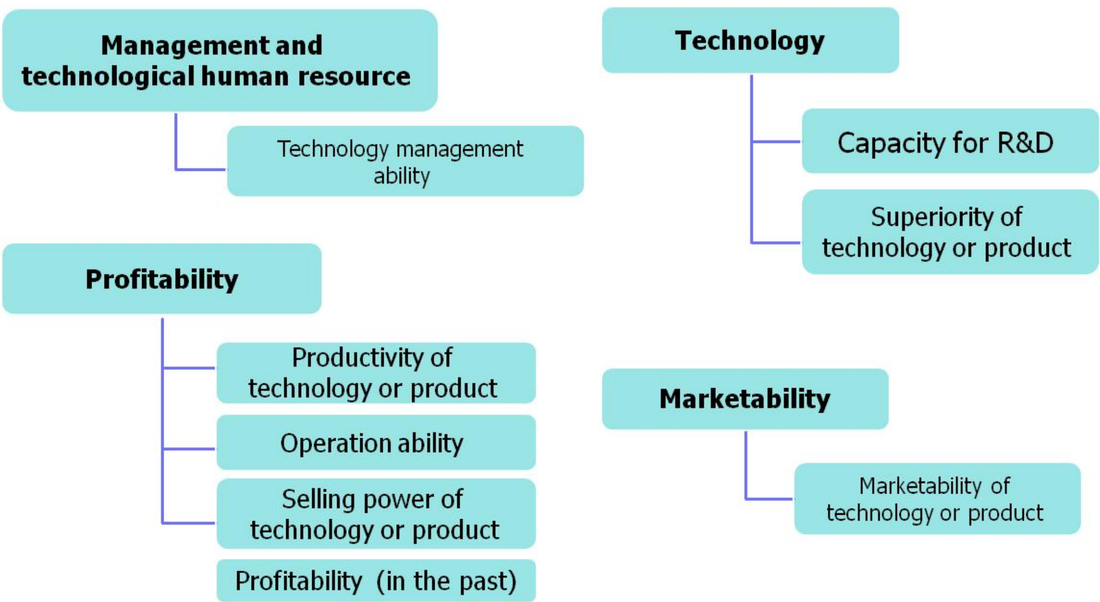


Fig 14 Core criteria of Technology evaluation (Technology grade)

Technology feasibility	Market feasibility	Business feasibility	Other business environment
• Outlines of technology • Domestic and foreign technology trends • Technology development environment • Technology level	• Market scale and characteristics • Present status of industry • Market needs	• Sales prospect • Price and quality competitiveness • Feasibility of business-forwarding	• Credit rating • Business capability of the management

Fig 15 Core criteria of recent Technology Evaluation Certificate System

The above mentioned criteria are largely attributed to the Oslo Manual by OECD, although many other ones are accumulated from Korea's own experiences of technology evaluation. Oslo Manual refers to the ability to determine the scale of innovation activities, the characteristics of innovation firms and the internal and systemic factors that can influence innovation is a prerequisite for the pursuit and analysis of policies aimed at fostering innovation. The Oslo Manual is the foremost international source of guidelines for the collection and use of data on innovation activities in industry. This third edition, published in October 2005, has been updated to take into account the progress made in understanding the innovation process and its economic impact, and the experience gained from recent rounds of innovation surveys in OECD member and non-member countries. For the first time, the Manual investigates the field of non-technological innovation and the linkages between different innovation types. It also includes an annex on the implementation of innovation surveys in developing countries.

Although there have been various derivatives, the most widely used criteria can be found in the technology rating (scoring) model used by KIBO (formerly KOTEC) in Korea from 1997 (model A) for the purpose of technology credit guarantee. In Korea, liquidity problem is a major setback for many companies with a great degree of growth potential in technology. In order to support such companies, technology credit guarantee fund has been established. A fidelity guarantee is given to the companies which obtained a high score by technology evaluation model so that they can get loan from the several financial institutes. However, critical loss had occurred with the model A, which in turn produced criticism on the model as an inadequate evaluation model and necessitate the model reconstruction. Finally, this model (model A) is reviewed and completely reconstructed in 2003-2005 (Model B), which will be shown later.

In the case of scoring model A, all of the attributes are measured in 5 or 10 point Likert scale by the experts committee as shown in Table in below. Those which are evaluated in 10 points scale are considered to be worth two times more than those in 5 points. The determination of weighting was done through so called Delphi process, which is simple but produced universality problems. There were also inter-relationship problems (multicollinearity) between KPIs, which are supposed to be independent with each other.

Table 11 Technology Evaluation Factors and Attributes used for a Scoring Model A

Factors (Criteria)	Abbrev	Attributes (KPI)	Score
Management	KMA	Knowledge management score	5
	TEPS	Technology experience score	5
	MAS	Management ability score	5
	FSS	Fund supply score	5
	HRS	Human resource score	5
Technology	ETDS	Environment of technology development score	5
	OTDS	Output of technology development score (e.g. patents, certifications)	5
	NTS	New technology score	5
	TSS	Technology superiority score	10
	TCS	Technology commercialization score	10
Marketability	MPS	Market Potential score	5
	MCS	Market characteristic score	5
	PCS	Product competitiveness score	10
Profitability	SPS	Sales schedule score	10
	BPS	Business progress score(new*)	5
	ASS	Amount of sales score(old+)	
	RIS	Return on investment score (new*)	5
	PFS	Profitability score(old+)	

* New: Less than 3year old companies, + Old: older than 3 years

In model A, the score is obtained as the simple sum of the scores of the sixteen attributes where two different attributes are used for the firms depending on the length of their history:

(BPS and RIS for new ones vs. ASS and PFS for older ones). As mentioned, one can easily suspect that there would be some problems associated with multicollinearity among these sixteen attributes.

To examine the older scoring model, the empirical results of 6057 cases of technology evaluation were analysed for scoring model A during 1997-2002. The data contains information of the companies which obtained the credit guarantee by technology evaluation model A. Among the 6057 companies, 150 (2.5%) went to bankrupt after 1 to 7 years. Although the bankruptcy rate in 2003 has been not published yet, it was predicted to be a lot higher. In the context of scoring model, it is very important not to pass those who would go bankrupt after getting the fund and this rate could be decreased by eliminating potential multicollinearity among the sixteen attributes.

The potential multicollinearity was examined first using the multiple regression analysis with VIF (Variance Inflation Factor) where each attribute is used as the dependent variable and the others are used as explanatory variables. The results are given in next table. As seen in the table, all variables except for BPS or ASS are associated with high VIF values and they may cause the multicollinearity with the others.

Table 12 Results of Multicollinearity Test

Attributes	KMA	TES	MAS	FSS	HRS	ETDS	OTDS	NTS
VIF	22.282	24.026	48.664	23.094	36.074	34.466	17.881	21.859
Attributes	TSS	PCS	MPS	MCS	PCS	SPS	BPS or ASS	RIS or PFS
VIF	46.215	37.403	29.261	31.315	47.744	35.589	6.991	41.881

Through the intensive review process, it had been validated that the existing scoring model in an effort to provide an improved version of technology evaluation model and suggested an adjusted technology evaluation score to eliminate the multicollinearity among the evaluation attributes based on the empirical study results of the existing one.

As a result, new scoring model based on independent factors was reconstructed. In addition, completely new approach for the reconstruction was employed after reviewing possible problems which could be engaged in intangible assets evaluation, i.e., technology evaluation as shown in the figure.

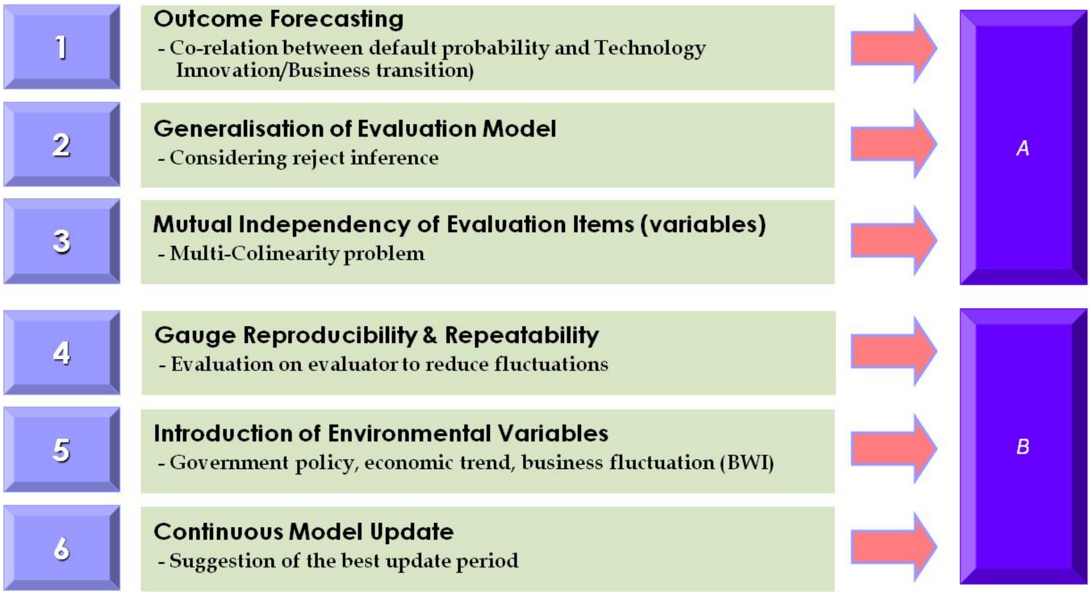


Fig 16 Problems in intangible assets evaluation

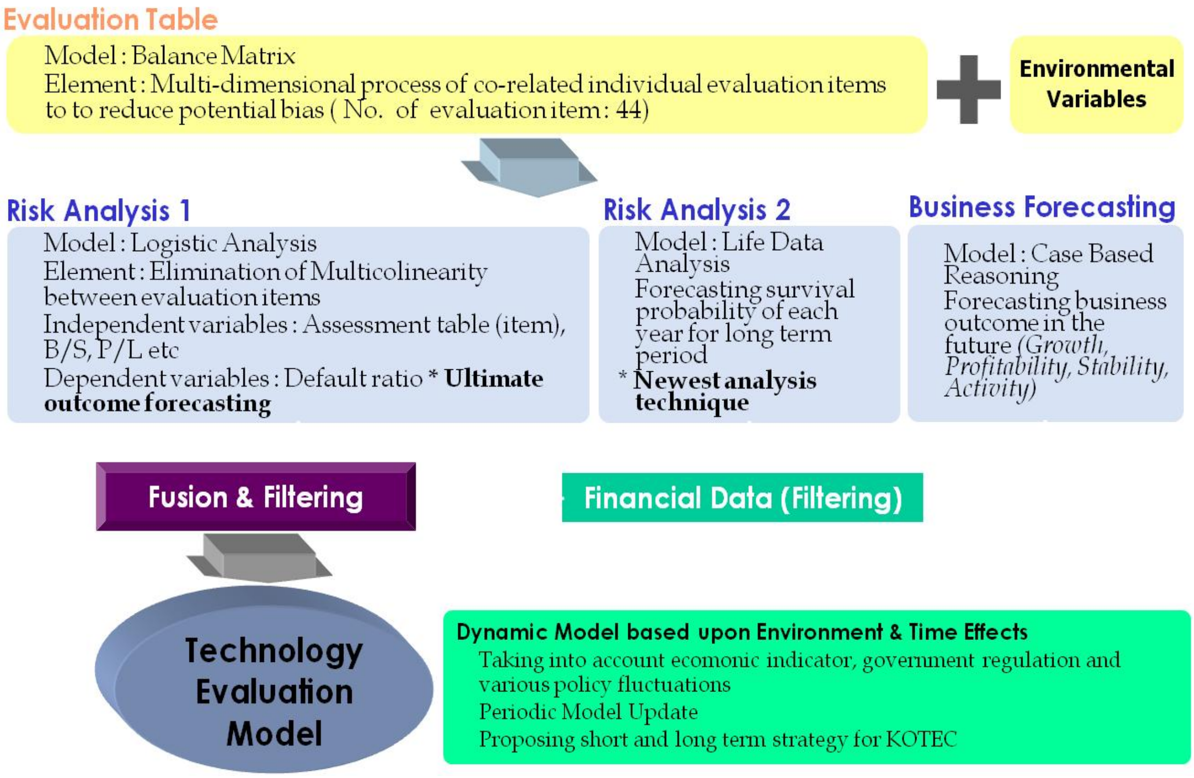


Fig 17 Techniques used in technology evaluation system construction

After considering such potential problems, various approaches to overcome had been suggested as shown in the figure. In order to receive general agreement of technology evaluation, different characters of various parties involved in the evaluation process should be considered. For example, bank is usually concerned about financial stability while the applicant (the firm) only cares the technology. In the similar manner, investors are concerned about future profit. Therefore, for the policy maker's point of view, the model needs to embrace not only technological impact but also sustainability and future growth potential.

Unfortunately, there had not been a unique model which could consider all the issues simultaneously. The major issues can be categorised into three sections. The first is originated from inside of the firm (internal issue). The second is originated from outside of the firm (environmental issue). The last is nothing to do with the formers, but related to the evaluator and model's inherent error. The internal issue could be subdivided into further, such as the default rate and/or survival duration (bank), and future business forecasting (investor). Different methods were employed to work on different issues. It should be pointed out that same criteria and KPIs were applied to different method, otherwise the model could be too complex to be used.

Concerning the internal issues, the logistic function was used for the analysis of default rate, and this method is hinted from the risk analysis of traditional corporate credit analysis. The estimation of survival duration was constructed from life data analysis. This technique is still very new techniques even in academia. The case based reasoning was employed to forecast future business prospect, and this method was often used for national policy evaluation model. For the technology level, AHP was employed. Consequently, internal issues can be summarised as combination of risk level and technology level.

Unlike internal issues, environmental issues nothing to do with companies. It is rather related to the economical or industry status. Environmental variable can be extracted from various indices related to economy and can be updated regularly. In addition, KPIs consisting of the model can be structured as multi-dimensional matrices. In such way, evaluator's error or unwanted exaggeration caused by certain KPI can be diminished.

Based upon above process, new technology evaluation model was developed and reconstructed. Once this basic model fixed, the simpler derivatives can be extracted when the handy evaluation process is more appropriate. Next figure shows examples of technology evaluation structure currently used in KIBO in Korea. Corresponding to the object technology, KIBO uses 3 levels of appraisal (evaluation) models, High, Middle, Basic. This structure applies to all industry section and technology field except for Culture technology which has completely different model. However, the various criteria and KPI table version (input variable for the model) often to be prepared for the different technology area or industry section. In the case of KIBO, 6 different tables are used (Manufacturing, Software, Online business, Bio technology, Environmental technology, Design)

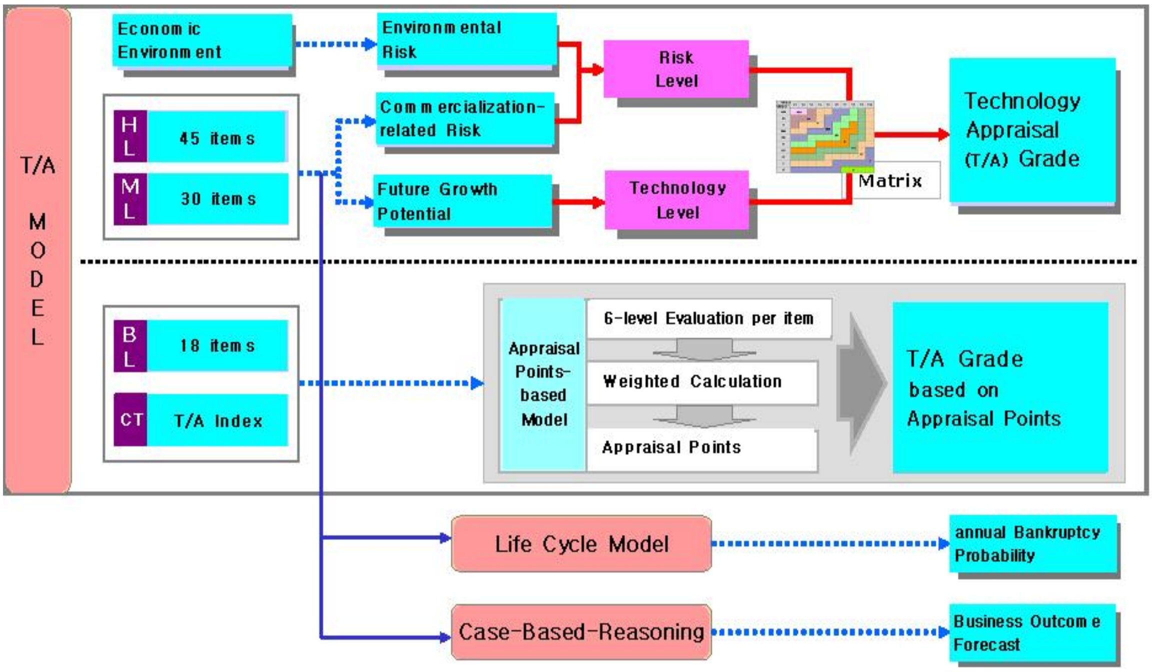


Fig 18 Structure of Model Technology Rating System

When compared to the previous model, the new model showed an outstanding decrease in default rates, enhancing KIBO's managerial soundness. This enabled KIBO to be awarded the Grand Prize of Korean Innovation Management 2006. This soundness also heightened the utilization of Technology Appraisal Certificates. During the year of 2006, a total of 404 certificates were issued and The number of loans related with these certificates were 217 and the amount 129 billion Won (approximately 150 mil USD).

Table 13 Achievement of Technology Evaluation System (Example)

(Unit: Cases, 100 Million Won)

Comparison on 3-year Default Rate	Cases			Amounts		
	Total	Default	Default Rate	Total	Default	Default Rate
KTRS	3,889	9	0.23%	17,853	24	0.13%
Former Model	1,456	29	1.99%	4,741	88	1.86%

Awarded "Grand Prize of Korean Innovation Management 2006"

The above table clearly demonstrate the importance of technology evaluation in technology financing. Technology financing can be defined as all kinds of financial activities including guarantees, investments and loan-lending which are accompanied by a series of technology innovation processes like R&D and commercialisation. Technology financing is thought to play a role of bridge which connects both ends of so called Death Valley. The estimated technology evaluation process in combination with technology financing is shown in the next figure.

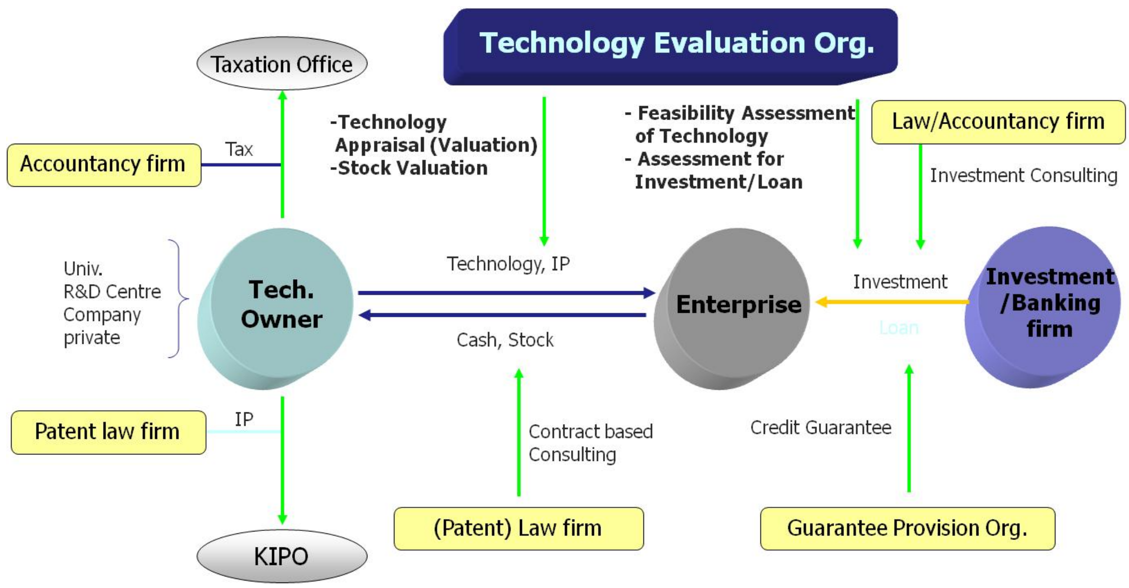


Fig 19 Technology (IP) evaluation and financing processes

6. Technology Evaluation (TE) Systems

6.1. Precursors for embedding TE

In order to implement technology evaluation system successfully, there are various pre-requisite to be satisfied. Most of all, willingness of government to implement such system is important. The embedding process of the system requires consensus among the different interest groups. It is essential that they mutually need such system. Such demand can be increased spontaneously or intentionally by government. Government might need to solve the conflict between the interest groups. Even after forming such consensus, sufficient human resources to be devoted to such job should be found.

It should be reminded that the candidate system and related policies need to be in harmony with practical status. This applies not only TE related policies but also all the other policy making. Since TE system essentially can be regarded as regulation or guideline for the evaluator, the new system also needs to be in accord with or embrace previous system if any. The following table which made in UK can be useful general guidelines for making new system.

Measuring Regulations Against the Five Principles of Good Regulation (UK)

TRANSPARENCY

• The case for a regulation should be clearly made and the purpose clearly communicated
• Proper consultation should take place before creating and implementing a regulation
• Penalties for non-compliance should be clearly spelt out
• Regulations should be simple and clear and come with guidance in plain English

Those being regulated should be made aware of their obligations and given support and time to comply by the enforcing of authorities with examples of methods of compliance

ACCOUNTABILITY

• Regulators and enforcers should be clearly accountable to government and citizens and to parliaments and assemblies
• Those being regulated must understand their responsibility for their actions
• There should be a well-publicised, accessible, fair and efficient appeals procedure

Enforcers should be given the powers to be effective but fair

PROPORTIONALITY

• Any enforcement action (i.e. inspection, sanctions etc.) should be in proportion to the risk, with penalties proportionate to the harm done
• Compliance should be affordable to those regulated-regulators should 'think small first'

Alternatives to state regulation should be fully considered, as they might be more effective and cheaper to apply

CONSISTENCY

• New regulations should be consistent with existing regulations
• Departmental regulators should be consistent with each other
• Enforcement agencies should apply regulations consistently across the country
• Regulations should be compatible with international trade rules, EC law and competition policy

EC Directives, once agreed, should be consistently applied across the Union and transposed without 'gold-plating'.

TARGETING

• Regulations should be aimed at the problem and avoid a scattergun approach
• Where possible, a goals-based approach should be used, with enforcers and those being regulated given flexibility in deciding how best to achieve clear, unambiguous targets
• Regulations should be reviewed from time to time to test whether they are still necessary and effective. If not, they should be modified or eliminated
• Where regulation disproportionately affects small businesses, the state should consider support options for those who are disadvantaged, including direct compensation

Source: extracted from Principles of Good Regulation published by the UK Better Regulation Task Force.

6.2. Required Resources (Standardization and reliability)

Standardization is crucial for the successful implementation of technology evaluation system, since it is closely connected to diversity, simplicity and universality and thus reliability. Most of all, the necessity of the introduction of technology field, industry classification and SME or/and start-up categories should be reminded. Without this process, the effort to understand major driving forces and hurdles for technology-based business to create value-added cannot be performed systematically.

The standard can be different based upon each county's situation. In the case of Korea, Start-up category refers the firm within 3 years after establishment (This category has been changed to 5 years in 2006). SMEs are divided into medium enterprises and small enterprises according to the number of constant workers and the volume of capital and sale. (General Criteria (Article 2 of Framework Act on SMEs and Article 3 of Enforcement Decree of the Act)

Table 14 SME criteria in Korea

Sector	SMEs		Small Business	Micro-enterprises
	No. of Workers	Capital & Sales	No. of Workers	
Manufacturing	Less than 300	Capital worth $8M or less	Less than 50	Less than 10
Mining, construction and transportation	Less than 300	Capital worth $8M or less	Less than 50	Less than 10
Large general retail stores, hotel, recreational condominium operation, communications, information processing and other computer-related industries, engineering service, hospital and broadcasting	Less than 300	Sales worth $30M or less	Less than 10	Less than 5

Seed and seedling production, fishing, electrical, gas and waterworks, medical and orthopaedic products, wholesales, fuel and related products wholesales, mail order sale, door-to-door sale, tour agency, warehouses and transportation-related service, professional, science and technology service, business support service, movie, amusement and them park operation	Less than 200	Sales worth $20M or less	Less than 10	Less than 5
Wholesale and product intermediation, machinery equipment rent for industrial use, R&D for natural science, public performance, news provision, botanical garden, zoo and natural parks, waste water treatment, waste disposal and cleaning related service	Less than 100	Sales $10M or less	Less than 10	Less than 5
Other sectors		Sales worth $5M or less	Less than 10	Less than 5

* For micro-enterprises, Article 2 of the Act of Special Measures on Assisting Small Business and Micro-enterprises shall apply.

For many countries, the standards for the industry sector and SME criteria are already set. But, it should be noted that there are not many developing counties which have a nationwide standard or compatible for technology field. It is true that different KPIs or sometimes even different TE system might be required for the different technology field, since it is natural that no one would think that the attribute of BT is identical to IT.

7. Policy Matters

The technology evaluation system is not solely related to policy making process, since it is closely linked with financing and SME policies. In other words, TE related policies should be considered after setting up the other policies such as financing. For example, depending on the direction of financing policies, the matching evaluation system can be greatly differs.

In spite of this situation, the policy makers are supposed to have basic knowledge on followings to facilitate the TE setup process when it is necessary:

- Understand the role of “technology evaluation” for “technology financing”
- Understand the necessity of technology and industry classification
- Understand major driving forces and hurdles for technology-based business to create value-added in each technology area and industry sector
- Understand required resources to implement each type of “technology evaluation”
- Learn how these systems are applied in various areas (such as investment, loan, technology transfer, corporate analysis etc)
- Understand “technology” as an intangible assets in corporate
- Understanding the role of technologies in creating value-added
- Identify the various factors which make technologies into business
- Learn the origination and background of “technology evaluation”
- Understand the connection between evaluation for corporate and for technology
- Learn different types of technology evaluation methodologies (such as “assessment or rating” and “valuation”) and their practical applications

For the objectives shown above, the recommended solution would be dependent upon individual economy’s status (such as geography, resources and main industry sector etc), it is noted that the case studies shown are no more than reference. Although there is no absolute answer, the solution seeking process itself is still important, since the arbitrary establishment of this basic concept on their own may induce confusion which results in failure in applying policies. Each economy should set up its own industry classification as well as technology classification. Since technology evaluation requires standardisation eventually, the pre-requisite status can make large effect on the evaluation system implementation However, the plausibility can be tested upon a couple of institutions first, such as the business incubator, without great effort. This kind of attempts has been made successfully elsewhere.

8. Discussions

8.1. Implications and Suggestions

The discussion agenda are not limited to certain topics and opened to any related matters. Some of the examples would be (1) What are the main issues concerning this subject in participating member economies? (2) Why should government care about technology evaluation? (3) What are the initial areas where this subject can be applied in each participating countries? (4) What are practical limitations and/or problems which should be considered? and (5) Are there any chances of building up international cooperation or assistantship?

8.2. Key Factors Measuring Successful Implementation of Technology Evaluation

Technology evaluation as a business feasibility measurement is not just mentioning technology level measurement. This consists of measurements not only for technology status, but also for market status where the designated technology would be applied. In addition, corporate credit including the integrity of financial transactions would be very important in terms of mid- or long-term growth of corporate.

Understanding the relationship between “technology evaluation” and “technology financing” is crucial. It is then possible to define the role of the “technology evaluation” system according to market demand, which facilitate design process of the system in more practical way. As mentioned earlier, it should be noted that “technology evaluation” in this subject is concerned with government policy. This suggests that the system should reflect the philosophy of each economy’s science and technology roadmap (or strategy). On the other hand, since this system is used for financial support distribution which is related to budget management, risk management function should be considered at the same time.

In order to implement technology evaluation system effectively, the followings need to be considered. First, defining who will be the user for technology evaluation result. This can be done through investigating whether there has been existing demand for the system, by judging the possibility to create new demand after the system is implemented, and/or by estimating practical possibility for government to persuade potential users to participate. Second, designing the proper system depending on various financing schemes. The major interest of debt financing and equity financing are completely different. Therefore it is a natural thing, to design different system in accordance with different type of financing. One of the major reasons for previous failures in adopting evaluation system is because the system for debt financing has often been confused with the one for equity financing. Third, the identification of the required resources to build up and administering the system needs to be performed. To guarantee fairness and expertise, independent legislation, budget, organisation may be required. Fourth, it is necessary to ensure repeatability and reproducibility is key issue for successful implementation of the system. Standardisation process can be helpful. The proposed technology evaluation system needs to have attributes which described in the figure shown in below.

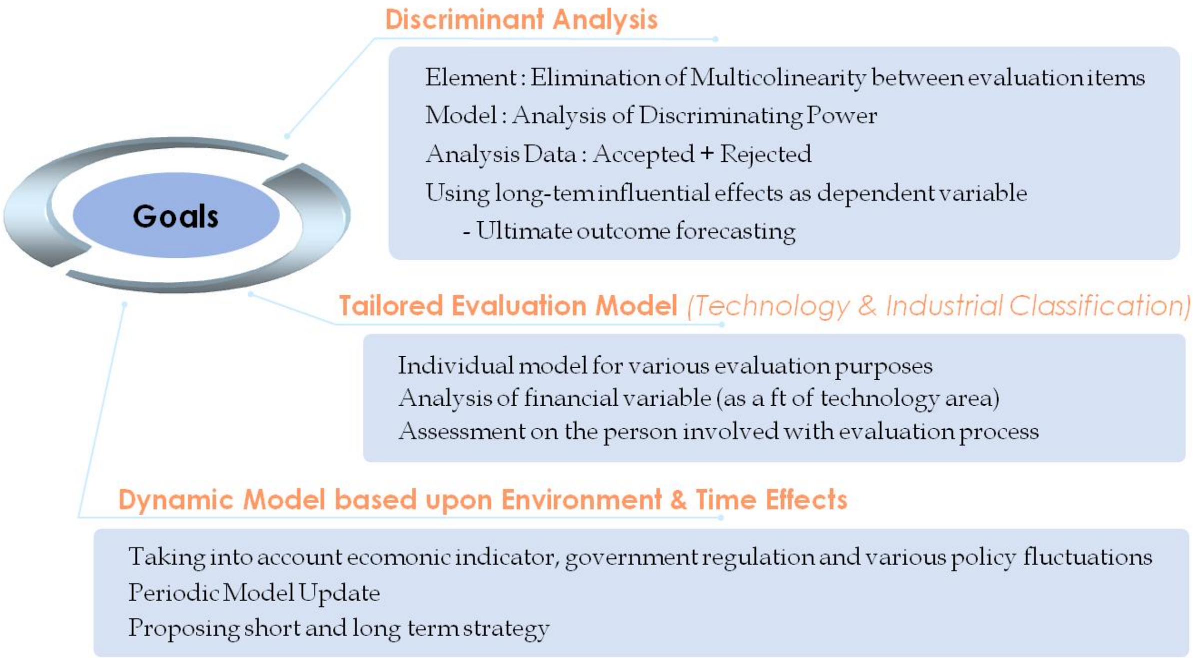


Fig 20 Proposed Technology Evaluation Model

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Part III

Marketing Promotion

Chapter 8. Business Counseling

Kyung Suk Han[1]

This workshop will discuss business counseling concepts compared with consulting, the effect of supporting SMEs providing business counseling and a coupon consulting system in Korea for the small and medium enterprises along with many actual case studies.

This workshop will discuss US business counseling programs of SBA (Small Business Administration) that provides small business counseling and training through a variety of programs and resource partners, located strategically around the country. The office of Small Business Development Centers (SBDC) provides management assistance to current and prospective small business owners (http://www.sba.gov/aboutsba/sbaprograms/sbdc/index.html). SBDCs offer one-stop assistance to individuals and small businesses by providing a wide variety of information and guidance in central and easily accessible branch locations. The program is a cooperative effort of the private sector, the educational community and federal, state and local governments and is an integral component of entrepreneurial development network of training and counseling services.

1. Introduction

1.1 What is Business Counseling?

Different consulting characteristics among Micro Businesses, Small and Medium Business and Large Businesses need to be considered while consultants or business counselors provide the consulting service to their clients. Studies have shown that micro and small businesses have not kept pace with the human resource capability and the development of new technologies such as Knowledge Systems and Information Communication Technologies (ICT) in implementing their businesses. They need business counseling rather than simple consulting. That's why this workshop focuses on business counseling.

The growth of Micro and Small Enterprises (MSEs) becomes new trend in APEC region. Many economies, both developed and emerging economies, are experiencing unprecedented growth in micro and small businesses. They recognize the importance of MSEs for emerging economy. Micro and small businesses provide more jobs and the unique infrastructure to maintain lifestyles and rural cultures. They need business counseling that is the concept of consulting with training and management education. The concept is more closely related to mentoring. The growth of Micro and Small Enterprises is another reason why this workshop focuses on business counseling. The following figure shows the concept graphically.

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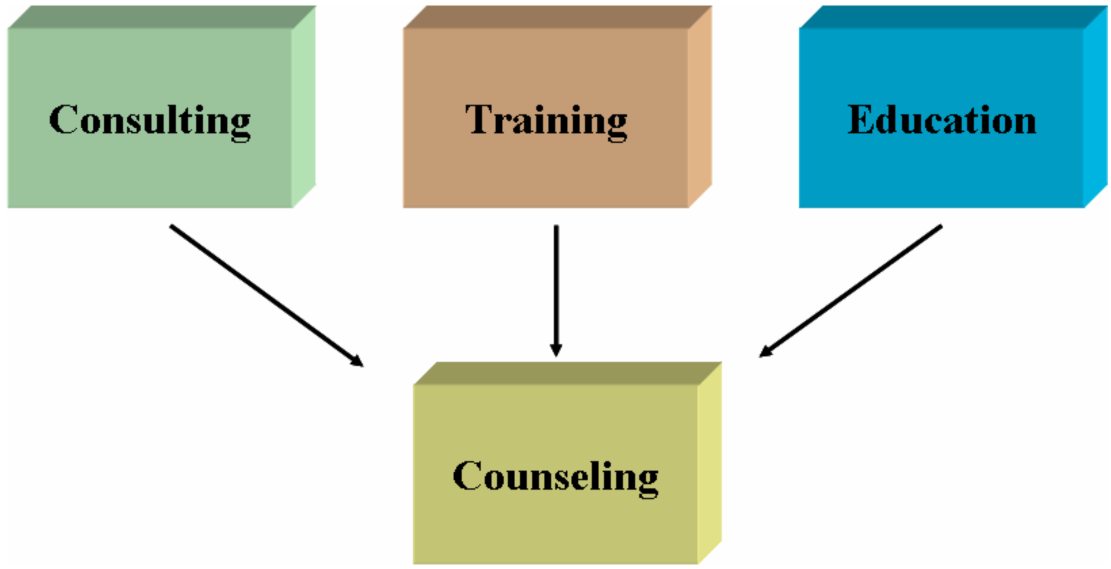

Fig 1 The Concept of the Business Counseling

1.2. Related Theories, Business Counseling Programs, and Policies at a Glance

One of the most important related theories of business counseling is that business counseling could provide confidential one-on-one management counseling services to new and existing small businesses. Areas of counseling include business plan development, pre-venture feasibility, marketing, financial planning, cash flow management, loan packaging, record keeping, personnel and training issues, production, and general management for the small business entrepreneur (http://www.williams.edu/admin/deanfac/exped/pdf/business_counsel.pdf). Training workshops could be also available at a reasonable cost. There are many business counseling programs in the world. The SBA (Small Business Administration) of USA government provides small business counseling and training through a variety of programs and resource partners, located strategically around the country (http://www.sba.gov/services/counseling/index.html).

The SCORE Association (Service Corps of Retired Executives) is a resource partner of the SBA dedicated to entrepreneur education and the formation, growth and success of small businesses nationwide. There are more than 10,500 SCORE volunteers in 374 chapters operating in over 800 locations who assist small businesses with business counseling and training. SCORE also operates an active online counseling initiative. The Office of Small Business Development Centers (SBDC) provides management assistance to current and prospective small business owners. SBDCs offer one-stop assistance to individuals and small businesses by providing a wide variety of information and guidance in central and easily accessible branch locations. The program is a cooperative effort of the private sector, the educational community and federal, state and local governments and is an integral component of Entrepreneurial Development's network of training and counseling services. In order to get more detailed information about SBDCs we can introduce the organization as follows (http://www.sba.gov/aboutsba/sbaprograms/sbdc/aboutus/index.html):

The U.S Small Business Administration (SBA) administers the Small Business Development Center Program to provide management assistance to current and prospective small business owners. SBDCs offer one-stop assistance to individuals and small businesses by providing a wide variety of information and guidance in central and easily accessible branch locations. The program is a cooperative effort of the private sector, the educational community and federal, state and local governments. It enhances economic development by providing small businesses with management and technical assistance. There are now 63 Lead Small Business Development Centers (SBDCs) -- one in every state (Texas has four, California has six), the District of Columbia, Guam, Puerto Rico, Samoa and the U.S. Virgin Islands -- with a network of more than 1100 service locations. In each state there is a lead organization which sponsors the SBDC and manages the program. The lead organization coordinates program services offered to small businesses through a network of sub centers and satellite locations in each state. Sub centers are located at colleges, universities, community colleges, vocational schools, chambers of commerce and economic development corporations.

SBDC assistance is tailored to the local community and the needs of individual clients. Each center develops services in cooperation with local SBA district offices to ensure statewide coordination with other available resources. Each center has a director, staff members, volunteers and part-time personnel. Qualified individuals recruited from professional and trade associations, the legal and banking community, academia, chambers of commerce and SCORE (the Service Corps of Retired Executives) are among those who donate their services. SBDCs also use paid consultants, consulting engineers and testing laboratories from the private sector to help clients who need specialized expertise. The SBA provides 50 percent or less of the operating funds for each state SBDC; one or more sponsors provide the rest. These matching fund contributions are provided by state legislatures, private sector foundations and grants, state and local chambers of commerce, state- chartered economic development corporations, public and private universities, vocational and technical schools, community colleges, etc. Increasingly, sponsors contributions exceed the minimum 50 percent matching share.

The SBDC Program is designed to deliver up-to-date counseling, training and technical assistance in all aspects of small business management. SBDC services include, but are not limited to, assisting small businesses with financial, marketing, production, organization, engineering and technical problems and feasibility studies. Special SBDC programs and economic development activities include international trade assistance, technical assistance, procurement assistance, venture capital formation and rural development. The SBDCs also make special efforts to reach minority members of socially and economically disadvantaged groups, veterans, women and the disabled. Assistance is provided to both current or potential small business owners. They also provide assistance to small businesses applying for Small Business Innovation and Research (SBIR) grants from federal agencies. Assistance from an SBDC is available to anyone interested in beginning a small business for the first time or improving or expanding an existing small business, who cannot afford the services of a private consultant. In addition to the SBDC Program, the SBA has a variety of other programs and services available. They include training and educational programs, advisory services, publications, financial programs and contract assistance. The agency also offers specialized programs for women business owners, minorities, veterans, international trade and rural development. The policy of US SBA (Small Business Administration) is to help small businesses start, grow, and compete in global markets by providing quality counseling (http:// www.sba.gov/aboutsba/sbaprograms/ed/index.html). Korean government policy is also to promote quality business counseling for small and medium businesses based on the coupon consulting system and APEC Certified Business Counselors programs.

2. Introducing existing Business Counseling Programs

2.1. A Coupon Consulting System of the Small and Medium Businesses in Korea

The coupon consulting system is a business counseling program to support SMEs in Korea. The amount of fund supported is about US$17Million. Small businesses must meet certain eligibility criteria to participate in the coupon consulting system. Company size of the small businesses that want to apply for the program is limited to 300 employees. A start-up company with less than 3 years is eligible if it applies for the start-up only company program. It will be extended up to 7 years if it has a special permission

Processes of the coupon consulting system are as follows:

Announcement → Application by SMEs → Selecting target SMEs → Buying Coupons → Selecting Consulting companies → Contracts → **Business Counseling** → Mid-term report → Final report → **Approval**

In the area of ‘Innovation Support,’ the consulting service supported will be provided to inno-biz companies, venture companies and innovative companies equipped with high-tech. In the area of ‘Productivity Improvement,’ the consulting service will be given the companies for the productivity improvement. In the area of ‘Small Business’ the business counseling service is specialized to small businesses. In the area of ‘Supporting Start-up Businesses,’ the business counseling service is provided to support start-up businesses for national economic growth and creating jobs for the youth.

The main goal of the coupon consulting system is to improve SMEs’ productivity and to develop knowledge-based industry with active consulting businesses (by establishing an active consulting business environment). The vision of the coupon consulting system is as follows.

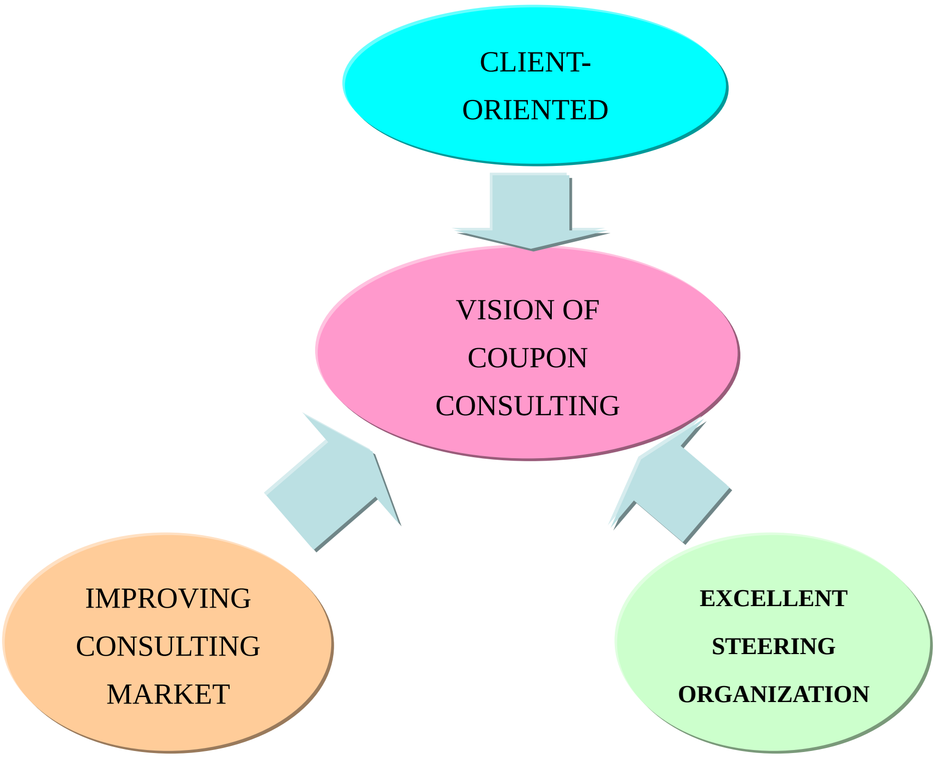

Fig 2 The Vision of Coupon Consulting System

2.2. The APEC CBC (Certified Business Counselors) Program

In this section we will describe APEC CBC program. In terms of historical context we will explain what APEC-IBIZ is about, program objectives, updated participating economies, updated heads of the Economy Institute and the benefits of APEC-IBIZ. We will also introduce the current status of the project.

2.2.1. Historical Context

APEC-IBIZ stands for APEC International Network of Institutes for Small Business Counselors and also refers to as APEC Network of Institutes for Small Business Counselors or APEC International Network of Counselors. APEC-IBIZ was made possible through the SME Working Group of APEC by implementing a program entitled "Training and Certification Program for Small Business Counselors." It is the program that was endorsed by the SME WG, approved by SME Ministers Meeting in Shanghai in August 2001 and as such, the program for SME WG to implement and monitor. The objectives of the APEC-IBIZ program are as the following: to recognize and sustain small business counseling profession across the APEC Region; to grant certification to APEC-qualified counselors; to make use of information and communication technologies to achieve optimum access and cost effectiveness; and to enhance the competitiveness of SMEs in the global market.

Organizational structure is as the following figure:

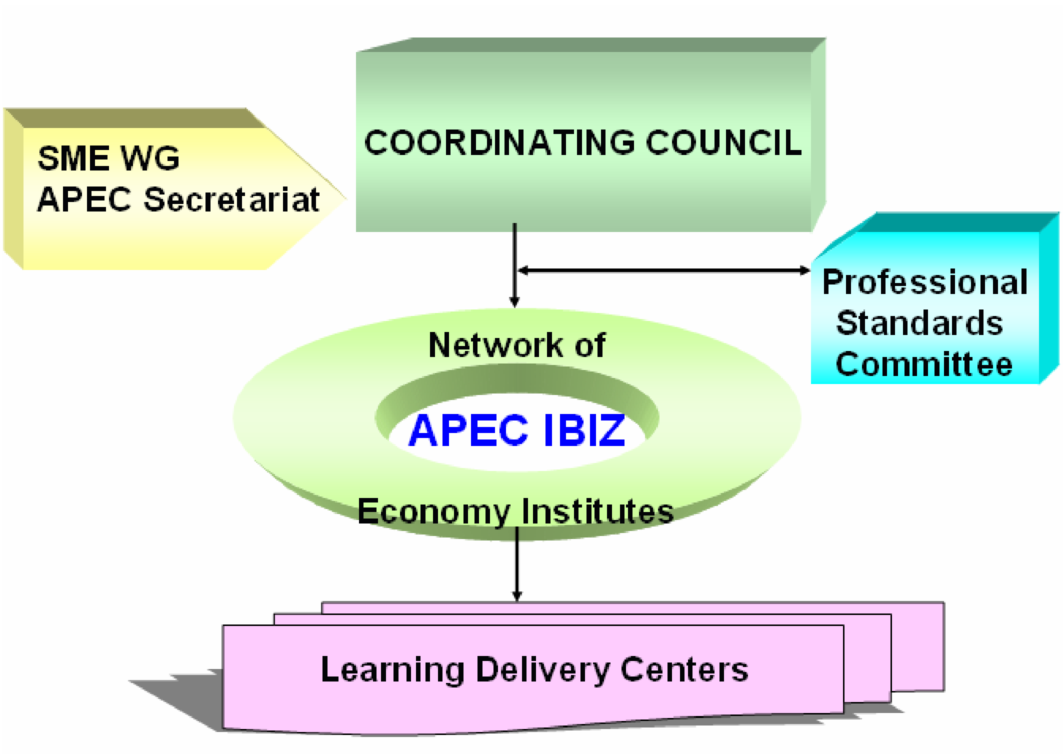

Fig 3 The Organizational Structure

The participating economies include Australia (1997), Brunei Darussalam (2001), Canada(1997), People's Republic of China-Hong Kong(1997), Indonesia (1997), Republic of Korea (2001), Malaysia (2000), Mexico (2001), Papua New Guinea (1999), Philippines (1997), Russia (2005), Singapore (1997), Chinese Taipei (1997), Thailand (2001) and United States of America (1997).

The procedures that the program was developed and being implemented are as the following:

Development of Program design for training small business counselors (Development of self-directed training materials for ten modules (Development of the Training/Learning Packages (Development of Assessment Scheme, Operations Manual, Mutual Recognition Agreement and Website (Start of the Program in 1997 with Canada and Philippines (overseer) spearheading the project (Approval of the project to become an APEC program in August 2001 (Workshops of the heads of economy institutes, tutor/LDC managers/assessors and Coordinating Council (About 128 APEC Certified Business Counselors (About 710 Learner-Counselors in 16 Economies

The program flow appears as the following figure:

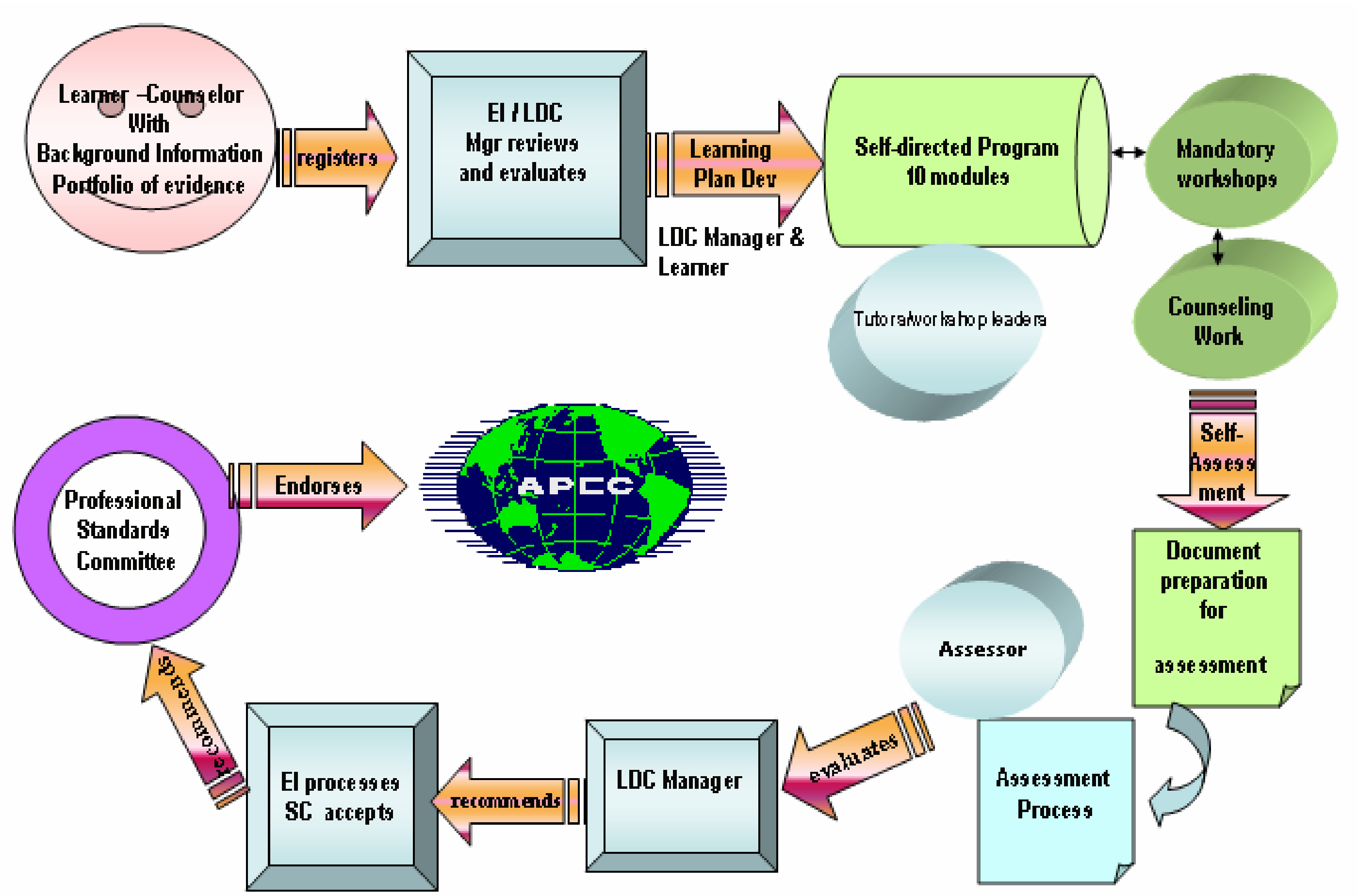

Fig 4 The Program Flow

2.2.2. Current Status

The current status of APEC-IBIZ project is that the project becomes more successful based on win-win strategy among APEC economies. The project shows the successful implementation and the program enhancement for small and medium enterprises in APEC region through expanded network of certified business counselors and national institutes based on improving the efficiency of SME management.

The progress report of SME is to keep increasing the number of APEC CBCs (Certified Business Counselors) – about 180 APEC CBCs. The project also promotes and establishes the program among APEC Economies not yet participating in the program. It keeps making use of information and communication technology (ICT) to achieve maximum assess and cost effectiveness of the program throughout the region. The members of APEC-IBIZ keep modernizing existing modules and creating appropriate new modules so as to maintain relevancy and currency. The website enhancement for the project has provided increased capacity for information sharing, promotion, documentation, and networking. Moreover, e-Learning capacity is now being developed in several economies.

3. Case Studies on Best & Failure Business Counseling Programs

Participants need to read many cases of best and failure business counseling programs to discuss for the workshop. This approach will help participants guide their SMEs clients more effectively and efficiently.

3.1. A Case of Assuring Consultant Quality for SMEs – the Role of Business Links

In Journal of Small Business and Enterprise Development, British Government instituted a new direction for small business support in 1992 with the establishment of business links (Journal of Small Business and Enterprise Development, 1998, Vol.5, Iss.1, page 7-18). These are intended to coordinate assistance through locally integrated business support services. Business Links have been the subject of several evaluates studies, one of which was particularly critical, besides being the focus of comment in the business press. In particular, Personal Business Advisers (PBAs, who are usually employees of Business Links) have been subjected to scrutiny; concerns being expressed about the extent to which PBAs' recommendations are acted upon. Much of the specialist consultancy is provided by self-employed consultant persons under contract for particular projects.

This study focuses on the self-employed consultants who undertake specialist Business Link supported work within SMEs. While most Business Links have roll and job descriptions for PBAs, this is rarely case of consultants. Self-employed consultants are generally accredited by Business Links themselves or by third parties. Accreditation procedures could be improved; clear criteria are required for monitoring consultancy processes and outcomes, and consultants need to receive feedback. There are opportunities for closer contact between self-employed consultants and Business Links which would improve the quality of the service to SMEs, the learning of individuals and the organizational learning and public accountability of Business Links.

It has been noted that a performance indicator for many PBAs is the number of business reviews undertaken and attention has been drawn to the fact that less than 50 percent of SMEs accept the recommendation given. A more meaningful Business Links performance indicator would be the extent to which interventions made by consultants as a result of business reviews enhance the competitiveness of client SMEs. Indicators for such an approach might include return on capital employed, turnover, new business, new products, rate of technological innovation, or an increase in the number of employees over time. There is at present no effective infrastructure for the Business Links self employed consultants and consultancies more with Business Links culture, support, knowledge base, and experience of core Business Links staff. This would, potentially, have a two way advantage since insight, skills, knowledge, and learning vested in self employed consultant could be employed for Business Links organizational learning.

Self employed consultants, while being responsible for the delivery of much of the detailed work identified in Business Links initial business reviews remain in a black box. Few Business Links have either job descriptions or person specification for consultants. And Business Links have not distinguished between the generic skills and attributes desirable for accredited self employed consultants who are contracted for work in SMEs, and the specialist knowledge and skills required for a particular project. Specialist skills are more appropriately designated at the level of individual project specifications and contracts. The selection process, often conducted by a third party, focuses on the verification of qualifications and references, together with an interview, despite the relatively low validity of interviews as a predictor for the quality of performances in role. Much depends on the skills of those conducting the interviews and there is evidence that interviews are sometimes undertaken by persons with little experience or training in the selection process. There is little evidence that the selection procedures relate to job descriptions and person specifications for the role. While, on the whole, training and development are provided for PBAs, it is neither general policy nor practice for Business Links accredited consultants to undergo continuing professional development, although it is a requirement of the accreditation process, and SELECT assure monitors development through the annual re-registration process. There is no evidence, however, that consultants who do not undergo training and development are removed from the accredited list.

An intervention undertaken by an independent consultant in negotiation with client involves a managed marketing process during which a project specification is designed and a contract negotiated. One outcome is rapport between the parties concerned, as well as learning by both client and consultant during the process of initial data gathering and problem definition. This is less likely to occur in a Business Links supported consultancy where the PBA is involved in the initial diagnosis and rapport building. The consultants arrive more or less 'cold'. For the SME this amounts to a cost arising out of the requirement for further rapport building and consultant briefing. The consultant has little personal autonomy to work on problem definition with the client who will, by this stage, be impatient for solutions. Such a consultancy is more likely to result in a series of recommendations destined to lie on the shelf rather than a process of working with the client to achieve change. Moreover, self employed consultants are paid by the day rather than an overall fee for a project. This will tend to promote a solution driven attitude on the part of the consultant which may inhibit longer term client learning and organizational transformation (Journal of Small Business and Enterprise Development, 1998, Vol.5, Iss.1, page 7-18).

A further drawback is noted in those Business Links where SME problems are perceived and solutions found in functional terms such as IT, marketing and/or finance. Management is smaller companies is generally multi functional. Business problems diagnosed by the client may, on the other hand, be perceived, rightly or wrongly, as specifically functional. That is a danger that one specialist consultant will be followed by another, thus compounding the problems of rapport building and failing to facilitate integration within the business. In these case studies on SMEs, many respondents told their desire for 'hand-holding' by consultants. There is not a great deal of evidence of this approach to consultancy being currently taken by Business Links. As Business Links increasingly become income generating businesses they are likely to be concerned with short term targets and innovative methods may be needed to achieve relationship building in consultancy. Yet the longer term, and possibly intermittent, consultancy intervention of working alongside the client may be of as great or greater benefit to SMEs than the short functional specialist one.

Almost two-thirds of responding Business Links have a procedure for monitoring the process and outcomes supported consultancy. The criteria, however, are far from clear, some Business Links identifying input criteria for the measurement of outcomes. Nor do the criteria, where they exist, derive from a clear understanding or model of consultancy. It is important that appropriate performance measures be identified and clarified, and that monitoring procedures be designed to ensure that the data collection is appropriate. Business Links should consider whether incentives could be designed to motivate consultants. There is no reason in principle why, despite their self employed status, consultants should not be subject to checks and incentives in a similar way to PBAz and ITCs, Business Links becoming more like managed networks. Checks would not readily be accepted by consultants without appropriate incentives. While Business Links could make the acceptance of monitoring by agreed performance indicators a contractual requirement, a higher rate of remuneration would be likely to attract higher caliber consultants and greater commitment to the ethos of the one stop shop. In an effectively managed Business Links infrastructure for consultancy there would be enhanced SME benefit and greater Business Links learning and public accountability, as well as the opportunity for individual consultant development (Journal of Small Business and Enterprise Development, 1998, Vol.5, Iss.1, page 7-18).

3.2. A Case of the Advisor-SME Client Relationship: Impact, Satisfaction, and Commitment

In Small Business Economics, there is a study which investigates the relationship between the type of business advisors used by SMEs and the level of impact and satisfaction a SME receives (Small Business Economics, 2005, Vol.25, page 255-271). The role of other influences, such as the intensity and cost of the service, and the level of commitment to an advisor by the client are also investigated. A structural equation path model is estimated from survey information for SMEs in Britain. The analysis shows that customer impact, satisfaction and re-use intentions are related to the character of the firm (particularly its size), the intensity and cost of services, but is only marginally influenced by the geographical distance between advisor and client. Affective commitment, measured by the level of the ‘trust’ of the advisor by the client, is shown not to be significant, except for public sector and business association suppliers. The importance of trust to these suppliers, despite the low satisfaction levels they achieve, is argued to be incompatible with attempts to charge fees, as has been sought for the government network of Business Link. Both business association and public sector support bodies therefore have severe limitations in combining their broader roles with a commercially-based fee-based income strategy.

The study thus confirms the importance of comparing different types of suppliers of advice and the institutional governance regimes within which they operate. Our analysis finds that different supplier types operate through different processes and produces different levels of impact and satisfaction for their customers. However, comparing between broad sector categories (social, public, private and association advisors) we find that affective commitment (trust) is generally only weakly associated with increased satisfaction and impact. These findings are generally in line with Clark (1995) and Bennett and Robson (1999), that trust, cost and interaction intensity vary between different types of supplier and depend on both client-supplier formality of relations, and on contrasts between the governance regime and other external mechanisms for controlling quality, and developing reputation and brand. These structures also influence the outputs that are evaluated by clients who generally receive higher impacts and satisfaction the higher the interaction intensity during service delivery.

Our results also confirm that trust, service cost and service intensity tend to be positively associated with each other. Direct causality in these relationships cannot be deduced from our results, but out structural equation path model indicates that as service intensity increases, which is strongly related to higher service costs, trust is also involved to a greater extent. This is expected. As advice becomes more intense, and hence more potentially significant to a firm, greater effort is made to use both personal relationships and trusted suppliers either in supplier selection, or in the management of advisor relationships. An important public policy implication of our findings is that there is generally low satisfaction and impact from public sector supply of advice. This is similar to Priest (1998) for the case of Business Link. Hence, the attempt to raise fees from public service advice may be ill-advised, since attempts to increase intensity leads to higher levels of dissatisfaction and lower assessments of impact for the public sector. This may result either from bottlenecks in the capacity of public sector advisors to intensify (there is only limited skill and capacity available within the sector), and/or that clients perceive the attempt to charge for the public advice they seek as contrary to the ethic of trust expected from the public sector. This suggests that the stated ambition for Business Link to raise at least 25% of its incomes from fees, which existed from 1993 to 2002, was fundamentally flawed.

The study also suggests that localization is not an effective strategy for marketing of advice services. Distance between advisor and client is usually an insignificant influence. Where it is significant, greater distances produce higher intensity and greater impact and satisfaction. In common with the findings of Bennett and Smith (2002), this appears to be chiefly a supply side effect; i.e. the most technically intensive, and consequently high cost, advisors are found at greater distances from the main regional commercial centers. The localization effect, which should reduce transaction costs, does not appear to be present. This also has important public policy implications as well as private sector marketing consequences. It suggests that a large network of 45 local outlets for Business Link advice services is unnecessary. The same service could be provided from a small number of regional centers.

Clearly further research is needed using larger scale and broader survey bases to replicate these results, particularly to examine the different service submarkets of different types of advisors that will allow more detailed assessment for different markets, credence structures, and trust/ regulatory/self-regulatory relationships. Further research is also required on the role of firm age and sector in how the advice process operates. However, the present research is significant in pointing towards these lines of further inquiry, and in showing how standard marketing concepts can be applied to the predominantly relational exchange that governs SME business advice, including that from the public sector. Whilst further research is clearly required, the results do tend to confirm that the structure of the conceptual model used by Shemwell et al. (1998) applies: that there is a chain of relationships between outcomes, satisfaction and continuance commitment. But for the case of business services the results suggest that there is a predominance of objective outcome measures (such as impact on reduced costs or enhanced profitability), a relatively lower degree of emphasis on subjective outcomes (such as ability to manage), and a low role for affective commitment (trust) in most cases.

3.3. A Case of Gambling for Growth or Settling for Survival: The Dilemma of the Small Business Adviser

In Journal of Small Business and Enterprise Development, there is one study questions aspects of the UK government's policy to target small firm support on fast growing firms – to maximize its employment impact (Journal of Small Business and Enterprise Development, 2000, Vol.7, Iss.4, page 305-314). The study explores the tension between advice likely to increase growth and risk-taking and advice likely to ensure firm survival in the turbulent small and medium-sized enterprise sector. The research data derive from 24 semi-structured interviews and a group interview of ten business advisers in the West Midlands region collected between autumn 1996 and spring 1997, and a national survey of 175 Business Link personal business advisers (PBAs) conducted in April 1998. Interviewees responded to a prompt asking for advice to a fast growing firm. The study compares qualitative interview responses from a wide variety of West Midlands business advisers with questionnaires responses from PBAs.

The study suggests that the advice given by accountants and bank managers differs little from that given by Business Link's PBAs. The study will argue that advisers including PBAs, offer risk-averse advice and support to small firms. Present business advice might reduce insolvency rather than increase the number of fast-growth firms. The risk-averse nature of advice, reflecting the adviser's clientele, undermines policies designed to increase the number of fast-growth companies. It concludes that advice will often be inconsistent with the growth-oriented aim of government policy.

There may be several reasons why advisers accent problems associated with fast growth, despite research evidence that suggests growing companies have a higher rate of survival. First, although it seems unlikely to promote growth among small firms, the emphasis on constraints might be a perfectly feasible method to assess the potential for the growth of an SME. Those firms that control their cash may be able to invest in new markets and new products. Secondly, the relationship between advisers and firm owners is akin to a sales relationship. The PBA establishes rapport and credibility with the business owner - as the PBA group noted earlier in this study - which requires the PBA to tread very carefully. Moreover, the quantitative targets given to Business Links by central government are another burden on the PBAs' relationship with the business owner because the PBA needs clients to fulfill their targets, whether these clients are fast-growing companies or not. Thirdly, many PBAs are ex-small business owners and their typical experience might be struggling to survive. Indeed, experience of fast growth in a small firm over the long term is exceptional. Fourthly, the experiences of PBAs in the small firm sector might lead them to believe that the key to small firm support is survival rather than growth. Finally, although they may mostly work in growing firms, PBAs find it difficult to target a priori fast growth firms. PBAs' advice may be risk averse as, in their account manager role; they tailor their advice to the client's requirements. Thus, the PBA may face a risk-averse client and find it at least difficult to suggest more risky growth strategies, although both UK and US evidence suggests that growing firms have greater survival chances.

Government agencies advice tends to be survivalist because (a) most SMEs fail, (b) most clients seek advice when they have a difficulty, (c) survivalist advice is appropriate to most clients, (d) psychologically, risk-increasing advice is more stressful, and (e) internal management control is what most SMEs lack. Business advisers (whether bank managers, accountants or Business Link advisers) seek assurance that properly financed firms have capable management. During the processes PBAs respond to the high attrition within the SME sector and the evidence that internal management failures contribute to firm bankruptcies. Accordingly, although internal management control can be strength of all firms, including those that sustain growth, their effect on firms may be seen in reduced SME death rates rather than increased growth rates. The evidence presented here suggests that the advice from most business advisers promotes survival; not growth. Are PBAs providing the wrong advice, to the right clients - promoting survival to fast-growing firms? Rather than promote growth to growing companies; PBAs promote internal management control to companies that ask for assistance. PBAs have altered the policy, but improved their performance figures, to a policy that suits their skills and the clients that approach Business Link. Thus advisers wish to `control growth', and stress the inherent risks involved in fast-growing firms. Rather than gambling for growth, business advisers settle for survival (Journal of Small Business and Enterprise Development, 2000, Vol.7, Iss.4, page 305-314).

3.4. A Case of University Counsels Small 'Split Firms' in Post Communist Country

In Journal of Small Business and Enterprise Development, the transition from centralized to market economy created a number of difficulties for polish enterprise and many of them went bankrupt, especially after the soviet market had been lost (Journal of Small Business and Enterprise Development, 1999, Vol.6, Iss.4, page 386-400). While large companies, such as steelworks, coal mines, railways, etc, have been protected by the government for social reasons, the small and medium enterprises (SMEs) could survive only when they, by themselves or with some external assistance, were able to introduce internal changes and adjust to the market environment. Polish SMEs may be divided into to groups: emerging private firms and split firms which were created by a partition of large state-owned enterprises. The various reasons for failure are discussed for both groups and compared with those described in the literature. A general model of consultancy intervention is presented and the attitudes of Polish enterprises towards change are described. In general, the state-owned and split firms are reluctant to change unless their situation is critical, and if restructuring is done it is rather superficial. Thus, a successful consultant has to be not only convincing and flexible but also must assess how deep a change is wanted by a given enterprise.

This study presents the approach used in helping the split firms by the University of Mining and Metallurgy (UMM), Faculty of Management Consulting Group. In order to find solutions for a given firm, a working team consisting of representatives of an enterprise and university was set up. The team devises a strategy of enterprise survival and prepares a detailed plan of the steps to be taken. This approach, which in many cases has proved to be successful, consists of trying to infuse the employees with the philosophy of enterprise survival and organizing a series of relevant training activities. When the employees fully understand the essence of all the actions necessary for enterprise survival (privatization, improvement of marketing, creation of system of motivation, quality control, management information and other), the consulting group’s role as ‘company doctor’ is limited to the supervision of the change planning process and the assessment of the solution chosen. This system of triggering employee initiative has been found to be not only effective but also cheap, an aspect which in the case of small enterprises should not be underestimated.

Polish SMEs often fail due to a lack of cheap credit, poor knowledge of market or deficiencies of the national fiscal system. This relates also to the so-called split firms which emerged from large state-owned enterprises though the main things these split SMEs need is restructurization and a new strategy. In general, the split firms are reluctant to the change unless their situation is critical and if restructurization is made it is rather superficial. In general, the consultancy is not treated in Poland as a way towards higher competitivity and special measures have to be taken for SME customers (Journal of Small Business and Enterprise Development, 1999, Vol.6, Iss.4, page 386-400).

The counseling approach used by the UMM Consulting Group to assist such split SMEs has the following advantages: the change is created by joint efforts of employees and consultant; employees' initiative is triggered within task groups during change creation and implementation; employees identify themselves with the change and fully accept it; employees understand the change and do not fear for their safety; new leaders emerge from lower and middle-level managers;

Companies receive not only the final product (strategy, business plan and detailed tasks set) but also know-how useful in future restructurizations; the cost of service is much lower than expenditures on the report prepared by a commercial consulting firm. The feedback effect between the firms and UMM Faculty staff was also observed. University staff provided courses, training, workshops, etc and received information on real cases, situations and solutions. Company staff provided real questions to be solved and received theoretical knowledge as well as knowledge of the method used by other firms. In conclusion, the authors would like to underline the approach presented in this study is in some part the fruit of cooperation with UK experts and institutions within such projects as PHARE (a program of the European Union for the economic and social restructuring of the countries of Central and Eastern Europe).

3.5. A Case of the Impact of Consulting Service on Spanish Firms

In Journal of Small Business Management, specialized services that help in efficient decision making in company management-that is consulting service-undoubtedly make up one of the most dynamic sectors of the economy in most European countries and in Spain (Journal of Small Business Management, 2003, Vol.41, Iss.4, page 409-416). There is a huge amount of literature available on the subject of consulting, and it often is stated that the consultant contributes a large dose of common sense to a management situation that is not always rational. However, the consultant is not a magician who discovers what the client did not know, although the consultant is able to look at the problem from a more appropriate angle and his or her services should be more wisely used. Technically speaking, this study asserts that consulting is the planned intervention in a company with the aim of identifying the problems that may exist in its organization and implementation those measures considered suitable and fitting in order to resolve them.

The evaluation of the effects of the consulting process generally is performed by looking at the behavior of the company. It is accepted that the benefits of the management process are not limited to just putting the recommendations into practice; they also should include the changes and development brought about by the process. In this study, from the recommendations made by the consultant, only the short term financial benefits of the project can be evaluated given the difficulty involve in evaluating the quality of the service. This is increasingly so, taken into account that Spanish firms find themselves in a difficult moment, as they currently are adapting themselves to the implementation of the “culture of quality” regarding both their products and suppliers. Quality management system, such as the European Foundation for Quality Management (EFQM) in the case of many European companies, are still a long way from being part of the cultural and strategic reality of the commercial sector in Spain.

The present study analyzes external consulting in Spanish commercial and distribution firms by looking at management decisions concerning activities related to organization, quality, marketing, and strategy. This analysis can be extrapolated to other European areas, especially those around the Mediterranean Sea. This study examines the effect of management consulting on the company when there is the intervention of an external adviser-in other words, when there is an increase in the company's knowledge and capabilities in these activities, enabling a later investigation and evaluation of its impact on the firm's situation in the future. Assessment performed by experts from outside the company is an activity that is growing in firms as they try to decrease structural loads, that is, the fixed cost of staff. More than 50 percent of the Spanish commercial or distribution companies in this study have used external consulting services. The consulting work can be performed in any area, department, or activity within the company. This analysis was limited to the study of the areas or departments dealing with organization, quality, marketing, and strategy, and it can be seen that external advice on marketing is used most frequently. On the other hand, organization, quality, and strategy consulting are sought less often because companies prefer to carry them out internally or because the offer is of insufficient quality or quantity (Journal of Small Business Management, 2003, Vol.41, Iss.4, page 409-416).

From the results of this study, the idea that advice on organization, marketing, and strategy is sought more often if the management activities in each of those areas are held to be of little value is rejected. And only consulting about quality is engaged more frequently if the functioning of the quality department is valued lower. The lack of professional staff in the management of the department forces the choice between in-house staff training or engaging the services of an external professional to help the company. Only those companies that sought consulting services on marketing showed a significant relationship. In other words, the less prepared the specialist or marketing director was in the company, the more it resorted to outside consulting services. For the other areas, the relationship is not significant. Lastly, there was no kind of relationship found between staff qualifications within each department and the use or engagement of consultants in the areas of organization, quality, marketing, and strategy.

3.6. A Case of the Training Train out of control: A Case of Evaluation Failure from New Zealand

In Journal of Small Business and Enterprise Development, there is a noticeable absence of robust debate over the decision to deliver free or subsidized training programs to those running small to medium-sized enterprises (SMEs) [Journal of Small Business and Enterprise Development, 2004, Vol.11, Iss.4, page 458-466]. Many government offer these schemes, despite the lack of empirical evidence that programs aimed at individuals contribute positively to firm performance and therefore to economic growth. A similar situation probably exist in the firms that participate in training; a lack of robustness in the way they ensure a relationship between the training selected and the needs of employees in the context of their jobs. This study explores the issues facing both firms and government agencies in New Zealand as they make decisions about investing in training as an enterprise development strategy. It is suggested that the way in which firms and government agencies behave in relation to training investment decisions is flawed: those involved follow received wisdom, act upon hunches and appear indifferent to ensuring that their respective investments are maximized. This situation will continue until it is realized that training is a key developmental strategy and gaining value from training events means that more rigor needs to be applied to planning and evaluation.

For government seeking ways of developing the capability of their SME sectors, the decision to deliver free or subsidized training could be described as a “no-brainer”. While the introduction of differential tax rates and targeted assistance (e.g. support offered to certain industries) are both strategies that are hotly debated, training as means of encouraging “enterprise development” is about as controversial as a mother’s home-baked apple pie. The lack of debate based on a rationale that has become received wisdom in policy making circles: Developing the skills of individuals who work in SMEs or who own them will lead to enhanced performance for the firm. However, there is widespread dissatisfaction with the lack of empirical evidence that exists to demonstrate the value of training as a developmental strategy for governments. This situation has been exacerbated by the fact that historically much of the debate over enterprise development has been focused on how much a government favors “intervention” as opposed to “market forces” – rather than on which intervention is best suited to a particular situation. The discussion on best practice enterprise development has been concerned with how to make the most efficient use of resources within the prevailing ideological climate, rather than addressing the most perplexing question of all: what intervention works best, in which circumstances?

This study explores the this question from perspective of both firms and government agencies in New Zealand as they make decisions about investing in training as an enterprise development strategy. Using data from two different sources, the author suggests that the way in which firms and government agencies behave in relation to investment decisions is flawed : those involved follow received wisdom, act upon hunches and all in all appear indifferent to ensuring their perspective investment are maximized. In many countries there is a noticeable absence of robust debate over the decision to deliver free or subsidized training programs to those running SMEs. Many governments now offer these schemes as a matter of course, on the assumption that developing the skills of individuals who own or who work in SMEs will lead to enhanced performance for the firm. This position has now been repeated so frequently that it is widely regarded as axiomatic, and has led to a view that achieving high performance for an economy means that governments need to provide training opportunities and firms need to invest resources in employee training (Journal of Small Business and Enterprise

Development, 2004, Vol.11, Iss.4, page 458-466).

However, there is a noticeable absence of empirical evidence that programs aimed at individuals do in fact contribute positively to firm performance and therefore to economic growth. Many of these same governments that focus on training as an intervention for ED also fail to evaluate the effectiveness of the training in any robust way, and there is no doubt that this means that the value of their investments is not being maximized. A similar situation exists at the level of the firm, with many firms failing to apply robust and clear thinking to their training investment decisions. This situation is not new, and will continue while firms and government agencies continue to be driven by short-term thinking. At the government level this type of thinking is characterized by decisions to implement particular developmental interventions (in this case training) without making evaluation an integral part of the design, or by using their own staff to carry out client satisfaction surveys and describing them as program evaluations. The result is poor quality evaluation which doesn't deliver the answers that are needed. This merely strengthens the naysayers' arguments that the value of training as an intervention cannot be assessed.

At the firm level, this type of thinking is characterized by the use of training as a way of responding to functional needs rather than as a long-term developmental strategy, and is demonstrated when managers view training needs from the perspective of the employee only rather than carefully analyzing the fit between an employee, their job and the needs of the firm, i.e. allowing employees to chose training that they wish to attend. It could be claimed that the key issue causing this situation to occur is the resource-constrained nature of SMEs. However, the degree to which SMEs are resource-constrained is precisely the factor that provides the only hint of optimism in what might otherwise appear to be a fairly gloomy situation. While at present neither governments or firms exhibit particularly good practice in terms of evaluating training investments, at least there is some reason to believe that small firms could be persuaded that there would be a benefit from doing so. While it may be impossible for those working in government agencies to take the advice inherent in the saying "live like there's no tomorrow, and work like you own the firm", it should be a piece of cake for small firm owners – they do own their firms. If anyone can break the vicious cycle of failure to evaluate training investment followed by poor training investment decisions, it will be those who are the most conscious of the value of each dollar: the SME owner (Journal of Small Business and Enterprise Development, 2004, Vol.11, Iss.4, page 458-466).

3.7. A Case of Employer Characteristics and Employee Training Outcomes in UK SMEs: a multivariate analysis

In Journal of Small Business and Enterprise Development, workforce development is becoming a higher priority for government, both as a means of addressing social exclusion and raising competitiveness. However there is limited evidence of the contribution of training to the success of individual firms and even less evidence of the impact of such training activity on small to medium-sized enterprise (SME) employees (Journal of Small Business and Enterprise Development, 2004, Vol.11, Iss.4, page 449-457). This study draws on a survey of 1,000 employees to investigate the impact of a training intervention on employees in SME workplaces. It explores issues associated with the equity of provision of training in the workplace and the impact of training on the employability of SME employees in the labor market. The results suggest that training interventions lead to positive outcomes for the majority of SME employees, particularly those working in organizations with relatively formalized training practices. It concludes by suggesting that there should be a greater focus on the employee dimension in research and policy regarding training in SMEs.

This study has presented some results emerging from evaluation research exploring the impact of undertaking training on 1,000 employees, the majority of whom were employed in SMEs at the time they received training. It is important to note that the training in question was supported by the ESF Objective 4 program, which was aimed primarily at providing skills for workers considered to be under threat from structural change in the economy. As such there is a fundamental tension between the policy instrument (O4) which sought to provide training to improve the skill-set of employees and their labor market mobility and the employers' need to retain their employees. Whilst not the focus of the evaluation research, this is of interest given the influence of the poaching externality in the policy discussion surrounding training and skills development in SMEs. The analysis suggests that employees "quitting" the workplace are significantly more likely to have gained a qualification and have followed a course of career progression (promotion) through moving to a different employer. This may be of concern to the employer, as the loss of an employee following investment in training is perceived to be a major barrier to the provision of training opportunities, particularly by smaller employers. However employers themselves do not report this as a major problem either in terms of their involvement with O4 or with training interventions more generally.

The results suggest that the majority of SME employees that undertake training do indeed report some form of benefit from the training. The findings suggest that the majority of SME employees participating in O4-funded training have derived benefits from externally-supported training activity in terms of informal measures (such as increased confidence) and accredited learning (gaining a qualification). The majority of them remain with the same employer. However there are mixed messages in terms of the extent to which the intervention has reinforced or helped to overcome existing inequalities in the labor market. The benefits are spread across most sections of the workforce, although there are statistically significant differences associated with the propensity of female workers to obtain a qualification (more likely). This coupled with the finding that older workers are less likely to undertake further training and education activities may concern policy makers as they seek to meet the challenges of structural change and the implications for older, male members of the workforce.

The profit analysis provides further illuminating findings associated with the outcomes of the intervention. It reinforces the finding associated with older workers who are significantly less likely to undertake further training and education. However it uncovers some positive (though not statistically significant) impacts in terms of those who did not have any qualification prior to the intervention and those who are members of ethnic minorities. The analysis suggests that employer human resource practices can influence the probability of a positive outcome for an employee. The data suggests that people employed in organizations with relatively formalized training practices (as indicated by the existence of IiP in the workplace) were more likely to report positive outcomes across three of the four variables under study. Employees were significantly more likely to cite an increase in confidence, to obtain a qualification and to go on to undertake further education and training than their counterparts in non committed/ recognized organizations. However the application of IiP may be limited in smaller enterprises and more appropriate and arguably innovative forms of human resource development practice needs to be encouraged to spread the benefits of learning more widely amongst the SME workforce.

Finally, the finding suggests that employees in the smallest organizations are more likely than those employed in the largest organizations to have gained a qualification. This is interesting in the light of other research which suggests that in general, support for accredited learning in the workplace increases with business size but remains at a relatively low level overall and is worthy of further investigation. Our analysis suggests that the policy intervention has had a positive impact on the pursuit of accredited learning in the smallest businesses but that those employed by medium-sized enterprises (50-250 employees) are more likely to obtain a qualification. These findings generally demonstrate the benefits of including the employee dimension within studies of training within SMEs and taken with the positive views of impact expressed by employers demonstrate the “win-win” nature of effective training interventions. The key policy challenge is to learn what works and to go on to mainstream cost-effective intervention designs and embed them in the economy (Journal of Small Business and Enterprise Development, 2004, Vol.11, Iss.4, page 449-457).

3.8. A Case of Gender-Based Performance Analysis of Micro and Small Enterprises in Java, Indonesia

In Journal of Small Business Management, Republic of Indonesia, a geographically diverse country with a population of 207 million, has been able to achieve high rates of economic growth (Journal of Small Business Management, 2001, Vol.39, Iss.2, page 174-182). However, despite three decades of rapid growth, the economic structure is still based on informal or traditional activities in which most people are employed. Indonesia's labor force is growing at a substantially faster annual rate (2.7 percent) than the population as a whole (1.6 percent) (World Bank 2000). The government of Indonesia is faced with a challenge of providing long-term sustainable employment and income opportunities for the growing rural labor force. The promotion of Micro and Small Enterprises (MSEs) as a strategy to promote employment in rural areas has received considerable recent attention in Indonesia, as well as in other developing countries. Recent economic turbulence and concerns with growing economic and social inequalities in Indonesia has stimulated discussions of means and objectives of government policies regarding small businesses. The potential contribution of MSEs to generating employment and income in densely populated rural areas of Asia has been documented. Their development is seen as a way of providing aid to the poor and creating job opportunities for the under-employed.

The majority of female workers in developing countries have entered the labor force through the MSE sector, primarily because of ease of entry and limited access to other enterprises and employment opportunities. Research in Africa and Asia show that females and males exhibit significantly different priorities in production and consumption. Females contribute larger proportions of their personal income toward household expenditures than males and thus are able to retain less profit for reinvestment. Tinker (1987) and Downing (1990) suggest that females have different business strategies and objectives than men. Women's motivation is often household survival, whereas men are more often business-motivated. Therefore, male business owners are more likely to reinvest profits into the business.

Effective policies and programs to support the development of MSEs depend critically on adequate knowledge of characteristics and constraints of MSEs. Also, given the growth of entrepreneurship among women, it is important to understand the social and economic factors influencing the success of female-owned small business. This article is an attempt to examine the micro- and small-scale enterprise at two levels: the individual and the enterprise. The specific objectives of this study are: (1) to present a descriptive profile of enterprises in Java by gender; (2) to examine the rate of growth of employment in Indonesia by gender and type; and (3) to determine the factors influencing the performance of female enterprises in Java. Such an understanding is crucial to the evolving policy debate involving the MSE sector. The survey revealed that businesses operated by female entrepreneurs appear to be concentrated in more traditional and less dynamic markets than businesses operated by men. Female businesses were concentrated in low-income informal sectors, where prospects of growth were limited. Employment growth rates of female enterprises were, for the most part, significantly lower than those of male enterprises.

From a policy viewpoint, the findings shed doubt on the feasibility of drafting a single policy or program to assist all Micro and Small Enterprises (MSEs). Given that the majority of MSEs are female-owned and these enterprises seem to be less oriented toward growth, one common program may not work. To the extent that women do have different objectives than men, programs and policies need to be gender-differentiated. At the program level, it is important to recognize that enterprises are heterogeneous, with different opportunities, needs and constraints. Program assistance must be tailored to reflect such differences. Most of the research on women enterprises has been conducted in developed countries. This study suggests that theories and results derived from research in developed countries be examined and tested before they are applied to developing countries due to differences in social and organizational structure, financial institutions, needs and constraints, family, human capital development, and other demographic features. A better understanding of enterprises and entrepreneurs can make a major contribution to the development of improved approaches for promotion of efficient and equitable growth of female-owned MSEs in developing countries (Journal of Small Business Management, 2001, Vol.39, Iss.2, page 174-182).

3.9. A Case of the Performance of Small Enterprise during Economics Crisis: Evidence from Indonesia

In Journal of Small Business Management, Indonesian economy seemed to be performing very well in the first half of 1997 (Journal of Small Business Management, 2000, Vol.38, Iss.4, page 93-101). Inflation, having averaged a moderate 9 percent per annum since the early 1980s, had been reduced to about 5 percent in mid-1997. In the first half of that year, output grew by 7.4 percent, and capital investment grew by almost 17 percent. Exports grew in constant rupiah terms by 3 percent, by comparison with 14 percent on average over the 1990s. Imports grew by 10 percent, compared with an average of 15 percent previously. The government budget had been managed well for years, and the government was able to prepay a small but significant amount of its outstanding debt in 1996 (McLeod 1998).

Indonesia's economic crisis began to emerge in July 1997, following the floating of the Thai bath and the Malaysian ringgit. Although purely a financial phenomenon initially, the crisis began to have a severe impact on the economy by the end of 1997, mainly because of a range of counterproductive policy decisions made by the government and because of growing political instability associated with presidential succession. Both the non-financial and the financial sectors suffered terribly in the crisis. It is estimated that in 1998 some 5.4 million workers in the non-financial sector were displaced by the crisis, mainly from service (37 percent), manufacturing (25 percent), and construction (19 percent), and the rate of new unemployed people increased further in 1999 (ILO 1998). However, because many workers cannot afford to remain unemployed for long, around half of them will be re-absorbed in small-scale economic activities, mostly in the informal sector. Further, due to stagnant wages and incomes and the increase of displaced workers, on one hand, and high inflation on the other, about 75 million people (or 37 percent of the country's population) were expected to fall below the poverty line by mid-1998. The corresponding figures by the end of 1998 were about 100 million people (48 percent of the population). This number is a three- to fourfold increase from the officially estimated 11 percent poverty incidence in 1996 (ILO 1998). The main purpose of this study is to discuss the impact of the crisis on the development of small enterprises (SEs) in Indonesia, especially in the manufacturing sector.

In Indonesia, small enterprises (SEs) are very important in creating employment opportunities and hence generating income, especially in rural areas. In the manufacturing sector, a majority of employment is in SEs (also called small scale industries or SSIs). In all sectors of the economy, the number of SEs was large and growing before the crisis. SEs are found all over the country, in urban as well as rural areas. In 1992, for instance, there were about 33.4 million SEs with average sales volumes of less than 1 billion rupiah per year. Considered by sector, 64.7 percent of the total SEs was found in agriculture, with only 7.0 percent in manufacturing. In 1996, the number of SEs increased to almost 39 million, an increase of 16 percent during those four years.

Data published by the Indonesian Central Bureau of Statistics on the manufacturing sector indicate that SSIs are indeed very important in that sector, both in terms of employment and number of units. In the period of 1974-1997, most of the employment in the manufacturing sector was concentrated in SSIs. The employment in all size categories of manufacturing establishments expanded throughout that period.

Although it varies among industries, the limited evidence presented here indicates that SEs that are export-oriented and/or less import- and less credit-dependent are better able to cope with the crisis than those that are domestic market-oriented and/or more import-oriented and more credit-dependent. This suggests that the key factor determining the impact of the crisis on Indonesian SEs is whether the enterprises earn foreign exchange, procure their raw materials locally, rely on a strong domestic market for their products, import their raw materials, and find formal credit for financing their production activities. It is relevant to note that an important fact emerging from the crisis is that many SEs in Indonesia are very dependent on imports for their raw materials and other inputs, even in traditional manufacturing sub-sectors such as textiles, garments, and footwear. This is in contrast with a general proposition in the literature on SEs that, different from MLEs, SEs are very intensive in the use of local raw materials and other inputs.

One thing learned from this crisis is that despite years of economic and industrial development in Indonesia since 1969 (when the New Order government came into power led by the former President Suharto), the "midstream" industries producing capital, intermediate goods, other inputs, and processing raw materials are still underdeveloped. During that period, too much attention was given to the development of the upstream and downstream industries, while the midstream industries were neglected. As a consequence, not only large and medium-scale, but also many small-scale downstream industries must rely heavily on imports of capital and intermediate goods, processed raw materials, and other inputs (Journal of Small Business Management, 2000, Vol.38, Iss.4, page 93-101).

3.10. A Case of failure Rates for Female-controlled Business: Are They Any Different?

In Journal of Small Business Management, a research has found that female-owned businesses generally under-perform male-owned businesses on a variety of measures such as revenue, profit, growth, and discontinuance (failure) rates (Journal of Small Business Management, 2003, Vol.41, Iss.3, page 262-277). It has been suggested that this finding might be the result of systematic differences between male- and female-owned businesses, particularly industry differences. This study analyzes data from a representative sample of 8,375 small and medium-sized Australian enterprises that originally were surveyed in 1994-95, with follow-up surveys in each of the subsequent three years for a sub-sample of businesses. The aim was to determine whether female-owned businesses exhibit higher failure rates than male-owned businesses and, if so, whether this finding persists after controlling for industry differences. The results suggest that while female-owned businesses do have higher failure rates compared to male owned businesses, the difference is not significant after controlling for the effects of industry.

Much of the prior research on the comparative failure rates for male- and female-owned businesses has been based on limited samples and, possibly as a result of this, some of the findings have been in conflict. The major advantage of this study is its use of a large data set collected by the ABS on behalf of the Australian federal government specifically for gaining a better understanding of a variety of issues concerning SMEs. Because the ABS legally can enforce compliance with its data requests, response rates were very high, and, therefore, non response bias is not an issue in this study. Similarly, because of the sampling techniques used by the ABS, it is reasonable to conclude that the results are representative of all Australian employing SMEs. In summary, the results from this study support previous findings that female-owned businesses, in aggregate, have higher failure (discontinuance) rates than male-owned businesses. However, female owners relatively are overrepresented in industries (such as retail and service) that have above average failure rates and relatively are underrepresented in industries (such as manufacturing) that have lower-than average failure rates. After controlling for the effects of industry, there appears to be no significant difference in the failure rates for male- and female-owned (controlled) businesses.

There are three major implications that can be derived from the results of this study. First, for financial institutions the implications should be quite clear. If financial institutions are going to discriminate between businesses in terms of the risk they represent, this should be done on the basis of industry and not on the basis of the gender of the person controlling the business. Coleman (2000) found that although lenders did not appear to discriminate against women in terms of access to capital, women-owned firms paid higher interest rates than men for their most recent loans, and women owned service firms were more likely to put up collateral than men-owned service firms. Further, it should be noted that although the risk of discontinuance may be higher in industries in which female controlled businesses relatively are overrepresented (such as service and retail), the risk of bankruptcy actually may be lower.

Second, entrepreneurs should be aware that discontinuance (failure) rates differ across industry sectors; this may be a factor worthy of consideration when deciding whether or not to establish a new venture in a particular industry. However, it has been shown that for both male and female entrepreneurs establishing a new venture, previous experience in the field of their new venture is a key to its survival (Brush and Hisrich 1991). It also should be noted that although the discontinuance rates for retail and service businesses may be higher (than for manufacturing concerns), the expected losses from such businesses should things go wrong may be considerable lower (because of their smaller capital requirements). Finally, for policymakers, the major implication of this study is that specially designed courses targeting potential female entrepreneurs may not be required (if the justification for such courses is an apparently higher failure rate for female business owners). Instead, if government-funded courses are to be provided, it might be more appropriate for such courses to be directed toward all potential entrepreneurs (male and female).

3.11. A Case of Vocational Training: Trust, Talk, and Knowledge Transfer in Small Business

In Journal of Small Business and Enterprise Development, vocational training by those involved in small land-based businesses can lead to innovation as transferred knowledge may be applied to make marginal changes to enterprises or, in some cases, a major reorganization of resources within a business (Journal of Small Business and Enterprise Development, 2007, Vol.14, Iss.2, page 280-293). The purpose of this study is to explore how knowledge is disseminated in personal business networks and how this is used in a very traditional industry. Analyzing the networks of individuals who have participated in vocational training demonstrates how knowledge travels and how best this can be transformed into action. Furthermore, the networks provide examples of how each element of the tripartite model of knowledge transfer needs to be aligned for the training to meet its goals.

In most cases, knowledge gained through attending VTS (Vocational Training Scheme) funded events, does not lead directly to significant changes in businesses but once discussed it may be acted upon to make marginal adjustments to make business enterprises more competitive. The effectiveness of this process may depend on the receptiveness of those closest to the business, particularly kin. If more than one member of the business network attends the training then change is perhaps more likely. However, in a minority of cases, knowledge, determination and support can induce significant changes. For example, one VTS participant used the knowledge gained through attending a specific training courses funded by the VTS to transform himself from employee to sole-trader status. Capturing his personal business network community reflected a business in its embryonic stage – less than two weeks into its inception. Key to his network is his Wife who is formally responsible for the paperwork of the business. Her role is much greater as she knows all the others in the participant's network. Structurally, she is the central actor in his personal business network and as such she is the primary discussant. Therefore, his wife not only provides important business skills but also acts as a strong supportive tie. Two other key players in the participant's decision to enter into business are his former manager, through whom contacts for work are gleaned, and his course administrator. Both of these he considers friends as well as respecting their professional positions. While these three have different structural and relational roles, they singularly provide conduits for discussing his training as part of trusted relationships and have assisted him transfer his knowledge into practice. It is likely, that if the newly formed business develops, the distinction between who is close to the business, and who is less important will clarify.

Social network methodology is often used in corporations as a tool in order to improve efficiency and/or innovation. Applying it to small and family businesses is in itself innovative, particular as the research draws on a peer-group of businesses that enabling some comparison. Broadly, three conclusions are apparent: the first about the methodology itself; the second about rural businesses and innovation: and the final one about the policies that regard changing the disposition of land-based businesses. The term network is frequently used a metaphor in the description of business and social activity but it is rarely measured or mapped. In doing so, many of the common sense assumptions have been re-affirmed about these particular networks while at the same time others have been challenged. For example, although it is assumed that rural business networks are tightly knit (network density) it has been demonstrated that they are in fact highly variable. If advice and policy to small land-based business is to be more effective, rooting conceptions about how the businesses operate in empirical observation should be helpful. Whilst the method is only a snapshot, it does provide valuable insights into the flows of information within a small business and how training is deployed.

The emphasis on innovation through loose ties or the role of the outsider may not be an appropriate model for small land-based business. The chance of a weak link appearing towards the core of these businesses is low and as such the flow of information inward through these routes is low. With the pre-dominance of strong ties and low flows of information these businesses are likely not to be able to change either quickly or easily. This is not the same as saying that such businesses cannot or do not adapt or that they participants are not entrepreneurial. Rather that they are not the fleet of foot business organizations that might be typical of other industrial sectors. Equally, given these characteristics they would appear to be highly robust forms of business, able to weather severe economic downturns and to perpetuate themselves. The premise of UK rural business policy created around land-based businesses beginning to behave like other firms looks unrealistic in the light of these findings. Providing funds for training has been a pillar of rural development funding and is likely to be so in the coming Rural Development Regulation (2007-2013). It is clear from this study that knowledge can stimulate business change but a simple correlation between “knowledge in” and adaptation does not exist. This study provides pointers that to improve the injections of knowledge into small land-based businesses requires more focused intervention than is currently emphasized on program based support for rural businesses (Journal of Small Business and Enterprise Development, 2007, Vol.14, Iss.2, page 280-293).

3.12. A Case of Small Business Owners: too busy to train?

In Journal of Small Business and Enterprise Development, the reason often cited for the poor relationship between small businesses and their uptake of vocational education and training is that small business owner-managers claim that they are too busy to engage in training or any type of learning activity and that most training is of little value to them (Journal of Small Business and Enterprise Development, 2007, Vol.14, Iss.2, page 294-306). The aim of the research is to examine the relationship between these factors. Poor managerial competencies have often been linked to small business failure (Gaskill et al., 1993; Jennings and Beaver, 1997; Perry, 2001). However small business is vital to all economies and within the Australian context, small business represents a significant employer of labor as well as providing employment for the owners of the business. Of the 1,179,300 small businesses in Australia, an estimated 1,591,500 people were business operators (ABS, 2004). Consequently, small enterprises represent a significant component of the private sector workforce in Australia.

It is also acknowledged that small business owner-managers, compared to owner-managers of larger businesses, have lower formal education levels and participate less in skills development and training activities (Bartram, 2005; Billett, 2001) and that there is a lack of emphasis on the relationship between successful business operation and management training (Billett, 2001; Westhead and Storey, 1996; Wooden and Baker, 1995). An educated and skilled labor force is considered to be essential to the success and growth of small business and for businesses to gain some competitive advantage in the global economy (Cosh et al., 1998; Huang, 2001). The influence of the human resource capabilities of the small business owner-manager is therefore critical in this process. To facilitate greater participation by owner-managers in training activities Ehrich and Billett (2004) have recommended the development of pedagogic principles that are suited to the changing skills development needs of small businesses. Of particular interest to the business owner-manager will be the impact that training will have on the business, not just in terms of the bottom-line, but also for its relevance and application to day-to-day operations. Storey (2004) and Westhead and Storey (1996) have also highlighted that there is not enough emphasis placed on the link between management training of small business owner-managers and business performance. This is despite owner-managers recognizing the importance of developing and maintaining management skills (Loan-Clarke et al., 1999; Smith and Whittaker, 1996).

The pre program interviews gained background information on the participants and assessed their current human resource competencies and their current HR situation in their business and ascertained why they wanted to participate in the workshops. Their current HR competencies were important to know in order to be able to structure the workshops to cater for their requirements. The interviews revealed that the majority of participants had little or no prior experience or skills in formal human resource management. Only one participant, who was studying human resource management at the time of the study, had any formal qualifications in human resource management or a related discipline. For the majority of small business owner-managers, the main reason for participating in the workshops was to gain general skills in dealing with staff, due to having experienced “staffing” issues in the past. As had already been revealed in the literature, most small business do not operate in a strategic way and therefore the assumption was made that the information the participants would be seeking would be operational. It should also be noted here that many of the small business owner-managers regarded employees as “staff” and the term “human resources” was a phrase used by big business not small businesses. Most staffing concerns were the result of a reactive rather than a proactive issue.

Another example of the informal methods used in small business was that, aside from a general “welcome” package in some instances being provided to new employees, no formal staff policies relating to the HR issues were provided to employees. Participants saw the following advantages in participation: gaining a better understanding of human resource management, training, and related issues; gaining skills so that they could recruit, interview, manage, and retain staff confidently, and, when needed, dismiss employees using correct procedures; and networking and talking to other people about their small business and human resource management related experiences. All participants acknowledged that they had gained an overall understanding of the human resource issues that affect and influence their day to day operations. Participants also acknowledged that discussing the issues in peer groups and recognizing that everyone has similar problems was a key learning point. The legal aspects of business, in particular employee termination were keys issues that many participants stated they were keen to participate in further training in. Other participants said that they would like to attend refresher courses on similar material, thus supporting the argument that small business is not too busy to train.

The results have demonstrated that small business owner-managers who recognize and act on their need for further training, and in this instance the topic was human resource management, are able to make significant gains in both their knowledge and confidence to deal with operational issues in their business. In achieving these outcomes the research has highlighted the need for small business owners to recognize and act upon their needs for management training in general and to have a broader understanding of their importance. The key finding of the research was that given certain conditions and business requirements, small business owner-managers are not too busy to train. Two factors appear to influence the small business owner-managers' attitudes toward training and development, which are the relevance of the training and the delivery process. Small business owner-managers will participate in training opportunities if they are directly applicable to current situations in their business, and if the delivery process is carefully structured in terms of location, time of day, and length of session. This confirms the work by Loan-Clarke et al.(1999, p. 306) who after surveying 551 UK small businesses and found that "small businesses not only recognize the potential benefits of MTD [management training and development] but are prepared to support their belief with cash".

To enhance participation in training by small business it is suggested that the location of the training venue needs to be in close proximity to the businesses operating base, as traveling long distances inevitably takes precious time away from the business. In addition, the time of day is also important. Business owner-managers are unwilling to participate in training if it removes them from their business during the busy periods in their day. This recognition was a factor in structuring the sessions over a fortnightly period. This structure was designed to limit the amount of time the owner-managers were required to commit to participate in the training, and also provided important opportunities for participants to put the knowledge gained during each session into practice. They were then able to come to the following session with any questions or feedback. This structure was integral to the quality of the learning process, especially for adult learners and when providing for the many small businesses who are resource poor. It is acknowledged that this particular delivery method is neither new nor revolutionary and is in fact what advocates of just-in-time training for small business have been arguing for. However, the Vocational Educational and Training sector in Australia has been slow to pick up on this and therefore it is hoped that this piece of research adds more evidence to the just-in-time delivery argument. The fact that 80 small businesses completed this program, demonstrates that there is willingness on the part of small business owner-managers to learn and to implement new ways of managing business, so long as certain conditions exist.

In relation to the actual content of this particular program, the initial findings were that these small business owner-managers had recognized that they had little knowledge of human resource issues prior to the training. They initially expressed a strong need to learn more about recruiting, retaining and dismissing staff using correct procedures. However, following the workshops, all participants acknowledged that they felt more competent and informed about human resource issues, particularly in recruitment and selection, retaining good staff, legal requirements and procedures, job advertisements, motivating employees and developing vision statements for their small business. These results highlight the need for small business owners and their staff to recognize their human resource training needs, and to have a broader understanding of the importance of their training and development needs. This study provides much needed evidence of the capacity of appropriate training to provide positive outcomes for small business, in this instance in relation to human resource management. The next stage, currently being undertaken, is a longitudinal study on this particular cohort, to determine whether any longer term behavioral changes on the part of owner-managers who participate in human resource training occur and whether or not this type of training is able to assist small businesses in regard to operational performance (Journal of Small Business and Enterprise Development, 2007, Vol.14, Iss.2, page 294-306).

3.13. A Case of Training Commitment and Performance in Manufacturing SMEs: Incidence, Intensity and Approaches

In Journal of Small Business and Enterprise Development, the contribution of small- and medium-size enterprises (SMEs) to a healthy economy has long been recognized and capability development of small firms remains critical to economic prosperity (Journal of Small Business and Enterprise Development, 2007, Vol.14, Iss.2, page 321-338). This concern for SME development is not new. Since the early 1970s in the UK, both academics and policy makers alike have started to pay attention to the role played by SMEs in economic growth, employment, and technological change (see for example, Bolton Report, 1971; Gibb and Scott, 1985; Storey, 1994; DTI, 2000). Despite this concern, and many initiatives to encourage small firms to grow, it is suggested that “one of the key reasons for low-levels of UK productivity is the “long-tail” of badly-managed and under-performing small firms” (Jones, 2003, p. 16). Management skill shortages still exist in the SME sector and management development and training in the sector remains a policy priority. Research has also shown that, because of the habit of promoting informal training over formal training, SMEs operating in the manufacturing sector are in a relatively disadvantaged position (Matlay, 1999).

Both demand and supply factors provide explanations as to why SMEs are reluctant to invest in training (Centre for Enterprise, 1999). From the demand side, it is believed that one of the difficulties is the lack of quantifiable evidence that shows a link between training and performance (Marshall et al., 1993, 1995; Patton et al., 2000). It is suggested that by making such a link more explicit and informing managers of the benefits, demand and interest for training and management development within SMEs could be improved. It is also considered that the demand for training may be determined by the context of a business. Characteristics such as age, size, ownership and main industrial activities may ultimately determine the nature and extent of training demand (Hendry et al., 1991). Alternatively, from the supply side, training policy and delivery systems fail to understand and address the specific needs of SMEs (Perren et al., 1999). SME managers are thus making an informed choice and deciding not to invest in the training offered (Storey and Westhead, 1997).

What is a particularly important contribution of this study is the finding that SMEs that conduct management training show a statistically significant advantage in terms of both employee and turnover growth, compared with those that either do not conduct training, or prefer to invest in informal training. It appears that the intensity of training (number of training interventions) is only relevant as the firm grows. This latter finding seems intuitive, since the number of training interventions required is likely to increase as staff numbers increase. It has been suggested in the literature (for example, Hill and Stewart, 2000; Kitching and Blackburn, 2002) that managers prefer informal to formal training interventions. However, while SME managers prefer an informal learning approach, this does not necessarily mean it is more effective. SFEDI (2004) note that it is important to distinguish between what is practiced (due to resource scarcity) and what is appropriate. In this research there is a clear and significant finding that formal training is associated with performance over and above that provided by informal training in small manufacturing firms. As with other studies, our findings are subject to criticisms of causal ambiguity (Storey, 2004). Also we must acknowledge that the measures of success used do not reflect the wide range of objective and subjective aspirations of SME owners (Curran and Blackburn, 2001). Nevertheless, the findings do add weight to the body of evidence on the training-performance relationship highlighted in earlier studies (for example, Cosh et al., 1998; Marshall et al., 1995; Betcherman et al., 1997; Huang, 2001; Smith and Whittaker, 1999).

There are a number of potential reasons that formal training may provide additional benefits over informal training. Firstly, there may be a lack of suitable skills – such as coaching or communication – within the firm to make the most of informal development activity (Hendry et al., 1991; Mabey and Thompson, 1994). Secondly, the owner-manager may be too busy to devote time to informal training. In this case when they recognize a staff development need they will utilize a formal approach that is cost effective in terms of their own time. In this case targeted formal interventions may be a chosen solution. This would accord with findings from Baldwin et al. (1995) who suggest that training targeted at a few key individuals is beneficial to SMEs' performance. Thirdly, previous research has highlighted training and development being utilized as a response to a problem (Blackburn and Kitching, 1997, Patton and Marlow, 2002), where "selecting training was particularly tailored to an identified training need" (Cassell et al., 2002, p. 687).

When we look further into the statistics, these latter two points seem particularly relevant. The most positively significant approaches within formal training were the use of outside providers for in-house courses, and the use of in-house designed and delivered courses. Taken together with the finding that it is the incidence and not the intensity of training that will be important, this suggests that both of these types of intervention are likely to be used to target a specific and identified need: the former when specific skills or knowledge are absent, but the failure to address the skill need is perceived to jeopardize the business; and the latter when there is an ongoing skills need in the business that warrants training investment. The identification of this particular approach to invest in organizational knowledge adds weight to the findings of Cassell et al. (2002) and Hendry et al. (1991) that training is undertaken as tactical solutions to problems; the demand for training is explicitly related to improving the way the business is operated (Patton and Marlow, 2002). The intensity of training is less relevant, since generic interventions provide benefits to the individual and not the firm (Westhead and Storey, 1999). Indeed, the most effective informal development initiative was shown in the findings to be attendance at training seminars. Given the difficulty of engaging SME managers who are under significant time pressures, attendance at seminars is likely to occur only when the information is considered relevant to a specific business issue. Thus, the most successful formal and informal interventions appear to be tactical solutions to crises, but, as such, they are likely to have a more direct effect on business performance. The idea that particular problems stimulate learning is highlighted in organizational learning theory (see, for example, Weick, 1995; Fiol and Lyles, 1985) and has been identified by Cope (2003) as a particularly important mechanism to achieve higher-level learning in smaller firms. Our findings are also consistent with studies that conclude more flexible, targeted and relevant business support mechanisms are required in order to engage SME managers in development activity (Perren et al., 1999, Macpherson, 2005). It seems that SME support programs need to understand and address the particular crises that individual businesses are facing, and be flexible enough to provide idiosyncratic solutions.

It is also interesting to note that the approach to training is moderated by contingent variables. In particular, this study highlights the influence of size (number of employees), structure, and uses of technology on the approach to training chosen. Similar to findings by Reid and Harris (2002), we also noted that business ownership was influential, with non-owner managed companies significantly more likely to engage in formal training. Thus, this study also extends our theoretical knowledge of the contingency influence on the training-performance relationship. Perhaps more importantly, it has managerial implications in terms of designing and choosing the most suitable training approach for a particular context. However, in this regard the findings are only preliminary and further research is necessary.

What is particularly important in this study is the finding that formal training is shown to be more significantly associated with performance than informal training by a number of contingent variables, including market, structure and leadership. Further analysis is required to provide a deeper understanding of these effects. More over, while managers may perceive that informal training is more relevant, this study highlights the importance of targeted formal interventions to specific problems. We suggest that these findings are consistent with tactical approaches to training that address specific and identified training needs. By addressing particular crises or difficulties, SMEs managers are investing (either time or money) to provide access to specific knowledge resources that can contribute directly to business performance. This finding along with others, such as Perren et al. (1999), Cassell et al. (2002) and Patton and Marlow (2002), suggests that training support for SMEs needs to address specific challenges that SME managers face. Support mechanisms for SMEs, if they are to add value, need to be flexible enough to support idiosyncratic development needs, and not just provide generic solutions that do not accrue value to the firm (Jayawarna et al. 2006).

3.14. A Case of the Nature of the Client-Personal Business Advisor Relationship within Business Link

In Journal of Small Business and Enterprise Development, a study reports upon the findings of a national survey of Personal Business Advisors (PBAs). It examines the nature of the client- PBA relationship in terms of how relationships are established with growth firms and how they are maintained over the long term (Journal of Small Business and Enterprise Development, 1999, Vol.6, Iss.1, page 80-88). Results show that a range of different approaches are currently used to identify growth businesses. Other findings indicate that the current role of the PBA is a broad one, extending beyond the client focus originally envisaged by the DTI. It is argued that financial targets are an important influence upon the nature of the client-PBA relationship.

Business Link was launched in 1992 when the DTI published a prospectus inviting competitive bids to develop `one-stop shops' for enterprise support. There are now over 220 Business Link outlets in England, Scotland and Wales (termed Business Shops in Scotland and Business Connect in Wales). These have been developed as partnerships between TECs/LECs, local government, Chambers of Commerce and other local business service providers, the objective being to provide greater coherence between the main suppliers of business services in local areas and to draw on private as well as public sector resources (DTI, 1992).

The primary focus of Business Link is upon developing micro strategies for product-market development (ENSR, 1994). The range of services provided include an extensive information and advice service, consultancy, export services, innovation, design, quality and technology services, training courses and business `health checks'. An important feature of the Business Links is their use of Personal Business Advisors (PBAs) who are assigned to individual firms to identify needs and assemble support packages. Business Link provides services that are available to all firms, but a key focus of its activities is upon the development of firms with growth potential. PBAs play an important role in achieving this by establishing long term relationships with such businesses. PBAs are also encouraged to adopt a more proactive approach, seeking out companies which might benefit from their help (DTI, 1994). This development reflects a perceived need to be more targeted when providing support for growth oriented firms (Curran, 1993) as well as concerns about being too reliant upon the one-stop shop approach, the success of which is dependent upon businesses' awareness of the support services avail- able (Jones et al., 1994; Vickerstaff and Parker, 1995).

The aim of this study is to examine the developing nature of the client-PBA relationship within Business Link. The role of the PBA has been described as `to develop and foster long-term relationships, in order to transfer their rich diversity of experience, knowledge and skills to clients, and to facilitate access to first class business support services' (DUBS/QED, 1995). Thus, the emphasis is upon establishing and then maintaining relationships over the long term in order to benefit the client firm. This study draws upon the results of a survey of PBAs to evaluate how, and to what extent, these objectives are being met. Particular reference is made to the possible impact of government targets (set by the Conservative government and reaffirmed by the current Labor administration) which require Business Links to generate 25 per cent of their income from the businesses they assist by the fifth year of their operation (Business Link Bulletin, 1997; DTI, 1997).

This study has provided evidence to suggest that the client-PBA relationship within Business Link is a complex one, affected by a range of influences. No evidence has been found to suggest that the overall quality of client-PBA relationships is sub- standard. Indeed, a large number of examples of good practice exist. However, an awareness of possible influences upon the services provided is important if standards are to be maintained and enhanced in line with the vision of the current government. The apparent conflict between meeting the growth-relevant needs of a predefined target client base and meeting Business Link's own financial needs is one issue that has been highlighted. Some evidence exists to suggest that this conflict can affect approaches to establishing relationships, and might have an impact upon the nature of ongoing relationships. A further issue defining the relationship between client and PBA is local economic development needs. Where a particular need group is felt to exist (such as in the case of micro businesses in rural areas), there would appear to be a shift in client focus that reflects local needs more than nationally set DTI guidelines. In other words, there appear to be variations in the extent to which PBAs are being used as instruments of locally determined policy as opposed to nationally determined policy. Certainly their ability to act as independent advisors is constrained.

In terms of policy implications, one positive step would be for the DTI to re-evaluate the job description and role of the PBA with a view to clarifying both their purpose (sales person or independent advisor), their client focus and to whom they are responsible (the board of individual Business Links or the DTI). However, more fundamentally, a review of the nature of targets set for PBAs (and within Business Link more generally) needs to be undertaken. Consideration needs to be given to how fee renewal targets can be used most effectively to maintain and enhance the quality of support provided, de-emphasizing targets that might encourage large increases in the quantity of clients per PBA.

Also, the continued deviation of the PBA client focus from DTI guidelines needs be recognized and the reasons behind it considered and, if necessary, addressed. It may be the case that regional or local variations are considered acceptable. If so, this should be more clearly acknowledged in national DTI guidelines. However, if an emphasis upon targeting only `growth potential' non-micro firms is to be pursued, a more consistent approach to supporting the young start-up firms and micro businesses which fall outside the remit of PBAs must be developed within the Business Link framework. This would replace the current system where the level and quality of such support varies between localities (Gavron et al., 1998). At the same time, and notwithstanding the acknowledged difficulties involved, there is a continued need to develop practical methodologies for helping PBAs to identify firms with growth potential.

3.15. A Case of Contemporary Training Initiatives in Britain: a Small Business Perspective

In Journal of Small Business and Enterprise Development, Britain focuses upon six recent training initiatives, all of which included a small business training remit. It evaluates the training impact of these initiatives on a sample of 6,000 small businesses and measures their effectiveness in terms of awareness, understanding, interest and actual implementation rates (Journal of Small Business and Enterprise Development, 2004, Vol.11, Iss.4, page 504-513). The research highlights a number of common trends pertinent to the training initiatives reviewed in this study, suggesting that there may be a considerable mismatch between specific small business training needs and the services on offer.

The birth of the modern small business sector of the British economy can be traced back to the beginnings of the Industrial Revolution (Boswell, 1973). Until recently, however, its contribution and development has remained largely unnoticed and unrecorded (Matlay, 2002). This socio-economic neglect continued until the mid 1960s when some business observers and commentators began showing an interest in smaller firms and their contribution to the British economy. The growing interest in the British “Cinderella”, however, highlighted the need for more accurate data and dedicated small business statistics (Storey, 1994; Matlay, 1994). Parliamentary lobbying led, in 1969, to the appointment of the Committee of Inquiry on Small Firms, which reported its findings two years later (Bolton Report, 1971). According to Goss (1991, p. 2) the Bolton Report was successful in quantifying, for the first time, the important contribution that the small business sector made to the stability and development of the British economy. One of the most important and worrying aspects to emerge from the findings of the report related to the apparent lack of vocational education and training (VET) prevalent among small business owner/managers and their workforce (Matlay, 2002a). In the context of the ongoing training debate, this was widely perceived to confirm and reinforce the argument that endemic skills shortages resulted in loss of competitiveness at firm level and contributed significantly to Britain’s long-term, relative as well as absolute economic decline (Matlay, 1997).

The research upon which this study was based focuses upon six recent training initiatives that incorporated small business training and support components. The training initiatives under scrutiny were evaluated in terms of owner/manager awareness, understanding, interest and actual implementation. The results show that only a relatively small proportion of owner/managers in the research sample were aware of the existence of Industry Training Organizations and fewer still admitted to be interested in this type of training and support. Actual usage was recorded at 9.79 percent in micro-businesses, 10.68 percent in small business and 14.27 per cent in medium-sized organizations. In view of their length of operation and the variety of training schemes on offer during their existence, the impact that ITOs had upon the SME sector of the British economy can be surmised as low. The data points towards an inflexible approach as well as a mismatch between the specific training and support needs of smaller firms and the services on offer through ITOs. The uptake of Investors in People amongst the smaller businesses in the research sample was very low. None of the owner/managers in micro-businesses showed any interest in IiP or set out to achieve accreditation. Even though awareness, understanding and interest had increased amongst respondents in small businesses, only 1.02 percent of them claimed to have been successful in gaining the IiP “Badge of Achievement”. Higher rates of accreditation were reported by respondents in medium-sized organizations, amongst whom 12.24 percent claimed to have successfully completed the accreditation process. These results indicate that IiP was not perceived to be useful for micro- and small business owner/managers. In contrast, however, the IiP "Badge of Achievement" seemed to be more valuable for the HRD strategies adopted in medium-sized organizations.

The most disappointing implementation rates were recorded in relation to Scottish/National Vocational Qualifications. Despite improvements and enhancements that occurred over a prolonged period of operation, the competence-based system of vocational qualifications appears to have failed to make a significant impact on the training strategies of smaller firms. Despite comparatively high rates of awareness, only 0.63 percent of respondents in micro-businesses and 2.72 percent of small business owner/managers incorporated S/NVQs into their training strategies. Even in medium-sized businesses actual usage only reached 10.13 percent. Most owner/managers blamed their low rates of implementation upon the complexity, length of time and expense involved in adopting the competence-based framework of vocational qualifications. In contrast, over a considerably shorter period of time, Modern Apprenticeships and Accelerated Modern Apprenticeships had a higher impact upon training in the SME sector. In terms of usage, 5.83 per cent of owner/managers in micro-businesses, 13.76 percent in small firms and 34.18 per cent in medium sized organizations claimed to have used MAs and/or AMAs as part of their training strategies. These results appear to indicate that MAs and AMAs were much better suited to the specific training needs and HRD strategies of smaller businesses.

This research has identified a number of common trends pertinent to the training initiatives reviewed in this study. While owner/manager awareness and understanding of government sponsored initiatives was relatively high, interest and actual usage rates were relatively low. There was a marked size-related increase in usage rates that held across the whole sample, regardless of age, location or type of economic activity. None of these initiatives appears to have made a significant impact upon either the skill levels or the competitiveness of smaller firms. On balance, those initiatives that incorporated specific small business remits (i.e. TECs/LECS and MAs/AMAs) proved to be more successful in the SME sector than the more general training and support schemes made available in recent years. It is recommended, therefore, that policy makers should consider the implementation of discerning training and support initiatives that would focus exclusively upon the specific needs of micro- and small business owner/managers and their workforce. Such initiatives would be more likely to succeed in raising the skill levels of the workforce and improve the competitiveness of businesses operating in this important sector of the British economy (Journal of Small Business and Enterprise Development, 2004, Vol.11, Iss.4, page 504-513).

3.16. A Case of Entrepreneurs' Attitudes to Training and Support Initiatives: Evidence from Ireland and the Netherlands

In Journal of Small Business and Enterprise Development, there are increasingly, academics, practitioners and governments recognize the need to examine the role and effectiveness of entrepreneurship training and support (Journal of Small Business and Enterprise Development, 2004, Vol.11, Iss.4, page 440-448). Studies to date have examined the importance of training and other skill development opportunities in promoting entrepreneurship in the context of different sectors, regions and countries. An important theme to emerge from the research is the failure of some programs to take on board the cultural, educational and social background of the "entrepreneurs", leading to ineffective training and support. This study investigates the effectiveness of training and support initiatives for entrepreneurs in Ireland and The Netherlands, examining the experiences of 57 entrepreneurs from the services, manufacturing and high technology sectors in Ireland and The Netherlands. The results highlight the value of non formal support structures, such as mentoring and networking, and question the value of traditional formal business education and training strategies.

Scrutiny of the role and effectiveness of entrepreneurship training and support initiatives has increased in recent years. Academics, practitioners and governments worldwide increasingly recognize the role of education and training in providing entrepreneurs with the necessary business skills and acumen to plan, setup and grow their business ideas. An important theme to emerge from the research is the need to take on board the cultural, social and educational background of the "entrepreneurs" in developing training and support systems. By way of extending research into this area, the study investigates the effectiveness of training and support initiatives for entrepreneurs in Ireland and The Netherlands. The justification for this study is twofold. First, because of the increasing importance of training and support as an effective way of stimulating entrepreneurial activity and in reducing small business failure, as recognized by academics, practitioners and governments world-wide.. The increased availability of such programs, coupled with the importance attached to training and support in promoting entrepreneurial activity, necessitates a need to continually monitor and evaluate such initiatives.

This study analyses the experiences of 57 entrepreneurs in Ireland and The Netherlands who have accessed a wide variety of training and support provisions, from formal start-up training programs, to mentoring and networking support. The evidence reveals both similarities and differences in the take-up of training and support between these two countries. The results, based on both quantitative and qualitative data for 57 entrepreneurs, from the services manufacturing and high-technology sectors, highlight the role of non-formal support structures, such as mentoring and networking. The overall aim of this study was to examine the experiences of entrepreneurs in both Ireland and The Netherlands with regard to structured entrepreneurship supports, specifically entrepreneurship training. In addition, the authors sought to note any particular differences or similarities in the take up and rating of entrepreneurship training and support initiatives in these two countries. The key findings from this study are as follows:

(1) Types of organizations and supports accessed the entrepreneurs in this study received support from a wide range of organizations including government, trade associations and the third level educational institutions (i.e. universities, colleges and Institutes of Technology). Networking and mentoring were among the most frequently accessed informal supports. This finding has interesting implications for support organizations, since support mechanisms of this type tend to cost less to deliver than, for example, the more structured training and development programs. The fact that financing was the second most frequently accessed support, according to this study, emphasizes the important role of this element in the start-up process.

(2) Differences in perceptions between the two samples Irish entrepreneurs are more likely to access supports than their Dutch counterparts, possibly reflecting the Irish culture of reliance. The results suggest that the Irish entrepreneurs were more likely to access formal supports, such as training, incubation and funding, while the Dutch entrepreneurs indicated a preference for less formal supports, such as mentoring and networking. In terms of perceptions, the respondents were generally favorable towards the supports which they accessed. However, this study revealed that several of the entrepreneurs were dissatisfied with the expertise provided by third level educational institutions. Although the statistical tests applied by the authors revealed that there were no significant differences between the ratings of the two entrepreneur groups, overall, the Irish respondents were slightly less likely to be positive about the supports they accessed than the Dutch. This aspect clearly needs further investigation.

(3) Content and delivery of programs a key finding of the study, revealed by the questionnaires and further supported by the interviews, was the fact that many of the entrepreneurs felt the services they were offered as part of an entrepreneurship support program either were not very good in practice or did not materialize at all. Consistent with Dana (2001), these findings imply that many entrepreneurship training and support programs are not meeting the needs of the entrepreneurs for whom they were intended. Alternatively, consistent with Dunsby (1996), among others, this finding may indicate simply that academics might not be the best suited to deliver entrepreneurship support.

Finally, while the findings of this small comparative survey have revealed that there are no significant differences in the take up and perception of entrepreneurship supports between entrepreneurs in Ireland and those in The Netherlands, the study makes a number of important contributions. These include providing further evidence of the value entrepreneurs attach to informal support mechanisms, such as mentoring and networking, and highlighting the critical role of third level educational institutions in supporting the entrepreneurial process. The main recommendation of this study, therefore, is for third-level institutions to revisit their entrepreneurship support provision, taking account of the actual needs of the entrepreneurs they aim to support. In this respect, constant monitoring and evaluation of entrepreneurship supports is critical (Journal of Small Business and Enterprise Development, 2004, Vol.11, Iss.4, page 440-448).

3.17. A Case of the Effect of Business Advisers on the Performance of SMEs

In Journal of Small Business and Enterprise Development, there has been a considerable rise in firm's use of business advice, whether from government agencies, professional service firms or research and educational organizations (Journal of Small Business and Enterprise Development, 2006, Vol.13, Iss.1, page 33-47). Bennett and Robson (1999) after providing a review and comparison of 13 previous studies reported that sources of advice could be grouped into six areas: professional specialists, professional generalists, market contacts, social contacts, business associates and government agencies. They noted, in line with previous studies, that from their study the private sector suppliers of advice were dominant and that small and medium-sized enterprises (SMEs) used a range of sources but accountants dominated. In addition, they found that the SMEs reported that the impact of advice was important rather than crucial. Bennett and Robson (1999) conjectured that the use of advisers reflected the institutional (from professional assurance) and personal (from relationships) trust that existed between them and their clients. These authors suggested that the lower levels of use of public bodies may have been related to lower levels of (institutional) trust.

Wren and Storey (2002) reported upon the positive effects on growth in sales turnover and employment of marketing advice provided to mid-sized (£0.3 million to £2.0 million turnover) SMEs in the UK government's enterprise initiative. However, these authors noted that the SMEs always had a defined project, for which they sought assistance, suggesting that one valuable role of the advisers was bringing technical expertise to bear in these projects. The growth of business advice suggests that it has passed a market test. However, the reasons for seeking advice varied considerably, from a wish to be in touch with the latest thinking via some forward-looking problem solving to the need to handle a crisis.

The research reported here was based upon a survey of 140 SMEs in the Manchester City region. This was a similar order of magnitude to the 11 studies compared by Bennett and Robson (1999) where sample size was disclosed. But it is very much smaller than that of those authors or the Wren and Storey (2002) study. However the concentration upon the role of external accountants followed along from the almost universal recognition of their significance in the provision of external business advice to SMEs. The Manchester city region, where many of the sample firms were found, is a dense concentration of economic activity which underlines the argument of Bratton et al. (2003) that such a concentration may be a reason for the higher reported use of accountants and consultants as business advisers.

In this study most of the business advisers had limited use by the owner/managers but the networks contacts were used most, and this included other owner managers who were a more likely source of external advice. Of almost equal use were accountants who had a key role in this process, but mostly on statutory work. McChlery and Meechan (2000) observed that there were concerns about the low added value of (external) accountants, who were principally focused on basic attestation and reporting work for their small firm clients. Our findings were not so limiting, and indicated a significant effort by many of the external accountants, as perceived by owner-managers in our sample, to shift into the value-adding areas we have observed. However, there have been positive requests that auditors should not provide business advice to the same clients. The raising of the audit threshold to £5.3 million means that many smaller firms are not required having an audit. But these firms may well be prepared to pay for an audit for the purposes of providing confidence to banks and other business relationships.

The support agencies were not used by half of the firms and used as much as the business consultants. In both of these cases the user firms were growing faster than the non-user firms. The very low levels of use of academic advice leads to a need for academics and their universities to become "more professional" in the way they present themselves and interact with the SME owner/managers and other advisers. This may not fit well with an academic culture of UK HEIs driven by the demands of the research assessment exercise. Perhaps the universities might consider establishing special units resourced by experienced advisers and academics to enable themselves to make the crucial knowledge contribution that is needed (Luna and Velasco, 2003). However, owner-managers and businesses need to be able to champion and sustain the new ideas for themselves if the changes are to be durable and worthwhile – this is consistent with general innovation theory. The key must be with the owner-managers themselves being prepared to understand the different techniques and then using them to help to guide their decision-making. Merely having knowledge or a "passing acquaintance" with new accounting ideas and procedures may not be enough to engender change. Some external stimulus or shock such as the timing of contingent events, a cash flow crises or a shortfall in finance, may also be necessary (Reid and Smith, 2000).

From the survey it was found that SMEs whose owner managers were high users of a range of business advice were also those that were growing most quickly, hence the contribution of advisers of many kinds did make a positive contribution to SME growth. The external accountants and network contacts provided most of the business advice sought by the SME owner/managers. While most of the advice provided by external accountants was related to statutory work, the very significant contribution of external accountants (albeit at a lower level of provision) of emergency, financial management and business advice was observed. The growth rate of the businesses was directly related to the degree of usage of these latter categories of advice from external accountants. The external advisers from the universities were given a very low profile by the owner managers. This is a problem that must be addressed if the universities are to play a more significant role in SME development. An alternative approach would be to mediate the relationship between the universities and SMEs by support agencies, accountants or consultants. The use of network contacts, more likely to be informally traveled rather than formally constructed, was a very significant contribution to business performance (Journal of Small Business and Enterprise Development, 2006, Vol.13, Iss.1, page 33-47).

3.18. A Case of the Asia Foundation Experience in Indonesia : Unleashing Small Business Growth

Throughout Asia, small businesses are a critical component of local economies. The Asia Foundation has developed an innovative approach to helping small businesses grow rather than providing direct assistance to firms, the Foundation directs its activities towards improving the business environment, working with grassroots business groups that advocate market reforms, and providing technical assistance to local institutions tasked with implementing reforms (http://www.asiafoundation.org/pdf/indo_SME.pdf). The Foundation has six years of experience implementing such programs in Indonesia and is a leader in the field of building private-sector engagement in policy reform. This approach complements the efforts of other organizations that provide business development services or financial services to the small business sector. Building on the lessons learned in Indonesia and adapting the framework to suit local needs, The Asia Foundation is in the process of developing significant programs directed at the small business community in Bangladesh, Nepal, the Philippines, and Cambodia.

Businesses employing fewer than 20 people employ roughly 90 percent of the population in Indonesia, a statistic similar to that of other developing countries in Asia. Traditionally overlooked by economic development strategies that emphasized the creation of large and often state-owned companies, small businesses have garnered increasing recognition in recent years for two primary reasons. The first is their ability to generate employment — thereby reducing poverty — with limited capital. As large, well-connected firms continue to founder in the wake of the Asian financial crisis, small businesses have absorbed the unemployed and played a fundamental role in ensuring the economic survival of many families. Small businesses are important for growth, as well. The presence of a dynamic private sector made up of all sizes of business is an important indicator of a healthy economy.

In much of Asia, however, small businesses operate in an environment where state-owned enterprises or well-connected large companies continue to be granted privileged access to resources, procurement contracts, and regulatory concessions. Small businesses, in contrast, face a heavy burden of restrictive regulations, levies, and licenses. They bear tremendous financial costs and must allocate considerable amounts of time to obtain the multiple licenses that are required to operate legally. Moreover, these local regulations are frequently amended, and this constant state of flux leads to new opportunities for corruption. Sometimes the problems are unintentional, but still costly, for small businesses. Poor governance in some countries produces regulations and procedures so obtuse that entire industries of middlemen spring up to expedite the processes. Even when institutions do not formally exclude them, small businesses owners may find themselves on the outside looking in. For example, cultural barriers prevent many from approaching lending institutions, even those that exist to serve small borrowers.

The Asia Foundation is a nonprofit, nongovernmental organization dedicated to the development of a peaceful, prosperous, and open Asia-Pacific region. Working out of 17 offices across Asia, the Foundation sponsors a wide array of programs that support the reform process by strengthening local partners who actively advocate greater openness, greater transparency, and greater participation. These programs fall into the broad areas of governance and law, economic reform and development, women's participation, and international relations. In Indonesia, the Foundation has been responding to the real and pressing needs of small businesses since 1996. The Partnership for Enterprise Policy Reform program, funded by USAID, works to improve the business environment by broadening private sector participation in government decisions on small business policy (http://www.asiafoundation.org/pdf/indo_SME.pdf). The program is also enabling greater access to credit at the local level through a better functioning financial system. Lastly, the Foundation works to increase the availability of relevant technology and information to and among small and medium enterprises (SMEs).

The majority of SME programs focus on business training or the provision of credit, approaches designed to overcome perceived weaknesses in the sector. This conventional wisdom is not without some basis in reality. Small businesses often operate in environments where capital is scarce and where knowledge of best-management practice is limited. Nevertheless, this view ignores that the SME sector across Asia includes a rich array of entrepreneurs who survive despite business environments that are often hostile to their business interests. Time and resource-intensive interventions at the firm level cannot be fully effective when the market itself is heavily distorted, as in many Asian countries. When the Foundation began its work with small business in Indonesia, existing business associations involved selected groups of well-connected businesses. These business groups, often organized along sectoral lines, usually advocated behind closed doors for advantageous treatment of their own businesses or industries. The Foundation initiated the establishment of the first independent small business associations in 1997. Today, there are more than 60 small business associations serving more than 1,500 member businesses across Indonesia – from Sumatra to Papua – and they have engaged successfully with local and national government on issues ranging from corruption to monopolies, credit, and relations with large companies.

The business associations are initiated by local businesspeople, often after they have enjoyed exposure to other Foundation-supported business associations, and are driven by members' interests. Often run by volunteers, they function essentially as local chambers of commerce, representing the interests of independent small businesses in the principal cities and towns. In addition to their advocacy activities, the associations play an important role in circulating market information and providing networking opportunities. The value of these services is evident in the associations' ability to collect dues: associations receive no operational support from the Foundation for rent or salaries, only technical assistance and grants for policy related activities. Every two years, the Foundation supports a national conference that brings together the local business associations from across the country. These conferences give national prominence to the needs of small business by applying their collective political weight to issues of common interest in front of prominent officials from the national, provincial, and local governments. More than 100 SME owners from more than 20 provinces attended the third national conference, held in 2000 in Yogyakarta, as did representatives of central and local government agencies, analysts, the private sector, and the media. The fourth conference, in August 2002, enjoyed even greater numbers. In addition to bringing regional concerns to the capital, the national meeting allows businesspeople from across the country to trade information on markets and technology and to share ideas and experiences on organizing business associations.

The Foundation also created and manages an advocacy fund that receives proposals to fund business association activities related to the local business environment. Business associations apply for funds on a competitive basis, and proposals are judged by a joint group of The Asia Foundation and its partners on the basis of their potential impact and demonstration of cost sharing. Activities supported under the fund include: advocacy on unclear bureaucratic procedures for business licensing, advocacy on anti-competitive behavior by state-owned enterprises which reduces opportunities for SMEs, advocacy on unfair business practices by large retailers, and advocacy on illegal levies that have to be paid by SMEs. Over the past four years, approximately $80,000 has been distributed to more than 40 business associations.

The Foundation has provided technical assistance to improve the performance of OSS centers in seven cities in Java, making the issuance of permits more efficient and predictable. With the active cooperation of local governments, the Foundation provides a range of capacity building to help existing one-stops increase transparency and reduce processing time. Assistance includes the provision of a private consultant, who performs an organizational assessment, convenes meetings between local SME owners and officials to discuss how to improve services, and drafts recommendations for enhancing the functioning of the one-stop shop. Local officials, local parliaments, SME owners, and the media are also taken on study tours to districts with well regarded systems for issuing business licenses and permits so that they can be exposed to best practices. Finally, the Foundation provides computer hardware and software to one-stop shops to increase efficiency in business-licensing procedures.

The program has succeeded in a variety of ways. SME owners are increasingly aware of the importance of having the necessary business licenses if they want their business to grow. At the same time, the Foundation has received enthusiastic requests from several local governments for help in replicating the success of OSS centers. In Gianyar, Bali, for example, where Indonesia's first one-stop service center was established, the number of registered businesses grew from less than 16,000 to more than 21,000 in the first five years after its services were improved. During that same period, Gianyar increased local tax revenues by more than 330 percent. The Foundation has been asked to work with the Department of Home Affairs and local governments to spread the lessons learned in Bali to other provinces in Indonesia.

3.19. Success Stories : Barbara Manzi - Metal Distributor

Barbara Manzi's ambition was almost crushed when a high school teacher told her, "Learn to cook and sew - you're a poor black child and that's the only job you'll ever have." "I vowed," says Barbara, "to prove her wrong." And she did. Born and raised in a rural area in Massachusetts, Barbara was the third of 12 children. Her family worked "extremely hard" as fishermen and housekeepers just to eke out living. They were poor, but supportive; Barbara felt appreciated at home and it instilled in her a desire to achieve. Despite the well-intentioned advice of her teacher-who drove her to and from school every day - Barbara did achieve. She mastered cooking and sewing, but she also earned an associate degree in business marketing and business management. (http://www.sba.gov/aboutsba/sbaprograms/onlinewbc /WBC_BARBARA_METAL_DISTRIBUTOR.html)

She headed for the New York area and built a successful career in retail, eventually becoming a department store manager. Along the way, she also married and had children. In 1982, Barbara left retail. She used her sales experience and her mathematical ability to get a job with an aerospace supplier, Northern Alloys of Amityville, New York. There she learned all she could about the metal distribution industry and, within a few years, was bringing in $3 million worth of business. Her boss recognized what a treasure he had and offered Barbara 51 per cent ownership of the company. "He gave me a lot of confidence," she says. "He was forever nurturing." "I got in contact with SBA to find out as much information as they would be able to feed me," explains Barbara. She received technical support and training in many areas. "Every time I had a problem - anything from accounting to managing - I turned to the SBA and got assistance immediately."

In 1989, Barbara's husband retired from the police force and the family relocated to Florida. There, having dissolved the old company, Barbara established a new company, merging with another firm in 1993. But, says Barbara, "I preferred to be in full control of a business." She ended the partnership and started Manzi Metals, Inc. in a spare room in 1995. Her goal: to become one of the foremost metals distributors in the United States. Once again, she succeeded. Today Manzi Metals distributes aluminum, stainless steel, titanium, brass and other alloys to aerospace and commercial industries throughout the U.S. and Canada. The company also supplies raw metals in all shapes and forms. Customers include Lockheed Martin, Raytheon, Gulfstream Aerospace, Boeing, and General Motors, as well as shipyards, and federal and local government facilities.

Barbara has received many awards, including Lockheed Martin's Woman-Owned Business of the Year in 1995, the Avon Women of Enterprise Award in June, 2000, and the Business and Professional Women of Achievement Award. Barbara says she is lucky to have a family that supports her. Her husband works in the warehouse, shipping and receiving, and quality assurance. Her son is vice president of the company, where he is in charge of sales and management training. People often ask Barbara how they can start their own businesses and achieve success. "I tell them it takes determination plus hard work," she says. "My dream is to someday omit the word 'small business' from my credentials and become a large corporation providing jobs and opportunities for the Hernando County area. I believe that within a few years this will become reality," says Barbara.

4. Focal Points of Policy Making

In this section we will provide expectations of the business counseling with reference to each objective to ensure that the success of the subject can be measured over the short and medium term. Those objectives and expectations are as the following:

- This training course will develop an international perspective for business counseling. After the course we are expecting that all of the trainees will develop an international perspective for the business counseling.
- This course let the participants to identify key factors that can make business

counseling successful in order to make the program successful.

- Target trainees are expected to increase the ability of setting up efficient policies for business counseling in order to make the program more progressive.
- Participants are expected to steer related business counseling in the right direction to meet the needs of SMEs and their market.
- This training course is expecting the participant can increase knowledge about functional strategy on the enterprise, and we expect that the participants can transform all the knowledge that they have received to train their client in stimulating the functional strategy for their own business performance. Those functional strategies are including marketing, IT management, finance, and human resource management.
- We are expecting that all the participants is transferring the knowledge to their clients in the right direction and comfortably so that their client can keep maintaining long term relationship with the business advisor.
- Participants are expected to increase the ability to develop new markets, to develop new products, and to spot new opportunity, which are the key success factors for the business growth.
- Participants are expected to increase their skills in evaluating SME's management capability and management's internal controls through the heuristics such as the tidiness, management information, and competitor analysis.
- Participants are expected to find out the effect of management consulting on the company when there is the intervention of an external adviser. In other words, they can identify an increase in the company's knowledge and capabilities in these activities after the investigation and evaluation of its impact on the firm's situation in the future. Only consulting about quality is engaged more frequently if the functioning of the quality department is valued lower. The lack of professional staff in the management of the department forces the choice between in-house staff training or engaging the services of an external professional to help the company.
- Participants are expected to have knowledge about best practice enterprise development has been concerned with how to make the most efficient use of resources within the prevailing ideological climate.
- Participants are expected to identify the training interventions which lead to positive outcomes for the majority of SME employees, particularly those working in organizations with relatively formalized training practices.
- Participants are expected to learn what works and to go on to mainstream cost-effective intervention designs and embed them in the economy.
- This training course also let the participants to increase knowledge of characteristics and constraints of SMEs and identify the growth of entrepreneurship among women, because it is important to understand the social and economic factors influencing the

success of female-owned small business.

- Participants are expected to increase the enterprise owner's managerial competencies in order to minimize failure in running business process.
- Participants are expected to increase knowledge about gaining a better understanding of human resource management, training, and related issues; gaining skills so that enterprise owners could recruit, interview, manage, and retain staff confidently, and, when needed, dismiss employees using correct procedures; and networking and talking to other people about their small business and human resource management related experiences.

5. Discussion Points

Sharing ideas based on close cooperation among APEC member economies

Business counseling program provides management with the assistant service through training and consulting to enhance the enterprises performance for Small and Medium Enterprises (SMEs). In order to make the program successful, there is some sharing ideas based on close cooperation among APEC member economies in the following points below:

- The performance of Business Counseling programs to reduce any failures for the entrepreneurs in operating their businesses.
- The key success factors that have been received by the entrepreneurs in joining Business Counseling program.
- How to organize an effective schedule for Business Counseling program?
- Do female entrepreneurs need more special training rather than male entrepreneurs in Business Counseling program?
- The purpose of joining Business Counseling programs by the entrepreneurs is what they obtain the results that they expected. Is there any possible guarantee for their higher business performance after the Business Counseling?
- How could the professional trainers give a good quality standard of training to the SME employees so that the training can be running in the right direction?
- How to build a good long-term relationship between entrepreneurs and business counselors (advisors)?
- Small business owners are interested in skills development and training opportunity, provided that they are directly applicable to the current situation in their business, and as long as the delivery process is carefully structured in terms of location, time of day, and length of session.
- The degree of use of a range of external advice was positively related to the growth

rate of the SMEs. In common, the most sought-after advisers were external accountants and network contact. The nature of the advice provided by external accountants, which was found to include business, emergency, and financial management support in addition to statutory advice. The degree of provision of this additional assistance was associated with higher growth.

- What is the “value-added” of training and support structures for entrepreneurs?
- Possibility about mismatch between the specific small business training need and the services on offer.
- The importance of “Trust” between SME clients and advisors.
- The intensity cost of service, and level of commitment to an advisor by the client.
- The emphasis on innovation through loose ties or the role of the outsider may not be an appropriate model for small land based business. With the pre-dominance of strong ties and low flows of information, these businesses are unlikely to change either quickly or easily. Radical changes to business structure imply a more costly and focused intervention than the current emphasis on project and program based support for rural businesses.
- Increasingly, academics, practitioners, governments recognize the need to examine the role and effectiveness of entrepreneurship training and support. An important thing is the failure of some programs to take on board the cultural, educational and social background of the “entrepreneurs”, leading to ineffective training and support.
- Most Business Links have roll and job descriptions for PBAs, this is rarely case of consultants. Self-employed consultants are generally accredited by Business Links themselves or by third parties. Accreditation procedures could be improved; clear criteria are required for monitoring consultancy processes and outcomes, and consultants need to receive feedback. There are opportunities for closer contact between self-employed consultants and Business Links which would improve the quality of the service to SMEs, the learning of individuals and the organizational learning and public accountability of Business Links.
- Management skill shortages still exist in the SME sector and management development and training in the sector remains a policy priority. Because of the habit of promoting informal training over formal training, SMEs operating in the manufacturing sector are in a relatively disadvantaged position because of the habit of promoting informal training over formal training, SMEs operating in the manufacturing sector are in a relatively disadvantaged position
- Training is a key developmental strategy and gaining value from training events means that more rigor needs to be applied to planning and evaluation.
- SME problems are perceived and solutions found in functional terms such as IT, marketing and/or finance.

- Female businesses were concentrated in low-income informal sectors, where prospects of growth were limited. Employment growth rates of female enterprises were, for the most part, significantly lower than those of male enterprises.
- The probability of failure would be higher for female-controlled businesses. Industries in which female-controlled businesses relatively were overrepresented would have higher failure rates compared to industries in which male-controlled businesses relatively were overrepresented.
- The advice given by accountants and bank managers differs little from that given by Business Link's PBAs.
- The approach and effectiveness of training appears to be mediated by a number of contingent variables, including market, structure and leadership. (Journal of Small Business and Enterprise Development, 2007, Vol.14, Iss.2, page 321-338)

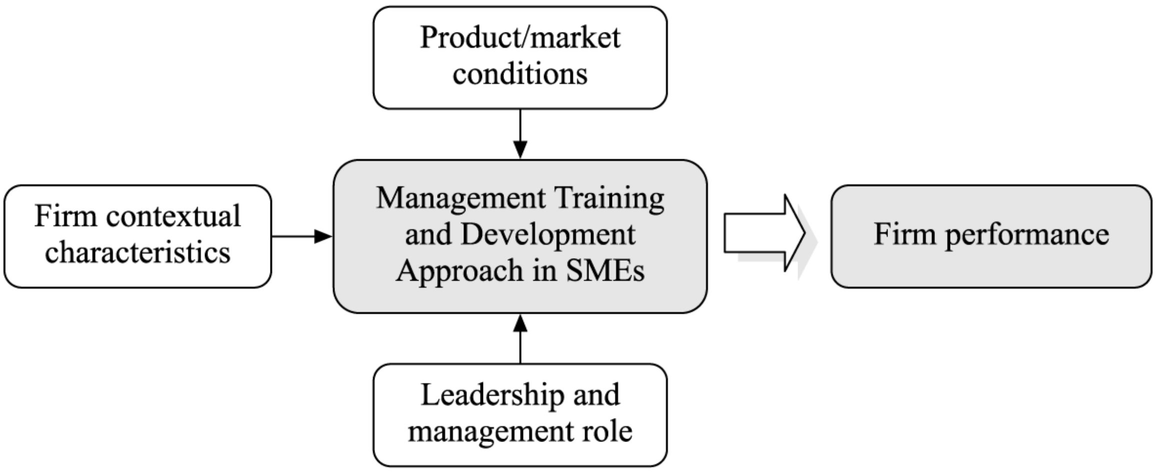

Fig 5 The Management Training and Development Approach in SMEs

6. Conclusions

Business counseling program for small business is focus to the growth of the client's enterprises. It is such a good solution for entrepreneurs to maintain a healthy relationship with the business advisors. Based on the case studies on the best and failure Business Counseling program, there are some related conclusions:

- To enhance participation in training by small business it is suggested that the location of the training venue needs to be in close proximity to the businesses operating base, as traveling long distances inevitably takes precious time away from the business. In addition, the time of day is also important. Business owner-managers are unwilling to participate in training if it removes them from their business during the busy periods in their day. (Journal of Small Business and Enterprise Development, 2007, Vol.14, Iss.2, page 294-306)

- Specially designed courses targeting potential female entrepreneurs may not be required (if the justification for such courses is an apparently higher failure rate for female business owners). Instead, if government-funded courses are to be provided, it might be more appropriate for such courses to be directed toward all potential entrepreneurs (male and female). [Journal of Small Business Management, 2003, Vol.41, Iss.3, page 262-277]
- Customer satisfaction, impact, and re-use intentions have been demonstrated as important to business client-advisor relationships for SMEs and Trust is also the most important thing for the relationships between client and advisor. (Small Business Economics, 2005, Vol.25, page 255-271)
- The external advisers from the universities were given a very low profile by the owner managers. This is a problem that must be addressed if the universities are to play a more significant role in SME development. An alternative approach would be to mediate the relationship between the universities and SMEs by support agencies, accountants or consultants. The use of network contacts, more likely to be informally traveled rather than formally constructed, was a very significant contribution to business performance. (Journal of Small Business and Enterprise Development, 2006, Vol.13, Iss.1, page 33-47)
- Employees in the smallest organizations are more likely than those employed in the largest organizations to have gained a qualification. These findings generally demonstrate the benefits of including the employee dimension within studies of training within SMEs and taken with the positive views of impact expressed by employers demonstrate the “win-win” nature of effective training interventions. The key policy challenge is to learn what works and to go on to mainstream cost-effective intervention designs and embed them in the economy. (Journal of Small Business and Enterprise Development, 2004, Vol.11, Iss.4, page 449-457)
- It is recommended, therefore, that policy makers should consider the implementation of discerning training and support initiatives that would focus exclusively upon the specific needs of micro- and small business owner/managers and their workforce. Such initiatives would be more likely to succeed in raising the skill levels of the workforce and improve the competitiveness of businesses operating. (Journal of Small Business and Enterprise Development, 2004, Vol.11, Iss.4, page 504-513)
- Business Links could make the acceptance of monitoring by agreed performance indicators a contractual requirement; a higher rate of remuneration would be likely to attract higher caliber consultants and greater commitment to the ethos of the one stop shop. In an effectively managed Business Links infrastructure for consultancy there

> would be enhanced SME benefit and greater Business Links learning and public accountability, as well as the opportunity for individual consultant development. (Journal of Small Business and Enterprise Development, 1998, Vol.5, Iss.1, page 7-18)

Finally, participants are supposed to make innovation-oriented SMEs sustainable with the sufficient amount of profit and to help them establish the business counseling strategy with appropriate practical governmental policies. The business counseling strategy is a critical part for SMEs' development in the APEC member economies.

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Chapter 9. E-Business Policy Making for SMEs

Meili Hsiao[1]

The course is mainly about how to develop e-business policy for SME policy makers of APEC developing economies. It includes a series of procedures to plan, execute, control and assess the e-business Policy Making for SMEs. The case study of Chinese Taipei will be introduced to demonstrate the process of policy making and facilitate discussion among trainees

1. Background

1.1. Definition

Electronic Business, or "e-Business", was coined by IBM, Inetrnational Business Machines Corporation, around 1995. According to IBM, e-Business is "an organization that is transforming its interactions with customers, suppliers, partners and employees using Web technologies; extending its reach to improve its performance." "E-Business" may be also defined broadly as any business process that relies on an automated information system or web-based technologies. E-business means connecting all types of buyers and sellers into a single global enterprise.

1.2. e-Business and e-Commerce

In practice, e-business is more than just e-commerce. While e-business refers to more strategic focus with an emphasis on the functions that occur using electronic capabilities, e-commerce is a subset of an overall e-business strategy. E-commerce seeks to add revenue streams using the World Wide Web or the Internet to build and enhance relationships with clients and partners and to improve efficiency.

1.3. e-Business Applications

E-business involves business processes spanning the entire value chain: electronic purchasing and supply chain management, processing orders electronically, handling customer service, and cooperating with business partners. Special technical standards for e-business facilitate the exchange of data between companies. E-business software solutions allow the integration

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of intra and inter firm business processes. E-business can be conducted using the Web, the Internet, intranets, extranets, or some combination of these.

1.4. Why Do We Need a Topic on the e-Business Policy Making?

Internet has dramatically transformed the way people do business. Through Internet, companies search information, perform transactions online, and exchange business data with their trading partners at the speed of light. Therefore, e-business companies can easily enhance their competitiveness. SMEs can hardly be competition or even survive if they do not incorporate "e-Business". Primary observation indices such as the World Economic Forum's Networked Readiness Index (WEF NRI), also utilizes the e-readiness of e-Business as one of the primary indices for evaluating the overall competitiveness of a nation. In addition, taking on challenges of global competition, promoting e-Business policy is a necessary strategy for developing economies. Learning about e-Business policy making would be extremely practical for developing economies. Furthermore, sharing of e-business policy making experiences and best practices will greatly lower the learning costs and speed up the implementation of e-Business.

1.5. The Scope of the Course

The course focuses on the methodologies of e-Business policy development for SME policy makers in APEC's developing economies. It includes a series of procedures pertaining to the planning, execution , control and assessment of the e-business policy making for SMEs. Chinese Taipei will be used as a case study to demonstrate the process of policy making and facilitate discussions among attendees.

The scope of the course will include:

- An overview of related e-Business theories and economies employing e-Business
- Factor analysis of successful e-Business policy
- e-Business policy making: Chinese Taipei's experiences
- Focal points of policy making
- Lessons learned
- Discussion

Attendees are required to share e-Business policy formulation experiences. It would be a plus if participants arrived at the workshop having already identified ideas, problems, e-Business policies, or project plans.

1.6. E-Business Policies in EU, USA, Japan, Singapore and Korea

The e-Business policies vary widely according to the economic situations and the context in which they are made. Broadly, e-Business policies are typically instituted in order to help to reach the national economic development goal of an economy. Many developed economies use e-Business as an important strategy in seeking positive benefit for applying information and communication technology (ICT). Among these economies, overviews of the policies of EU, USA, Japan, Singapore and Korea are briefly introduced to stimulate attendees thinking on f e-Business policies.

1.6.1. European Union

In the context of the Lisbon Strategy, which focuses on improving the competitiveness of the European industry and its sectors in a knowledge-based economy, the impact of ICT for the acceleration of productivity growth is commonly recognized by EU. In 2004, EU announced that it aims to be the most vital and competitive zone in knowledge economics. The major E-Business projects is as follows.

Table 1 e-Business Projects of EU

E-Business Projects of European Union

Project	eEurope2002	eEurope2005	i2010
Year	2000-2002	2002-2005	2005~
Goal	Provide low cost, fast, and secure Internet	Expanding the Internet cross link of the whole Europe area. Emphasis on the application and content of the public service.	Promote the Europe as an information society to create job opportunity and economic development.

The framework of e-Business Projects is as follows[2].

2 Source：Adapting e-business policies in a changing environment: The lessons of the Go Dig

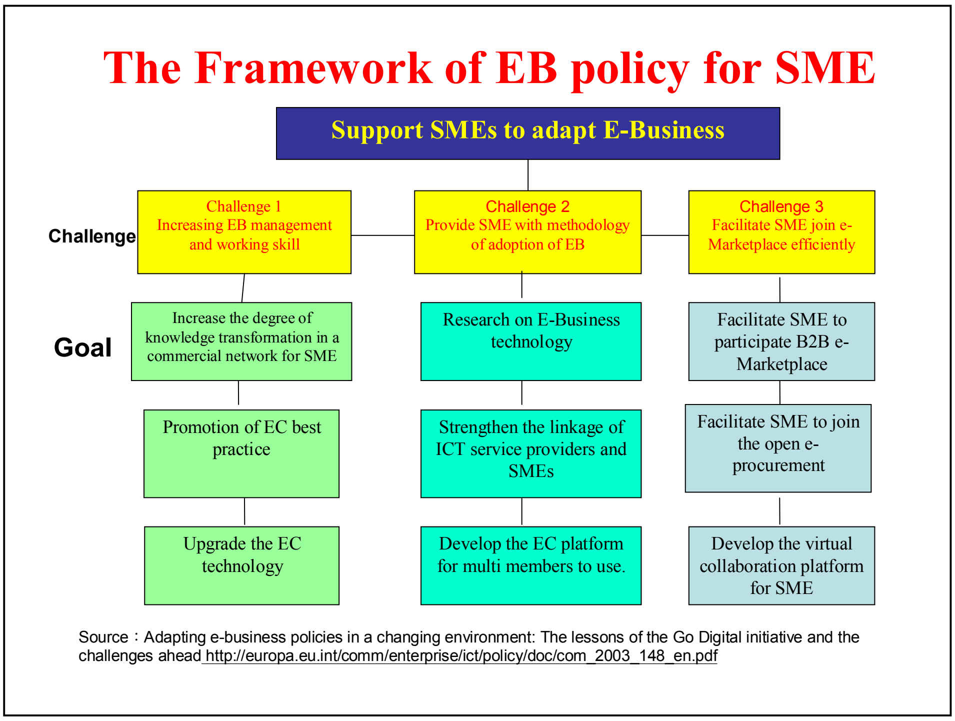

Fig 1 The Framework of EB Policy for SME, EU

Under this strategy, the characteristics of e-Business policy of EU is as follows:

- Implemented by professional organizations such as Innovation Relay Centers, European Information Center, European Information and Technology Association…etc.
- Budget support—EU Technology Research Framework Project (No.7) support the amount of USD$17.7 billion.
- The European e-Business Support Network (eBSN) builds upon the results of the "Go Digital" initiative and specifically on a benchmarking study on national and regional policies in support of e-business for SMEs in 2002. The main lesson to be learned from this study is that many successful policy initiatives in support of e-business for SMEs exist in Europe but their efficiencies could be further enhanced by learning from each other and sharing best practices As part of the enterprise policy, the eBSN is meant to be a tool to improve co-operation among existing e-business policy initiatives in Europe and to better leverage synergies between them.
- Project financing to SMEs includes US$1.9 billion in SMEs loan; and European Development Foundation provides USD$5.6 billion for SMEs to adopt ICT.
- The member economies of EU formed a professional and well-trained team to

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ital initiative and the challenges ahead. http://europa.eu.int/comm/enterprise/ict/policy/doc/com_2003_148_en.pdf evaluate market requirements and ICT technology needs.

- Emphasis the differences between each region of EU, especially taking into consideration the differences between the northern and southern parts of Europe. The northern areas are more robust in telecommunication and e-Business development. EU transformed the differences into opportunities with those enterprises in the northern Europe providing best practices. Policy makers of each member economies can exchange their experiences and information via support networks.
- EU has established fully responsible monitoring and evaluation teams. Since 2001, e-Business W@tch, established by European Commission, began to survey and research on the depth and impact of e-Business. e-Business W@tch intends to establish a cross economies and cross industries measurement indices for e-business. The indices are meaningful and useful in the assessment of the development of e-Business.

1.6.2. The United States

Since the United States is well developed in IT, the government focuses on the e-Government capability building of those government agencies which provide service and information to SMEs. Enabling SMEs to get suitable e-services through Internet is a major responsibility of the US government. Please refer to the service portal of US government at http://www.firstgov.gov/.

The Government Paperwork Elimination Act (GPEA, Pub.L. 105-277) requires that when practical, Federal agencies should use electronic forms, electronic filing, and electronic signatures to conduct official business with the public by 2003. In doing so, agencies create records with businesses of legal and, in some cases, historical values. This guidance focuses on management issues involving records that have been created using the electronic signature technology.

United States pays much attention to the development of SMEs, with the government agency Small Business Administration (SBA) playing an important role. The mission of SBA is "to maintain and strengthen the Nation's economy by aiding, counseling, assisting, and protecting the interests of small businesses and by helping businesses and families recover from economic and other disasters."

The SBA is an independent agency that operates under the authority of the Small Business Act of 1953. The Secretary of Commerce delegates small business responsibilities to the SBA. Small Business Administration directly reports to the President Office of US and the Congress. The level of the SBA is very high in the US governmental hierarchy.

SBA holds several types of Guaranteed Business Loans through banking institutions including the Economic Development Program. The Program offers SBA partners such as SCORE and the Small Business Development Centers (SCDC's), operating in each state provide free and confidential counseling and low-cost training to small businesses. SBA also provides information, business consulting, distance training, disaster assistance, loan application, and government procurement for SMEs.

SBA established a long-term strategic plan--Enabling the establishment and viability of small businesses strategic plan FY 2003 - FY 2008. The goal of the plan is as follows:

- Enhancing the economic environment of SMEs
- Facilitating more successful SMEs by assisting the linkages with competitive business opportunities. Helping SMEs rebuilt after natural disasters
- Providing the best leadership and supportive services, ensuring that the plan can be executed effectively and obtain the best result.

1.6.3. Japan

In general, Japan is seeking knowledge based economic growth on a national level. Japan plans to create more diversified and independent SMEs for better economic growth.

Since 2001, Japan began to promote the “e-Japan” Program[3]. The major milestones of e-Japna Programs is illustrated as follows.

[3] IT Strategic Headquarters, Japan http://www.kantei.go.jp/jp/singi/it2/index.html

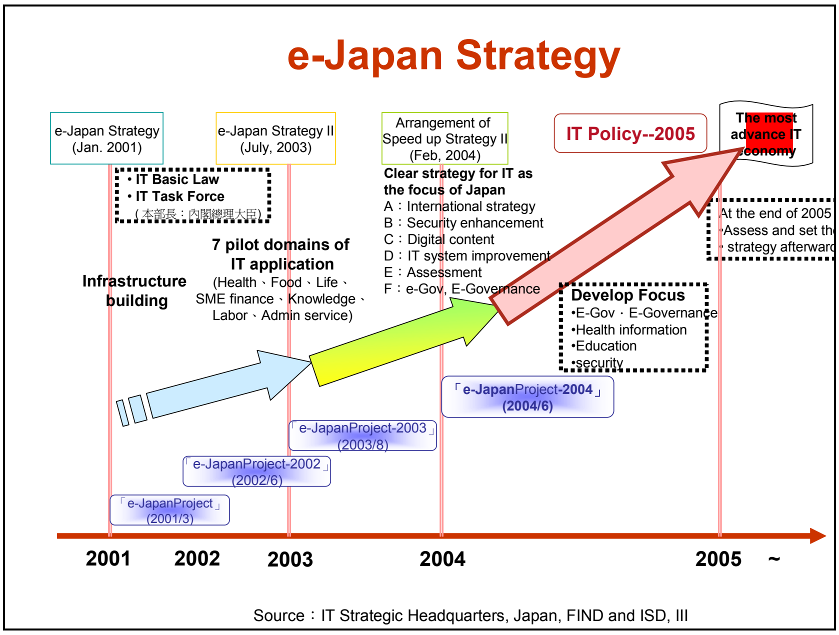

Fig 2 e-Japan Strategy

Under the e-Japan Program, Japan set up responsible government agencies, and implementation schedules for 5 focus domains, 7 pilot domains, and 370 action items. The 5 focus domains are international cooperation (Asia), security, digital content, e-documents, and e-Government. The 7 pilot domains are health, food, life, SME financing, Knowledge, labor, and administration service. The framework of e-Japan Project of 2004 as follows.

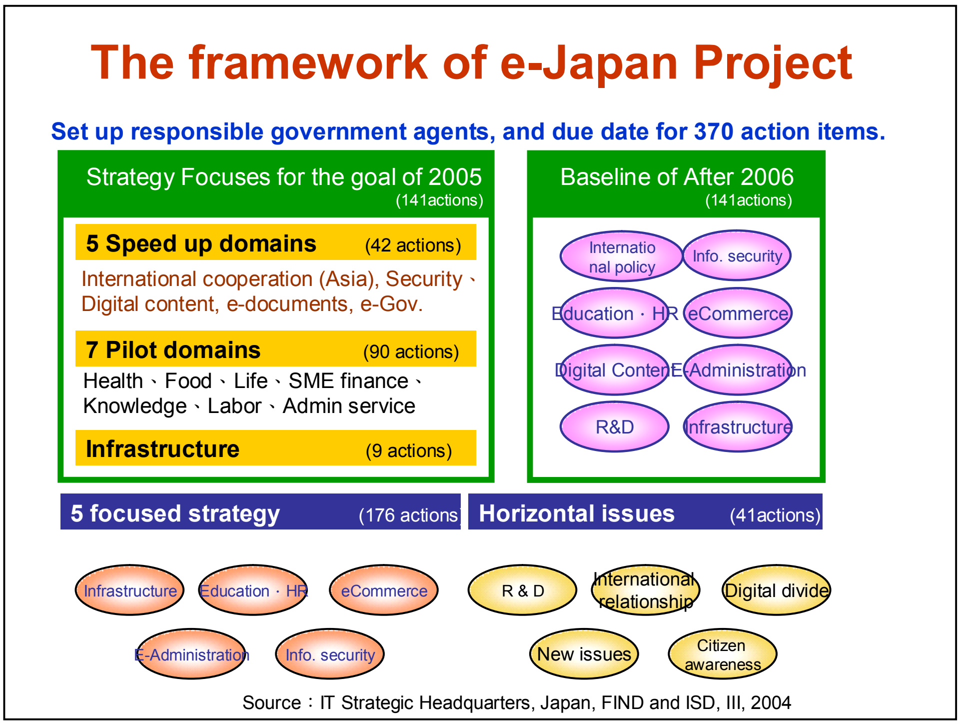

Fig 3 The Framework of e-Japan Project

In the SME e-Business domain, Japan has taken a "step by step" approach on its e-Business policy. The goal from 2001 to 2003 is to achieve 50% of SMEs usage of Internet for e-Commerce. The goal from 2004 to 2006 is to increase the competitiveness of SMEs by facilitating the utilization of IT on business operation. The first phase of "SME IT Action Plan"built e-Commerce related infrastructure and e-readiness. The second phase established five major directions according to IT application status and SMEs' requirements. It focused on the following domains on building good business models, innovating ideas before they implement e-Business.

- Design and manufacturing
- Retail and distribution
- Customer and service
- Contracting and accounting
- Internal information

The SMEA of Japan granted 50% of ICT investment funding to SMEs for applying information technology to innovate their businesses. In 2002 to 2003, there were 741 applications' seeking funding. 112 of which were funded. 50% were in the manufacturing and 16% were in the services industries. Japan followed up with an excellent campaign to promote the success stories upon the e-Business implementation. Though unconfirmed, the actions introduced new opportunities to industry development.

The Action Plan was quite comprehensive, taking into account the current IT developing trend and solving IT development problems of SMEs. There were detailed action items on human resource development, consulting support, finance support, information and network support. It also reviewed the outcome of the plan and collected IT problems of SMEs through consultants and service contacts.

Under the e-Japan strategies being carried out by the government as a whole in Japan, results are steadily bearing fruit, as seen by the spread of broadband and the setting of lower connection fees. All of this is an effort to transform the country into the world's most advanced IT nation by 2005. From 2005, Japan is taking the "u-Japan" policy.The Ministry of Internal Affairs and Communications will contribute to the e-Japan Strategies in the future through its "u-Japan Policy" aimed at realizing the "Ubiquitous Network Society."

1.6.4. Singapore

Singapore has put in much effort on building an advanced broadband network infrastructure for SMEs to increase their competitiveness. Singapore also focus on stipulating the transaction of e-Commerce. In year 2004, the budget of The Ministry of Information, Communications and the Arts, Singapore is USD $326 million, comprising 1.6% of the government's total budget. As for the economic development budget, ICT accounts for 0.2% of the total government budget.

Singapore has effectively utilized the resource and technology of MNCs to provide e-Business capability for SMEs. One of the major projects is the Infocomm Local Industry Upgrading Program (iLIUP). The iLUIP Project is designed not only to upgrade the e-business capability of local enterprises, but also to attract foreign companies to invest their research and development in Singapore.

There are a total of 22 MNCs joinging the iLUIP Project, including CISCO, Oracle, Apple, Microsoft, NEC, Sun Microsystems…etc. The Infocomm Development Agency Development Agency (IDA) of Singapore introduces advanced E-Business best practices and products such as ERP, CRM, EC, to local SMEs through iLUIP. The project creates a win-win strategic partnership relation between Singapore and the MNCs.

1.6.5. Korea

Korea has initiated a series of programs to create a suitable environment for the development of SMEs. From 1996 to 2000, Korea initiated the Information Promotion Program. From 1999 to 2002, Korea implemented the Cyber Korea Program. From 2000 to 2006, there was the e-Korea Program from 2003 to 2006. And now, Korea is initiating the u-Korea Progrm.

The e-Business policy progress of Korea is as follows[4].

4 Source：Ministry of Information and Communication, South Korea, FIND and ISD of III，2 004.

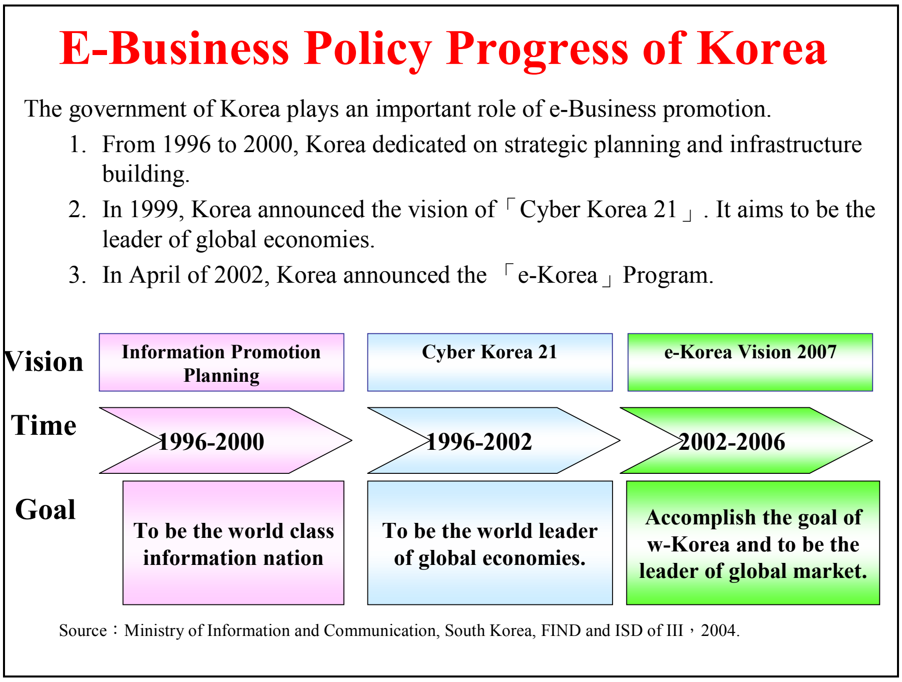

Fig 4 e-Business Policy Progress of Korea

The goal and concept of e-Korea is as follows.

Fig 5 The Vision of e-Korea

Korean government has been investing on the network infrastructure and best applications in various domains. Korea currently owns the highest wired and wireless network penetration rate in the world. Facilitating entrepreneurship and increasing the ability of innovative research development are major tasks. The Ministry of Commerce, Industry and Energy planned to develop e-Business for the six major industries in Korea. The six big industries include the electronic, automobile, machinery, steel, textile, and shipbuilding industries. The goal is to establish B2B networks for the six big industries that could be then spread out to other industries. According to the APEC Informatization Survey for Small and Medium Enterprises done in 2003, The progress was quite siginificant as follows.

Table 2 The e-Commerce Progress of Six Industries

Industry	E-commerce progress / Stage		Core Tasks
	2000	2003	
Electronic	8.5% (Early Growing)	30.3% (Entrenched)	•Share standardization •Cooperated with leading
Automobile	2.4% (Starting)	14.0% (Growing)	•Build an Industry-wide netwoek(KNX) •Enhance competitiveness of parts industry
Shipbuilding	2.3% (Starting)	14% (Growing)	•Build collaborative system for design & production industries •Entrench a culture of inter-company collaboration
Steel	2.3% (Starting)	14% (Growing)	•Led by POSCO •Early establishment of e-commerce system
Machinery	2.0% (Starting)	12.5% (Growing)	•Standardize classifications and codes •Digital parts industry
Textile	2.0% (starting)	15% (Early entrenched)	•Entrench digital transactions •Build co-infrastructure, i.e. QR

The SMBA information upgrading Project is aimed primarily at the manufacturing industries. There are three major directions of the Project:

- Building the basic information systems
- Building an information network to help SMEs
- Assisting SME to use information system to operate and manage their businesses

Information society, telecommunication, IT industry and internationalization are four major policy components of e-Korea Program. In the IT industry policy, Korea initiated the IT839 Strategy. The IT839 Strategy illustrates the government's active efforts towards u-Korea, which will bring about changes to the lifestyles of its citizens through IT. The IT industry is an area where equipment and software are compatible based on networks.

The IT839 Strategy was set forth as a new development strategy for this sector in accordance with the unique characteristics of the IT industry. Under this strategy, the introduction and development of eight new IT services will, in turn, encourage investment in three key network infrastructures. Based on the infrastructures, nine promising sectors - equipment, terminal, software, contents, etc. - will create a synergy as a result of concurrent growth through cooperation among the government, private sectors, and research institutions.

The eight new services are Wireless Broadband(WiBro), satellite and terrestrial Digital Multimedia Broadcasting(DMB), home network,telematics and Radio Frequency Identification(RFID)-based services. At the same time, it will facilitate the use of existing services such as W-CDMA, terrestrial Digital TV(DTV) and Voice over Internet Protocol(VoIP). It also plans to continuously support international standardization activities. The three major infrastructures include the broadband convergence network, u-sensor network, and the next-generation Internet protocol(IPv6).

The IT839 Strategy focuses on the belief that IT will bring about qualitative changes to the economic paradigm. The Korean government's IT839 Strategy actually serves as a greater national strategy that promotes industrial and economic development, brings down the walls between regions, classes and generations, and improves the quality for life. The IT839

Fig 6 IT839 Strategy of Korea

We all know that SMEs need a strong supporting force. The Government of Korea serves as such a supporting force. The government is devoted to creating an efficient e-Government and in turn promoting it to industries. It provides a fair market machnism and platform.

To summarize this session, the various e-Business policies of economies described above as follows:

- The policy direction of each economy is different from one another.
- Most economies take e-Government as a pilot project to spread out the service of the government to the public.
- All economies aim to build an ideal e-society.
- Increase ICT capability through e-learning seems common for many economies.
- Promoting e-Business awareness is an important task for many economies.
- e-Transaction security is a significant barrier of e-Business.
- Fair opportunity to all
- Connection on an international level serves as an important guidance

2. Factor Analysis of Successful e-Business Policy

In order to develop a suitable policy, the following processes are put forth for reference.

2.1. Identify the Actual e-Business Needs of SMEs

The actual e-business needs of SME have to be identified. The following steps may be helpful to the attendees on their understanding of the real needs of an economy.

2.1.1. Review of Present Situations and Analyze the Existing Strategies

One may include an assessment of the present conditions of one's economy. Pin point the critical situations that e-Business can be of assistance to. One may determine relevance from the results of an internal/external appraisal. Some economies might have conducted some ICT, e-Business, or e-Commerce related programs. Try to summarize the current status, problems, and results of those programs. Understanding the gaps between expectation and the current status is conducive for the economies in making the proper policy move. One can also perform a gap analysis that looks at environmental factors.

2.1.2. Identify the E-readiness of the Economy

E-Readiness is the ability to use ICT to develop one's economy and foster welfare.

There are several benchmarking indices on the global level, e.g., those calculated by the UNPAN, World Bank, Economist Intelligence Unit ... etc. E-Readiness indices at the macro level are constructed primarily for ranking countries, and thus are concerned with the global digital divide, i.e. the gap between countries that have access to ICT and those that do not, mainly because of differences in income, education, etc.

According to Econimist Intelligent Unit, e-readiness includes infrastructure, Business environment, e-adoption of consumers and enterproses, legal and policy environment, socialand culture environment,and the degree of e-service suporting. Regarding infrastructure, telephone penetration and broadband network infrastructure availability are two major factors to consider. The usage of different applications, the ability to access the web and Internet are also important indices. Furthermore, SMEs require not only available network infrastructures but also affordable prices for the telephone and the Internet access.

Building an accessible and affordable infrastructure is in fact the most important task in e-Business policy. If the geographic area of an economy is too huge to build a network infrastructure, narrow down the area to a manageable and executable area is a must. Starting within a metropolitan area, areas such as science or industrial parks areas are often good choices.

2.1.3. Identify the Business Needs

Most SME owners are only concern about how to create business opportunities and how to achieve cost downs. There must be a strong correlation between higher revenues, lower operational costs, and e-business implementation in order to motivate SME owners.

The need of e-Business depends on the level of e-readiness of the economy. As people are exposed to the Internet, the need for e-Business then becomes practical. Otherwise, it is not practical for advanced e-Business applications adoption.

Moreover, the strategy of e-Business will differ for different industries in the same economy. For example, basic agriculture related industries may need basic or appropriate, not advanced IT application. On the otherhands, the IT related industries and retail industries which carry larger number of merchandises may need to implement robust supply chain management systems.

2.2. SWOT Analysis to Develop Possible Strategies

SWOT Analysis is a strategic planning tool used to evaluate the Strengths, Weaknesses, Opportunities, and Threats involved in e-Business policies. It involves specifying the objectives of e-Business policies of an economy and identifying the internal and external factors that are favorable and unfavorable to achieving those objectives. The purpose of the SWOT analysis is to identify an optimize e-business policy mix for an economy.

2.2.1. Strength and Weakness Analyses

The following factors may be used as a check list for identifying an economy's internal strengths and weaknesses:

- Resources: natural, geographic, financial, intellectual, industries…etc for implementing e-business.
- Leading know-how of selected industries or domains
- Human resource of ICT or e-business
- Leading government departments or research institutions
- The capability of research institutions or universities that conduct e-Business related researches
- Capacity of e-Business solution providers

- ..etc

After identifying the strengths and weaknesses, we may think about the matching strength-enhancing strategies for every strength and the matching weakness-mitigating strategy for every weakness. Write down those matching strategies and prioritize them by assigning some scores such as 4, 2, or 1 for highest, middle, and lowest priority. A template is listed below:

Table 3 Template of e-Business Priority Table

Strength	E-Business enhancing strategy	Priority Score(4 as the highest, 2 as middle; 1 as the lowest priority)
Strength 1		
Strength 2		
Strength 3		
…		
…		

We can construct similar tables for weaknesses, opportunities and threats.

2.2.2. Opportunity and Threat Analyses

Pursuing external opportunities and avoiding external threats need to be taken into consideration when formulating e-Business policies. The following elements consititute a check list of opportunities and threats:

- Market trends which may change the willingness or awareness of e-Business adoption of the private sectors
- Economic conditions which may affect the adoption of e-Businesses
- Strategic alliances of the economy, the industry, or key companies of a supply chain
- The technology trend or network development trend which may speed up the adoption of e-business
- Public expectations about e-business
- Competitors and competitive actions toward the economy, the industry, or the key companies of a supply chain
- Global market development require SMEs to be e-business ready
- Environmental scanning
- Set objectives – defining what the organization is intending to do

After identifying the external oppotunities and threats, the attendees of the seminar might think about the strategy for pursuing the opportunities and the strategies for avoiding the threats. Again, list all strategies for every opportunity and threat. Prioritize the strategies by assigning some scores for the highest, middle, and lowest priority.

2.2.3. Establish Critical Successful Factors

Collecting all strategic issues defined above according to the sum of each proritized score. Identify key factors in the development of the e-Business policy which needs to be addressed by the economy.

Although the above process for strategy formulation may seem high level, attendees still need a detailed assessment and hold strategic meetings to fine tune a set of clearer strategy. More importantly, the assessment and strategic meeting shall be hosted by authorized organization of the economy.

2.3. Goal Setting

Establish the goal of the policy. The goal had better be measurable. The goal also contains some short, middle, or long term objectives and attainable checkpoints.

2.4. Resources Overview

Fist of all, the presence of an authorized senior leader is absolutely critical as the leader will decide which are the responsible organizations. An organization chart can illustrate the responsible department or party for each sub task. The responsible organizer shall then prepare the budget, human resources, offices, projects plans…etc to ensure proper implementation. It is recommended that the organization chart will consititute research institutions, industry associations, and universities to form alliances to execute the projects.

2.5. Strategy Development

One can derive the possible implementation strategy from the above analysis, including the analysis of present situation, existing policies, e-readiness, and SWOT. The strategy should include the selection of target industries or geographic regions to be the focus of the e-Business projects. The philosophy of “Think big but start small” may be chosen as a e-Business implementation strategy. The strategy may specify the focus applications for some industries while it may also specify the international cooperation entities and possible projects.

2.6. Individual Sub Project Action Plan Development

Develop action items, implementation time table , major milestones or KPIs for progress review purposes.

2.7. Result Monitoring

Mapping against plans, taking corrective actions that may mean amending objectives/strategies.

3. E-Business Policy Making: Chinese Taipei's Experience --E-business Program of Chinese Taipei

In order to illustrate the process of policy making, this chapter uses Chinese Taipei as a case study . This session will describe the background, goal, the so-called Project A, B, C, D, and E, policy focus, result, and assessment of the program.

3.1. Program Background

3.1.1. The history of Chinese Taipei's Policy and the e-Taiwan Program

In 1960s and 1970s, Chinese Taipei was an export-centric economy. The national policy was characterized as "Enlarge the Exporting Policy". The establishment of the Export Processing Zone and Ten Public Construction Program were the results of the governing policies. In 1979, the first Information Week Exhibition took place in Taipei. It began a nation-wide information technology awareness campaign. From then onwards, Chinese Taipei evolved from an industrial-centric economy to a technology-centric economy. The Hsin Chu Science Park and Ten New Emerging Industries were the results of the transformation. For the next two decades, the number of personal computers and Internet users increased dramatically. The National Information Infrastructure (NII) Program was completed to set up the foundation network. In 2002, Chinese Taipei implemented the e-Taiwan Program. The Program involved e-Government, e-Business, and network society services. The objective of the Program is to transform Chinese Taipei into a high value-added center for manufacturing and services, knowledge based economy. E-Business was one of the major projects of the e-Taiwan Program.

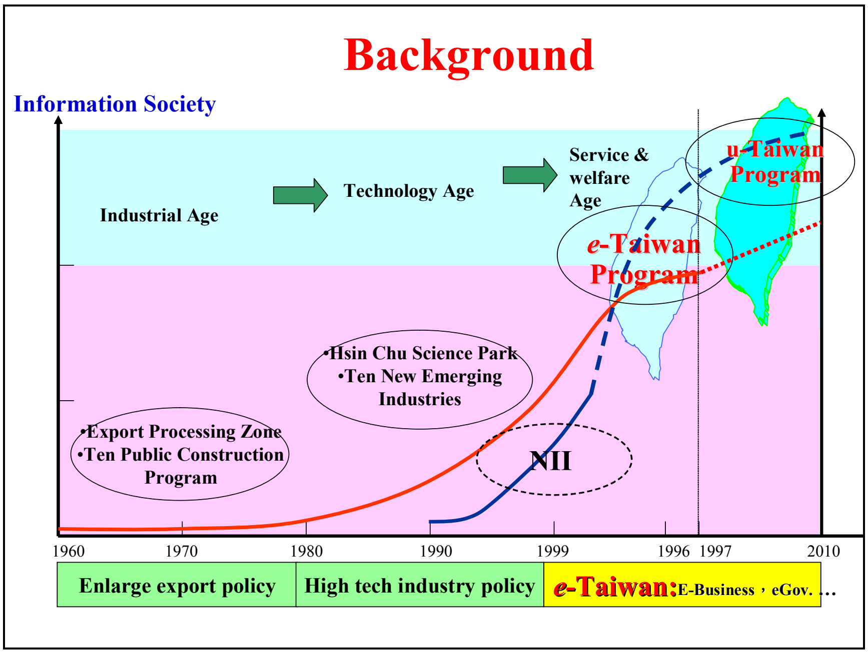

Fig 7 Background of e-Business Program

3.1.2. e-Business Projects Background

Recognizing the importance of information technology towards the upgrading of Taiwan's industrial competitiveness, the Executive Yuan expanded its existing industrial automation project into a new "Industrial Automation and Electronic Business: iAeB Program" in 1999. While continuing to promote automation in production, warehousing, transportation and sales, the Ministry of Economic Affairs (MOEA) was instructed to give priority to the establishment of B2B e-commerce systems, in order to build pilot e-Business systems for both the supply chain and the demand chain.

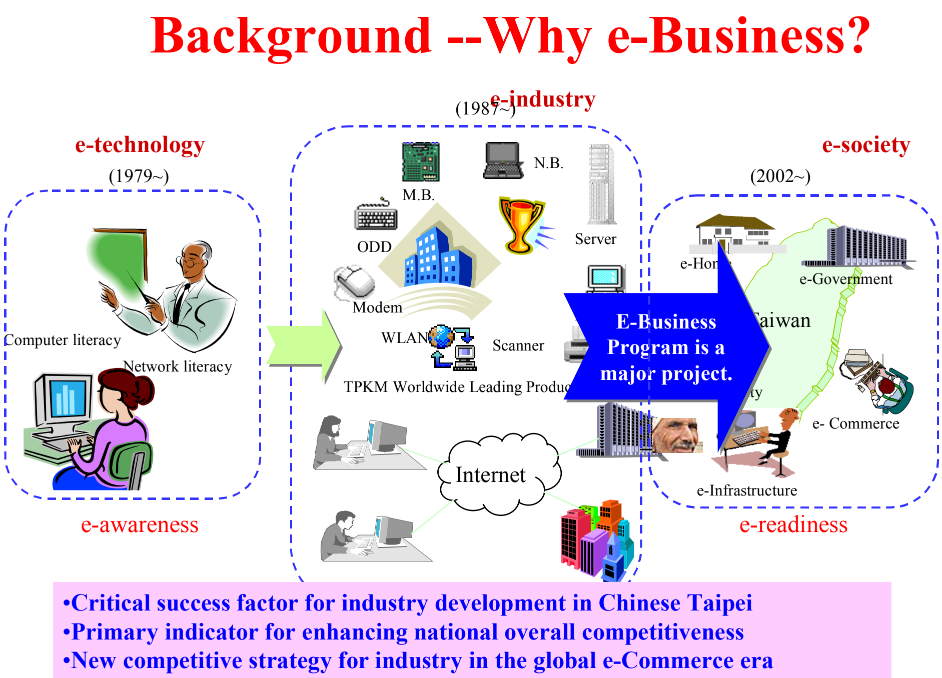

Fig 8 Background-Why e-Business?

3.1.3. Why Implement the e-Business Project?

bnWhat was the reason for the implementation of the e-Business Project? The first reason is that e-Business implementation is one of Chinese Taipei's most critical success factors for industry development. Second, e-Business capability is considered the primary index for enhancing the overall national competitiveness. Third, while facing the challenges of global e-Commerce, industries should create new strategies for the development of new business models. It was evident that e-Business would bring about a new business model for Chinese Taipei and our business partners.

Back in 1999 when Chinese Taipei was still an OEM based economy and the IT industry was the major industry, it faced the following challenges.

- Incomplete e-Business infrastructure with our trading partners. For example, the regulations of securities and the e-business standard was not yet ready
- Increased global competition for local manufacturer, especially after Taiwan joined the WTO.
- e-Business providers were still building up their competence for better services.

3.1.4. The Role of SME in the Growth of Chinese Taipei's IT Industry

3.1.4.1. SMEs are the Linkages of the IT Global Supply Chain in Chinese Taipei

Chinese Taipei is one of the major IT manufacturers of the world SMEs play the role of critical components suppliers to domestic IT Central manufacturers. In 2006, SMEs contribute USD$17,901million in output value, about 32% of IT industry's total output value. SMEs actually play a critical role linking upstream and downstream supply chain.

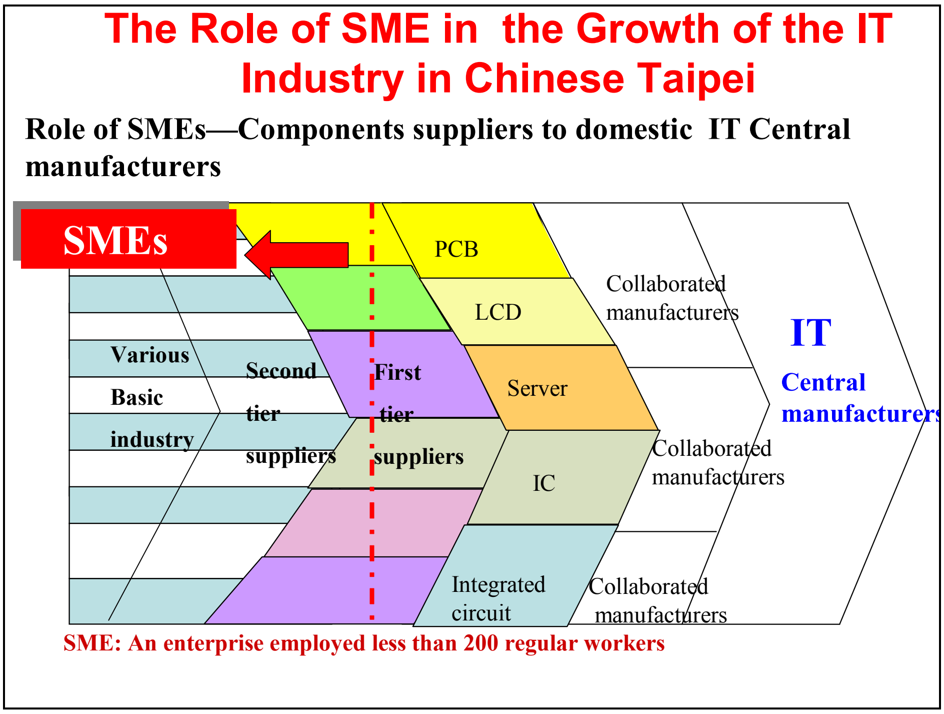

Fig 9 The Role of SME in the Growth of the IT Industry in Chinese Taipei

3.1.4.2. SMEs Require the Transformation to From a Robust IT Supply Chain

The supply chain of IT industry exists as a complete entity. If SMEs do not transform, the IT supply chain won't be successful. For the dramatically changing global market, adoption of ICT makes the entire supply chain more competitive. For big companies, adopting e-Business with their international customers may be not as difficult as SMEs. SMEs are usually more proactive in adopting ICT because of its insufficient resources. If the government did not stepped in, Chinese Taipei might have been driven out of the global competition. Therefore, we consider that helping SMEs establish linkages with the global IT supply chain was a major driving force in the transformation of the whole IT industry.

3.2. General Introduction of e-Business Program

3.2.1. Goals of the e-Business Program

The objective of the e-Business program is to build a highly efficient e-Supply chain framework to establish a global logistics operation system as a network on a national level.

The goals are as follows:

(1)It is expected that there are 50,000 enterprises forming 200 supply chain systems (80% are small-and-medium-sized businesses) to apply B2B e-Commerce in depth.

SMEs stand to benefit the most from the opportunities offered by e-Commerce because they are more flexible and easier to re-engineer and, most importantly, they will be able to take advantage of new avenues for competing with larger firms.

(2)To establish B2B e-Commerce pilot system for IT industry.

(3)Aiming at target industries to develop production, warehousing, distribution and selling modules, we will build 40 model sites to demonstrate the functions and processes.

(4)2,000 companies will be selected from the manufacturing, commerce, banking, securities, agriculture and construction engineering sectors. We will assist them to build up their own enterprise-wide e-Business.

What is the reason to accomplish such goals? It is very important for manufacturers to respond quickly to the global market. So, the whole supply chain should be joined by e-business. In which case, all the companies in the network can share information with one another and simplifying communications with foreign customers .

3.2.2. Project Organization -- Responsible Government Agencies

The project was led by the minister without portfolio who is in charge of Technology Development, Executive Yuan. For a long time, the minister without portfolio had always been supportive of the IT related programs regardless of the political climate. The e-Business Program is composed of many projects such as Construction automation, Government Procurement, e-Commerce project, and the A, B, C, D, and E projects and related policy mesures.

There is a very clear responsibility ownership among various government agencies. Below is a table of the responsible government agencies for each industry and domain. The Minister hosted regular meetings to coordinate tasks among different agencies to ensure flawless execution.

Table 4 Responsible Government Agencies

Industries/Domains	Responsible Government Agencies
Technology and Secretary of the Projects	Dept. of Industry Technology, MOEA
Manufacturing	Industrial Development Bureau, MOEA
Commerce	Dept. of Commerce, MOEA
Finance	Ministry of Finance
Agriculture	Agriculture Commission, Executive Yuan
Construction	Department of Construction, Ministry of Interior
Government Procurement	Public Construction Commission, Executive Yuan
Small to Medium Enterprise Administration	Provide last mile e-Business to SMEs of all industries and domains.
State-operated Business	Ministry of Economic Affair, Ministry of Transportation & Communication

3.2.3. The Strategy

Implementation Strategies of e-Business program are as follows:

(1)Private-public cooperation

First of all, we expect our private sector companies to lead the development of electronic business. At the same time, our government will resolve the barriers and actively work to establish the necessary legal and communication infrastructure.

(2)IT industry as the pilot industry

Next, the IT industry is used as an implementation benchmark. The e-Business of IT industry projects are the A and B projects. Following the implementation of A and B projects, Chinese Taipei planned a comprehensive promotional program. The reason we selected the IT industry is because the IT readiness level of the IT industry is higher than other industries in Chinese Taipei. IT industry was then build as the implementation benchmark and the model was applied to other manufacturing industries such as food, metal, textile, petrochemical, automobiles, machinery... etc.

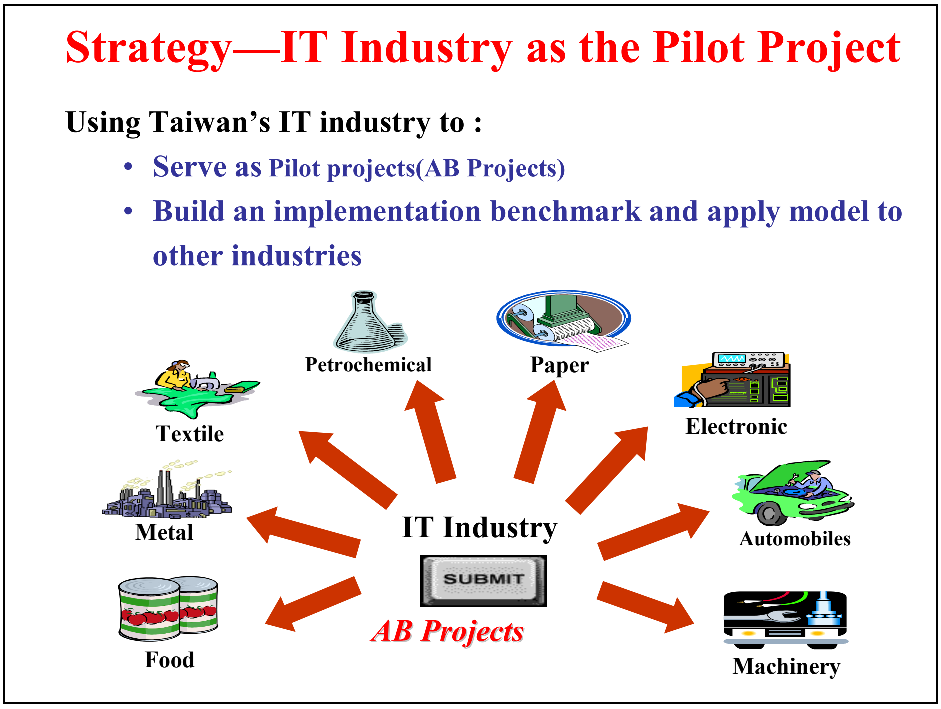

Fig 10 Strategy—IT Industry as the Pilot Project

(3)Work closely with global and domestic companies

Through practical implementation, we work closely with global and domestic companies, providing technical services, manpower training and incentive policies. We focus on the e-Supply Chain System which was led by major manufacturers to enforce suppliers' B2B e-Business application.

We solve related problems and establish an implementation model. After the establishment of the implementation model, it will be extended to other industries.

(4)Government internet procurement systems as the first mover

Government, as the biggest buyer, first established the Internet procurement systems as an initiative.

3.2.4. Actions of -Business Program

According to the goals and strategies already mentioned above, 4 actions have been taken.

(1)Enhance the e-business infrastructures

Our first priority is to enhance the e-Business infrastructure. There are 5 sub working items in the category.

- To develop e-Business standards to facilitate the communication in e-Business implementation.

- To train e-Business professionals: The lack of professionals in e-Business implementation and the training of professionals was an urgent mission.
- To develop e-Business service industry in order to satisfy the domestic demand of e-business.
- To provide tax incentives
- To provide low interest loans

(2)Build up the e-supply chain pilot projects

The second action is to reinforce Industrial e-Supply Chain capabilities. Project A and Project B are the pilots of e-Supply Chain implementation. The purpose of Project A is attracting international leading companies to construct e-supply chain with Taiwan Contract Manufacturers while that of Project B is building up the e-Supply Chain system of domestic leading companies with their upstream suppliers.

(3)Reinforce industrial e-supply chain capabilities

This e-Supply Chain model can be applied to other manufacturing industries, especially in domestic industries with higher e-readiness. The 8 industries chosen are: Food, Metal, Textile, Petrochemical, Pulp &Paper, E&E Engineering, Automobiles, and Machinery

(4)Assist e-marketplace development

The third action is to assist e-Marketplace development. First, we promote the related international category standards for e-Catalog. It is the basis to link domestic and international e-Marketplaces. Second, we build up Taiwan's e-Marketplace portal to encourage industries to use the e-Marketplace to sell their products and services to enhance their global competitiveness.

Furthermore, we assisted e-Marketplace providers to strategically aligned with international e-Marketplace. In order to attain better results, the project also set up a registration and certification mechanism for e-Marketplace providers.

3.3. Introduction of Project A, B, C, D, and E.

3.3.1. Overview of Project A, B, C, D, and E.

In 1999 the Department of Industrial Technology (DOIT) of the MOEA formulated and began implementation of two pilot projects --Projects A and B for promoting e-business in the IT industry. The aim was to make effective use of the experience that other countries had accumulated to establish model e-Business systems that would help to enhance the e-Business capability of Taiwan's export-oriented supply chain, while overcoming the environmental and systemic problems that Taiwan had experienced in the promotion of e-Business, and achieving the diffusion of e-business into other industries.

After implementation of Projects A and B, the MOEA began implementation of Projects C, D and E as a continuation of Projects A and B in 2001. The aim of these new projects was to ensure the provision of e-Business services covering payment, accounts receivable management, on-line financing, global inventory management, delivery tracking and collaborative design services in order to maintain the competitive advantage of Taiwanese industry and meet their evolving needs. The existing e-Business supply chain system would be used as the foundation for further integration of cash flow, delivery systems and engineering collaboration, with the aim of strengthening the global logistics management capability of Taiwanese industry and its competitiveness in international markets .

The following are the definition of Project A, B, C, D, and E.

Project A: The international IT supply chain systems

Project B: The domestic IT supply chain systems

Project C: The cash flow between manufacturing companies and banks

Project D: The delivery and logistics support

Project E: The engineering collaboration, product design, research & development

The overall architecture of projects A, B, C, D and E is illustrated below:

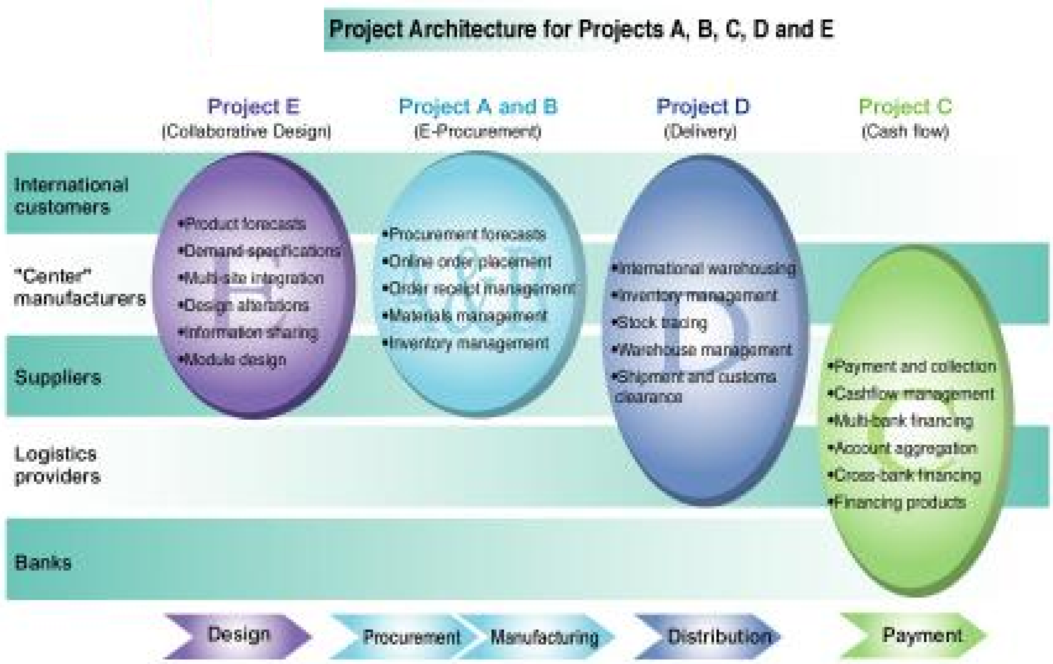

Fig 11 Project Architecture for Projects A, B, C, D and E

The overall scope projects A, B, C, D and E is illustrated below:

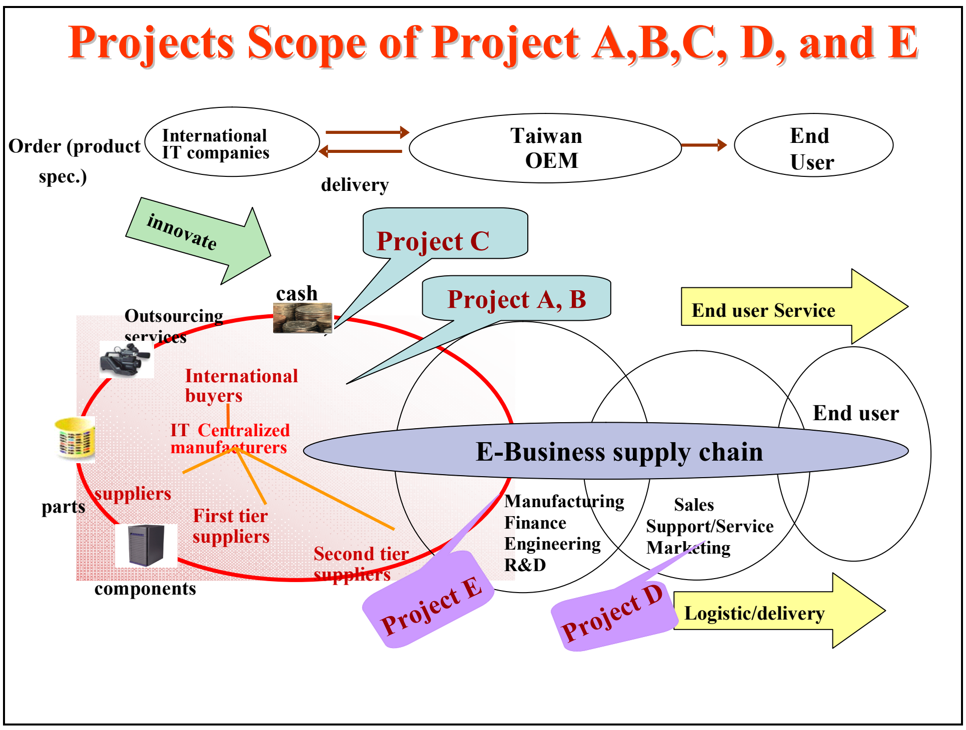

Fig 12 Project Scope of Projects A, B, C, D and E

3.3.2. Projects A and B

3.3.2.1. Goal of Project A and B

When the project began in 1999, there were 5 objectives to be achieved by 2002:

- The aim was set up at least 15 IT supply chain systems. It will become the future implementation model with better representation. Among the 15 systems, the target was to attract at least 2,500 small & medium sized enterprises to establish B2B e-Business capabilities.
- The same concept was applied to manufacturing industry with 25 supply chain systems as the goal and at least 3,500 SMEs to establish individual B2B e-Business capabilities.
- Increasing Internet usage of manufacturing industries from 32.3% in 1999 to 50% in 2002
- Increasing e-Procurement rate of manufacturing industries from 5% in 1999 to 10% 2002
- Increase revenue of Taiwan's e-Marketplace industry up to US$120 million.

3.3.2.2. The description (Details) of Projects A and B

The main focus of Projects A and B was on e-Procurement. Implementation began in July 1999, and was completed in December 2001. Project A involved helping IBM, Compaq and HP (three leading international companies that purchase large quantities of goods in Taiwan) and Taiwan's leading IT manufacturers to establish an e-business supply chain covering every stage from design through to procurement. In Project B, assistance was given to 15 leading Taiwanese IT manufacturers and more than 1,800 of their component suppliers to establish e-business supply chains covering the stages from procurement through to manufacturing.

3.3.2.3. Implementation Result of Projects A and B

(1)Encouraging leading international vendors to increase their procurement in Taiwan
Project A brought about collaboration between 31 leading Taiwanese IT manufacturers (including Acer, Asustek, Mitac, Inventec, Hon Hai and Quanta) and three of their biggest international customers(HP, Compaq, and IBM) on the establishment of a tightly-knit supply chain system. The major processes and messages exchanged include quotation, purchase order, order management, supplier management ...etc. The purchase amount undertaken in Taiwan by the three international vendors increased by 20% in 2001, and the three companies established their first offshore e-business procurement centers in Taiwan (an Operation Center in the case of IBM; a Hub Center in the case of Compaq).

(2)Boosting the ability of Taiwanese SMEs to secure orders from overseas customers

The 15 leading IT manufacturers participating in Project B encouraged more than 1,800 small and medium enterprises (SMEs) to join their e-Business supply chains, thereby strengthening the strategic partnership relationship between Taiwan's SMEs and the 15 leading manufacturers.

The 1800 Domestic components suppliers include Viatech, Hon Hai, Liteon, HKK, Yaego, Wpi...etc, most of which are SMEs. The major processes and messages exchanged include quotation, purchase order, order management, supplier management, payment...etc.

Many SMEs found that participating in Project B helped them to increase the percentage of successful transactions, cut inventory and procurement costs, reduce the time needed to respond to orders, and increase profits.

In addition, the association formed by the companies participating in Project B drew up standards and operating procedures for data exchange, helping to overcome the problems that had affected the joint participation of SMEs and larger manufacturers in e-business supply chains.

(3)Enhancing the corporate images and brand recognition of Taiwanese enterprises in international markets.

In Projects A and B, for the first time ever the RosettaNet international standard for data exchange was adopted across an entire industry, with the aim to bring Taiwan inline with the international e-Business environment. This initiative on Taiwan's part has attracted a great deal of attention from RosettaNet organization in the US.

(4)Encouraging the adoption of e-Business in Taiwan’s other industries

Besides facilitating the establishment of e-Business supply chain systems in Taiwan's IT sector, Projects A and B also encouraged the participation of information service providers, thereby helping to foster the development of Application Service Providers (ASPs) and software service providers in Taiwan, which in turn made it less expensive for Taiwanese companies to make use of e-Business software and services. The success of Projects A and B has also encouraged the rapid adoption of e-Business in other industries.

The e-Business supply chain linkage operations undertaken as part of Projects A and B stimulated demand for e-business applications in global cash flow and delivery, encouraging the private sector to invest in these areas. The projects have thus helped to establish a solid foundation for the future e-Enablement of global logistics in Taiwan’s semiconductor and IT industries.

A total of US$70,000,000 has been funded by the private sectors and government for Projects A and B. Moreover, it also provides successful experience for industries other than the IT industry.

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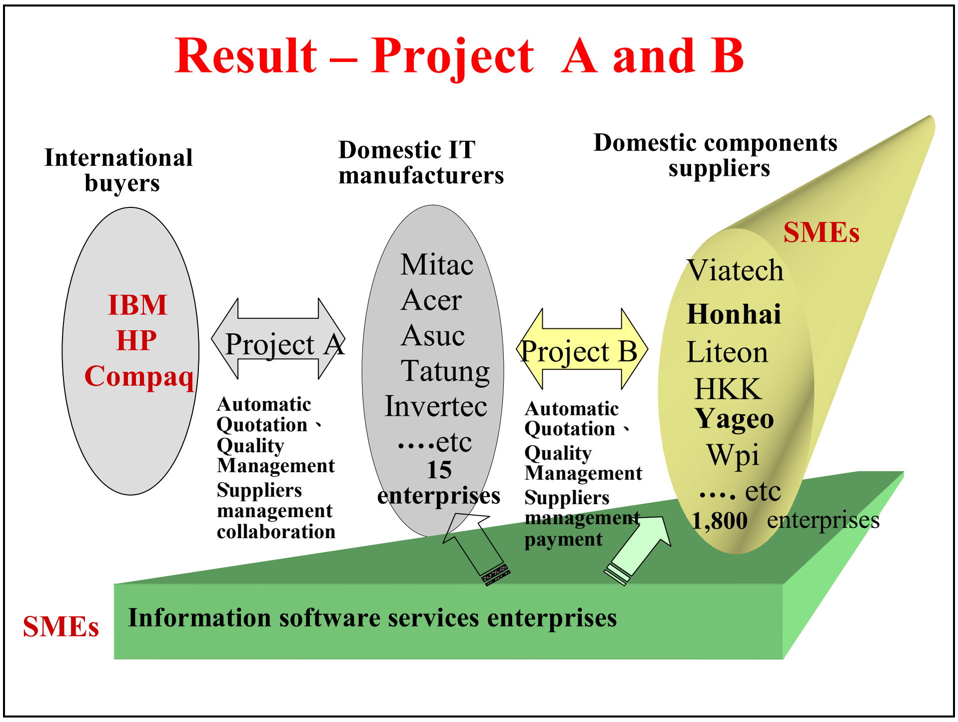

Fig 13 Implementation Result of Project A and B

3.3.3. Project C

3.3.3.1. Objective of Project C

Project C aimed to build on the e-Business supply chain foundations established in Project B. The idea was for banks to help solve the problems that "center" manufacturers (in center-satellite systems) and suppliers faced in the area of payment and collection, to provide real-time online financing service, and to establish mechanisms to achive e-Business integration in the areas of information exchange and cash flow between banks, “center” manufacturers and suppliers, thereby boosting Chinese Taipei’s industries’ competitiveness as a whole and creating a favorable environment for the development of business models whereby Taiwanese enterprises continue to receive orders and arrange financing in Chinese Taipei and essentially, "keeping the money in Taiwan". Project C also provided for the establishment of a global financial services network by Taiwanese banks, to help Taiwanese companies to achieve effective global deployment.

3.3.3.2. Description (Details) of Project C

Implementation of Project C began in August 2001 and ended in December 2003. Eight banks, namely Chinatrust Commercial Bank, International Commercial Bank of China, First Commercial Bank, Cathay United Bank, Fubon Commercial Bank, Hua Nan Commercial Bank, Chang Hwa Commercial Bank and Far Eastern International Bank participated in the project. The main contents of Project C included on-line payment and collection, account aggregation, and online financing mechanisms.

3.3.3.3. Implementation Result of Project C

(1)The amount of online financing is growing rapidly, with suppliers demonstrating great enthusiasm for the new model

The commencement of large volumes of online financing business under Project C began in October 2003. By the end of 2003, a total of USD$400 million of online financing had been provided, and the total for the first quarter of 2004 was USD$70 million. At end of the first quarter of 2004, more than 4,500 suppliers were connected to the system.

(2)Suppliers are now able to secure financing more rapidly, and at more advantageous interest rates

In the past, when applying for financing in the traditional manner, SME suppliers have often found it difficult to obtain financing because of their small scale of operations or their financial circumstances. In order to obtain the working capital they need, suppliers are often required to provide collateral or joint loan guarantees, and they may find themselves in situations where they have received an order but do not have sufficient working capital in hand to process that order. The banks are hobbled because of the difficulty of securing access to transaction details; they tend to be very cautious about providing financing to small suppliers because of the risk that falsification or alteration of the transaction details, cancellation of the order or simple misjudgment may cause the bank to suffer a loss. Project C sought to remedy the problems relating to access to information between the two parties. By using the order details provided by the "center" manufacturer, it is possible to bring forward the stage at which financing is provided to the supplier from the collection stage to the invoice-issuing stage, the acceptance inspection stage, the order placement stage, and in some cases even the order anticipation stage. It is estimated that this has reduced the time needed to secure financing by 2 weeks in the case of the IT and electronics industry (where lead times are shorter) and by 3 weeks in the case of traditional industries.

From the point of view of the supplier, as long as they have an order coming in they can secure financing; there is thus now an effective solution to the problems that SMEs have traditionally experienced in the area of working capital adequacy. Online financing applications require neither collateral nor guarantors; the procedures are simple, financing can be secured quickly, and the interest rates are attractive.

(3)Reducing banks' labor costs and helping to bring down their NPL ratios

As far as the banks are concerned, the implementation of Project C has made it possible to streamline credit operations. If one compares the cost of traditional manual processing of credit operations with the cost under Project C, the reduction in manual processing costs per transactions can exceed 90%. The "center" manufacturers participating in Project C are all financially healthy with impressive records for on-time delivery, and the banks have access to the transaction data of both the "center" manufacturers and the suppliers; this has enabled the banks taking part in the project to bring their non-performing loan (NPL) ratios down by nearly 2%.

(4)Building on the success of the project to enhance e-Business capabilities and stimulate growth in business opportunities in all sectors

The success of the cash flow and information exchange integration models that were established in 11 IT sector center-satellite systems as part of Project C has encouraged companies in many other industries to participate in the project. As of the end of the first quarter of 2004, more than 200 center-satellite systems in non-IT sectors were involved in the project; the associated industries included distribution, mold making, electromechanical engineering, machinery manufacturing, textiles, food products, plastics, iron and steel, car manufacturing, precision instruments manufacturing, papermaking, department store operation and the healthcare sector.

3.3.4. Project D

3.3.4.1. Objective of Project D

The main focus of Project D is on providing guidance for the adoption of e-Business delivery services by Taiwanese IT hardware and semiconductor manufacturers and logistic service providers (LSPs), and to encourage other IT service providers to participate in the development of e-business services that integrate delivery and information flow in line with industry's needs.

IT and electronics manufacturers have to conform to the price strategies of the leading international vendors. In order to reduce overall manufacturing and assembly costs, production of most products has already been moved overseas, making shipping schedule planning and ensuring that information is kept up to date that much more important. The underlying philosophy behind Project D is to make the information and electronics industry a model for other industries to imitate, using the establishment of e-Business delivery networks to upgrade the overall global logistics performance of the IT sector as a whole.

3.3.4.2. The description (Details) of Project D

Implementation of Project D began in August 2001 and ended in December 2003. The participants included: HP (a leading international IT vendor); leading Taiwanese "center" manufacturers such as Tatung, FIC, CMC, Inventec, Mitac, Arima, Asustek and Sampo; Taiwanese application service provider (ASP) Kuan Mao Networks. The project thus brought together leading Taiwanese IT hardware manufacturers, overseas customers, component manufacturers, contractors, transportation service providers, customs brokers and other LSPs, and ASPs, to jointly handle the complex domestic and overseas shipping and customs clearance operations. The project's main contents included online order processing, transportation planning and implementation, shipment tracking and inventory information access, document and payment/collection management, customs clearance data management, supply and demand forecasting, etc.; the aim was to establish an e-business delivery network that would provide transparency of information between enterprises.

3.3.4.3. Implementation Result

(1)"Center" manufacturers, LSPs and ASPs have succeeded in strengthening their information application capabilities, boosting their efficiency and cutting costs.

Taiwanese "center" manufacturers, LSPs and ASPs have worked together to build an information application capability that conforms to international standards. In the case of the "center" manufacturers, the amount saved per annum by optimizing logistics and reducing wastage in inventory and key components amounts to NT$8 billion. The "center" manufacturers have also helped 1,200 suppliers and LSPs to establish e-business delivery capabilities; 22 of these companies now possess B2Bi and RosettaNet capabilities. As a result of the project, LSPs enjoy savings on transportation and customs clearance documentation production amounting to around USD$3 million per annum. ASPs have been integrating their operations with seven leading domestic and overseas delivery service platforms to provide comprehensive shipment tracking data and improve customs clearance efficiency. In the case of the US customs, the time required to complete customs clearance has been reduced from 8 hours to 30 minutes. Project D also involved the formulation and adoption of five RosettaNet PIPs (Partner Interface Processes).

(2)A substantial increase in the efficiency of LSPs, accompanied by significant growth in business opportunities

As a result of the implementation of Project D, 70% of LSPs' shipping documentation has now been put online; it is estimated that this can save 26,000 man-hours of work. Project D has helped LSPs to upgrade their delivery information application capabilities; LSPs are now able to monitor and integrate shipment status data effectively online, thereby making it possible for them to provide customers with a more comprehensive range of value added services. "Center" manufacturers are now more willing to entrust supplier shipment management and overseas warehouse operation to LSPs. As a result, the scope of global logistics planning in the IT sector has been expanded, and market demand for information services has increased.

(3)Increasing benefits from applications through the use of shared platforms

In order to increase the overall benefits that Project D will bring to Taiwanese industry as a whole, DOIT has also been providing assistance for the promotion of the "Star Delivery" plan, whereby 10 IT manufacturers (Acer, D-Link, AU Optronics, World Peace Industrial, Compal, Lite-On, Yageo, Accton, Elitegroup and Yosun) will be using a shared B2B transaction platform to provide information flow, cash flow and delivery services for purchasing, shipment tracking and inventory management in both the upstream and downstream segments of the IT sector. It is anticipated that these 10 leading manufacturers will all have their systems online by 2004, and that they will be connected to more than 500 Taiwanese IT manufacturers and 5 major domestic and international e-Hubs. The network is expected to handle transactions worth more than USD$6 billion a year and create business opportunities worth USD$27 million; it will eventually be one of the world’s largest IT industry communities.

3.3.5. Project E

3.3.5.1. Objective of Project E

The objective of Project E is to establish models of e-Business adoption through collaborative designs. Project E aims to help companies establish interactive models for collaborative design with customers, suppliers and technology design partners at the new product development stage. Effective application of information technology and new processes can be used to reduce lead time, create synergy between companies in different industries, and encourage manufacturers to focus more on the new product R&D stage in the value chain, thereby enhancing the overall competitiveness of Taiwan’s industry.

3.3.5.2. Description (Details) of Project E

Implementation of Project E began in August 2001 and ended in June 2004. Six companies, namely Tatung, FIC, Sunonwealth, Compac, HP, and Amtran participated in the project. Project E was positioned as a pilot project targeting the IT sector; the companies participating included a leading international vendor, leading Taiwanese "center" manufacturers, primary suppliers and secondary suppliers. The collaborative design framework that resulted was extremely comprehensive. The main emphasis in project implementation was on helping manufacturers to transform themselves from traditional OEM providers into ODM providers and Collaborative Design Manufacturing (CDM) providers, while working to strengthen collaborative design R&D management capability. The idea is to integrate different companies' R&D capabilities at the product development stage, developing collaborative design business models that can meet the needs of the leading international IT vendors. By establishing a highly efficient collaborative design operations system it should be possible to make the leading international vendors more dependent on suppliers in Taiwan.

3.3.5.3. Implementation Result of Project E

The underlying objective of Project E is to help companies complete the development of new products as rapidly as possible and bring down production costs; at the same time, companies will be able to build a brand-new collaborative relationship with their customers.To achieve these results, companies will need to make use of the collaborative design model to strengthen their ability to exert influence over the formulation of product standards, and achieve improvements in the areas of information transparency, problem follow-up management, design alteration management, sharing of design drawings, design component database applications, collaborative design process management etc. Through the establishment of a collaborative design system, both "center" manufacturers and suppliers will be able to achieve a significant enhancement of their R&D capabilities. Not only will Taiwanese manufacturers be able to obtain new product development technology and concepts from the leading international vendors, they will also be able to satisfy customers' needs more effectively and strengthen their relationships with them.

The implementation of Project E has helped to build consensus between customers (leading international vendors) and suppliers in the area of new product development, with agreement being reached to make use of certain collaborative design processes in new product development. In all, 19 leading international vendors (including HP, Intel, AMD, Altera, Epson, ViewSonic, Sony, I-O Data, Siemens, Sharp, Hitachi, Toshiba and ATi) and 164 Taiwanese suppliers participated in the project. With the gradual completion of Project E, by working with the brand-name vendors on the establishment of collaborative design mechanisms Taiwanese companies have been able to increase the importance of the role that they play in the international vendors¡¦ global operations. Project E has stimulated the development of a "virtual" international R&D community characterized by close collaboration between the participants, and has helped to strengthen the R&D capability of Taiwanese industry.

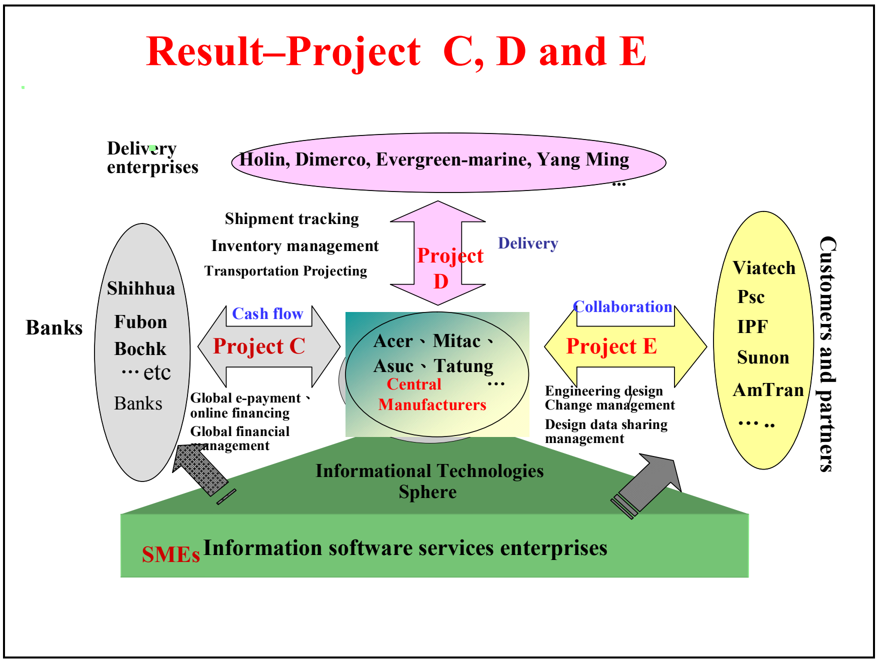

Fig 14 Implementation Result of Project C, D, and E

3.3.6. Total Achievement of Projects A, B, C, D, and E

The total achievements are summarized as follows:

(1)Strengthening local small and medium businesses' competitiveness in securing global purchase orders

(2)Introducing the global supply chain protocol, RosettaNet, that links the local e-Business environment to the global markets.

(3)Establishing 15 central plants and streamlining a total of 1,800 medium and small businesses into the e-Supply Chain system to establish a long-term strategic partnership.

(4)Improving order delivery rate by 45% to 93% to reduce inventory cost, shorten the time on processing order, and improve the overall competitiveness.

(5)Improving B2B e-commerce adoption to increase global presence.

(6)Developing the information applications service industry and software service industry.

3.3.7. Case Study of Project A, B, and D: Mitac International Corp.

3.3.7.1. About MiTAC International Corp.

MiTAC International Corporation (MiTAC) is an ICT manufacturing company founded in 1982. Major products of MiTAC include personal computers, digital home products, servers, workstations, storage equipment, mobile communications products, GPS devices, Smart Phones, wireless networking cards…etc. There are 12, 400 employees worldwide. The headquarter is located in Taipei. The production locations are in Hsin Chu and Mainland China. The overseas assembly centers are in US, UK, Germany, and Japan.

3.3.7.2. Objective and Goals of Projects A, B and D OF MiTAC

Based in Taiwan as its operational base, MiTAC planned to use effective global supply chain management to provide global logistic support to capture greater market share. MiTAC plans to designate Chinese Taipei and US as R&D and design centers, and to have Mainland China and Chinese Taipei as the production centers for product modules and semi-finish goods while establishing US, Australia, and UK as the BTO and CTO centers. Based on this objective, MiTAC set up the goal of Projects A, B, and D as follows.

(1) Set up logistics management and service center

- Direct shipping from Chinese Taipei
- Lower transportation costs by 10% (about US$3 million)
- Increase customer service satisfaction by 20%
- Shorten transit time
- Decrease document error rate and document handling manpower
- Decrease logistic handling manpower by 30%. (Before the project, 20 people handled logistics management. After the project, the 20 people were reallocated to strategic and management jobs.)
- Provide statistics of transportation costs and volume for higher management decision needs.
- Make the global logistics and stock information transparent, lowering the overall cost of in-stock.

(2) Help suppliers of MiTAC upgrade e-logistics management and e-business capability

- Exchange and manage logistics information with more than 200 suppliers through the MiTAC e-Logistics platform.
- Exchange and manage shipping and custom information with 25 third party logistics service providers, including 10 local 3PL, and lower cost by 10% (about US$3 million)
- Connect with at least 4 global based warehouse or hub warehouse to manage warehouse information

3.3.7.3. Strategy

- Be the first PC manufacture in Chinese Taipei to establish e-Logistics capability, hence increasing the customer satisfaction and order-taking competitiveness.
- Establish the e-Logistics platform for MiTAC family, MiTAC customers, suppliers, and 3PL.
- Co-design the e-Logistics process and message with trading partners to decrease the cost of implementation on message exchange.
- Timely control the inventory information of the pipeline via the data exchange framework of hub, vendor, and 3PL to lower inventory cost.
- Through BPR of e-Logistics, achieve the goal of total Logistics Cost down, including the cost of 3PL, manpower, communication, and error handling.

3.3.7.4. Major Tasks and System Functions

Major tasks of the projects involve BPR with customers, suppliers, logistic partners, integration with ERP systems and implementation of e-commerce, and Electronic Data Interchange. E-Procurement, VMI-vendor managed inventory, track and trace of shipment, and freight management are major system functions implemented. RosettaNet PIP standard is used by MiTAC and its trading partners as information exchange protocols. Information exchange includes order management, shipping management, inventory management and cargo tracking. Via application to application data exchange, MiTAC has been able to establish an efficient operation hub with more than 400 suppliers to respond to MiTAC's customer needs. At the same time, MiTAC built an e-Commerce infrastructure with its 400 suppliers.

3.3.7.5. Implementation Results

- Joint development management with customers
- Establish the business models of Build to Order(BTO), Configure to Order (CTO) with Taiwan Direct Shipment(TDS)
- Multi-mode logistics to cope with different production models
- Inventory management by Vendors
- Receiving orders by global single window via the web
- Moving from decentralized to centralized logistics control

3.3.8. Policy Focus on the IT Industry and Research Development in Chinese Taipei

Besides Projects A, B, C, D, and E, let us turn our attention to a greater scope of e-Business related policies in Chinese Taipei .

3.3.8.1. Objective: Deep-rooting Chinese Taipei's IT Development for global presence

The future will be an era of e-adoption in which the importance of the Internet continues to grow. This will be a worldwide trend, and Chinese Taipei will inevitably have to focus on developing itself into a fully e-enabled society. Chinese Taipei will be positioned as a center for operations, R&D and design, emphasizing the acquisition of information and seeking to leverage the advantages that different regions possess in terms of manpower, capital, technology and distribution channels so as to achieve integration with supply chains in other countries. In this way, Chinese Taipei will be able to develop its own effective global strategy.

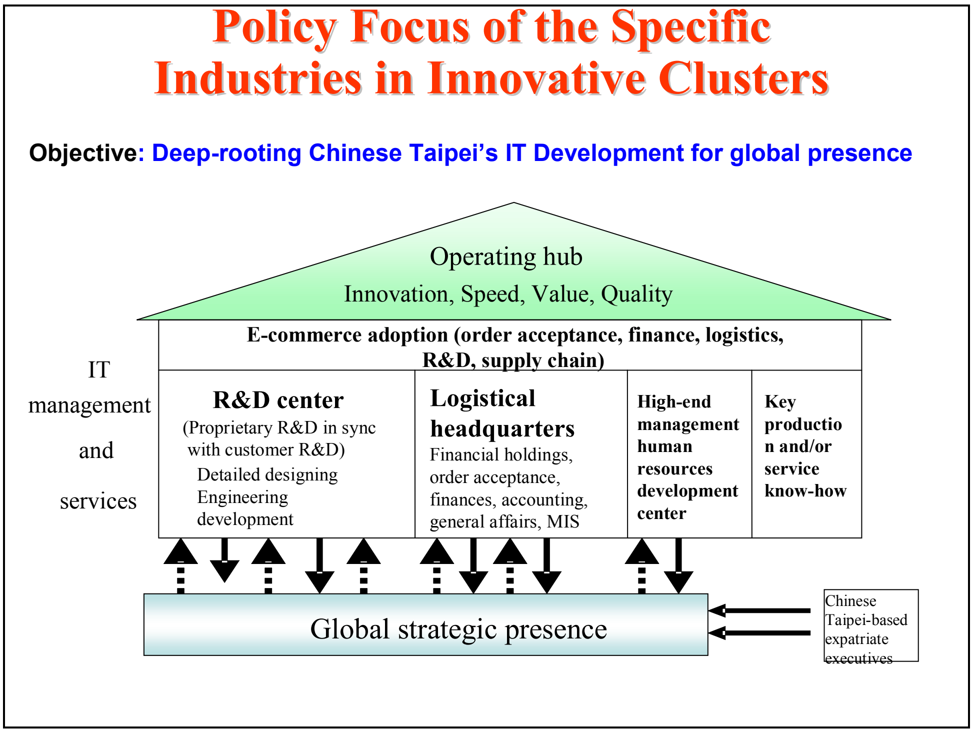

Fig 15 Policy Focus of IT Industry and RD

3.3.8.2. Strategy Development

In the future, the areas in which Chinese Taipei will be most competitive will include information, communications, semiconductors, biotechnology and automation. Supporting industries will play a vital role in the ongoing development of these sectors. In addition to the suppliers of raw materials and the providers of processing services, Chinese Taipei will need to develop knowledge-intensive service industries (including information services, communications services, industrial design and other supporting industries) if it is to strengthen the overall level of R&D and operational efficiency and overcome the obstacles that the key industries will face in the future.

The IT hardware manufacturers in Chinese Taipei will need to join forces with its software companies to develop an integrated cross-industry technology capability. By strengthening the integration between manufacturing and services domestic companies will be able to increase the level of value added that they provide within the global supply chain, helping to turn Chinese Taipei into a leading global design, manufacturing and supply center.

In addition, to upgrade and transform Taiwanese industries , Chinese Taipei launched a series of government support RD programs to stimulate overall industrial researches of all private sectors(include IT industry).

3.3.8.3. Implementation: Policy Measures

Viewed in terms of the "smile curve", the main focus in Chinese Taipei industrial policy today is on allocating resources to the points on the supply chain that lie at the ends of the smile curve. The key industrial development promotion projects implemented by the government include the RD and SBIR Support Program, project to encourage the establishment of innovation and R&D centers (to meet industry's needs in the area of design), the "Two Trillion Twin Star Industry" plan (components), Plans A, B, C, D and E (logistics), and the incentives provided to encourage the establishment of operational headquarters (enterprise operations). The government's planning thus covers every aspect of the IT industry's needs as Chinese Taipei continues its development into a high-value-added "Asia Pacific Electronics and Information Industry Resource Integration Center".

The policy mesaures adopted by the government are outlined below:

(1)Incentive measures to promote the upgrading of the information industry and RD

- The government provides investment incentives in the areas of manpower cultivation and the procurement of equipment and technology, along with tax breaks for shareholders, and exemptions and remissions for import duty and business tax.
- Incentives to encourage R&D activity include tax breaks for investment in R&D, awards for companies developing new products, the provision of guidance to help companies in traditional industries development new products, and exemption from payment of income tax on royalties.

SBIR--Small Business Innovation Research is one of the incentive programs launched by the Department of Industrial Technology of Ministry of Economic Affairs (MOEA) in 1998. It aims to encourage local start-up companies and pursue innovative research of industrial technologies and products. In 2000, the target applicants were extended to include companies in the private sector.

Types of Research encouraged by the program include:

- Developing brand new ideas, concepts, or technologies.
- Applying existing technologies to a new application.
- Applying new technologies or business models to an existing application.
- Improving existing technologies or products upon various aspects (this point sounds a bit awkward).

In the past three years, an average of 320 out of 500 applications per year received grants of USD$60,000. SMEs represent 76% of the applicants who received the SBIR grants.

- Allowing companies that move to a new location to benefit from a reduced rate of land value increment tax.
- Provision of incentives to encourage the improvement of pollution prevention technology and equipment.

(2)Encouraging domestic and overseas enterprises to establish R&D centers in Chinese Taipei:

- Incentive measures for overseas enterprises include simplified administrative procedures, manpower support, funding assistance and tax breaks.
- Incentive measures for domestic enterprises include funding assistance and the provision of higher quotas for national service personnel allocation.

The related policy measures are as follows.

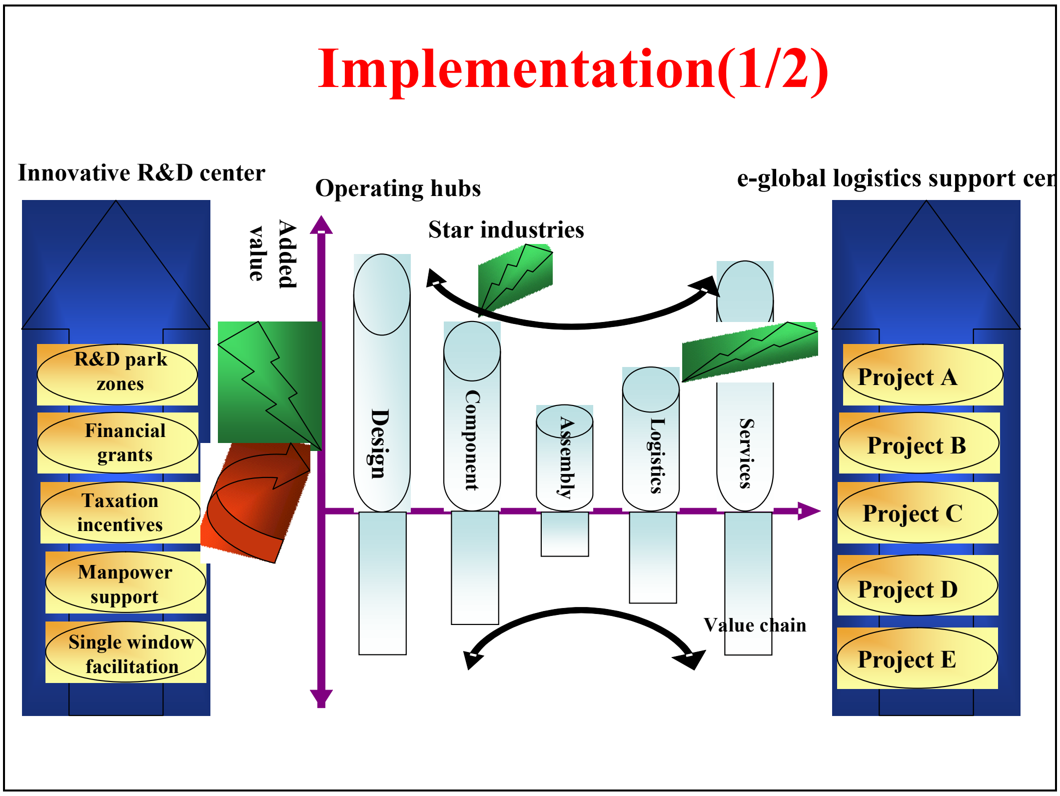

Fig 16 Implementation of Policy Measures(1/2)

(3)The "Two Trillion Twin Star Industry" plan:

The government's strategic thinking for the development of the industry in the twenty-first century attaches particular emphasis to R&D and innovation. The "Two Trillion Twin Star Industry" plan targets the most competitive industries – those that have the greatest potential for continuing development. The "Two Trillion" industries (industries with annual production value in excess of NT$2 trillion) are the semiconductor industry and display industry; the "Twin Star" industries (industries with the potential to become new "star" industries in the twenty-first century) are the digital content industry and biotechnology industry.

(4)The e-Taiwan plan will have a major impact on the development of the software industry in Chinese Taipei:

On December 26, 2001 the Executive Yuan gave its approval to the National Information & Communications Initiative (NICI) based on the "e-Taiwan" vision. It is anticipated that this plan will involve an investment of at least USD$1.2 billion over a five-year period. By 2006, the government aims to have completed the promotion of "e-government", "e-commerce", "e-lifestyle" and "e-transportation". The government will provide direction, while entrusting the actual implementation of the "e-Taiwan" plan to the private sector. The investment in "e-government", "e-commerce", "e-lifestyle" and "e-transportation" in line with the NICI strategy will help to build a comprehensive information application environment in Chinese Taipei, while also creating enormous business opportunities for software companies.

It is intended that larger companies such as Acer, FIC and Mitac will lead the way in the implementation of the e-Taiwan plan, providing the platforms on which SMEs can roll out their application services. The business models adopted will need to emphasize mutual benefit and synergy, so that both the system providers and application service content providers benefit from the plan's implementation. By encouraging software companies to seek Capability Maturity Model Integration (CMMI) assessment, it should be possible to enhance overall software development and management capability, thereby establishing a solid foundation for the internationalization of the software industry.

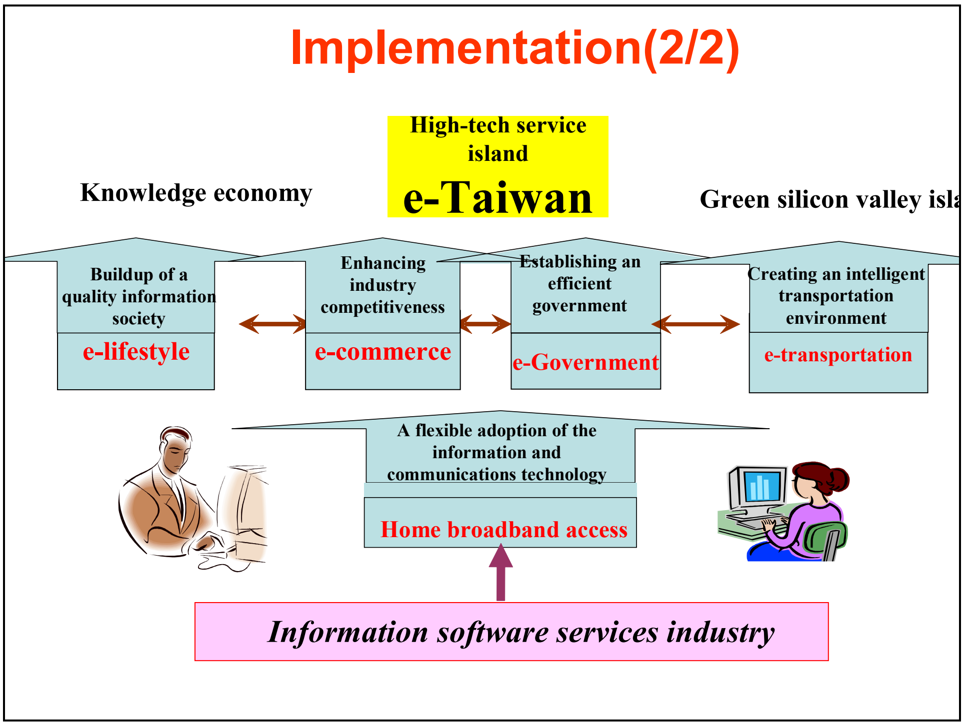

Fig 17 Implementation of Policy Measures(2/2)

3.3.9. Achievements

Thanks to vigorous promotion by the government, it is anticipated that the strengthening of the information and communications infrastructure and the enhancement of the IT application capabilities of domestic enterprises will make it possible to achieve an across-the-board upgrading of the IT capabilities. With the adoption of an innovation-oriented growth model to raise value added, Chinese Taipei will develop into a high-value-added manufacturing and service center, thereby boosting the competitiveness of domestic industry as a whole. The results that have been achieved so far are described below(as in 2004):

Table 5 Implementation Result of the EB Policy

Category	Project	Implementation Yield
Innovative R&D center	Establish R&D Centers	● A total of 36 local corporations have established R&D centers in Chinese Taipei. ● A total of 6 foreign corporations have launched R&D centers in Taiwan.
The Two Trillion Dollar Two (Twin) Star Industries	Semiconductor Industry	● Wafer processing output accounts for 73% of the total global output. ● IC design output accounts for 26% of the total global output.
	Image Display Industry	● TFT-LCD output accounts for 34% of the total global output. ● FPD output accounts for 24.5% of the total global output.
	Digital Content Industry	● Launch the “Digital Content Industry Promotional Office” to help the industry reach US$10.7 billion mark by 2006.
	Biotech Industry	● Launch the “Biotech Industry Single Window” to help the industry reach US$7.3 billion mark by 2006.
Computerized Global Logistics Support Center	Project A	● Foreign purchase increased by more than 20% from US$15 billion to US$18 billion. ● 1,800 SMEs joined the e-Supply Chain system to efficiently process global order and secure competitiveness. ● Greatly enhancing industry’s global image and popularity by implementing Project A and B ● Project C, D, and E have successfully established over 25 industry systems introducing e-Service in the banking and logistics industries.
	Project B	
	Project C	
	Project D	
	Project E	
e-Taiwan	Home Broadband Access / e-Lifestyle / e-Commerce / e-Government / e-Transportation	● Promote the overall development of the information software service industry. ● Promote SME broadband access to help enhance competitiveness.

3.3.10. Vision of an e-Society in Chinese Taipei

In line with the vision of “M-Taiwan: Opening up New Vistas With Boundless Possibilities for Wireless Applications”, the government has planed the construction of new broadband backbone networks that will cover the whole of Chinese Taipei, thereby speeding up the rollout of Fiber-to-the-Home service by the fixed line operators. Mobile Internet access and wireless Internet access will be integrated to develop an obstacle-free dual-network environment extending throughout Chinese Taipei. At the same time, government resources and the resources of the private sector will be brought together to develop a whole new range of wireless broadband services falling under the categories of mobile lifestyle, mobile services, mobile learning and mobile applications for remote areas. The ten key work items here will include: broadband backbone network deployment; broadband backbone network operations management; m-Taiwan application platform development; operations management for m-Taiwan application platform development; establishment of joint platforms; establishment of roaming centers; m-Taiwan R&D; m-learning; publicity and promotion; dual-network integration.

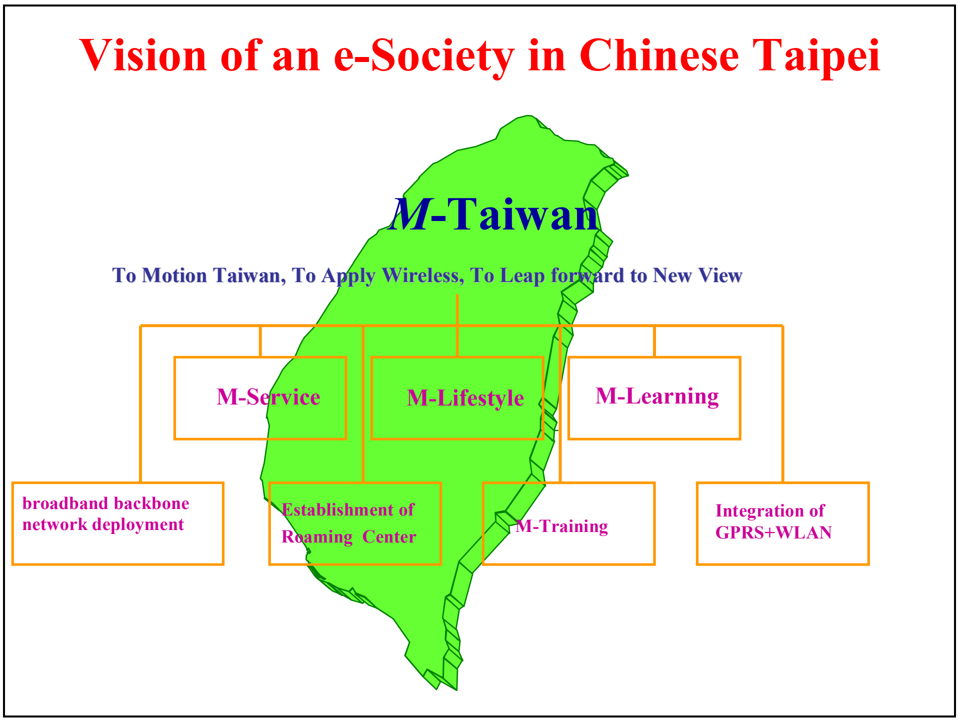

Fig 18 Vision of an e-Society in Chinese Taipei

3.4. Program Assessment

Policy evaluation is a formalized approach to study and assess projects, policies and programs to determine if they 'work'. Although there are different types of assessments, the easiest way is the “outcome” based or “performance” based assessments. Performance-based assessment focuses on policy achievements.

The KPIs of an e-Business may contain, but not limited, to the following. Attendees are encouraged to set up one’s own policy goals, tasks, and KPIs.

- Revenue increase for target industries, domains, or geographic regions
- The number and percentage of SMEs implementing e-Business
- The number of supply chains implementing e-Business
- The number of IT Service Providers
- Sales amount and percentage via e-Commerce or growth rate
- e-readiness ranking of EIU or WEF of an economy
- Readiness of infrastructure
- The percentage of online SMEs
- The depth or quality of e-Business implementation
- The number or skill of e-Business professional trained
- …etc

Note that the KPI of an economy's e-Business policy may be the aggregation of KPI of companies. In Projects A and B of Chinese Taipei, the KPI of a single company often involves time to market, inventory volume or value decrease, the percentage of electronic transaction…etc. The aggregation of these KPI makes for better and more meaningful comparisons of the effects of the policies.

The most relevant KPIs for Chinese Taipei are listed for reference. The following table lists examples of Chinese Taipei's usages in the e-Business Program.

Table 6 Assessment of the e-Business Program

Index Task Items	Objectives	Actual	Achieved Level
No. of IT supply chain system (Corporation Numbers）	15 systems （2,500）	18 systems （3,955 ）	120% （158%）
Other major manufacturing industries systems (Corporation Numbers)	25 systems （3,500）	30 systems （6,421）	120% （183%）
e-Marketplace revenue	US$120 million	US$196 million	163%
Internet usage rate in overall manufacturing industry	50%	59.7%	119%
e-Procurement rate in overall manufacturing industry	10%	14.3%	143%

In order to evaluate the achievement, a set of well-defined goal, tasks, and KPI of the tasks should be identified before the policy is determined.

4. Focal Points of Policy Making

The focal points of the e-business policy making are summarized as follows:

- **High level commitment is a must**
  E-Business policy involves strategic decisions for an economy. The implementation of a policy will drive investments in various government agencies, resources, budget…etc. Furthermore, the coordination between many agencies and non-profit organizations is a difficult task. Without a powerful, high positioned government leader, even well formulated policies will be difficult to implement.

- **The communication infrastructure and the e-readiness are essential for a practical e-Business policy**
  Although the e-Business policies may differ because of varying economic situations and the context in which they were made, building communication infrastructure is the most fundamental task. Bringing awareness to the public and performing e-Readiness reviews are also important tasks.

- **Keep the focal value of e-Business policies simple and clear**
  Make the value proposition behind the policy simple and valuable towards one's economy so the policy can be a consistent and continuous one.

  Set up clear cut goals and establish the right strategies. One should ensure that the objectives and the goals are clear and measurable. One also needs to choose the proper policy tools to tackle the problem and to pursuit the appropriate opportunities.

- **Select specific industries or fields for greater success**
  In Chinese Taipei, IT sector was selected as the pilot project because the IT industry is big in terms of revenue, number of SMEs, influence, international relationship, and impact. Moreover, the IT industry requires quick response. It is also an ICT intensive industry. Therefore, investment in ICT is possible and promising results can be expected.

- **Focus on specific fields to achieve breakthrough effects**
  Chinese Taipei focused on e-Supply Chain so it was easier to achieve the breakthrough effects.

- **Establish effective mechanisms for better e-Business support**

Chinese Taipei has built a series of government support R&D encouragement program to assist its e-Business policies. The programs include SBIR, industrial R&D support programs…etc. Through these programs, SMEs received matching funds from the government and mitigated the e-Business implementation barriers.

In addition, tax reduction is another important mechanism. These policy tools all together make the e-Business Programs more attractive to industries.

- **Construct a KPI monitoring mechanism for policy management**
  A KPI monitoring mechanism will help the policy maker to better understand the program status, to control, and evaluate the progress. In Chinese Taipei's experience, this enabled the programs to obtain precise results and simplified the change control process for the projects.

5. Lessons learned

From Chinese Taipei's e-Business policy making experiences, we learnt the following lessons:

- **Big introducing/bring small is a good strategy**
  Although Projects A, B, C, D, and E began from the big central manufacturers in IT industries, the big manufacturers in turn introduced many of their second, third, and even fourth tier SME suppliers to participate e-Businesses. The ripple effect still continues nowadays. This shows that the bottom line for SMEs is increases businesses and sales. SMEs are always seeking business opportunities. Requests by customers to implement e-Supply Chain is an effective way to implement e-Business for SMEs.

- **Policy makers should give higher priority for SMEs' needs**
  SMEs think differently. SMEs use IT differently than big companies. SMEs need easy, feasible, user friendly and inexpensive applications. As we know, most software applications are customized for big companies. As most SME solutions that IT vendor provides are "down-sized" compared to those for big companies, they may be not really what SMEs want. This really slows down the implementation or decreases the willingness of e-Business adoption. Strengthening the capability of IT solution vendors, specifically for SMEs, is an issue to consider in policy making.

- **E-Business is less about technology adoption, but more about business model changes**

The success of Projects A, B, C, D, and E were very beneficial in bringing about business model changes. It is about the restructure of business relationships. It is the remodeling of business process of a supply chain partners. The technology is considered an enabling tool to realize the changes.

- **Industry-academia-PRI collaboration**

  Both the planning and execution of e-Business policies require not only professionalism and authorities, but also research and execution capacity. Fortunately, Chinese Taipei enticed many universities, industry associations, scholars, and research institutes such as the Institute for Information Industry (III) and Industrial Technical and Research Institute (ITRI) to join the Program. Therefore, Chinese Taipei has an abundant resource network to facilitate the work, one of the key factors to the program's success.

6. Discussion: Promote tangible cooperation among APEC members

- What is the current status of e-business in my economy?
- What kind of problems are SMEs facing in the area of e-business in my economy?
- What requirements on SME e-Business are most critical in my economy?
- Are there any policies of e-business in my economy? If there are, I think they are… (please comment on the policy).
- What are the key factors of e-business policy?
- Will I develop the e-Business policy for my own economy? If so, how?
- Do I need further assistances from other APEC member economies?

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Chapter 10. Strategic Public Procurement

Woosung Lee[1]

Government Procurement can be utilized as a vehicle for innovation for SMEs' capability build-up and business growth. Innovation policy has focused on the supply-side of SMEs' innovation, such as R&D subsidies and tax incentives. However, the demand side of innovation policy is recently highlighted as a leading and effective instrument for SMEs' innovation. Among the tops of the demand-side innovation policy is strategic procurement policy, which targets specific technology development enhancing growth potential of innovative SMEs. This course can provide 1) general schemes of demand-side SMEs' innovation policies, 2) strategic procurement policies in advanced economies and recent development in policy agendas, and 3) specific case studies from Korean SMBA experiences. Through this course, developing economies' government officials can earn an effective instrument to mobilize innovative capabilities of an economy's numerous SMEs.

1. Introduction

1.1. General Description

Government Procurement can be utilized as a vehicle for innovation, capability build-up and business growth of SMEs. Traditionally, innovation policy has focused on the supply-side of SMEs' innovation, such as R&D subsidies and tax incentives. However, the demand side of innovation policy is recently highlighted as a leading and effective instrument for SMEs' innovation. Among the demand-side innovation policy's instruments, strategic procurement has been considered as the first priority, which can effectively target specific technology development. This course material intends to deal with this strategic procurement policy instrument. This course material intends to explain 1) general schemes of demand-side SME innovation policies, 2) strategic procurement policies in advanced economies and recent trends, and 3) strategic procurement cases from Korea and EU. Through this course, government officials from APEC member economies can have hands-on taste of experiences about strategic procurement policies, which is an effective instrument to mobilize their economies' numerous innovative SMEs.

The theme of the whole course materials is "Linkage of technology development to marketing." This theme indicates that the final goal of the courses and workshops is to learn about how to effectively transfer technological achievements of SMEs to business success in market. SMEs often fail to commercialize their technological developments to market success

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despite of their technological excellences. This can be generally attributed to SMEs' weakness in business management and marketing capabilities, however, in many innovative products, this can be attributed to lack of efficacious initial market demands. Through strategic procurement policies, government can lead this initial market demand and play a catalytic role of early adopter, accelerating diffusions of new technologies in this very early stage of new technologies.

Strategic procurement policy instruments should be considered as an important instrument of demand-oriented innovation policy. Almost every SME innovation policies only focus on the supply of R&D and innovative activities. However, if there do not exist effective market demands for new technologies or new products, the commercialization of SMEs' innovative technologies or products can not be realized in market. Strategic procurement policy instruments can mobilize market demands and act as a catalyst for fomenting market demands in the very early stage of technological development. And also with the combination of technology foresight exercise such as total technology roadmap, strategic procurement policy instruments can be used as effective industrial policies developing strategic future industries as growth engines of an economy. In accordance with economic and industrial development strategies in mind, strategic procurement policy instruments can target core technologies for future economies, and thus leading overall technology development paths of an economy. Specially, in the context of developing economies, the centralization of government procurement is quite extensive enough to produce 'economy of scale and scope' effects, but, on the other hand, initial market demands for new technological innovation are severely insufficient. Thus, the relevance of strategic procurement policy instruments can be more intense in the context of developing economies. And governments of developing economies can effectively act as a catalytic demander of innovative technology products by indigenous domestic SMEs.

The target trainees for this course should be middle-management group of policy makers in charge of innovation policies for SMEs, or middle-managers of SME supporting public organizations, or researchers in the related fields. All participants should be from APEC developing member economies, and if they have experiences about public procurements, it will be more complementary. The course requires 3 hours time period, which consist the 1 hour of lectures, the 1 hour of case studies, and the 1 hour of discussions.

1.2. Objective and Expected Benefits

The objective of this course is to enhance the capabilities of policymakers in developing economies by learning an effective policy instrument in the area of public procurement, especially strategic demand-oriented innovation policy. Trainees are expected 1) to apprehend the importance of demand-oriented innovation policies and strategic procurement, 2) to understand the advanced economies' demand-oriented procurement policies and recent developments, and 3) to develop a capacity to apply strategic procurement policies in their economies, promoting technology-focused SME innovations in practice.

Trainees will be benefited from this strategic procurement policy course in several aspects: 1) trainees will have a better understanding of public procurement policies, which can be effectively utilized for the purpose of promoting SME innovation, not just for traditional roles of serving as an cost-effective instruments of government purchases. 2) Trainees will a have better understanding of what are the global trends in procurement policies, especially in advanced economies which attempts to achieve innovation-driven economic development. 3) Trainees will have an in-depth practical understanding about good practices of strategic procurement policies, which may be possibly implemented in their economies' own procurement policy programs.

1.3. Methodology and Assessment

The subject of the "Strategic Public Procurement" course will be divided into three steps of implementation. During the first 1 hour of the lecture time, the trainees will be provided theoretical backgrounds of public procurement policies, the general schemes of strategic procurement policies which have a huge potential to promote SME innovation in developing economies, and finally the example of public procurement policy programs among advanced economies. Through the first 1 hour of lecture on this subject, trainees will be equipped with general schemes of strategic public procurement and will have a better understanding of the purposes and effectiveness of strategic procurement policies for SME innovation.

During the second 1 hour of best practice case studies, the trainees are expected to learn practical operation aspects of strategic procurement policies. Through two examples of Korean procurement policy programs and EU recommendation on strategic procurement procedures, trainees will have an in-depth understanding of strategic public procurement policy schemes, structures, management process and their effectiveness in promoting SME innovation. Through these case studies, trainees are expected to be able to utilize these advanced cases of strategic procurement policy instruments to implement their own effective strategic procurement policy programs.

In the last step of the 1 hour roundtable discussions, trainees will discuss about the status of their economies' procurement policies: what would be implications of this strategic procurement policies to their economies and their innovative SMEs; how to apply this programs to their procurement policy schemes and structures; and what would be obstacles and expected problems in incorporating strategic innovation perspectives into their procurement practices.

The success of the public procurement course can be assessed by examining several aspects of the course outcomes: 1) to what extents, trainees apprehend the importance of demand-oriented innovation policies and strategic procurement, 2) to what extent, trainees understand technology procurement policies and recent development of strategic procurement policies in advanced economies, and 3) in the medium term, to what extent, the trainees have an understanding of the practical operation, management, structures of strategic procurement policies so that whether they can develop a capability to apply strategic procurement policies in their own economies, promoting technology-focused SME innovation in practice.

1.4. Scope and Structure

The structure and scope of this course material are divided into four sections: 1) theoretical background of strategic procurement policies and the differences between general procurement policies and supply-oriented policies, 2) technology procurement policies of advanced economies, and recent development of strategic procurement policies in European economies, 3) procurement policies of APEC member economies, and 4) cases from Korean experiences and EU policy recommendations.

In the first section of “Theoretical background of strategic procurement policies,” the differences between general procurement policies and supply-oriented policies will be discussed. Innovation policies for SMEs are mostly supply-oriented, which are public R&D provision, R&D tax incentives, financing policies. Demand-oriented innovation policies can be said to be 1) direct public procurement policies for R&D and innovation, or 2) policies to stimulating private demands. Traditionally, procurement policies for SMEs are considered as instruments helping weak and ineffective SMEs. However, SME innovation policies focus on innovation-inducing aspects of procurement policies. Moreover, there exist the differences between general procurement for innovation and strategic procurement for innovation. While general procurement utilizes procurement procedures to promote SMEs’ innovation, strategic procurement has the objective of developing targeted-specific technology and strategic industries.

In the section of recent development of strategic procurement policies in advanced economies and European countries, recent innovation policy developments are discussed. The EU has implemented RIAP (Research Investment Action Plan), among which agendas specifically recognize the importance of strategic procurement policies in achieving 3% GERD rule. In 2006, the EU published and distributed “Handbook on Innovation Procurement.” Germany published a research paper addressing the importance of public procurement in innovation, which is "Impulse Circle Innovation Factor State." The Cotec of Spain published policy research paper, "Public Procurement and Technology." Netherlands set aside 2.5% of total public procurement for purchasing innovative commodities or services from the year of 2006. UK have produced a series of policy developments in strategic procurement areas: 1) 2003 Innovation Report: Focus of technological innovation in procurement, "Intelligent Customer" for technological innovation, 2) Kelly Programme: Systematic and Strategic approach, "Capturing Innovation": guideline of procurement for innovation, 3) DTI 5-years Programme 2004: Biz-leaders and OGC cooperation for projects to promote strategic procurements for innovative commodities and services (Woosung Lee, 2006). Diverse cases of strategic procurement and economic impacts are provided.

In the section of procurement policies of APEC member economies, several APEC economies' procurement policies will be examined and compared. Australia has implemented 1) Financial Management Accountability Act 1997, and set the official guideline of minimum level of procurement for SMEs, which are 10% for hardware, 20% for software/services. The Chinese Taipei' procurement policies focus on ensuring1) fair treatment, and 2) information/consulting provisions to SMEs. The Philippines formulated the Magna Carta for SMEs, which requires 10% quota of total public procurement to SMEs. Korea's SMBA has the "New Technology Purchasing Assurance," which will be reviewed in more details in the following sections of Korean strategic procurement policies and EU recommendations.

In the section of cases of strategic procurement policies, two cases of Korean procurement programs are examined, respectively "New Technology Purchasing Assurance," and PPS (Public Procurement Service)'s "Procurement for Best Products." And EU recommendations for "Strategic Procurement Procedures for Innovations" are examined in details how every step of procurement procedures should consider and involve innovation-promoting aspects and what will be best practices.

2. Theoretical background of strategic procurement policies

2.1. General Description

In most of economies, as the proportion of government's procurement demand reaches to 10-20% of GDP, the importance of public procurement sharply increased recently. Traditionally, the ultimate objective of public procurement has been cost-effective acquirement of public demands. However, because of the high proportion of public procurement in GDP, policy makers has started to reconsider public procurement policies so as to utilize as a strategic promotion tool for economic and social purposes. Among these economic and social purposes include procurements for small and medium enterprises, procurements for products of woman entrepreneurs or disabled group, or environmentally-safe-products.

From the perspective of innovation policies, public procurement can be served as demand-sided innovation-promoting policy instruments. Edquist(1996) provided a typology of innovation policies into two dimensions. Innovation policies, according to Edquist(1996), can be divided into demand-oriented and supply-oriented innovation policies, and in another dimension, divided into technology development policies and technology diffusion policies as in Table 1.

Table 1. Technology Policy Instruments

	Technology Policy Instruments Operating on:	
	The Supply Side	**The Demand Side**
Technology Development	**(1) R&D (Research and Development) Policy** (Government Funding of Research)	**(4) Commanding Technology** (Creation-Oriented Government Technology Procurement)
Technology Diffusion	**(2) Accessing Technology** (Technical Attachés)	**(3) Implementing Technology** (Diffusion-Oriented Government Procurement of Goods and Services)

Innovation-oriented public procurement should be distinguished from traditional public procurement. The purpose of traditional public procurement is the achievement of the cost-effectiveness in acquiring quality commodities and services, but the ultimate purpose of innovation-oriented procurement policies and the determining factors of procurement decision-making lie on whether the procurement decision can promote innovation of private sectors and can guarantee commercialization and diffusion of new products or new technology in market. Thus not just the purposes of cost-effectiveness and quality control, but the purpose of innovation promotion aspects is incorporated into strategic procurement decision making process.

Innovation-oriented public procurement can be specifically divided into general procurement for innovation and strategic procurement for innovation (Edler, 2006). General procurement for innovation means that government imposes, in the procedure of procuring, contracting and evaluating commodities or services, higher priority upon innovative capacity or innovative activities of a firm, such as the number of patents, or the ratio of R&D investment to sales,. Through this higher priority setting on innovation-aspects, government can indirectly promote general innovative activities of private sectors, which endeavor to provide goods and services to government.

Strategic procurement for innovation means that government strategically targets to develop specific new technologies or new products, which are non-existent before in markets. Through this strategic procurement policy instrument, government can provide a critical mass of demands for new technologies or new products, guaranteeing an initial market for new technologies and thus minimizing firms' high-risk bearing inherent in new technology development. Government plays a catalytic role in securing early-market demand for new promising future technologies by strategic public procurement.

Innovation-oriented procurement policies can be implemented in various forms by the variations of the extent of public-private partnerships. Government can directly provide procurement for innovation without private sector's involvement. Or government can closely cooperate with private sectors in developing new technologies or new products with guaranteeing certain amounts of public procurement for research outputs and new products even from the development stage of technology innovation. Lastly, government can only act as a catalyst role in promoting private demands of already-existing technologies or products in markets for the purpose of diffusion of strategic technologies or products.

Table 2 Matrix of Procurement Policy

		Societal Need	Private Need
End-user	**State**	**direct public procurement**	**X**
	State&private	**cooperative procurement**	**X**
	Private	**catalytic, state-induced procurement**	

Source: Edler(2006)

Edquist(1996) stressed that innovation-oriented procurement policies can also be divided into targeting new technology development or targeting promotion of technology diffusion. Procurement for technology diffusion or market growth of new products has clear intentions to augment 'private' market demands for new technologies or new products. If government can provide a critical mass to mobilize private demands, then new products or new technologies can achieve momentum to be developed into a new standard of market. Or in the case that government endeavors to spread new-imported-high-technology from MNCs to be utilized by domestic firms, procurement for new-technology-diffusion can also be effective. Especially the governments of developing countries, where adaptive technology capabilities and technology-imports are the main sources of innovation in private firms, should be aware of the importance of technology procurement from MNCs and diffusions of this-imported technologies into domestic indigenous firms.

Extensive literature such as Edler(2006), Rothwell and Zegveld(1981), provides empirical results that public procurement for innovation and technology development can be more effective than supply-oriented innovation policies such as R&D subsidization. Geroski(1990) also concluded that public procurement for new technologies and new products can be “a far more efficient instrument to use in stimulating innovation than any of a wide range of frequently used R&D subsidies.” Dalpej et al.(1992) also indicated that public procurement policy is more influential and effective, especially in the areas of highly innovative sectors and high technologies.

Why public procurement policies can be more effective instrument than supply-sided innovation policies in promoting private sectors’ innovative activities? Edler(2006) provides five rationales for the effectiveness of demand-oriented innovation policy instruments as explained in the box 2.1.

Box 2.1. The effectiveness of Demand-Oriented Innovation Policy Instruments

1) Demanding demand: As already mentioned above, the state is frequently a very "demanding" demander, necessitating innovative solutions to fulfill its tasks in society. This applies in the military and non-military area. New societal needs and thus state priorities inevitably offer leeway also for innovative solutions. This is confirmed by innovation research. Dalpé et al. have determined empirically that the state develops strong demand particularly in those technology areas which are distinguished by high innovation dynamics. In the research-intensive fields in which the state appears as demander public administrations are often more demanding than the private demand, i.e. it is more often "lead user" for new innovations than private demanders (Dalpé et al. 1992, p. 258 ff).

2) Bearing higher entry costs: In connection with political tasks or even "missions," the state is also frequently more willing or able to pay the higher price at the beginning of the life cycle of innovations. However, this constitutes at the same time a potential danger for innovations if the political intention behind the procurement does not have sufficient acceptance and no corresponding demand is realized subsequently in the private market.

3) Critical mass: State demand may lead rapidly to a critical mass, in particular by bundling the needs of various government bodies. Such public demand creates clear incentives for manufacturers and reduces their market risk. This critical mass also structures the manufacturing branches connected with the innovation in question. This effect is especially strong for young technologies, i.e. when industry is able to react to strong impulses on the part of the state.

4) Visibility and signaling: Government demand for innovative products additionally sends strong signals to the private users, the diffusion impulses are sometimes much stronger than those triggered by purely private demand.

5) Linking innovation to production: In contrast to supply side measures such as R&D subsidies, the concrete state demand for innovations leads not only to technological capacities, but at the same time to increased production capacities for innovations (Geroski 1990, p. 189).

Source: Edler(2006)

Current governments' discussion about demand-oriented innovation policies is, however, limited to public procurement, the roles of government's *'public demand'* promoting private innovation. However there exist diverse measures to promote innovation through spurring *'private demands'* for innovations. Edler(2006) intensively explains that these policy arms to promote strategic private demands for innovations include 1) direct financial incentives for private demands, 2) awareness promotion and information provisions, and 3) regulation.

1) Direct financial incentives can be provided in order to promote certain private demands under specific 'conditions' or 'purposes', which should be derived from mostly societal needs or industrial policy targets, for instance, such as the areas of 'sustainable growth', 'energy efficiency', or 'environmental safety'. These direct financial incentives for promoting private demands for certain products and technologies can be implemented through either by financial subsidies or by tax exemptions instruments and for most cases, these instruments are utilized to support the diffusions of innovations.

2) The obstacles of new technology diffusions can be originated from cognitive and psychological barriers of consumers adopting new technology or new products. Awareness promotion and information campaigns are to increase awareness about characteristics or safeties of new technologies to consumers of technologies. Examples can be amply found in the demonstration projects in the biotechnology fields or information campaigns on

automobile safety tests. These information campaigns provide necessary information about safety and effects of new technology or new products, and thus promoting private demands for innovative products, but also played the role of promoting innovations on the side of manufacturing industries to increase safety of new technologies and new products.

3) Regulations can also be an effective demand-oriented policy instruments which provide guidance for manufacturers' production behaviors or providing necessary information about new technologies or new products to consumers, reducing consumers' information acquiring costs. Governments can also take a part in promoting self-regulating standardization process by monitoring or by moderating negotiations between consumer groups and manufacturers about standardizations of new technologies. These instruments are explained more details in Table 3.

Table 3 Demand-oriented innovation policy measures

Instrument	Role of State	Method of Functioning
1. State Demand		
General procurement	buy and utilize	The state considers innovation in general procurement as main criterion (e.g. definition of needs, not products, in tenders)
Strategic procurement (technology-specific)	buy and utilize	The state specifically demands an *already existing* innovation in order to accelerate the market introduction and particularly the diffusion. This can include the targeted co-ordination of different government bodies and moderation with manufacturers.
		The state stimulates deliberately the *development* and market introduction of innovations by formulating new, demanding needs. This can include the targeted co-ordination of different government bodies and moderation with manufacturers.
Co-operative procurement	buy / use moderation	The state is *part of a group of demanders* and organizes the co-ordination of the procurement and the specification of needs. Special form: *catalytic* procurement: the state does not utilize the innovation itself but organizes only the private procurement
2. Support for private demand		
2.1 Direct support for private demand (monetary control)		
Demand subsidies	Co-financing	The purchase of innovative technologies by private or industrial demanders is directly subsidized
Tax incentives	Co-financing	Amortization possibilities for certain innovative technologies
2.2 Indirect support for private demand: information and enabling (soft steering)		
Awareness building measures	Information	The state starts information campaigns, advertises new solutions, conducts demonstration projects (or sup-ports them) and tries to create confidence in certain innovations (in the general public, opinion leaders, certain target groups)
Voluntary labels or information campaigns	support information	The state supports a coordinated private marketing activity which signals performance and safety features.
Training and further education	enabling	The private consumers or industrial actors are made aware of innovative possibilities and simultaneously placed in a position to use them.
Articulation	organizing discourse	Societal groups, potential consumers are given voice in the market place, signals as for future preferences (and fears) are articulated and signaled to the market-place.

Instrument	Role of State	Method of Functioning
2.3 Regulation of demand or of the interface demander – producer (steering via standardization)		
Regulation of product performance and manufacturing	regulation, control ("command and control"	The state sets norms for the production and introduction of innovations (e.g. market approval, recycling requirements). Thus demanders know reliably what certain products perform and how they are manufactured. The norm affects firstly the producer (norm fulfillment), but spreads to the demander by means of the information about norm fulfillment
Regulation of product information		The state sets standards, so that demanders receive reliable information about innovations.
Usage norms		The state creates legal security by setting up clear rules on the use of innovations (e.g. electronic signatures)
Support of innovation-friendly private regulation activities	moderation	The state stimulates self-regulation (norms, standards) of firms and supports / moderates this process and plays a role as catalyst by using standards
Standards to create a market	moderation, organization	The state creates markets for the consequences of the use of technologies (emission trading) or sets market conditions which intensify the demand for innovations
Systemic Approaches		
Integrated demand measures	combination of various roles	Strategically co-ordinated measures which combine various demand-side instruments
Integration of demand- and supply-side measures	combination of various roles	Combination of supply-side instruments (R&D programmes) and demand-side impulses for selected technologies or services.

SOURCE: EDLER(2006)

3. Public Procurement Policies: Country Studies

3.1. General Description of Strategic Procurement Policies in Advanced Economies

Public procurement policies was traditionally not recognized as innovation-promoting instruments in systematic ways until the early 1990s with the exceptions of the US and Sweden. While, from the perspective of the US, public procurement for defense-related technology developments are strategically utilized as innovation-oriented instruments, Swedish government led high-technology industrial development through public and private partnerships of technology development in 1980s and 1990s. Only since the early 1990s, public procurement is recognized as strategic innovation promotion policy. And EU-led research (Edquist et al., 1998) was the first one to systematically analyze public procurement as innovation-oriented demand policies. The Lisbon strategy of EU acknowledged the critical role of demand-oriented innovation policies for promoting private R&D and innovation investments, especially this recognition is manifest in the RIAP (Research Investment Action Plan).

Several members of European Unions implemented their own specific policy measures of ‘strategic procurement for innovations’, and published policy-oriented researches, which are closely related with ‘procurement for innovation’. “Fortas,” Irish Science and Technology Policy Agency, and “Cotec”, Spanish public fund for R&D, have produced diverse research results about how to implement demand-sided innovation policies through public procurement. Dutch government implemented the regulation that at least 2.5% of total public procurement budgets should be purchased for ‘goods and services that are never existed in the market before’. German government, which published the report, “Impulse Circle Innovation Factor State,” emphasizes the particular roles of strategic and general procurement for innovation, which can be effectively directed for inducing the developments of specific targeted-and-future-oriented technologies by private sectors (Lee, W., 2006).

UK government is most active in stimulating and restructuring public procurement for innovation in order to promote technological developments and diffusions. “Innovation Report,” which was published in 2003, suggested that government should be an “Intelligent Customer” of technology, products and services, and provided best practices and guidelines which can be implemented in procurement procedure. The guideline for public procurement procedure, “Capturing Innovation” was published and distributed to all governments’ procurement units and procurement-related public agencies. The “DTI five year Programme 2004” provided detailed public procurement-related policies, which include public and private partnership in providing public procurement for strategic technology developments and new products.

3.2. Examples of Strategic Procurement Policies in European Economies

There are several examples of strategic procurement for innovations in several European countries. Box 3.1. explains the PIA action plan of Netherlands, which represents procurement for innovation in the country. Box 3.2. shows the detailed description of NUTEK's project, which is Swedish governmental funding agency, for promoting environment-friendly technology development through procurement.

Box3.1. The PIA(Professional Inkopen an Aanbesteden) action plan (The Netherlands)

In 2001, the Netherlands established a five-year initiative intended to improve compliance with EU Directives, increase the 'market presence' of public procurement, capture and share procurement experience and improve co-operation where feasible.

The plan obliges each ministry to designate high-level responsible parties, analyze its own purchasing activities, reconsider the organization and outsourcing of groups of related procurements, examine the skill and ICT requirements of procurement, coordinate where appropriate with other ministries and report to the legislature on an annual basis.

The action plan is managed by a small core of people on secondment from ministries, who report to a client group of five senior civil servants and liaise with central purchasing officers in the ministries. This organization, funded by the Ministry of Economic Affairs, acts as a facilitator and coordinator, and a central point of knowledge to enable collaboration. In addition, the Dutch Purchasing Council (NIC) is a private company providing purchasing, project management and facility management services on a fee basis to public and private sector clients. Less than 4% of central and local government procurement is placed with NIC.

Specific PIA foci have been electronic sharing of information and e-procurement. In addition, the action plan has developed a range of tools, including joint procurement guidance, overview of contracts, a model for fitting procurement functions to specific requirements, a model for defining skill requirements and specific guidance for local authority procurement.

Sources: EC Expert Group Report "Public Procurement for Research and Innovation", 2005

Box 3.2. Eco-Innovative Procurement [Sweden]

NUTEK is a Swedish agency which aims to promote innovative products for specific public and technology objectives by conducting procurement exercises on behalf of end-users. For example, NUTEK conducted a contest for firms to submit bids to supply refrigerators, which used fewer chlorofluorocarbons as coolants and consumed less energy than the best available technology. The prize, an order for at least 500 items, was won by Electrolux within a relatively short time. Examples of improvements in energy efficiency stimulated by NUTEK procurements included high-frequency lighting ballast (20%), heat pumps (30%), refrigerators (33%), windows (44%) and communal washer/dryers (50%).

Sources: EC Expert Group Report “Public Procurement for Research and Innovation”, 2005

Danish public technology procurement, regulation and advanced demand have been indispensable driving forces for the formation and development of several Danish clusters of competence, such as wind energy, water supply, waste water treatment, hearing aids, handicap equipment, and medico industry. Examining the close connection and relationship between cluster formation and public procurement roles, Christensen et al(2005) identified that bio-informatics, waste handling, ecological food, and specialized sensors in dairy processing, wastewater treatment, medical equipment, handicap equipment and hearing aids are to be found links with public procurements. They concluded that “quantitative and qualitative public demands and regulation play a crucial role for the innovation and performance of business activities.” Box 3.3 and Box 3.4 explain in details about technological developments and the roles of public procurements both in the cases of wind energy turbine and hearing aid goods.

Box 3.3. Danish Wind Energy Case

Since the late 1970s, wind power has played an increasingly important role in the Danish energy production and consumption and over the same period the Danish wind turbine industry has obtained a leading world market position. In 2002 Danish firms account for around 50 per cent of the world production of wind turbines measured in MW and in market share.

The Strong anti nuclear power movement and the energy supply crises in the late 1970s spurred a growing interest in alternative sustainable energy technologies in Denmark. Most wind energy projects in the 1970s began as private projects, where technically interested people made experiments with scale-down version (10-15 KW) of the Gedser machine (Krohn 1999).

When the more “professional” turbine manufactures entered the scene in the late 1970s and beginning of the 1980s, most of them came with a background in agricultural machinery (e.g. Vestas, Nordtank, Bonus, Nordex, and later Micon), although one company, Wind World, was founded on gearbox and marine technology (Krohn 2000). The wind turbine companies illustrate how learning is cumulative and often based in the national production structure and at the same time “accidental” or unplanned.

A mixed palette of policy instruments has been introduced to stimulate the Danish wind power production. The obligation for utilities to buy wind power at 85 per cent of the market price level was crucial. Another was 30 per cent investment subsidy of investment in new wind turbines. The investment subsidy was introduced in 1979, but was gradually reduced until it was abandoned ten years later. Since 1985 the Danish government has ordered the utilities to install various amount of wind power. Relatively high green taxes on all electricity – but with a partly refund for renewable energy including wind power – has been another measure to make wind power more attractive also for the power companies.

The establishment of the public wind power test station at Risoe Research Centre in 1978 turned out to be crucial for the development of the Danish wind power activities in relation to the production, distribution, and regulation of wind power knowledge. To receive the public investment grants a wind turbine type approval from the national laboratory was required. This approval process was an important part of the knowledge development and diffusion both among the wind turbine manufacturer and the investors, and it stimulated an interactive learning process. The strict safety and performance requirements put a persistent pressure on manufacturer to upgrade their design and manufacturing skills, and today Risoe is among the leading international institutes when it comes to basic research in wind turbine technology and wind resource assessment.

Most wind turbine owners are organized in the Danish Wind Turbine Owners’ Association publishing a monthly magazine with production figures and notes on technical failures for more than 1,500 turbines. The statistical database, user group, and technical consulting services for members have been important instruments to secure a transparent market based on shared knowledge (Krohn 2000). The manufacturers of wind turbines have their own organizations too – the Danish Wind Turbine Manufacturers Association. The organization carries out an extensive information work, makes policy analyses, takes part in standardization activities, and is involved in national and international R&D activities. It seems fair to conclude that knowledge sharing and interactive learning among key players have bee (and still are) important characteristics of the evolving Danish wind power innovation system. Hitherto, an “open source strategy” seems to have prevailed for the benefit of the whole system, but new tendencies towards patenting and other forms of knowledge commodification may appear in the future.

Source: Gregersen et al.(2006), originally from Gregersen and Segura(2003)

Box 3.4. Danish hearing aid case

In the beginning of the 1950s the Danish association of hearing-impaired people convinced the Danish Government to give full public support for any Dane needing a hearing aid. This public financed demand helped pave the way for the modern Danish hearing aid industry. It is worth noting that a similar decision on public support was taken in the UK but without the same positive effects on the British hearing aid industry. According to Lotz (1997) this may have to do with the differences in the specification of the tenders. In the UK case, the tender was based on a specific design made by a medical research council, whereas the Danish tender only included a range of minimum specification to be met (Lotz, 1997).

An important part of the success story has also to do with a strong Danish knowledge base within audiology and acoustics. A knowledge base that beside hearing aids is applied in a vast range of other high tech products with a Danish niche production like loudspeakers, room acoustics, advanced measurement techniques, and various forms of noise control. Furthermore

Source: Gregersen et al.(2006)

3.3. Procurement Policies of APEC Member Economies

The APEC research report[2] [3] on comparisons of APEC member economies' SME innovation policies identified several policy instruments in promoting SME's innovation, which include public procurement. Most of the APEC member economies have the regulation of setting a certain target ratio of procurement budgets allocated only for SMEs' products and services. But, unfortunately, the procurement policies for SMEs are not seriously related to, or do not take into accounts the characteristics of strategic or general procurement for innovation. Most of procurement policies have the intention of ensuring favorable 'public-procurement-environment' for SMEs for the purpose of helping and assisting weak and uncompetitive SMEs. This basic principal of 'helping SMEs' has changed significantly in recent years to the principal of promoting competition among SMEs with the aim of improving competitiveness of SMEs, especially Japan and Korea. However, still the focuses of procurement for SMEs' products and services lie on ensuring 'sole markets for SMEs'. This attitude and principal should be changed to rigorously entail the innovation-inductive elements of public procurement. Reflecting the theoretical developments and recent movements of the advanced European countries in the areas of strategic procurement for innovation, APEC member economies should also consider aggressively the incorporations of innovation-promoting aspects when implementing public procurements structures and when operating daily procurement procedures.

Australian government procurement policy[4]

The government procurement policy has two aspects. Firstly, Australian public agencies are required by the Australian law to purchase a minimum level of SME products and services. The Government has committed agencies (under the Financial Management Accountability (FMA) Act 1997) to source at least 10 per cent of their purchases by value from SMEs. For a specific industry such as ICT, the Department of Communication, Information Technology and the Arts is to ensure SME participation in major Australian Government ICT procurements. For contracts of $20 million and above, Australian government agencies subject to the FMA Act are to include a minimum target level for SME participation ranging between 10-20% of contract value depending on the proportion of hardware and services (10% for hardware, 20% for software/services). Secondly, in order to ensure that procurement processes are transparent and open, and not to discriminate against and not to deliberately exclude SMEs from participating in a procurement process, Agencies subject to the FMA Act are required to publish on AusTender contracts and standing offers with a value of $10,000 or

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[2] APEC report "A Research on the Innovation Promoting Policy for SMEs in APEC: Survey and Case Studies (SME 01/2006)", which were conducted by the APEC SME Innovation Center of TIPA(Korea Technology and Information Promotion Agency for SMEs)

[3] Policy introductions of each member economy in APEC are based on survey and interview results of SME innovation policies in each member economies.

[4] Procurement policies in this section are based on the question survey results of SME innovation policies from Australian government.

more. From 1 January 2005, agencies subject to the Finance Minister's (CAC Act Procurement) Directions are also required to publish details of certain contracts and standing offers.

The Government has committed agencies (under the Financial Management Accountability Act 1997) to source at least 10 per cent of their purchases by value from SMEs (Department of Finance and Administration). Agencies subject to the Financial Management and Accountability Act 1997 are required by the Commonwealth Procurement Guidelines to publish on AusTender contracts and standing offers with a value of $10,000 or more, to demonstrate that public procurement is open and transparent, and that agencies are accountable for purchasing decisions. From 1 January 2005, agencies subject to the Finance Minister's (CAC Act Procurement) Directions are also required to publish details of certain contracts and standing offers.

Table 4 SME Participation in Gazetted Government Contracts

	SME% BY VALUE	SME% BY NUMBER
2003-2004	**26.8**	**52.0**
2002-2003	**27.0**	**55.7**
2001-2002	**25.1**	**61.3**
2000-2001	**22.4**	**58.3**
1999-2000	**27.6**	**58.2**

Source: AusTender

Box. 3.5. Government Procurement Guidelines January 2006

5.3. To ensure that SMEs are able to engage in fair competition for Government business, officials undertaking procurement should ensure that procurement methods do not unfairly discriminate against SMEs.

5.4. Agencies should seek to ensure that procurement processes are readily communicated and accessible to SMEs and should not take action to deliberately exclude SMEs from participating in a procurement process.

5.5. Agencies need to ensure that SMEs have appropriate opportunities to compete for business, considering as appropriate in the context of value for money: the benefits of doing business with competitive Australian or New Zealand SMEs when specifying requirements and evaluating value for money; the capability and commitment to regional markets of SMEs in their local regions; and supplier-base and competitive benefits of access for new market entrants.

5.6. The Government is committed to FMA agencies sourcing at least 10 per cent of their purchases by value from SMEs.

Source: Department of Finance and Administration (2006) Government Procurement Guidelines January 2006

SME participation is also strongly encouraged and ensured in major Australian Government ICT procurements, which is governed and operated by DCITA (Department of Communication, Information Technology and the Arts). The Government expects to obtain value for money in its ICT purchases. It also wants to encourage local industry to participate in large procurements. Its policy is that FMA Act agencies include minimum levels of SME participation in ICT contracts over $20 million. For contracts of $20 million and above, Australian Government agencies subject to the FMA Act are to include a minimum target level for SME participation ranging between 10-20% of contract value depending on the proportion of hardware and services (10% for hardware, 20% for software/services). This policy of minimum SME participation in major Australian Government ICT purchases supplements the Commonwealth Procurement Guidelines target of a minimum 10% SME spend generally. An ICT company is regarded as being an SME if it has an annual turnover of less than $500 million, averaged over five years.

Chinese Taipei’s procurement policies for SMEs

Government procurement, including expenditure on construction work, materials and labor, accounts for over 40% of the government’s annual budget with most of the rest going on personnel related expenses. However, SMEs’ efforts to secure government procurement business opportunities often end in failure because of unfamiliarity with the relevant laws, regulations and procedures. To help SMEs to participate in government procurement, Articles 37 and 38 of the section of the SME Development Statute covering public purchasing and public construction were formulated to provide a basis for SME participation in these activities. In addition, the July 1997 revision of the Constitution included a clause intended to protect SMEs’ rights in this area. Article 97 of the Government Procurement Law, which was promulgated in May 1999, clearly stipulates that the regulatory authorities may take appropriate measures to help SMEs to secure a specified share of government procurement business opportunities.

The SMEA has been working actively to help overcome the various problems that have inhibited SME participation in government procurement in the past. The Administration's key work items for 2004 were as follows: (1) Provision of information regarding government procurement opportunities and provision of consulting services relating to the Government Procurement Law. (2) Holding of seminars regarding SME participation in government procurement activities. (3) Ongoing statistical analysis of the level of SME participation in government procurement in Chinese Taipei.

Canadian procurement for SMEs

Canada once implemented a procurement policy in the 1970s through the Department Supply and Services Funds with 50% subsidy, but this program was dropped a few years later. It is still being debated whether to assign special benefit to SMEs in the procurement program. The only current exception are special procurement rights for Aboriginal firms – the majority of whom are SMEs - for any contract under $25,000. Since the site visit, the Minister responsible for government procurement has committed to at least 25% of contracts going to SMEs – the time for implementing this has yet been determined

Korean procurement for SMEs

Korean Small and Medium Business Administration (SMBA) requires public institutions to purchase SMEs' technological products that have been approved for performance by the government thereby promoting technology development of SMEs and public purchasing of SME products. Regarding the progress of the public purchasing system, in July 2005, the government introduced the system of recognizing the performance of technological products developed by SMEs and the performance insurance system. It also established the basis for exemption from liability for the purchasers of technological products. In Jan. 2006, the government also adopted the technological product purchase target system.

With regards to purchase target, the proportion of technological products that each public institution is required to buy out of SME products stood at 5% in 2006, but will be increased to 10% in 2010. To secure the effectiveness of this system, the level of accomplishment of a purchase target is reflected in evaluating the public institution concerned. In order to prevent technological products developed by SMEs from not being used through combined orders for construction projects issued by a public institution, the government increased the number of construction projects that are divided into lots in Jan. 2006.

Mexican government's procurement for SMEs

There is a specific law, "Law of acquisitions, contracting and services to the public sector," that promotes government tenders for up to 50% of contract value from SMEs (Article 42). However, there is no specific and major government procurement program dedicated to SMEs at the moment. Each Ministry and Government office takes the responsibility to promote the participation of SMEs in government procurement contracts.

Philippines's government procurement for SMEs

Magna Carta for SMEs, which is a milestone legislation to foster a dynamic SME sector having been effective since 1998, specifies the quota for SME in government procurement. That is SME should have 10% share of the total procurement value of goods and services supplied to the government.

4. Cases of Procurement for Innovation

The chapter provides the cases of *'good policy program'*, which can be applicable to practical situation of trainees' respective economies, rather than merely focusing on the academic side of innovative procurement policies. The cases that this chapter deliberates in more details are 1) Korean technology procurement policies for SMEs' innovation, which are "New Technology Purchasing Assurance" and "Procurement for "Best Products." While these Korean cases of procurement policies have the experiences of more than 10 years since 1996, the other case of 'general procurement for innovation' is based on the detailed recommendations of EU that every steps of public procurement procedures are advised to follow in order to effectively stimulate technology development and innovations through procurement.

4.1. Korean Procurement for Innovation[5]

New technology purchasing assurance

The case of "New Technology Purchasing Assurance" can be briefly described as follows. "In an effort to further commercialize new technologies, government agencies, public institutions including the Ministry of Defence, KEPCO (Korea Electric Power Corp.). KOGAS (Korea Gas Corporation), and Korea Railroad Corporation and private business commission SMEs to develop a new technology with the assurance that they will purchase the technological products. Under this program, SMBA finances the technological development of SMEs, while public institutions purchase products for a certain period of time. As of 2005, SMBA supported 80 technology development projects and now it plans to expand the participation of government agencies, public institutions and private business". This program started from 1996 in order to promote technological innovation of Korean SMEs. Under this program, if the technological products of SMEs are certified as the 'goods for purchasing assurances', SMBA can recommend to all of public institutions and governmental

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[5] The Cases of Korean procurement policies in this section are based on Woosung Lee(2006).

procurement units to procure these products with higher priority. However, the recommendation is not a requirement for public procurement and does not have regulatory enforcement means to ensure adequate procurements. Thus these recommendations can not require or ensure the public institutions' final procurements except the procurement of SMBA.

Recently, target system for technological product was introduced, which requires at least the 5% of total procurement in 2006 and the 10% in 2010 to be dedicated to this procurement program. And moreover, by law and regulation, at least the 20% of 'New Excellent Product' (NEP)[6] should be purchased through this strategic procurement policy program. Thus the problems of mere recommendation without any lawful enforcement mechanism are successfully resolved. There have been several remediation injunctions improving efficiencies of procurement procedures. These are 1) the introduction of "Performance Insurance for SMEs products," 2) the revisions of certification system into "Performance Certification," and 3) the establishment of "Committee for Procurement Promotion of SMEs' Technological Products."

Table 5 Trends of New Technology Purchase Assurance Program

	'02	**'03**	**'04**	**'05**	**'06**
Agencies involved	1	1	8	26	35
Number of Projects	13	49	40	77	120
Procurement budgets (billions of wons)	9	40	40	100	160

Source: Korean Presidential Commission on SMEs (2006)

Procurement for "Best Products"

The other practical case of Korean innovative procurement policy is "Procurement for Best Products", which are accompanied by NEP "National Excellent Products", NET "National Excellent Technologies" certification programs and central government procurement. For the purpose of enhancing the quality of SME products procured, the program was introduced in 1996, which make sure the public procurements of NEP (after commercialization less than 3 years) or NET (before commercialization, prospecting it in 2 years) certified products. There are also extra provisions for exhibitions, catalogue publications, and internet promotions. Cumulative total number of this program's procurement until 2005, was 1,486 products, and total amounts, 1,367 billion won.

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[6] NEP, NET is a form of certification for innovative products. Look at the "Procurement for Best Products" section in p. 30. for more details.

This program's original purpose is to increase and to ensure the quality of procured products of SMEs, but not promoting innovative activities of SMEs. However, when being combined with certification system of NEP and NET, this program can be utilized as an effective procurement for innovation. The selected "Best Products" can be ensured for public procurement for 3 year period and can be extended for one more year depending upon qualities and performances of "best products."

Table 6 Trends of Procurement for "Best Products"

	'96 ~ '00	**'01**	**'02**	**'03**	**'04**	**'05**	**Cumulative sum**
Number of "Best Products"	718	193	131	106	151	184	1,483
Procurement Budgets (billion wons)	1,939	1,728	1,892	2,288	2,409	3,409	13,665
Selection times	1~6	6	3	5	4	4	

Source: Korean Presidential Commission on SMEs (2006)

4.2. EU recommendations on Procurement Practices for Innovation

The Expert Group report on public procurement, "Public Procurement for Research and Innovation," which was published in 2005 by European Commission, recommends diverse measures and operational details about "developing procurement practices favorable to R&D and innovation." The report clearly defines 'procurement for innovation', as "the purchase of goods and services that do not yet exist, or need to be improved and hence require research and innovation to meet the specified user deeds." The report deals with the subject of procurement practices and policy instruments, which can directly influence innovative behaviors of private firms. Dividing public procurement procedure into four phases, 1) Preparation phase: "Gearing up for procurement," 2) Tendering, assessing and awarding contracts phase, 3) Contracting phase, 4) monitoring phase, the report suggests 25 recommendations on procurement practices favorable to R&D and innovation, which are articulated in Box 4.1.

Box 4.1. Recommendations for procurement practices favorable to R&D and innovation

Recommendation 1

By the year 2010, the European Commission should consider conducting a review, with

Member States, of the extent to which the new public procurement legislation flowing from EC Directives 2004/17/EC and 2004/18/EC is enabling R&D and innovation.

Recommendation 2
Member States should make use of the new possibilities under the directives and implement the new procedures into national law. At the same time, Member States should make the necessary clarifications to promote a successful use of the new instruments.

Recommendation 3
In transposing new directives into national law, Member States should ensure that procurement personnel receive training in the application of the new legislation.

Recommendation 4
To date, there is no a standard form for technical dialogues. Therefore, we recommend that the European Commission introduces and publishes a new standard form, to give contracting authorities the opportunity to improve preparations for a formal procedure within the context of the Directives 2004/17/EC or 2004/18/EC.

Recommendation 5
Member States should conduct a review of current procurement practice against the best practice described in this report and develop appropriate action plans to improve practice.

Recommendation 6
Member States, as part of their efforts to benchmark progress towards the 3% R&D investment target, should seek to develop indices of innovation in public supply markets.

Recommendation 7
Member States should review whether existing central civil policy developments likely to lead to major procurements are communicated effectively to procurement officials at all relevant levels of government.

Recommendation 8
Member States should develop mechanisms to handle unsolicited innovative proposals from firms, inventors or universities.

Recommendation 9
Member States should consider the bundling or unbundling of procurement projects with

innovation considerations in mind.

Recommendation 10

Member States should engage with major suppliers to explore ways of improving the visibility of subcontracting opportunities in their supply chains to open up opportunities for small innovative suppliers.

Recommendation 11

Member States should develop mechanisms to enable increased awareness of new technology solutions coming onto the market, including the use of foresight and involving EU-level co-operation where possible and beneficial. Those considering the implementation of foresight findings should be aware of the opportunities offered by procurement for innovation.

Recommendation 12

Member States should review their capability to communicate long-range procurement needs to potential suppliers and develop recommendations using the same or similar mechanisms as in Recommendation 10.

Recommendation 13

The Commission should examine the need for, and feasibility of, an Information Service for procuring authorities on new or emerging technologies, solutions and state-of-the-art performance levels, while respecting the principle of non discrimination in public procurement, in consultation with Member States.

Recommendation 14

All Member States should develop and implement proposals for training procurement personnel in the skills and knowledge needed for procurement for innovation.

Recommendation 15

The Commission should design and offer to stakeholders a cycle of seminars for procurement officials in Member States on procurement practice, to stimulate R&D and innovation within the new EU legislative framework, concentrated on the best practice areas indicated in this report. This would be in conjunction with the transposition of the EU Directives into national law.

Recommendation 16

The Commission should report on the feasibility of creating a Union-wide curriculum and developing a 'Diploma of Strategic Supply' (or similar) to include modules on procurement for innovation, which are recognised in all Member States and supported by a pan-European curriculum and learning network.

Recommendation 17

Member States should develop national portals to allow buyers from across the public sector to advertise tender opportunities below the Official Journal of the European Union (OJEU) notification threshold, thereby allowing suppliers to register for specific alerts when opportunities of potential interest are available.

Recommendation 18

Member States should develop a streamlined prequalification questionnaire for use by small businesses for procurement calls below the OJEU threshold.

Recommendation 19

Member States should provide legislation that ensures that tenders stipulate that innovative variants to specifications will be accepted unless there are specific reasons against them.

Recommendation 20

Member States should explicitly address public-private partnerships in transposing the procurement directives into national legislation.

Recommendation 21

European Commission should examine the possibility of providing additional guidance on how partnering can be encompassed within the scope of the procurement directives.

Recommendation 22

The European Commission should survey the use of IPR clauses in public contracts, and the impact on public and commercial exploitation of intellectual property developed in these contracts.

Recommendation 23

Member States should examine provisions within standard form contracts and provide guidance to procurement personnel on the strategic use of appropriate alternatives.

Recommendation 24

Policy and practice for procurement for research and innovation should be carefully evaluated and the results of that evaluation fed back into improved approaches. It is important that the evaluation considers the full range of costs and benefits.

Recommendation 25

> The European Commission should establish a mechanism to ensure that the recommendations in this report receive an explicit response and, where accepted, that there should be a follow-up mechanism to ensure their effective implementation.
> Source: EC Expert Group report, 2005, “Public Procurement for Research and Innovation”

The report also identify, in details, about how to incorporate innovation-promoting aspects in the every steps of procurement procedures. In 1) Preparation phase: “Gearing up for procurement,” procurement units are recommended to assemble teams and partnerships to decide upon the coverage and requirements of procurement products and services in order to reflect innovative aspects of targeted products and services. Especially, foresight exercise is needed to identify target technologies or products, services. Thus, in this phase, identifying future technologies and governmental strategic technologies are important. Then overall strategy planning and pre-qualification setting of procurement should be provided. In 2) tendering, assessing and awarding contracts phase, formulating tender requirements and selection procedures with awarding criteria and tender-offers-evaluations are in sequences. In 3) contracting phase, complicated and complex feedback loops of designing and negotiating contract procedures are followed in order to ensure effective and efficient delivery of contracts requirements. In 4) monitoring phase, the monitoring and evaluations of the contract outcomes should be followed and lessons-learned for subsequent contracts should be reflected for future innovative procurement. Figure 1 briefly describes this flow of procurement practices for innovation.

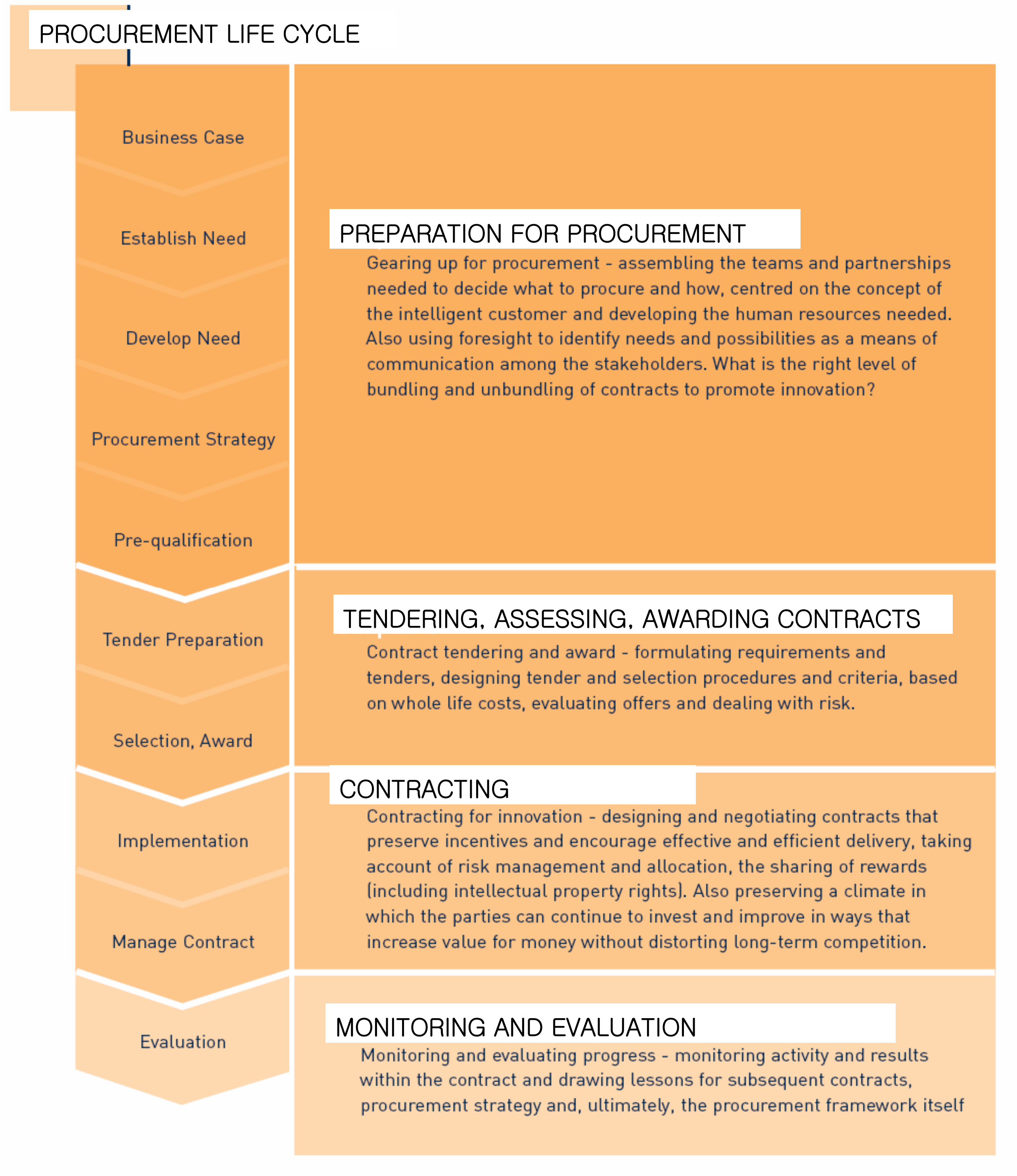

Fig 1 Procurement Procedures for Innovation

Source: EC Expert Group report, 2005, “Public Procurement for Research and Innovation”

Preparation phase

For 1) preparation phase: "Gearing up for procurement", the report recommends several good practice guidelines, which can be utilized as methods ensuring to incorporate pro-innovation aspects in developing procurements needs and establishing procurement strategy.

- Develop a cohort of public procurement officials at all levels who not only understand what is habitually done, but understand the full scope of what the legislative framework will permit and have experience of different procurement processes.
- Understanding or having access to market experts is vital.
- Share case study examples of innovative procurement processes/public procurement processes which have captured innovation across government frameworks. Build networks of people who have been through it.
- Build awareness of new technologies and ideas that are in development and being applied in the private sector - a close relationship with the supply base can help in this.
- Communicate long-range needs to existing and potential suppliers - make it easy for businesses to find out about known demand needs over the coming years.
- Ensure strong communication between procurement personnel and policy/delivery personnel. Ensure early communication of policy needs to procurement personnel.
- For organizational preparation, carry out a gateway review of proposed procurement strategy by independent assessors for all contracts over a set threshold.

Tendering, assessing and awarding phase

For 2) Tendering, assessing and awarding contracts phase, eight steps to embed innovation in this tendering process are suggested. Since promoting innovation with 'innovative procurement' is demanding and complicated enough to increase procurers' assessment costs and often requires far more stringent specifications for tendering, the selection procedure of public procurement should be more careful to identify innovative capability of tender offer firms whether to develop complex innovative procurement solutions. Below are the tips and suggestions for incorporating and ensuring innovative solutions in the procedure of tendering phase.

1. Study whether innovation is desired or feasible, and the way it will be made visible: through alternative solutions, embedded in the process or a product of the subject of the tender proposal.

2. Allow the legal and financial department to include the viability of assessing innovation issues in the framework of the tender proposal.

3. Before publishing the tender proposal, fix the qualifications required to participate in the competitive tender and the invitation procedure.

4. In the tender documents, fix the benchmark values needed to assess whether a proposed alternative solution complies with the requirement to be innovative.

5. Develop selection criteria which draw innovation into the tender appraisal.

6. Express how the shared liability issues, warranties, implementation risk and payments will be handled in the following contract.

7. Train the tender evaluators to assess complete compliance with tender documents and work conditions, and to introduce marks or points to innovative issues in a fair and competitive way.

8. Communicate results to all bidders, but keep in mind the importance of protecting the intellectual property, represented by the proposed innovations, in order to allow bidders to develop them fully or use them in future proposals.

Awarding criteria

If the procedure of selecting and awarding procurement contracts is determined on the basis of innovative quality of tender offers or past R&D and innovative performances of tender offer firms, then procurement selection procedures can effectively promote general performances of private R&D activities and innovation competency building. In the assessment of tender offers, the report solicits to consider MEAT (Most Economically Advantageous Tender) criteria than just lowest prices. The MEAT criteria evaluate effectively the optimum combination of whole-life costs, quality and innovation promotion. The Article 53 of EU Directive of 2004/18/EC clearly states about this criteria as below.

Box 4.2. Award criteria as set out in article [53]

1. Price
2. Quality
3. Technical merit
4. Aesthetic and functional characteristics
5. Environmental characteristics
6. Running costs
7. Cost-effectiveness After-sales service Technical assistance Delivery date Delivery period
8. Period of completion

Other criteria that are not specifically set out in article 53, but that are frequently used by contracting authorities are criteria such as partnering/team working innovation, organizational culture and risk management

Source: EC Expert Group report, 2005, “Public Procurement for Research and Innovation”

Dealing with abnormally low offers

Since innovative solutions for procurement tender are more heterogeneous and can show highly cost-effectiveness, the abnormally low-priced but highly innovative offer can be eliminated in the process of tendering and assessing. In order to deal with this case of abnormally-low-priced offers but having the possibility of highly innovative, the report provides the below suggestions of good practice guidelines.

- Specifications that focus on inputs will limit innovation - outcome-based functional specifications focus on the end result to be achieved and give suppliers more license to determine how best to deliver.
- Inappropriate evaluation criteria may provide a barrier to innovative ideas. Ideally evaluation criteria should consider whole life costs. Moreover, a recommended approach to value-for-money evaluation is to differentiate the financial and non-financial criteria for consideration in different strands.
- Build awareness of how 'concept viability' tests can help public procurers to take early market soundings and gauge the practicability of their ideas outside the procurement process.
- Early assessment of the risks associated with a tender should be an integral part of tender evaluation. Tender documentation should encourage bidders to include an analysis of the risks and show how these can be mitigated.
- Risks need to be sensibly apportioned and joint benefits should be pursued. Sharing of cost-savings identified by suppliers could incentivise innovation.

Contracting for innovation

In the process of tendering, ‘procurement for innovation’ can identify the tender offer firms with successful innovative solutions. But the terms and conditions of contract should be properly imposed in order to be provocative for innovation in the process of developing new technology or new products, new services. Because of the inherent high-risk nature of innovative solutions for procurement, the clear and precise definitions of terms and conditions in the contractual outcomes can help sharing risks fairly between procurers and tender-offer firms. Since developing new technologies, new products or new services, which are non-existent in the market, is quite unique process in itself, the traditional standard terms and conditions in the contract could hamper innovative behavior and outcomes of tender offer firms. Several aspects of terms and conditions in procurement contracting should be carefully reconsidered to stimulate innovation behavior of tender offer firms, among which are intellectual property rights (IPR) treatment, liability provisions, and duration of contracts.

Concerning IPR treatment, government's standard terms and conditions of contract sometimes even do not contains any provisions for IPR ownership or licensing conditions. Many of the IPR treatment cases, IPR ownerships of the contractual outcomes are strictly confined to procurer even in the cases that procurement agencies are only end-users of procured products and services. And procurement agencies are often without any capability to exploit the IPRs, which are developed through procurement. Concerning liability, still a number of regional and national governments require unlimited liability burdens on procurement suppliers. This unlimited liability and risk coverage burdens can be major obstacles to innovation of procurements. Concerning the duration of contracts, many of procurement contracts follow one-year-based budgeting practices. However, the cases such as service contract involving governmental structural reforms require extensions of contractual duration even to 4-6 years in order to ensure full transformation of governmental structure and to realize expected benefits from the contract. The duration of contract can induce or circumvent long-term investment decision of potential bidders' innovation and should be carefully considered to be promotive for innovation in private sectors. The below is the good practical guideline suggestions in considering IPR treatments, liability and contract duration in the process of contracting and determining terms and conditions of the contract.

- Ownership of intellectual property should not be assigned to the buyer automatically. IPR best practice guidance should indicate that the default position is to allocate it to the supplier, with due protection for the buyer's interests.
- Contract managers can challenge suppliers to be innovative (value engineering clause). Techniques include the use of continuous improvement drivers and supplier suggestion schemes. Provision needs to be built into the contract from day one for innovation over the life of the contract.
- Key personnel, responsible for the development of an innovative idea within the contract, should be named and only replaced by their equivalents.
- Payment structures within a contract need to reflect the expenditure patterns of smaller businesses which are to be prompt and reflect investment and other expenditures.
- Prime contractors can play a key role in encouraging innovation from sub-contractors and downstream suppliers including SMEs. Contract provisions should facilitate rather than hinder this with appropriate feed-through to contract risk assessment.

- Risk and reward sharing. In addition to the sensible apportioning of risk, buyers are encouraged to think how the rewards of a contract, for example cost-savings delivered, can be used to encourage useful innovation.
- Joint funding of investment and the award of longer-term/shorter-term contracts may help to motivate innovation.
- Continuous integration of policy and contract officials with the contract delivery team and clear decision-making lines (senior responsible owner) are both needed.

Monitoring and evaluation phase

Monitoring and evaluation of procurement outcomes and procedures have the purpose of reflecting experiences of procurement for innovation and to feedback into further modifications of procurement procedure to incorporate innovation-promoting nature. Thus ongoing reviews and evaluations of procurement projects should be part of procurement procedure for innovation. Overall procurement policy evaluation has to be clear about the types of policy measures to be evaluated, the level of policy application, policy objectives, targets of policy measures and the scopes of innovative activities. The report suggests the evaluation structure of policy objectives and indicators, methods, data sources in accordance with objectives in Table 7.

Table 7 Evaluation Structure of Innovative Procurement Policy

Objectives	Indicators	Methods/Data Sources
Behaviors of actors: change practices and rationales of procurers and suppliers	Changed decision behavior, knowledge and attitudes (acceptance of risk, life-cycle assessments, functionalities over concrete products, early dialogue, new interaction structures and practices, etc.)	Case studies Interviews Surveys Peer review
Technology: radical innovations, diffusion of innovations	Micro data, input indicators such as R&D budgets, R&D employees, output indicators such as number of patents, number of prototypes, share of innovative products in sales	Patent databases surveys Control group approach Longitudinal surveys
Market: shaping markets (strengthening suppliers	Micro and macro data, sales data, changes in market shares of targeted supplier	Analysis of market statistics

of innovative products/service, spillover to value chain suppliers)	groups, diffusion rates, value chain structures	Sectoral case studies Benchmarking
Administration performance: more effective and efficient service of public administrations (taking advantage of innovative products and services)	Quantified benefits (savings -direct, related areas, effectiveness measures), if appropriate intra and inter-organizational structures	Cost-Benefit analysis (taking into account net present value on the basis of life-cycle), user surveys (e.g. patients in improved health care systems) Interview Peer reviews
Sectoral policy aims: e.g. waste reduction, increased public construction, increased public infrastructure, advanced healthcare services, increased security services, etc.	Highly dependent on policy area, e.g. performance indicators such as level of energy savings, level of satisfaction in relevant 'user' or target groups	All methods to be applied in order to assess effects of sectoral policies (inter-temporal comparisons, benchmarking, statistical analyses, surveys, etc.)

Source: EC Expert Group report, 2005, "Public Procurement for Research and Innovation"

5. Conclusion

5.1. Discussion Agenda

There would be four topics for roundtable discussions among trainees and participants. First of all, all trainees from developing economies are expected to make short presentations about administrative structures of public procurement, procurement policies programs, procurement procedures, the aspects of SMEs consideration in their economies, e.g. specific quotas for SMES products. Secondly, roundtable participants will discuss whether their economies' procurement has strategic perspective for SME innovation. Thirdly, discussion agenda will be whether defense-related and public health-related government procurements in the economy have the purpose of promoting SME innovation and technological development. And does the procurement consider the strategic facets of SME innovation? Lastly, the discussion will move onto the topic of the relationship between government's public procurement and MNCs? What are the specificities of the procurement contract to require technology transfers to domestic SMEs?

5.2. Suggestions for Policy Implementation

The developing countries' innovation polices can be mostly viewed as supply-dominated policies, focusing on how to provide direct or indirect supports on R&D performances of domestic indigenous firms. While this supply-dominated innovation policies concern about stimulating innovative activities, the demand-oriented innovation policies can play a catalytic role in 'leading' innovation and technological development paths with a strategic directions in mind. This leading effect will be amplified when being combined with technology foresight exercises. Furthermore, since the centralization of public procurement are quite high compared to decentralized advanced economies' procurement practices, the effectiveness of this demand oriented innovation policy, "procurement for innovation," can be deeply exploited in the context of developing countries. As surveyed for European countries' recent developments in demand-oriented innovation policies, strategic and general procurement for innovation can be highly effective in promoting innovation activities and performances of private sectors.

Followings are the suggestions for demand-oriented innovation policies, procurement for innovation. First of all, strategic procurement policies for innovation should be systematically implemented extending the previous traditional roles of public procurement in cost-effective purchases of goods and services. Strategic implementation of procurement for innovation means that public procurement strategy should rigorously incorporate technological and industrial development planning with future national technology roadmap and foresight practices. Strategic procurement should be able to guide and direct overall private sectors' technological development in high-technology industries. Related to this strategic procurement policy implementation, procurement policy goals should officially include, in the procurement laws, the role of public procurement in promoting innovation and R&D performances of private sectors.

Secondly, proper law enforcement mechanism should be accompanied with strategic procurement for innovation. As in the Korean cases of procurement for innovation, if law enforcement or guarantee for final procurements of new technologies or new product, new services, are not adequately addressed, strategic procurement policies can not be effectively propagated through practices of government's and public agency's procurement unit. Especially, if procurement procedures are decentralized into different ministries and regional governments, the 'enforced' guidelines to comply with strategic procurement policies are indispensable for successful innovation-promoting procurement.

Thirdly, detailed guidelines about every step of procurement procedures ensuring innovation-provocative elements should be researched in the context of each developing country's technology innovation systems. These guidelines should be published and distributed throughout whole procurement units in public. Comprehensive feedback mechanism and evaluation system should also be established in order to develop continuous policy learning in the areas of innovation-promoting procurement procedures. Strategic procurement for innovation involves more risks and complexity in the process of procurement and because innovative solutions are in essence uncertain for their outcomes and performances in practices. Thus careful and sophisticated methodologies should be accompanied for procurement procedures, specification requirements and selection criteria.

Governments of developing countries in general have been much neglected of recognizing the importance of demand-oriented innovation policies. Thus overall reforms of procurement strategy and procurement procedures are necessary to implement strategic procurement for innovation. Through successful implementation of such mechanism, governments can play a critical role in developing and disseminating core and essential technologies in the areas of strategic future industries. As we are witnessing the limits of supply-sided innovation policies alone, the comprehensive combination package with demand-oriented innovation policies can be effective packages for innovation promotion and innovative-capability build-ups in developing countries.

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