



**Industrial Technology
Research Institute**
*Mechanical Industry
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How Government to Support the Small Medium Enterprise Conducting the Innovation-driven Research in Taiwan

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Outline

- Introduction of Taiwan Small and Medium Enterprises (SMEs)
- Government Goals, Policy, Action Plans, and Measures to Taiwan SMEs' Development
- R&D Status Review in Taiwan Manufacturing SMEs
- Focus on Taiwan SMEs' R&D Development
- Progress Review on the Six Years of the Taiwan SBIR Project
- Conclusion Remarks

Introduction of Taiwan SMEs

- Taiwan's economy is SMEs based economy
 - The small and medium enterprises (SMEs) are defined as those with less than 200 employees or capitals less than NT\$ 80 millions
 - The number of SMEs, which consist of commercial and industrial companies, takes 97.7% of the total in 2002
 - In 2002, there had 8% of newly established SMEs and 10 to 20 years old companies were more than 43%, and it helped the steady of economic growth and the social stability

Introduction of Taiwan SMEs

- Taiwan's economy is SMEs based economy
 - SMEs hire 77.9 % employees of the total in 2002
 - Sales of SMEs share 29.5% of the total in 2002
 - Taiwan SMEs have played the major role to boost the economic growth and to provide the job opportunities to hire most of the workforce

Enterprise Features	Larges	SMEs
No. of Companies (%)	25,819 (2.28)	1,104,706 (97.72)
Employees (thousands) (%)	1,147 (12.13)	7,361 (77.86)
Sales(Million NTD) (%)	17,900,347 (70.49)	7,495,827 (29.51)

Introduction of Taiwan SMEs Enterprises Age in 2002

Units: no. of enterprises; %

Age \ Size	SMEs		Large Enterprises	
	No. of enterprises	Percentage	No. of enterprises	Percentage
Total	1,104,706	100	25,819	100
Less than 1 year	91,435	8.28	477	1.85
1 – 2 years	94,036	8.51	1,103	4.27
2 – 3 years	77,477	7.01	1,232	4.77
3 – 4 years	70,554	6.39	1,120	4.34
4 – 5 years	63,851	5.78	1,187	4.6
5 – 10 years	233,742	21.16	5,090	19.71
10 – 20 years	279,065	25.26	7,863	30.45
20 years or more	194,546	17.61	7,747	30.01

Introduction of Taiwan SMEs

Newly Established Enterprises in 2002

Units: NT\$ million, %

Age \ Size	All newly established	Newly established large enterprises	Newly established SMEs
No. of enterprises	91,912	477	91,435
Percentage	8.91	0.52	99.48
Annual growth rate	-3.56	-4.02	-3.55
Sales	439,608	192315	247,292
Percentage	100	43.75	56.25
Annual growth rate	-10.6	-26.14	6.89
Domestic sales	338,398	133,430	204,968
Percentage	100	39.43	60.57
Annual growth rate	-9.48	-27.41	7.88
Exports	101,209	58,885	42,324
Percentage	100	58.18	41.82
Annual growth rate	-14.19	-23.08	2.27

Newly Established SMES Accelerated Taiwan Economy

- Newly Established Enterprises
 - The number of SMEs took 99.5% of the total in 2002
 - Sales of SMEs shared 56.3% of the total in 2002 was higher than total industry share 29.5%, and it showed the robustness of SMEs is much better than the larger industry sector in the business growing stage
 - The SMEs contributed sales of domestic and export markets were 60.6% and 41.8% respectively, and it showed that the Taiwan's SMEs had the high competitiveness to penetrate into the global market

Government Goals to Taiwan SMEs' Development

- Turning Taiwan into the Best Location for SME Growth in the Asia Pacific Region
 - Strengthening the functions of incubator centers
 - Establishment of a knowledge/information platform for business start-up and innovation
 - Helping start-ups to obtain working capital

Strategic Action Plan to SMEs' Development

- Strengthening the SME Business Service Network
 - A clear definition of the contact and coordination role which should be played by SME service centers at county and city level in the local business service network
 - Coordinating the participation of local universities colleges and research institutes in SME guidance work
 - Making effective use of volunteers
 - Effective integration of the service resources provided by different government agencies

SME Guidance Policy and Measures

- Effective Implementation of the Guidance and Service Mechanism for SMEs
 - Strengthening the Functions of the SME Service Network
 - Strengthening of SME Publicity and Award Activities
- Establishment of a Start-up and Incubation Platform for SMEs
 - Strengthening the SME Start-up and Incubation Function
 - Emphasizing SME Human Resource Development

SME Guidance Policy and Measures

- Improving the Quality of SME Management
 - Improving the quality of SME management to promote upgrading and transformation
 - Helping SMEs to secure financing
 - Strengthening the SME mutual assistance and collaboration network
 - Development of industries with local characteristics

Government Spending on the Provision of Guidance to SMEs

Units: NT\$ thousands; %

Annual Expenditure	Final Account for the 2002 Fiscal Year	Amount Spent on SMEs (%)
Organization		
Small and Medium Enterprise Administration (including the SME Development Fund)	1,027,065	1,027,065 (100.00)
Industrial Development Bureau (Industrial Technology Upgrading Guidance and Industrial Zone Development & Management Fund)	3,877,712	2,282,623 (59.00)
Board of Foreign Trade (Overseas Market Marketing Guidance and Trade Promotion Fund)	1,706,724	1,621,387 (95.00)
Commerce Department (Promotion of Commercial Modernization and Technology Development)	857,108	470,878 (54.94)
Industrial Technology Department	15,863,852	8,601,495 (54.22)
Investment Commission (Guidance for Overseas Investment and Recruitment of Overseas Experts)	147,905	48,405 (32.76)
Total	23,480,366	14,051,898 (59.85)

R&D Status Review in Manufacturing Enterprises

- Government spend 14 billions NT\$ for the SMEs development annually, and the industry technology development is the major spending has more than 54%
- R&D problems encountered for SMEs include
 - Scale of the company is too small to allocate enough R&D budget
 - Lack of knowledge-based resources to do R&D
- The focus of the R&D support to SMEs
 - Build up the common knowledge-based platform
 - Develop the user-friendly technology-based environment
 - Support innovative research projects

R&D in Manufacturing Enterprises

Enterprises' Enthusiasm for R&D

Unit: %

Year & Size Level of Enthusiasm	1999	2000	2001	Large Enterprises	Medium Enterprises	Small Enterprises
	Already undertaking R&D	59.78	55.95	47.36	84.71	67.31
Not yet undertaking R&D, but plan to begin doing so within the next three years	15.43	15.17	18.41	5.29	14.7	21.94
Not yet undertaking R&D, and have no plans to begin doing so within the next three years	24.79	28.88	34.23	10	17.99	42.74

Note: Large enterprises are defined as those with over 200 employees; medium enterprises are defined as those with 100 – 200 employees; small enterprises are defined as those with less than 100 employees.

Source: Statistics Department, Ministry of Economic Affairs, Survey of Manufacturing Industry Operations, November 2002.

R&D in Manufacturing SMEs

- A gradual decline in enthusiasm for R&D from year 2000 due to the slow down of the economic expansion from 1999
- Greater willingness to increase R&D spending in enterprise already undertaking R&D, because the harder global competition enforced them to do that
- Desire to increase total R&D personnel in enterprise already undertaking R&D, which showed the knowledge-based industry growing at faster speed
- Large enterprise more strongly motivated to undertake R&D, because of the harder global competition

R&D in Manufacturing SMEs

R&D Spending as a Percentage of Operating Revenue

Unit: %

Year & Size Percentage	2001	2001	Large Enterprises	Medium Enterprises	Small Enterprises
	(actual spending)	(planned spending)			
Less than 1%	30.53	24.98	27.55	30.75	31.94
1% -2%	22.97	22.79	23.61	22.99	22.65
2% -4%	23.89	23.28	28.24	24.14	21.6
4% -6%	9.99	14.26	9.03	11.78	9.76
6% to 10%	6.95	7.74	7.18	6.32	7.08
10% or higher	5.67	6.95	4.4	4.02	6.97

Source: Table 5-1-1 of “White Paper on Small and Medium Enterprise in Taiwan 2003”

R&D in Manufacturing SMEs

R&D Personnel as Percentage of All Employees

Unit: %

Year & Size Percentage	2001 (actual)	2001 (forecast)	Large	Medium	Small
			Enterprises	Enterprises	Enterprises
Less than 1%	26.39	22.67	16.9	24.14	32.06
1% -2%	19.13	18.77	16.9	17.53	20.91
2% -4%	18.46	18.46	22.69	18.68	16.26
4% -6%	12.13	13.71	13.66	12.36	11.27
6% -10%	11.27	12.86	13.89	13.79	8.94
10% or higher	12.61	13.53	15.97	13.51	10.57

Source: Table 5-1-1 of "White Paper on Small and Medium Enterprise in Taiwan 2003"

R&D in Manufacturing SMEs

R&D Personnel as Percentage of All Employees

Unit: %

Size	All Manufacturing Enterprises	Large Enterprises	Medium Enterprises	Small Enterprises
Motivation				
Develop new products	80.07	84.95	83.91	76.07
Improve product quality or functions	69.65	78.94	70.98	64.46
Develop new technologies or upgrade technical capabilities	51.86	63.19	54.02	45.3
Secure position in the market	49.36	52.31	51.44	47.04
Reduce production costs	43.14	49.31	47.13	38.44
Mitigate pressure from competitors	40.59	36.57	35.63	44.6
Achieve more flexibility in manufacturing in line with the needs of product diversification	31.44	34.03	28.74	31.24
Promote standardization of production processes in order to secure ISO certification	9.02	12.73	8.05	7.55
Incentives provided by the government	7.92	10.88	8.62	6.16
Need to respond to investment in R&D by competitors	5.24	4.4	4.6	5.92
Other	0.85	1.16	0.86	0.7

Source: Table 5-1-1 of “White Paper on Small and Medium Enterprise in Taiwan 2003”

R&D in Manufacturing SMEs

Reasons for Not Undertaking R&D

Unit: %

Size Motivation	All Manufacturing Enterprises	Large Enterprises	Medium Enterprises	Small Enterprises
No problems	11.26	19.41	12.38	9.31
Lack of a development capability due to small size of enterprise	34.29	7.45	18.96	43.15
Lack of technical talent in Taiwan	31.49	39.02	40.04	28.1
Shortage of funds	29.12	15.88	24.76	32.81
No market for new products due to small size of Taiwanese market	24.33	19.61	23.4	25.51
The rapid pace of change in technology, causing R&D achievements to become	21.53	30	21.28	19.81
High turnover of R&D personnel, resulting in a lack of continuity in R&D work	16.97	26.08	22.05	13.99
Difficulty in securing materials and equipment	13.45	11.18	14.51	13.7
Inadequacy of basic and applied research in Taiwan	13.19	20.78	16.44	10.91
Inability to secure the collaboration of research institutes in Taiwan	8.86	10.98	10.64	8.04
Difference in attitudes between managers and researchers	7.47	4.51	7.54	8.08
Other	5.11	4.71	5.42	5.13

Source: Table 5-1-1 of “White Paper on Small and Medium Enterprise in Taiwan 2003”

R&D in Manufacturing SMEs

Areas Where Enterprises Want the Government to do More to Stimulate R&D Spending

Unit: %

Size	All Manufacturing Enterprises	Large Enterprises	Medium Enterprises	Small Enterprises
Motivation				
Provision of tax breaks	50.04	69.22	55.32	44.91
Assistance with R&D funding	49.61	60.2	57.83	45.65
Strengthened provision of information	44.24	43.53	47.58	43.68
Assistance with manpower cultivation	44.24	57.06	56.09	39.05
Strengthening of technology transfer and its timeliness	33.74	40.2	36.94	32.2
Strengthening of coordination between research institutes and enterprises	34.08	38.24	37.14	32.08
Improved handling of patents	19.65	22.16	21.66	18.7
Other	4.62	1.57	2.71	5.66

Source: Table 5-1-1 of "White Paper on Small and Medium Enterprise in Taiwan 2003"

R&D in Manufacturing SMEs

Willingness to Establish a R&D Center in Taiwan

Unit: %

Size of Enterprise \ Level of Willingness	All Manufacturing Enterprises	Large Enterprises	Medium Enterprises	Small Enterprises
Very willing	6.61	15.62	9.88	4.03
Willing	18.2	31.04	25.79	13.89
Not willing	21.22	8.45	14.57	25.31
Undecided	53.97	44.89	49.76	56.77

Source: Table 5-1-1 of "White Paper on Small and Medium Enterprise in Taiwan 2003"

R&D in Manufacturing SMEs

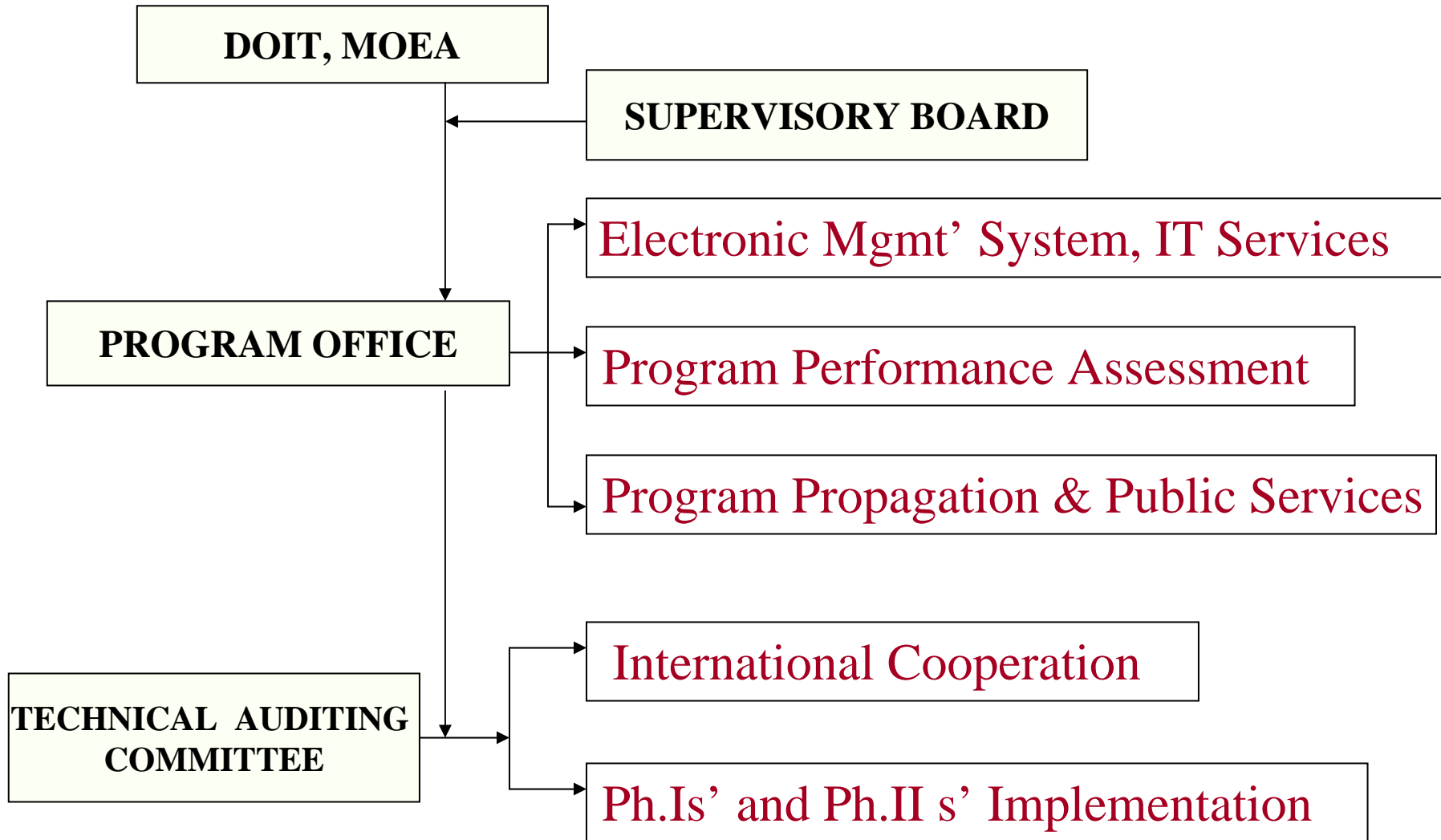
- Size restraints and lack of R&D capability – The major difficulties experienced by enterprises undertaking R&D
 - The SMEs require more R&D support from Government
 - The SMEs require better R&D infrastructure for them to conduct the application and integration types of R&D
- Strong desire for government provision of tax break to stimulate R&D spending
- Greater willingness in large enterprise to establish R&D center in Taiwan
 - It can help them to realize their products with better Q. C. D. & CS



Introduction of the Small Business Investigating Research (SBIR) Project

- Who launched it?
 - The Dept. of Industrial Technology (DOIT) of Ministry of Economic Affairs (MOEA)
- When ?
 - Nov. 1998
- What was referred to?
 - SBIR US version
- Who can apply it?
 - Local SMEs
- Why & Focal Points?
 - To help SMEs to pursue innovation-driven research of industrial technologies and products

Program Frame Work



SBIR Goals

- Enhance the private sectors' R&D competitiveness through the mechanism of promoting technological innovation and utilizing Information Technology
- By 2010, SBIR promoting program may assist in achieving the nationwide goals
 - Taiwan's R&D rises to 3% of GDP
 - SMEs sectors' R&D increases up to 60%



A.D. Little Business-Profile VS. Innovation

Stage of industry maturity

	Embryonic	Growing	Mature	Aging	Innovation	
Competitive position	Dominant	All-out push for share hold position +	Hold position hold share +	Hold position/ Grow with industry +	Hold position 0	Infrastructure to service model
	Strong	Attempt to improve position/ All-out push for share +	Attempt to improve position / Push for share +	Hold position/ Grow with industry 0	Hold position or harvest 0	Process improvement to alliance
	Favorable	Selective or all-out push for share/ Selectively attempt to improve position +	Attempt to improve position/ Selective push for share 0	Custodial for maintenance/ Find niche and attempt to protect 0	Harvest phased withdrawal -	Careful assessment to selective action
	Tenable	Selectively push for +	Find niche and protect it 0	Find niche and hang on or phased withdrawal -	Phased withdrawal or abandon -	Search for new product or service
	Weak	Up or out +	Turnaround or abandon -	Turnaround or phase withdrawal -	Abandon -	Search for new business



Types of Innovation-driven Research

- I. Developing a brand new idea, concept or new technology
- II. Applying an existing technology to a new application
- III. Applying a new technology or business model to an existing application
- IV. Improving an existing technology or product upon various aspects

Two Phases of the Program

Phase I. To evaluate scientific technical feasibility as well as industrial impact of an innovative idea or application

Phase II. To implement R&D upon an innovative and precise technical target which has completed feasibility evaluation

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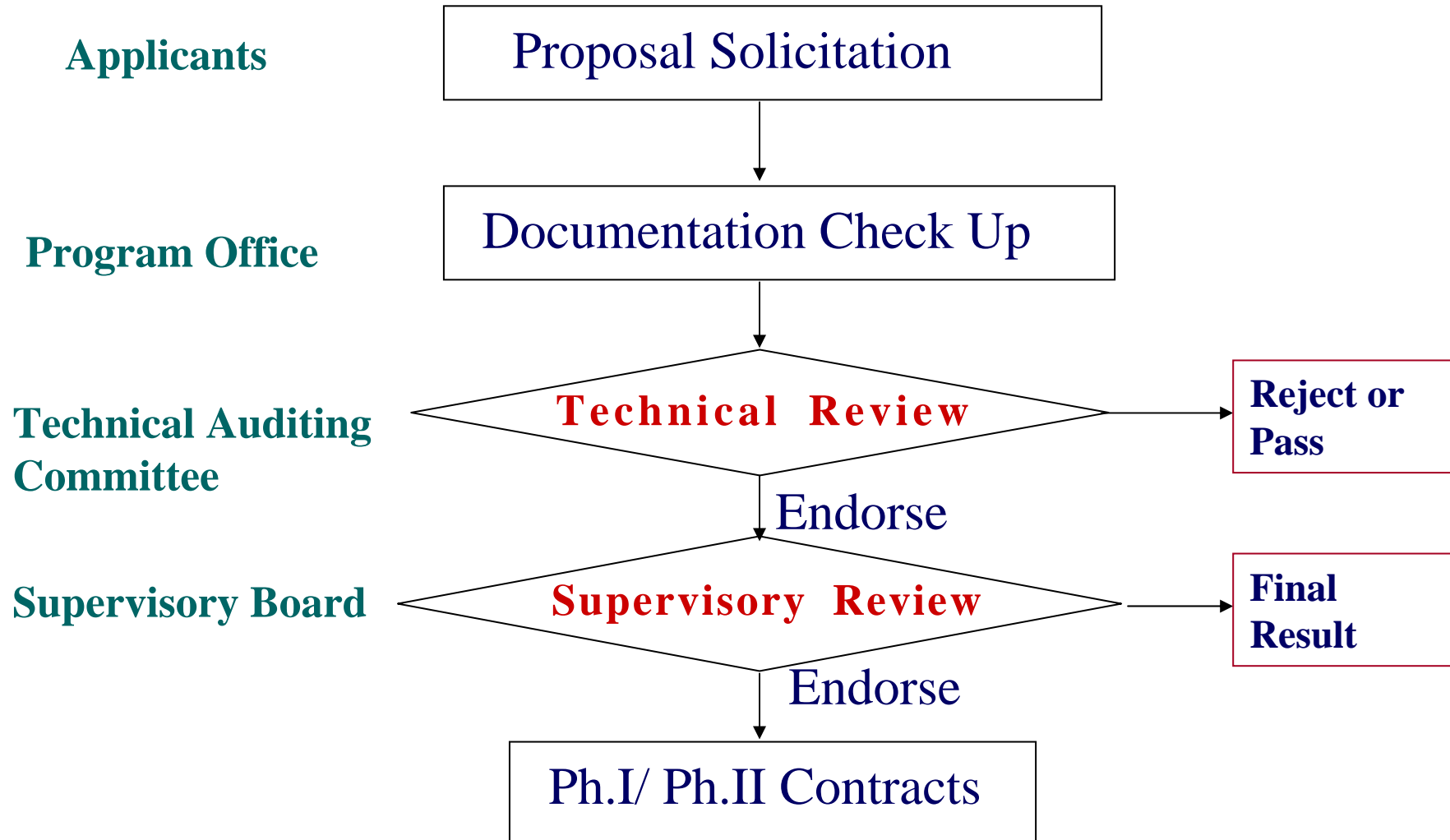
Phase I.

- Up to NT\$ 1million government subsidy with company's self-funds, no less than 50%, for up to 6 months period (Research Alliance may be up to NTD 5M for up to 9 months period.)

Phase II.

- Up to NT\$ 10millions government subsidy with company's self-funds, no less than 50%, for up to 24 months period (Research Alliance may be up to NT\$ 50millions for up to 24 months period.)

Application Process Flow



SBIR Project Review Focal Points

Concept	Design	Development	Production	Sales
Innovation→ Concept Verified	Design→ Prototype Verified	Prototype→ Product Validated	Pilot→ Job 1	Introduction→ Customer Satisfaction

Innovation

New material, formula, facility, and new way of doing business on engineering, manufacturing, or services.

**Core
Competences**

Competitive edge on product function, performance, quality, cost, safety, environmental friendly, better service model.

**Technical
Contents**

Owned IP, hi-efficient intelligent resources, and facilities to carry out the state of arts technology through IT and KM platform process.

**Industry
Impacts**

Good return ratio, gain market share, higher customer satisfaction, and continuous internal investment.



Eligibility Criteria

1. The scope of work meets specified technology development area
2. Intent to develop product or technology meets the innovation-driven criteria
3. The product or technology contents has the market potential to drive the high cost-benefit return
4. Clear description on product or technology specifications with the complete development process and good execution plan and capability
5. Reasonable budget, schedule, intelligent resource, and facility allocated
6. Expected performance, cost-effective R&D return, and hi-visibility of company core competences enhancement

SBIR 6-Years Progress Score Card

- 406 out of 584 companies received Phase-I award
- 741 out of 1,235 received Phase-II award
- Accumulated government subsidy NT\$ 2.5 billions vs. companies' self-funds NT\$ 5.6 billions
- Accumulated direct R&D manpower more than 10,000 persons, excluding outsourcing R&D resource

Note: data referred as of April, 2004

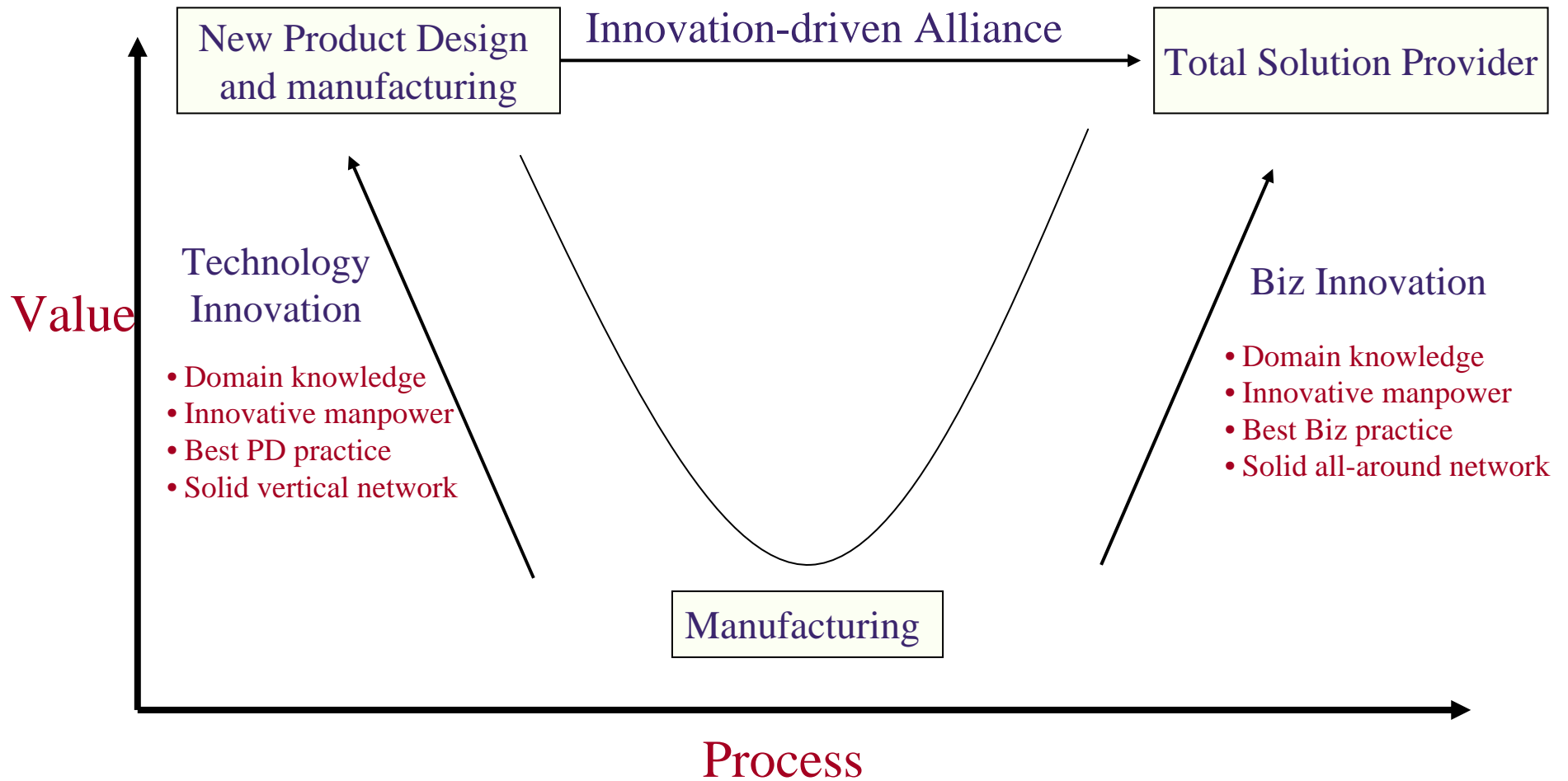
Prospective Issues

- Promoting cross companies' alliance for innovation-driven product or technology development
- Promoting advanced technology transfer via international cooperation to shorten the development timing and enhance global competitiveness
- Enhancing program management quality to assist more companies conducting quality R&D
- Conducting selected topics to support the Government planned industrial policies' development

Strategic Alliance R&D

- Referred to the smile curve, SMEs are moving from the manufacturing-based industry to the knowledge-based industry to increase the product values and global competitiveness
- Cross companies' alliance will enhance the SMEs' R&D critical scale and increase the process efficiency

Innovation Value Vs. Product Process



Case Study

- Six Cases consisting of Ph-I, Ph-II, and Alliance projects will be presented to demonstrate
 - How SMEs to search for the innovation-driven products or technologies
 - How to enhance their core competences through the SBIR projects
 - How to leverage the outside R&D resources to increase the development efficiency
 - How effective of the alliance to increase the product competitiveness and boost themselves from the SME's scale to the large enterprise company

Conclusion Remarks on SMEs Innovation-driven Successful Business Model

