



Topic 3: Strategies for Industry Foresight and Innovation

Subtopic 3: Strategies for Developing Fundamental Industrial Technology

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December 1, 2010



Outline

- 1. Background Information and Promotion Procedures**
- 2. Progress and Domestic Case Study**
- 3. Recommended Strategies**
- 4. Conclusion**
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1. Background Information and Promotion Procedures

Old strategy of technology transfer to expedite industrial development- **What's the Next?**

- **Just as a flower without its roots has a fatal limitation in growth, with imported technologies from abroad, Taiwan's manufactures lack a comprehensive grasp of product specs evolution and also face a similar growth limitation.**
- **Lacking self-reliant technologies is a large obstacle to further product advancement and industrial development; that's the reason why Taiwan's industry has not achieved world leadership.**
- **As basic know-how and essential IPR are often controlled by foreign companies, Taiwan's industry is at their mercy and can only produce low-value-added products or provide OEM' with low profit.**

We have accomplished a milestone of economic growth and industrial development via transferring technology from abroad to expedite Taiwan's industrial development. Only with core basic know-how at our hand can we have highly original inventions that are hard to bypass or replace by international rivals.



1. Background Information and Promotion Procedures

AS-IS

We often chase after novel technologies. Actually we are far behind in many fundamental technologies.



TO-BE

- High added value products (those producing high added value products in big industrial nations)
- Innovation which is a critical factor for economic growth

How to upgrade Taiwan's industrial level

- (1) Pay attention not only to electronics, but also mechanical and chemical industries.
- (2) Apply a new concept of spending a decade on fundamental technologies.
- (3) Focus on refining quality, not novel technologies.
- (4) Emphasize civilian life-related industries, shaping an elegant image for Taiwan.
- (5) Aim for being in first place worldwide and not content with second.

1. Background Information and Promotion Procedures

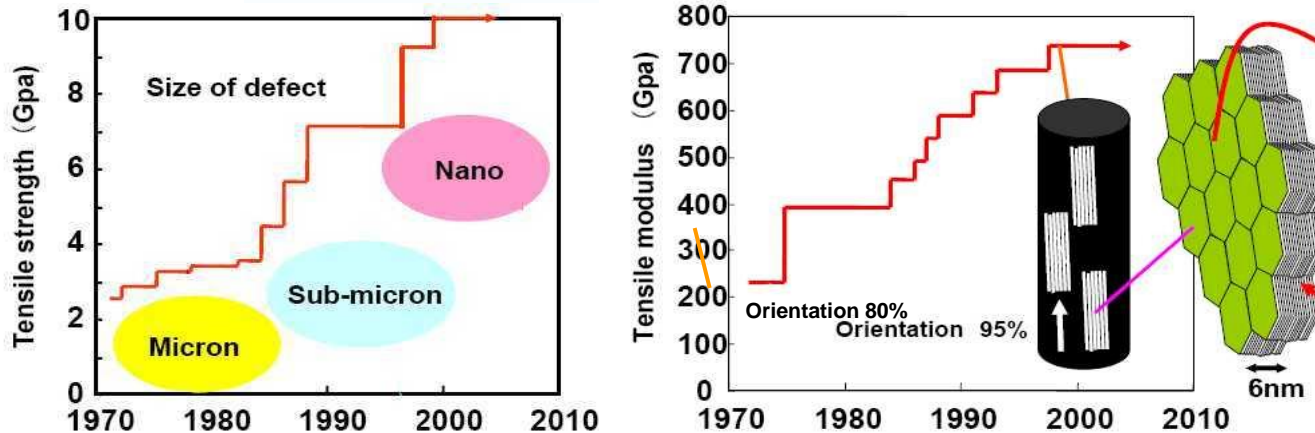
Considering the world's best performance as the goal to upgrade domestic fundamental technology of machine-tool accuracy.



- **Positioning Accuracy**
5 μ m/400mm \rightarrow \pm 0.5 μ m/400mm
- **To develop the fundamental technologies of the advanced precision machinery promotes the unit price of the new generation machine tool from 1.7 million to over 5 million .**

- **TOOL:** analysis tool and database (analysis error: 15% \rightarrow 5%)
 - Motion stiffness analysis database
 - Power system analysis database
 - Active thermal deformation compensation database
- **Know Why:** sub-micrometer positioning accuracy(\pm 5 μ m/400mm \rightarrow \pm 0.5 μ m/400mm)
 - Geometric tolerance design technology
 - Scraping and assembly craft of artisan
 - Ultra-fine and dense interpolation control rule
 - Surface manufacturing database
- **Key Component:** hydrostatic modulus (friction coefficient: decreasing form 10^{-2} to 10^{-5})
 - Self-adjusting stiffness hydrostatic bearing
 - Direct drive hydrostatic rotary modulus

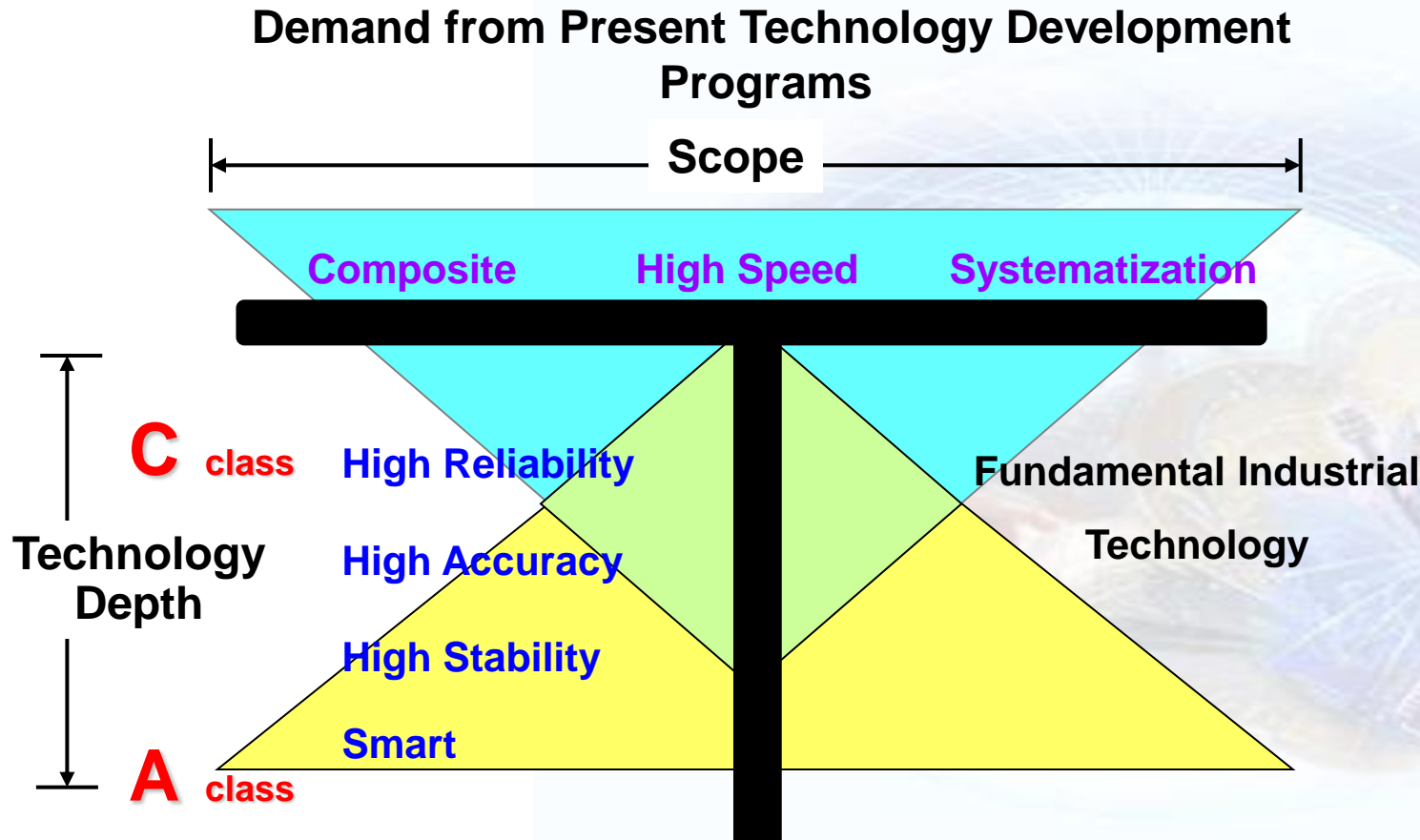
1. Background Information and Promotion Procedures



- Surface defect from micro scale to nano scale, carbon fiber application will be upgraded from sporting goods (700 NT/kg) to structure components of aircraft (1500 NT/kg)
- Graphite crystalline orientation from 80% to 95%, carbon fiber application can penetrate to structure components of aircraft from sporting goods
- The higher strength and modulus, the price of carbon fiber is higher



1. Background Information and Promotion Procedures



- ▶ **Technical skill** : familiarity with materials, instruments, and equipment which is skillfully applied in design and production
- ▶ **Theory-based** : solve real problems based on theories
- ▶ **Wide application** : widely applied to some specified group of industrial products

▶ The technology can support the required infrastructure of the whole industry and Infrastructure and lead to industrial development .



1. Background Information and Promotion Procedures

Time table





2. Progress and Domestic Case Study

- Analyze all the problems faced by each industry, and prioritize important fundamental technologies for deeply rooted development based on the criteria of high commonality, high challenge, high expected economic impact, and wide potential market.

Chemical Materials (focus on green environment)

1. High efficiency purification
2. High-performance textiles
3. High efficiency displays and lighting

Mechanics (focus on green and smart manufacturing)

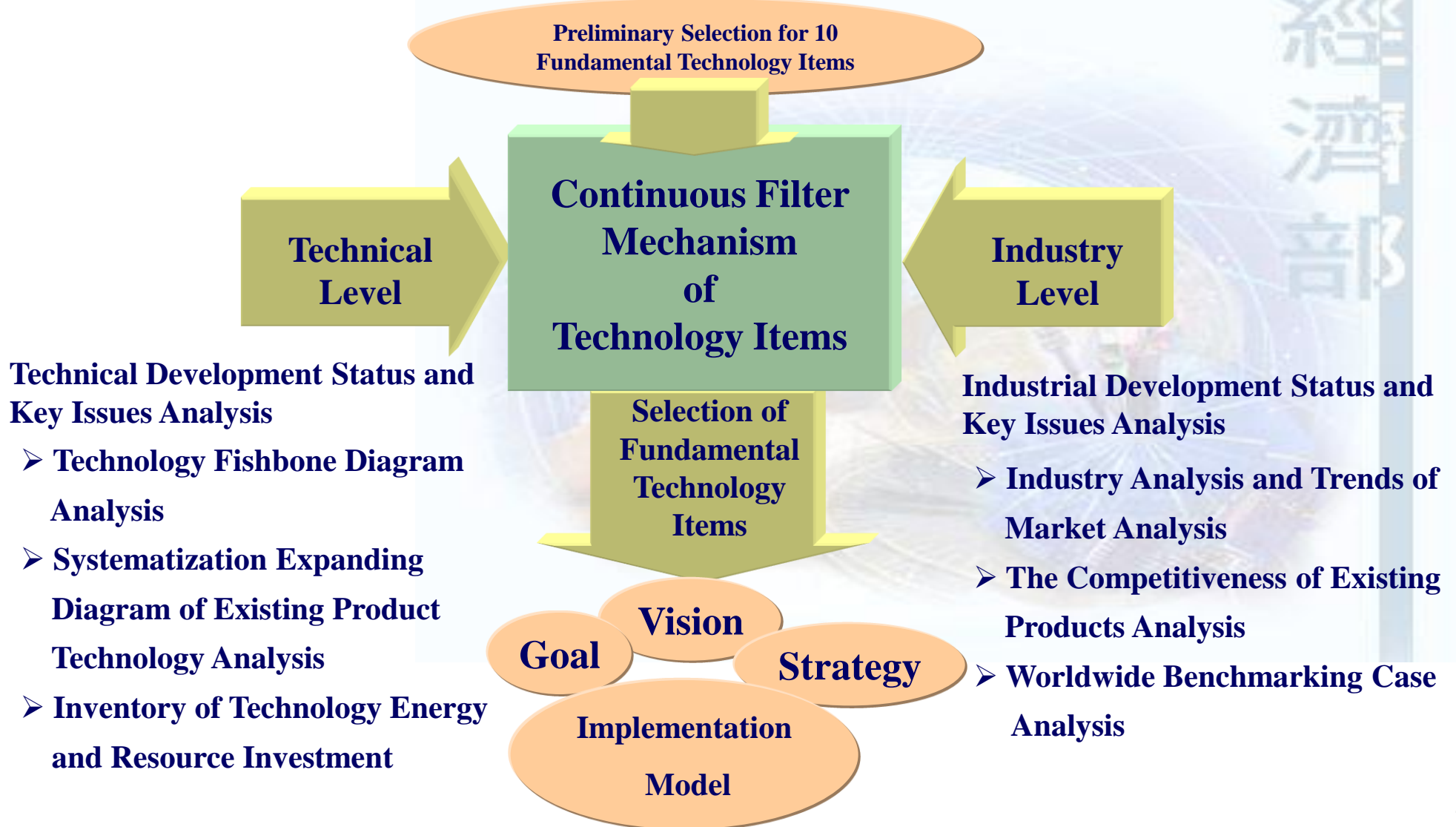
4. All electric metropolitan transportation
-electric buses
5. High-end manufacturing – A+ machine tools

E.E. and Software (focus on digital value-added and health)

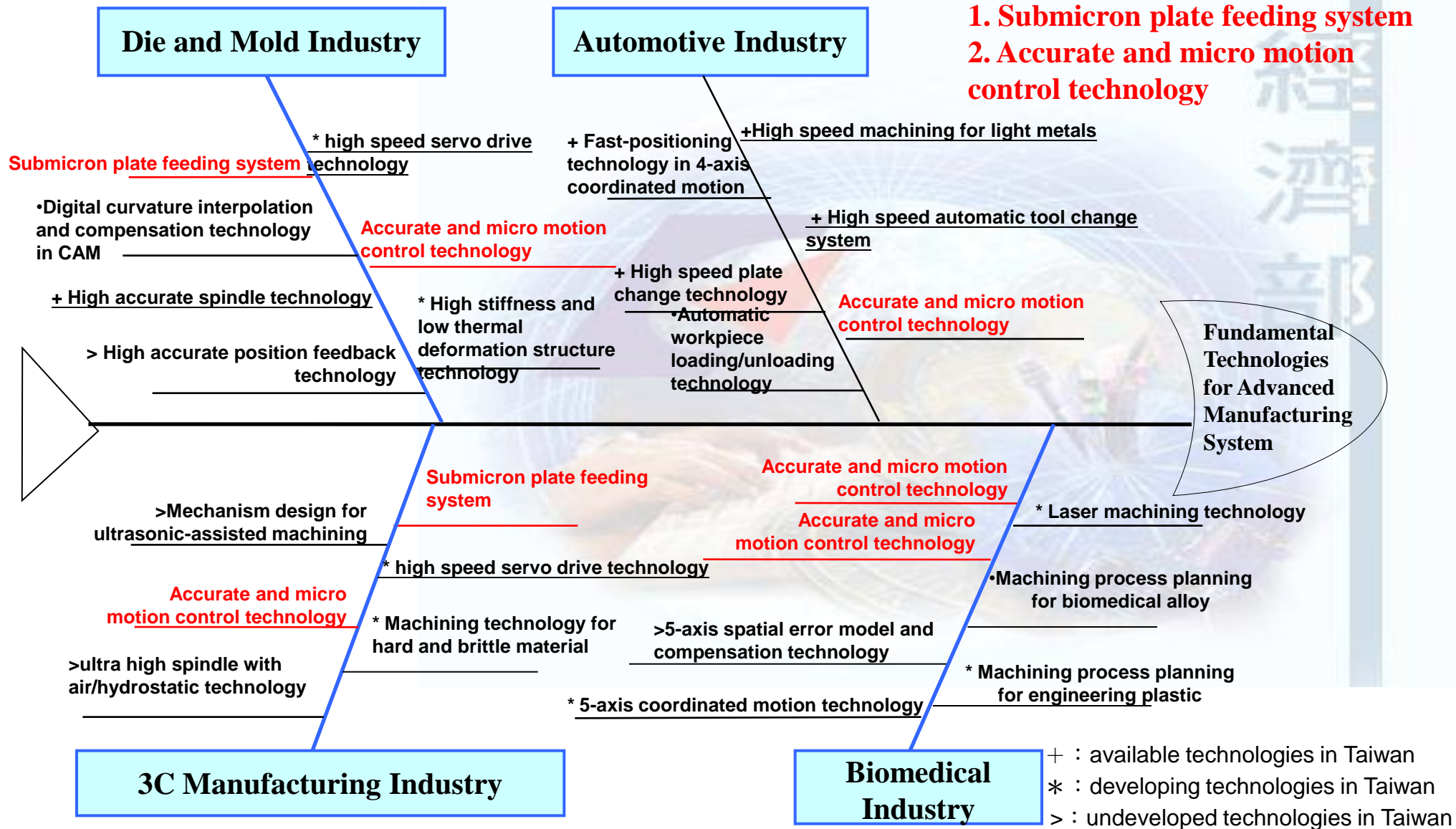
6. Semiconductor manufacturing key technologies
7. Communications systems
8. High-end measurement instruments
9. 3D graphics and high-end digital video processing chipsets
10. High-end medical devices

2. Progress and Domestic Case Study

Establish solid filter mechanisms for inventory check of technology status and resource investment, from the needs of industry to select the topics for technology development through review and continuous analysis.

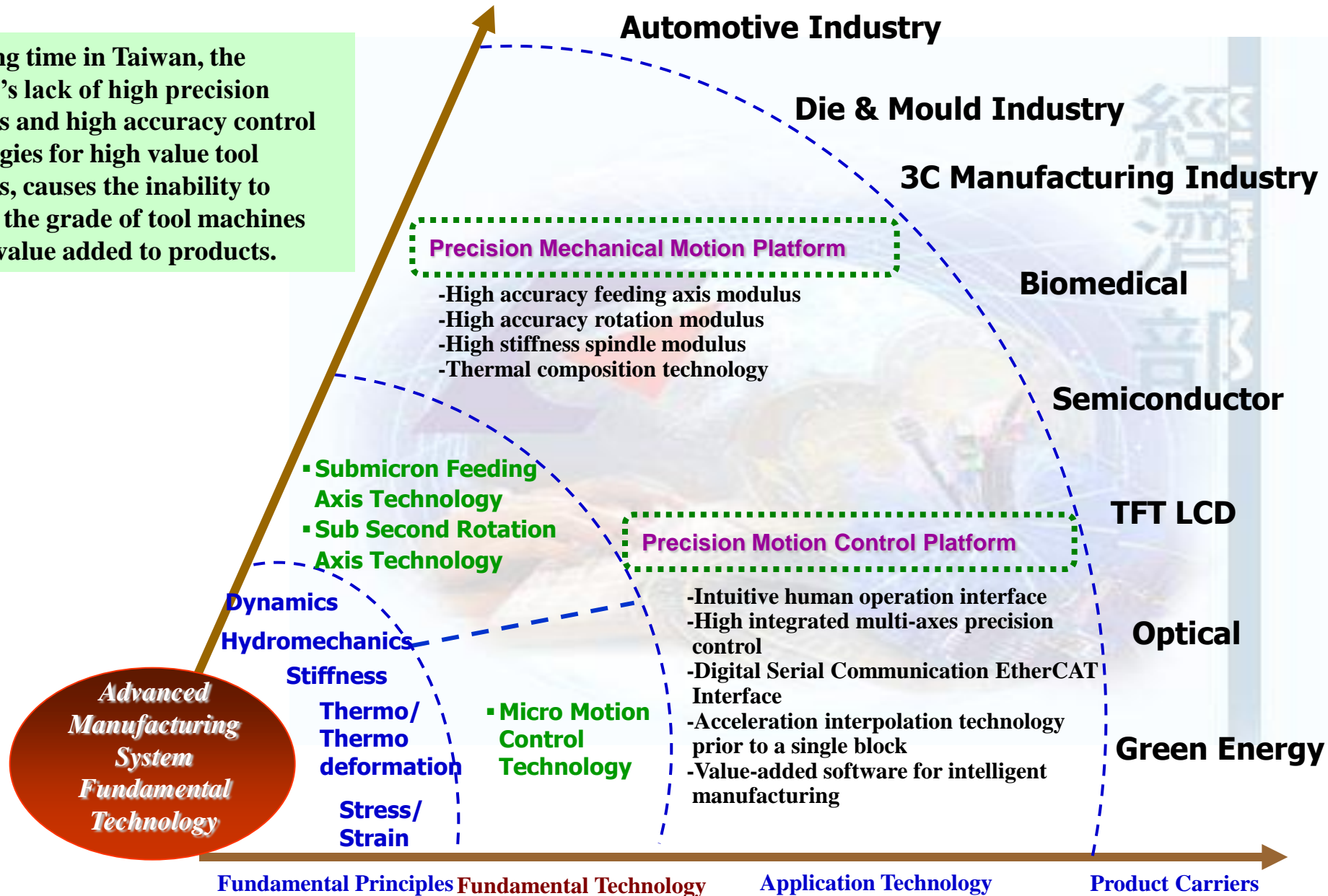


2. Progress and Domestic Case Study



2. Progress and Domestic Case Study

For a long time in Taiwan, the industry's lack of high precision machines and high accuracy control technologies for high value tool machines, causes the inability to improve the grade of tool machines and the value added to products.



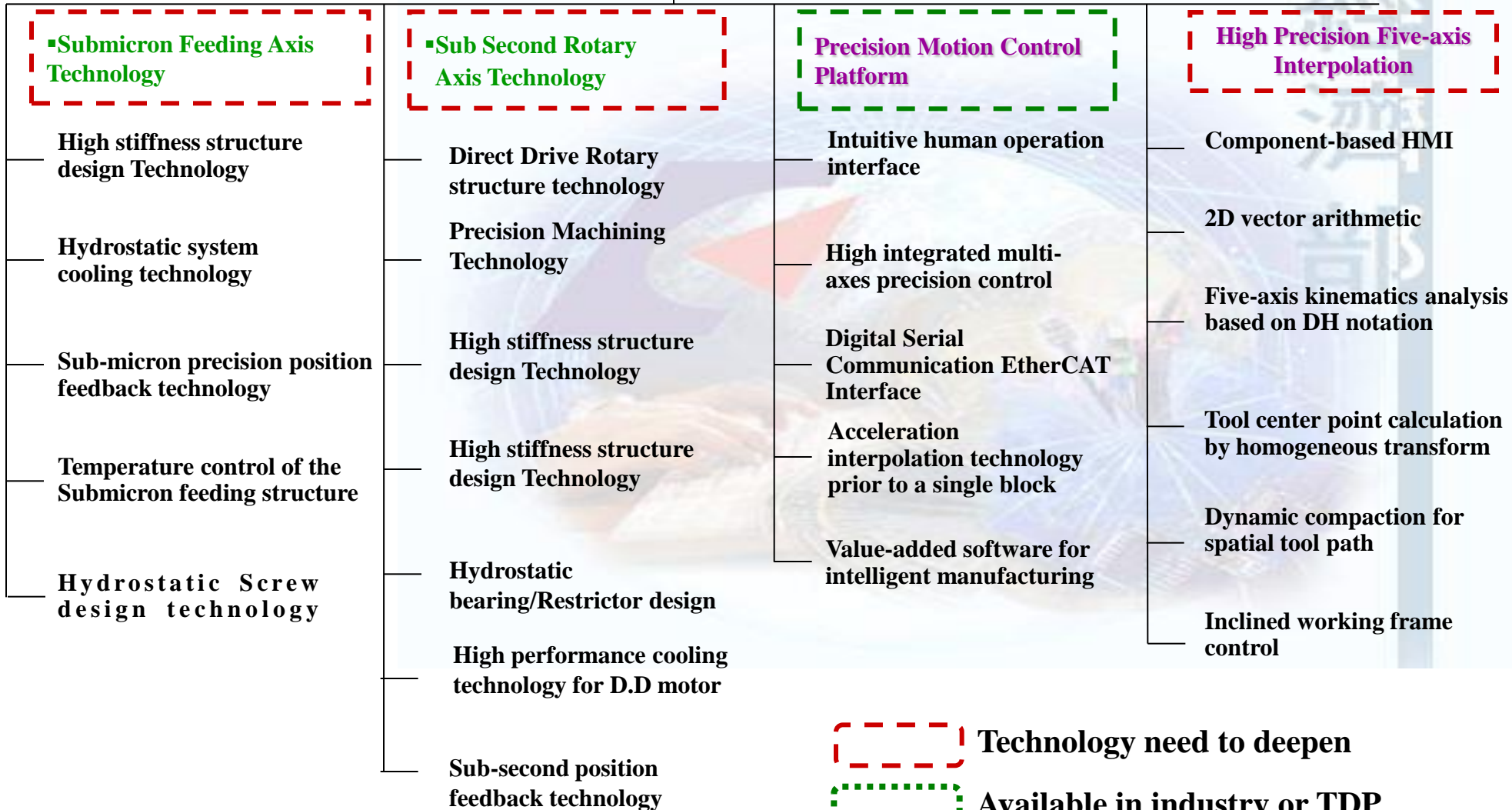
2. Progress and Domestic Case Study

Advanced Manufacturing System

Fundamental Technology

Submicron Plate Feeding Technology

Micro Motion Control Technology

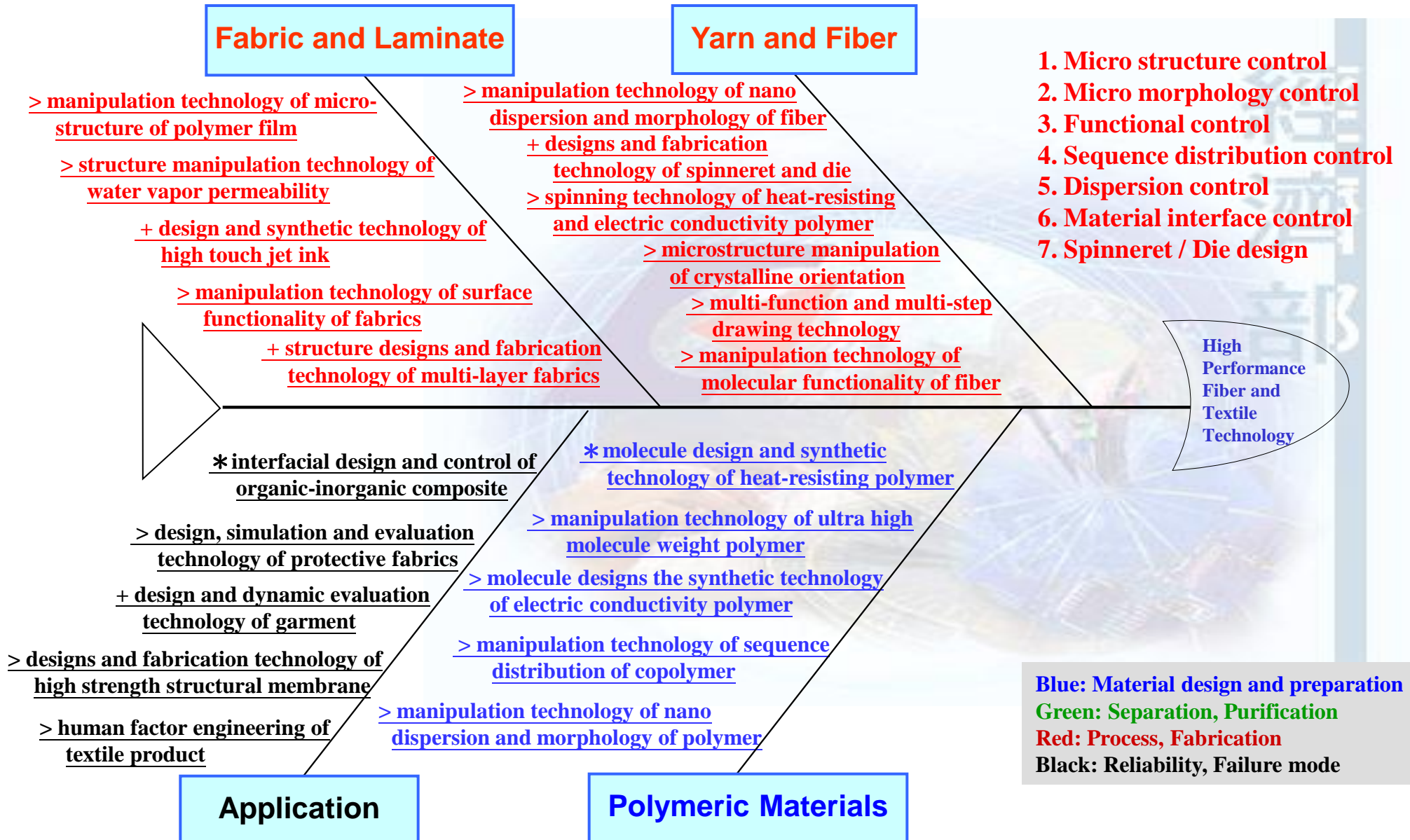


Technology need to deepen



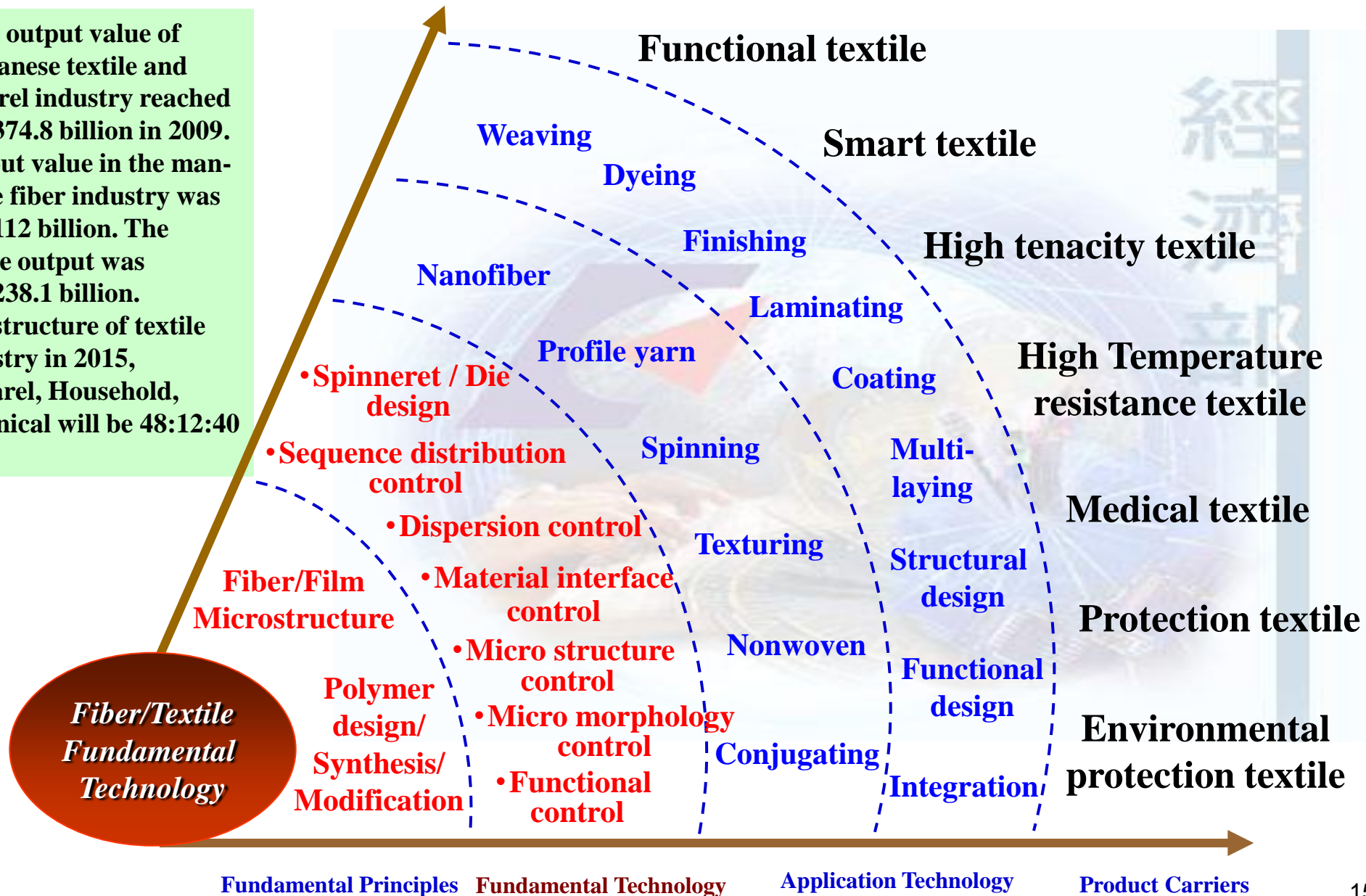
Available in industry or TDP

2. Progress and Domestic Case Study



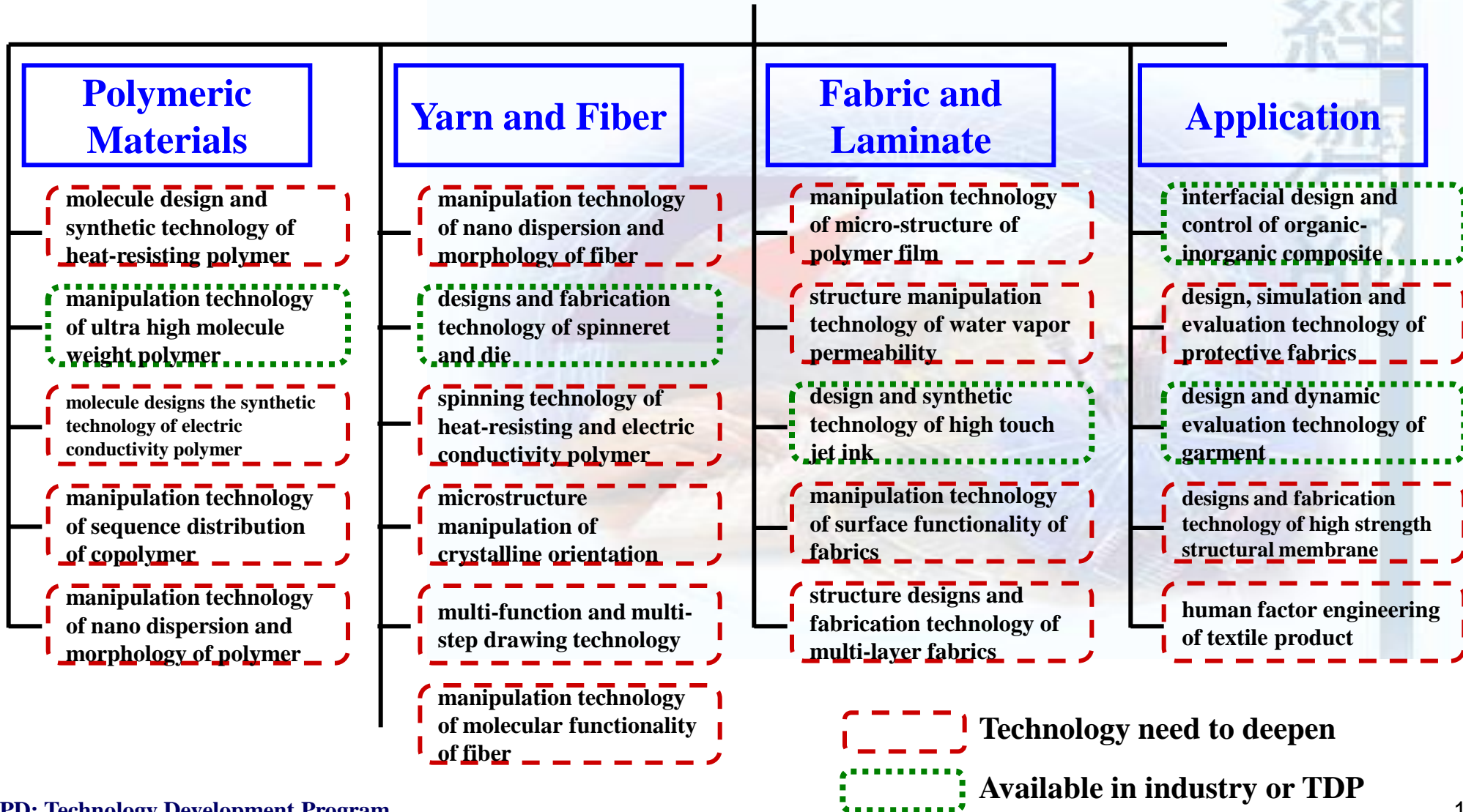
2. Progress and Domestic Case Study

- Total output value of Taiwanese textile and apparel industry reached NT\$374.8 billion in 2009. Output value in the man-made fiber industry was NT\$112 billion. The textile output was NT\$238.1 billion.
- The structure of textile industry in 2015, Apparel, Household, Technical will be 48:12:40



2. Progress and Domestic Case Study

High Performance Fiber and Textile Technology





3. Recommended Strategies

Roadmap for Implementation Strategies

1. Implementation Strategy from Government

1.1 Build a solid mechanism to push for fundamental industrial technologies

1.2 Select and focus on fundamental technologies to deepen fundamental technology development

1.3 Long term commitment and support from Government

1.4 Recognize Outstanding Individuals and Groups for Excellent Promotion of Fundamental Industrial Technology

2.1 Enhance the Development Mechanism within the Non-Profit Organization

2.2 Facilitate the Development Mechanism Outside the Non-Profit Organization

2.3 Stipulate the Positioning and Mission of Program Office

2.4 Promote Cooperation between Industry, Academia, and Research Institutions, and International Collaboration

2.5 Talent Training in Fundamental Industrial Technology

2. Implementation Strategy from the Academia, Research Institutes, and the Industry

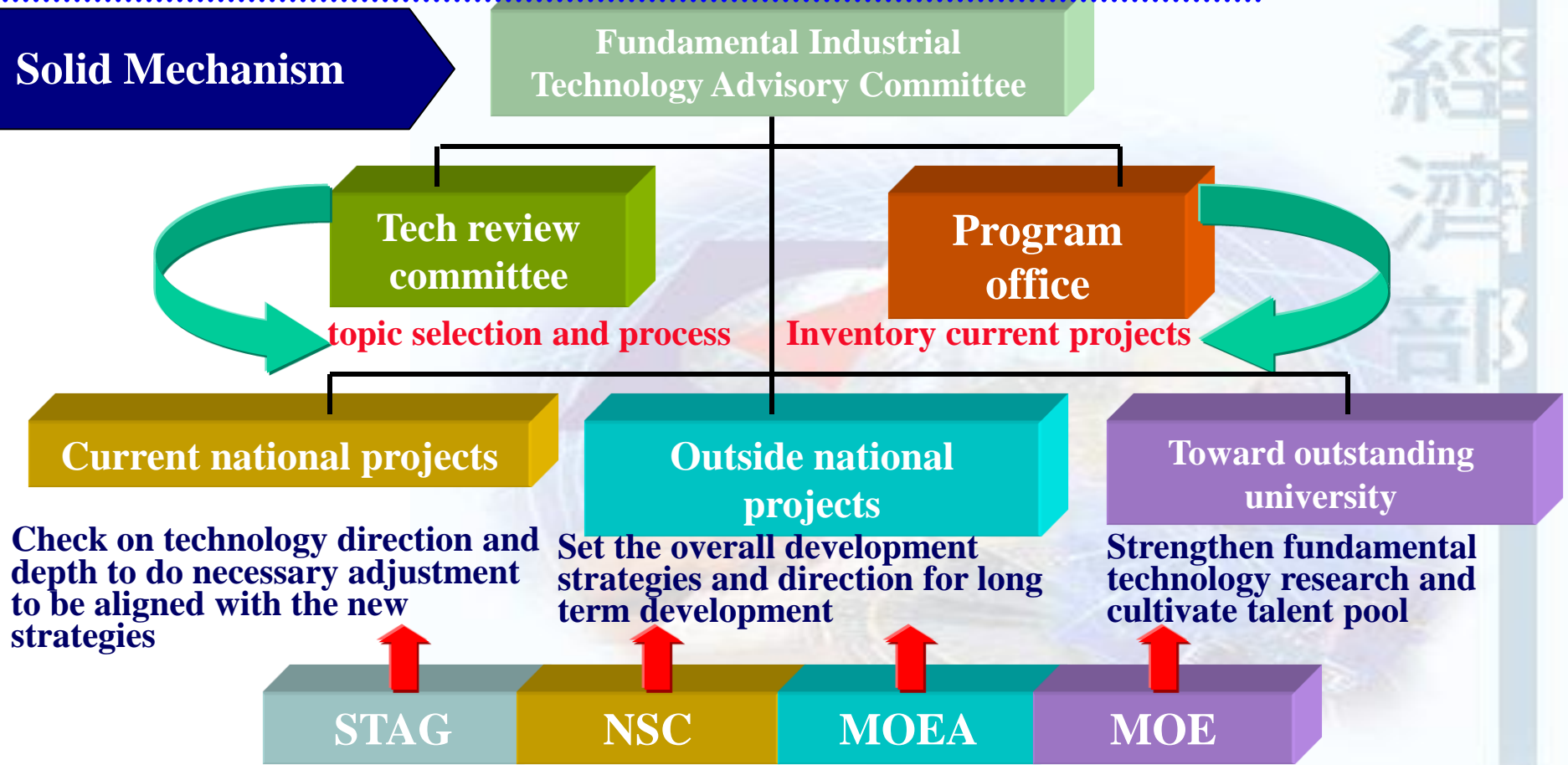


3. Recommended Strategies

1. Implementation Strategy from Government

1.1 Build a solid mechanism to push for fundamental industrial technologies

Solid Mechanism



- Establish Fundamental Industrial Technology Advisory Committee supervised by the Administrative Yuan, coordinating the participation of STAG, NSC, MOEA, and MOE to strengthen project integration.
- Enhance the long-term collaboration among the research institutes, universities and industries.
- Strengthen the tie with other major industrial nations pushing for long-term and close collaboration.



3. Recommended Strategies

1.2 Select and focus on fundamental technologies to deepen fundamental technology development

- Analyze all the problems facing each industry and try to identify key technologies needed. The selection of important fundamental technologies is based on high commonality, high technological challenge, high expected economic impact and wide application market.
- Work on industrial strategies analysis and technology roadmap planning for each selected fundamental industrial technology
- In line with the fundamental technology items, check the relevant capacity of current R&D projects, and define the role play of the academia, research institutes, and the industry respectively.



3. Recommended Strategies

1.3 Long term commitment and support from Government

Government's long term commitment and support

- National science and technology projects with full budget support from the Administrative Yuan ensure stable long-term financial support.
- During the first phase (from 2010 to 2014), the government allocates annual funding for this course gradually, leading academia, industry, and research institutes for fundamental technological development and talent cultivation.
- These projects become part of involved institutes' long-term business, with long-term commitment and investment.
- Adjust current MOEA Science and Technology project resource distribution mechanism, methods of review and monitoring, and performance index.
- Adjust the assessment of teachers promotion and university evaluation to require collaboration with industry just as German university systems have done so as to ensure their academic participation in the industry.
- Issue of talent cultivation is to be included in Talent Import and Training Monthly Report by CEPD for discussion.

Adjust current policy and measures to focus on long term deeply rooted performance



3. Recommended Strategies

1.4 Recognize Outstanding Individuals and Groups for Excellent Promotion of Fundamental Industrial Technology

Recognition of Outstanding Individuals and Groups

Through MOEA's Industrial Technology Award, University Industrial Technology Award, and the search for excellent Technology Programs, establish an award in recognition of significant contributions from individuals and groups in promoting fundamental Industrial Technology.



3. Recommended Strategies

2. Implementation Strategy from the academia, research institutes, and the industry

2.1 Enhance the Development Mechanism within the Non-Profit Organization

- For the R&D funding of fundamental industrial technology, autonomous and flexible management should be adopted. The funding should be adjusted gradually to an appropriate amount based on the need of the specific industry. In the early stage, material & chemical, and mechanical & system would be emphasized.
- Non-profit research institutions should develop its own internal management systems, which include resource allocation, and management guidelines.
- Appraisal system needs to evaluate the annual improvement of the institute's core competence (ex. the milestone achieved, benchmarking, etc.). In the first three years, set up the key performance index and invite the experts from industries to join. The evaluation criteria include the goal of the project, market evaluation, executing strategies, expected output, and competence of research team.



3. Recommended Strategies

2.2 Facilitate the Development Mechanism Outside the Non-Profit Organization

- To meet the industry need, centralize R & D capabilities and databases in certain organizations.
- Establish technical diagnosis group for fundamental industrial technology. Through large-scale visit, diagnose problems encountered by the industries, and actively provide consulting and technical services.
- The initial R & D must consider its ultimate market application. Therefore it should work closely with the industry to reach commercialization seamlessly.
- For the commercially available product, explore the market need, actively provide consulting and technical services for further upgrading.
- Upgrade the domestic industries (ex. wine-making, surface treatment, metal processing, electronic components, etc.), and assist the companies to establish high value-added venture.

3. Recommended Strategies

2.3 Stipulate the Positioning and Mission of Program Office

- **The positioning of the program office is as follows: a R&D communication hub, to coordinate project application and execution in fundamental industrial technology. The Office will also provide industrial consulting service, and explore potential cross-discipline collaboration.**
- **Update and prioritize the R&D topics by adopting the industrial opinions and the continuous technology screening.**
- **Compose white book, survey the long-term development of Taiwan's fundamental industrial technology, and promote its importance.**



3. Recommended Strategies

2.4 Promote Cooperation between Industry, Academia, and Research Institutions, and International Collaboration

- Select specific non-profit organizations and universities to set up joint R&D centers, to focus on fundamental industrial technologies, and to strengthen the cooperation and interaction with industries(including R&D, personnel training, exc.).
- Effectively link to the capability and systems in universities, industries, and research centers.
- Conduct an international case study, strengthen the link with developed countries and build close relationship.

2.5 Talent Training in Fundamental Industrial Technology

- Talent training by MOEA' s Training Program, and design courses by the joint efforts from various universities.



4. Conclusion

Vision

: Transform Taiwan into one of the world's top seven industrial nations in ten years.

“It is important to deep root technologies. Recently the MOEA selected 10 of the most fundamental industrial technologies. By developing these technologies, we hope to transform Taiwan into a big industrial nation in five or ten years. These key basic technologies are critical to the fast maturity of Taiwan's industry.” – July 1, 2010 presidential press conference



Goal

: Enhance product added value and self-reliant manufacturing

➤ **Research in depth and analyze the reasons why the existing products of Chemical Materials, Mechanics, E.E., Software and so on can't reach the industrial pinnacle in the world. Find the missing key elements in fundamental technologies. Encourage joint development between industries and academia. Train talents in the fields of fundamental technologies. Assist manufacturers to break through development bottlenecks so that our country will become one of the leading manufacturing countries in producing high technology products.**



The focus must be for the industry to apply the developed technologies to enhance the added value of products.



5. Topics for Discussion

- 【Topic 1】** How to build a mechanism, supported by stable long-term funding, to promote joint investments in fundamental technology development by the government, academia, and industry?
- 【Topic 2】** What are the roles played by various government agencies in talent cultivation, academic research, and industrial development?
- 【Topic 3】** How to build a platform to integrate R&D resources to invest in fundamental industrial technology development?



**End of Briefing
followed by discussion**