

EXECUTIVE SUMMARY

From April 9 to 19, 2000, a panel of experts revisited the People's Republic of China to assess the current status of electronics manufacturing technologies. This summary of the panels findings includes 1) a macro view of the economy and related policies, 2) a summary of the technologies that are central to the electronics sector, 3) a summary of the findings, and 4) reports of the site visits. The panel members' findings include discussion of the technological capabilities, political priorities, and implications of a "One China" policy.

CHINA'S RAPID DEVELOPMENT

Economic development continues to be China's leading priority. The new five-year plan targets development of Western China with 60% of its resources, including external borrowings in an effort to close the income disparities between eastern (over US\$1000/capita) and western (under US\$200/capita) regions of China.

The panel visited a China on the verge of joining the World Trade Organization, being rapidly driven towards deregulation and privatization of its state-owned-enterprises, and providing ever increasing incentives to attract foreign capital and technology. With a growing number of state-owned enterprises going out of business or downsizing, unemployment and welfare has become a major concern. It is estimated that over 18 million new jobs are needed annually to stay even. In addition, migrants are projected to reach 150 million per year. The prospect of civil unrest, even riots, requires more aggressive incentives and deregulation to entice foreign direct investment at a greater rate than ever before.

China's attempts to attract high technology firms have been successful. In 1999, China's 53 industrial parks generated aggregate revenues from technology, industry and trade of RMB 656 billion, with growth of 30% from 1998. The 17,900 enterprises located in national high tech development zones created profits of RMB 35.6 billion (US\$4.3 billion), tax paid RMB 27.5 billion (US\$3.3 billion) and foreign exchange earned through export USD 10.6 billion (a breakthrough of US\$10 billion for the first time in the sector). As a result, the enterprises whose output value have exceeded RMB 100 million (US\$12.5 million) reached 800 in number including some domestic renowned enterprises such as Legend, Haier, Hisense, Fangzheng.¹ The government plans to build 20 new high-tech industrial parks in western regions.

CRITICAL ELECTRONICS MANUFACTURING TECHNOLOGIES

The panel found most electronic assembly technologies widely available in China. For example, the world's leading electronics assembly firms already have established operations within China. Hong Kong firms are agents for equipment makers, including Japanese firms. Increasingly, producers of critical technologies and components are setting up operations, including flex tape and flex circuit manufacturers. LCD's and LCD modules for cellular phones are now produced in China. Namtai was producing advanced electronic components, such as LCD modules for hand-held electronic products, under license for export to Casio (Japan). Namtai was using chip-on-glass technology for its LCD modules. The availability of SMT and chip-on-board technology is widespread, including a small contract assembler like Whitways Enterprises Limited. Leading edge prototyping equipment and test and analysis facilities are also available. The primary problems come from state-owned enterprises that lack the capital to upgrade their production capabilities.

Semiconductor production in China is still limited to "prior generation" capabilities adequate to meet local customer needs. The real problem in semiconductors relates to the shortage of domestic supply. China has

¹ Development Targets of High Tech Development Zones Materialized Ahead of Schedule, *China Science and Technology Newsletter*, No. 28. March 20, 2000.

about half the number of IC fabs as Taiwan, which is much smaller, of course. Most semiconductors sold in China are imported from fabs in Asia, including Japan, S. Korea, Taiwan and Singapore. Similar problems occur with components of other electronics products that must be imported until the local industry can be developed. This is a problem that also plagues other Asian countries. However, this does not affect China's access to such technologies or components, since much is imported from Japan and Taiwan.

China Huajing Electronics Group Corporation has also completed a joint-venture with TSMC (Taiwan's leading semiconductor maker) to improve its MOS technology. Shanghai Hua Hong NEC Electronics is a joint venture with NEC (the world's largest semiconductor maker) that uses 0.35-micron design rules for fabrication of 8-inch wafers. Unfortunately, Hua Hong NEC's output is exported to NEC in Japan. Given the shortage of semiconductors in China, any capacity not utilized internally is a weakness. China would like to double its number of semiconductor fabs during the next five year plan.

The panel found that design technologies available in China for electronics components and products are competitive with those found in the West. A Chinese state-owned enterprise, China Integrated Circuit Design Center (CIDC), is producing advanced electronics products such as set-top boxes and MP3 players. CIDC has developed its own electronic design automation tool called Panda for developing ASICs for its own applications. Advanced ASICs can be purchased anywhere in the world, making it unessential for China to build the advanced fabs to manufacture them.

Chinese manufacturers were also gaining local market position. Legend Group, for example, controlled nearly 25% of the Chinese PC market. Legend produced about 1.3 million PCs in 1999 and was increasing capacity to 3 million in 2000 in anticipation of continued growth. Legend designs its own boards at its R&D facility in Shenzhen, and produces its boards in nearby Huiyang (Sun City). Legend has ISO 9001 and 9002 certifications.

ONE-CHINA POLICY

Now that Hong Kong and Macau have been returned to China, it seems inevitable that relations with Taiwan will be improved. The U.S. Administration continues to espouse the One-China policy. The question is one of timing, when discussion will resume. The proposed reunification of North and South Korea seems to support early action. With regards to technology, a One-China has interesting implications for improving China's overall technology base. Consider Taiwan's worldwide market share in PC and Internet hardware components. From Figure 1, these market shares would belong to China after reunification with Taiwan. The also means that related component technologies, such as Taiwan's 12.5% of the world market share for semiconductors, would also become part of China's calculations. At such time, China would not have a technology problem. Even more importantly, financial resources would also be available to support rapid transfer of such technologies to the mainland.

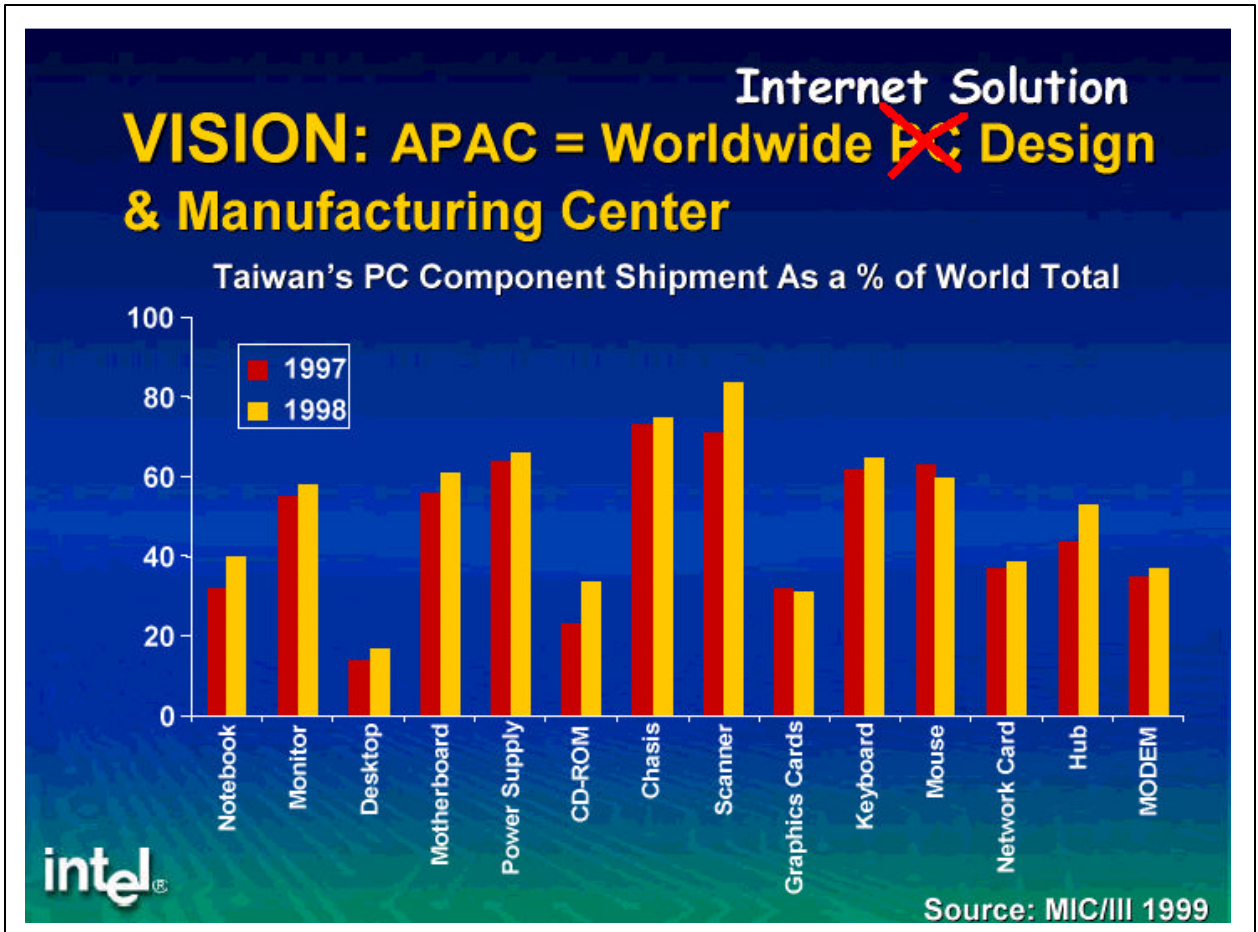


Figure ES -1: Taiwan's PC Component World Market Shares