Research Brief

Intel Boosts the Asia/Pacific Semiconductor Value Chain

Abstract: Intel’s latest investment announcements in Asia/Pacific prove the importance of the region and demonstrate Intel’s commitment to the region. Furthermore, they help define each Asia/Pacific market’s core competencies.

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Recommendations

- Companies should drive their investments by looking into three areas — technologies, human resources and government support — to take advantage of the large Asia/Pacific semiconductor market. Additionally, this will help companies enhance their capabilities to improve product portfolio and faster time to market.

- Companies need to launch strategic initiatives to increase their presence in Asia/Pacific and be closer to their customers.

- Asia/Pacific will lead global semiconductor growth in the coming years. Companies should realize the importance of Asia/Pacific emerging economies to the companies’ future, not only in consumption but in manufacturing and system design as well.
Introduction

Intel announced several investment plans in Asia/Pacific in August 2003, coinciding with CEO Craig Barrett’s trip to Asia. These investments not only are strong indications of Intel’s commitment to the Asia/Pacific markets, but they have also helped identify and distinguish each Asia/Pacific market’s core competencies. The investments ultimately have demonstrated the importance of Asia/Pacific to Intel.

The first stop was Taiwan, where Barrett met with Taiwan’s minister of economic affairs and officially opened the Intel Innovation Center (IIC). The center will be used as a platform to support the Taiwanese government’s IT development plan and to bring together a broad network of Taiwanese electronics manufacturers, government leaders and academics to expedite innovation for converged technologies.

Barrett’s next visit in Asia was to Intel’s new technology design and development center, PG12, in Malaysia. The $40 million investment will be used to expand the Penang site. The new center will house several design and development facilities, including Intel Malaysia’s Assembly Technology Development and Testing Technology Development labs, which focus on manufacturing processes and packaging technology for Intel products.

The next stop was China.

Intel plans to invest $375 million in an assembly and testing plant in Chengdu, Sichuan. The back-end manufacturing plant will initially employ 675 people. Construction is anticipated to begin in the first half of 2004, with the site becoming operational in late 2005.

During Barrett’s China trip, he also announced the establishment of Intel-Lenovo Technology Advancement Center (ILTAC) in Beijing. The cooperation between Intel and Legend Group (Lenovo) will focus on computing and next-generation Internet technologies. In addition, the center will develop new technologies for the convergence of computing and communications, such as mobile PCs and computer platforms for digital offices and homes.

Finally in China, a strategic cooperative agreement was made with the Chinese minister of education. The purpose of the agreement is to increase and improve the use of technology in China’s education system. Intel’s role under the agreement will be to act as technology advisor as the ministry designs and develops new standards for the integration of technology into educational programs.

Barrett’s last stop in his Asian tour was South Korea. There, he announced the plan to open an R&D center in South Korea by the end of this year. The center will focus on the development of technologies and standards for the digital home and wireless communications.
Gartner Dataquest Perspective

Intel is making big bets in Asia/Pacific. After all, more than 37 percent of its total worldwide revenue in 2002 came from this region, with China and Taiwan generating more than half of the Asia/Pacific revenue. Table 1 shows Intel’s total revenue breakdown in the past three years.

Table 1
Intel’s Total Revenue by Region ( Millions of Dollars)

<table>
<thead>
<tr>
<th>Region</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>13,912</td>
<td>9,382</td>
<td>8,648</td>
</tr>
<tr>
<td>Europe</td>
<td>8,066</td>
<td>6,500</td>
<td>6,139</td>
</tr>
<tr>
<td>Japan</td>
<td>3,074</td>
<td>2,349</td>
<td>1,904</td>
</tr>
<tr>
<td>China</td>
<td>2,148</td>
<td>2,333</td>
<td>3,199</td>
</tr>
<tr>
<td>Taiwan</td>
<td>2,382</td>
<td>2,531</td>
<td>2,854</td>
</tr>
<tr>
<td>Other Asia/Pacific</td>
<td>4,144</td>
<td>3,444</td>
<td>4,020</td>
</tr>
<tr>
<td>Total Worldwide Revenue</td>
<td>33,726</td>
<td>26,539</td>
<td>26,764</td>
</tr>
</tbody>
</table>

Source: Intel and Gartner Dataquest (October 2003)

The recent series of new investments by Intel across major Asia/Pacific markets has indicated the company’s interest in the region. Furthermore, it reaffirms Intel’s belief that investing more resources in its customers can help the company to develop new products more cost-effectively.

Intel’s announcements have shown how the company views each geographic market’s role in this region. For example, the announcement made in China shows that Intel believes that China will emerge as a global manufacturing base, not only for hardware products but for semiconductor production as well. The company’s plan for Malaysia is to elevate the country’s capability in assembly and test technologies, both in research and in development. Moreover, it is expected that Intel intends to leverage the design strengths in other economies such as Taiwan and South Korea. With the fast development of computing and communications technologies, Intel believes huge opportunities can be found in Asia/Pacific.

Taiwan
Taiwan has great potential to become one of the biggest global IT production and design centers in the next decade. To reach that goal, Taiwan needs to transform itself in advanced technology and production innovation. Intel chose Taiwan as the first innovation center of networking communications technology in Asia/Pacific because of the island’s solid technology foundation, strong original design manufacturing (ODM) services for IT products, strong design and manufacturing expertise and notable government commitment. The IIC will dominate in networking communications technological development. In collaborating with Intel, the Taiwanese government, academia and networking communications equipment providers will be more creative and efficient.
Intel establishes the IIC with the aim of collaborating with local industry to create a platform for converging technologies in the areas of personal mobile computing, enterprise networking, broadband access and digital home appliances. Under the concept, more of the related equipment, such as the media gateway and the wireless access point will emerge.

The new IIC will be regarded as a genuine R&D facility, in that the center will be more focused on technological innovation than Intel's preceding application design-in center. The 8-year-old Intel application design-in center, established with the close support of Taiwanese ODM industry, focuses on equipment R&D, products certification, testing and debugging.

Because of Intel's strategic position, the IIC will play an important role in developing future communications infrastructures, especially those applied on the Centrino-based personal mobile computing environment.

Since March, Intel has collaborated with several multinational PC companies and Taiwanese ODMs and introduced Centrino notebook PCs globally. Intel's promotion campaign now places more emphasis on Centrino and wireless, rather than the usual "Intel Inside." Intel expects the convergence of wireless computing and networking communications will restructure the PC industry.

From another perspective, PC spending represents more than 30 percent of the $1 trillion total global IT market revenue. While computers will continue to be the most important IT products and a major driver for IT market growth, wireless and networking communications technologies will be the next-biggest driver to stimulate PC demand. Therefore, we believe that Intel's future business will greatly depend on networking communications as well as personal computing.

As more and more Taiwanese IT companies move their production lines to China for cost-effectiveness and market expansion, Taiwan's IT industry may appear to be evaporating. However, with local IT vendors, such as Taiwan Semiconductor Manufacturing Co., United Microelectronics, Quanta, Hon Hai, Compal, ASUSTeK and Lite-On, and multinational IT vendors, such as Microsoft, Intel, IBM, Dell, Sony and Phoenix, strengthening their R&D centers with more-advanced technologies in Taiwan, Taiwan's IT recession anxiety can be reduced significantly. Rather than competing against Taiwanese industry on PC chipsets and keeping its core technology private, Intel is codeveloping future technologies together with Taiwanese IT industry. By working with Intel, Taiwan's IT industry will continue to play a crucial role in developing and creating innovative products for global consumption.
As Taiwan’s IT industry continues to reform, the industry and Taiwan’s government should value all external and internal technology resources. In addition, further advances in technological R&D should be strongly encouraged. Taiwan’s government should continue to implement and increase the "Incentive Program” fund for "High-Technology Research and Recreation.” By promoting the "knowledge economy" as well as raising its living standards, the island should be able to attract more multinational investment and become one of the world’s high-tech innovation centers.

Malaysia

With intense competition for investment from markets in Asia/Pacific, particularly China, significant challenges remain for Malaysia to maintain the momentum of investments coming to the country. Building and strengthening a strong manufacturing base and moving to higher value-added manufacturing are some of the major challenges ahead for the country. This investment from Intel has given a boost to Malaysia’s effort to move up the technology value chain. As labor-intensive and low-tech/low-cost operations move from Malaysia to less-expensive locations, Malaysia must start attracting higher-value-added operations. Establishment of R&D capabilities will help the electronics industry in Malaysia move up the value chain. However, this can only be done by having a more qualified and productive workforce and an efficient and cost-effective supply chain and logistics.

One of the major purposes for Intel to set up a new technology center is to consolidate its workforce into one place. These employees will not only focus on the packaging and manufacturing processing technologies, but will also help the company expand its microprocessor design work in support of worldwide initiatives. Two back-end manufacturing plants are in Malaysia already. In recent years, the skill and technical capabilities of the local workforce, a probusiness environment, and the government’s strong commitment to continuously invest in upgrading the infrastructure have provided a strong base for expansion in Malaysia’s electronics industry. This new design center has given a vote of confidence to the local semiconductor industry.

However, at the same time, the new Intel PG12 signifies that Malaysia is no longer competitive enough for manufacturing business. The country will need to focus on high-end technologies such as development of new manufacturing and packaging processes.

We believe that countries that drive technology innovation and invest in the development of technology will be positioned to lead and be successful in the digital era. Malaysia’s developed infrastructure and continued drive to be proactive and competitive will play a major role in the next level of growth for the electronics industry. We think that Malaysia can be an attractive location for further investment for design and development in Southeast Asia, depending on the availability of talent in the country to sustain design and development efforts.
China

Assembly/Test Services

Whether Intel will invest in the next wafer fab in Asia has been a fascinating topic. We believe that the need for Intel to build a new fab is not pressing. However, we believe a critical need exists for a new assembly/test facility for the upcoming Intel chipsets. The last assembly/test investment that Intel made was in Shanghai plant expansion in May 2002. Intel has already invested about $500 million in Shanghai. By investing an additional $375 million in Chengdu, Intel not only shows its sincerity in partnering with China; it will also be helping China to improve its manufacturing capabilities.

Chengdu, the capital of Sichuan, is in the southwest of China, far away from the more-developed coastal regions. It is one of the cities that actively follow the country’s "Go West" initiative. About 2,400 Chinese-foreign joint ventures have been set up in Chengdu, including General Electric, Siemens and Toyota. Chengdu is a fairly strong economic center in the West, with a gross domestic product (GDP) of $20 billion and growth of about 11 percent in 2002. To put this number in perspective, Shanghai’s 2002 GDP was $65 billion.

To consider building a manufacturing factory for the export market, in addition to the incentives and support given by the local government, other issues, such as human resources, transportation cost and the general investment environment, should be considered as well.

Chengdu has 20 universities, with over 114 doctoral degree programs, as well as over 10 post-doctoral degree programs. It is considered one of the most important scientific educational centers in southwest China. Key universities, including Sichuan University, have done research in high-tech areas such as in optics, fiber-optical communications, nuclear electronics, new material applications and aerospace. Institutions in Chengdu have also taken part in national projects such as satellites, artificial intelligence and mainframe computers. The training provided by Chengdu’s universities and technical institutions can provide Intel a high-level and well-trained workforce.

In addition to being able to offer a good education system, Chengdu can also provide convenience for travelers and trade. Chengdu is China’s major communications hub in the southwest. It has flights and railways to various major cities in the country, in addition to direct flights to Singapore, Bangkok and Hiroshima. It is also one of the eight main hubs of postal and telecommunications services in China, with about 1 million mobile phone users and 140 million Internet users. Several banks, such as the regional branch of the People’s Bank of China, Overseas Union Bank, Standard Chartered, Bank of Bangkok, and Tokyo Bank, are located in Chengdu as well. This provides financial convenience to foreign businesses. Furthermore, Chengdu continues to strengthen its infrastructure to expedite its urbanization plans. New roads and bridges are being built. By the time of completion, a high-speed transportation network will be formed.
Technology Center

The establishment of the ILTAC with Lenovo is among the action items in Lenovo’s “Collaborating Applications.” The concept behind Lenovo’s Collaborating Applications is threefold:

- Lenovo believes that by using a standard protocol, different personal terminals and devices such as electrical appliances, telecommunications products and computers can be functionally connected to shared resources and complementary services.

- Through Collaborating Applications for corporate IT systems, businesses will be able to achieve optimum sharing and utilization of resources among information systems, while also achieving internal resources optimization.

- With Collaborating Applications for communal information systems, IT service providers will be able to provide enterprises, organizations and individuals with applications and services in a one-stop fashion, through their worldwide IT infrastructures and application resources under established rules and standards.

Following the announcement of "Intelligent Group and Resources Sharing (IGRS) Standardization Working Group" in mid-July, the establishment of ILTAC further proves Lenovo’s aggressiveness in the development of new industry standards for IT enhancement. The IGRS, set up with TCL, Konka, Great Wall, Hisense and China’s Ministry of Information Industry (MII), was to bring changes in the forms of future products leading to new applications and new IT market opportunities.

The IGRS Protocol and ILTAC have similar purposes. Both are to strive for new IT industry standards development and hence promote influential technology applications.

Intel is the best partner for Lenovo to explore and expand business in the Asia/Pacific region and internationally. Lenovo is undoubtedly mature enough in the PC market to attract partnership from companies such as Intel (see Table 2). The adoption of the new company name Lenovo in April 2003 also proved the company’s diversified business development, especially in the international markets. Therefore, it is expected that more partnerships between Lenovo and large foreign enterprises will follow.

Table 2
Legend (Lenovo) PC Shipment Market Share By Platform, 1H03

<table>
<thead>
<tr>
<th></th>
<th>Desktop PCs (%)</th>
<th>Mobile PCs (%)</th>
<th>IA-32 Servers (%)</th>
<th>Overall PC Market (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>22.8</td>
<td>15.8</td>
<td>12.0</td>
<td>21.8</td>
</tr>
<tr>
<td>Asia/Pacific</td>
<td>10.3</td>
<td>5.6</td>
<td>5.1</td>
<td>9.5</td>
</tr>
</tbody>
</table>

IA = Intel Architecture
Source: Gartner Dataquest (October 2003)
From Intel’s point of view, its continuous investment in China will help in developing a good network among local Chinese vendors and in the MII. Stable economic growth and the size of the Chinese market will require Intel to work more aggressively and lay out more future IT development plans in the area to solidify its position in the market.

**South Korea**

The IT industry is becoming increasingly important to the South Korean economy. According to the government, digital electronics exports totaled $32.9 billion in the first half of 2003, up 14.5 percent from the year before. The new South Korean administration has shown much enthusiasm toward the high-tech industry and wanted to keep the country’s leadership position in the digital technology field. The Ministry of Information and Communication earlier this year had drawn up plans to help digitize at least 10 million households by 2010.

According to our data, South Korea had more than 32.3 million mobile phone users (a penetration rate of 67.7 percent), and 10.1 million broadband Internet households (a 75 percent penetration rate), by the end of 2002.

Digital home technology has drawn much interest from electronics makers and mobile service providers in South Korea. The government, in an effort to boost its global presence in digital home appliance technology, has set up several plans to support the industry:

- The government will provide solution developers and service providers loans that will allow them to provide home networking equipment to the public at a more affordable price and to implement home networking systems faster.
- The government will also streamline the standardization process for related technologies to jumpstart next-generation networking technologies such as ultrawideband and personal robots.
- The government will invest more than $470 million annually in R&D for digital home appliance technology.

South Korea is a key manufacturer of thin-film transistor liquid crystal display panels, dynamic random-access memory (DRAM) chips, and mobile handsets and MP3 players. To expand their competitive advantage, South Korean companies must extend their brand names and design capabilities. Given what the South Korean government wants to accomplish, it is not surprising to see Intel’s eagerness to establish a digital home R&D center in South Korea.

In the agreement, Intel will work with the South Korean government, universities and industry to accelerate the development of computing, communications and digital technologies. Intel, with the investment, plans to also boost South Korea’s role in the development of standards for the digital home and wireless communications.
Interestingly, Intel is not the only foreign giant that is interested in helping South Korea in developing digital home technologies. About a year ago, Microsoft also made a strategic alliance with Samsung Electronics and bought stakes in several South Korean Internet operators, such as KT. With the world’s largest hardware and software companies showing serious interest in the country’s growth in the IT and digital home industry, South Korea is on its way to being the world’s most digitized country.

**Key Issue**

How will semiconductor manufacturing grow in Asia/Pacific?