

IV-5-3. Present Status of Main Competitor Countries/Areas

(1) Korea

1) Outline of Computer Industry Development

Born in 1975, the Korean computer industry began exporting personal computers in 1981, and just three years later, in 1984, it had become the world's largest exporter of personal computers.

Development of this industry was led by the government, which in order to protect development of local-capital companies restricted production by foreign affiliates during the early phase of the industry. For local firms, on the other hand, it provided assistance in both financing and technical development and thereby promoted the *zaibatsu* (big business groups) to enter the computer industry. Although 1976 marked the first time that the computer industry was singled out as a sector for government promotion, it was the strong home appliance industry basis, which had received government promotion since the 1960s, that made possible the development of the computer industry in the 1980s. In the initial phase of the industry's development, products closely related to home appliances, such as monitors and terminals, took the lead. By the mid-1970s the home electrical appliance industry had established itself as an export sector, and private corporations had accumulated assembly technologies, capital, and marketing expertise. Korean manufacturers selected the U.S. market for its size and ease of entry, took into account the characteristics of this market (where emphasis is placed on service organizations rather than brand names), entrusted sales of their products to leading personal computer dealers in the U.S., and specialized in OEM production. Daewoo Communication supplied products to the Leading Edge dealer franchise, Hyundai Electronics to Blue Chip, and Sampo Computer to Computerland.

The ratio of electronics industry production value accounted for by the computer industry grew from 0.3% in 1980 to 10.3% in 1988, nearly doubling. Exports also grew from 0.3% of total electronics industry exports in 1980 to 12.4% in 1988, with computers coming to constitute the second largest export item in the industry after semiconductor products.

In 1985 the government opened the doors to investment by foreign affiliates, and since then worldwide industry leaders like IBM, Olivetti, Apple, Acer, and DEC have also established Korean affiliates. In addition, minicomputer imports were completely liberalized in 1987, followed by peripherals in 1988, thereby ending the age of government protection for the computer industry. Current targets for promotion in

the industry center include the development of mid-size and larger computers and the increase of local content for personal computers and peripherals.

In 1990 competition for Korean products in the U.S. market intensified, due mainly to the growing popularity of 32-bit machines (product lines at Korean manufacturers are based mainly on 16-bit units). In addition, profitability has been falling due to increased labour costs. This is a significant blow to Korean companies, which built their reputation on providing inexpensive products. The industry is therefore at a turning point in its development, and appropriate measures will have to be taken.

2) Production and Export Trends

(Production Volume)

Korean computer production began in the middle 1970s, but until 1982 a lack of development in the semiconductor and other components sectors coupled with a lack of necessary technologies prevented any significant growth in production. In 1983, government assistance for the information technology industries helped to bring about a more than four-fold increase in production over the previous year, and since then the rapid increase in overseas demand for personal computers and terminals, brought about in part by the appreciation of the yen, has resulted in average annual growth of 63.8% (1983-88).

When broken down into computers and peripherals, peripherals accounted for a much greater percentage of production until 1985, but since 1986 both sectors have been on an equal footing in terms of production.

Table IV.5-20 Computer Industry Production

(Unit: US\$million)

| | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 |
|----------------------|------|------|------|------|------|------|------|-------|-------|
| Computers | 2 | 17 | 6 | 73 | 150 | 216 | 486 | 548 | 1,172 |
| Peripheral equipment | 7 | 13 | 41 | 135 | 278 | 303 | 394 | 912 | 1,258 |
| Total | 9 | 30 | 47 | 208 | 428 | 519 | 880 | 1,460 | 2,430 |

Source: Association of Korea Electronic Industry Promotion

Table IV.5-21 shows a breakdown of production by item. International cost competitiveness, achieved through improvements in component production technologies and mass production, has brought about marked increases in production of personal computers and CDT monitors. In 1988 personal computers were responsible

for 41.6% of total production in the computer industry, followed by terminals, at 40.6%, and printers, at 5.5%. The greatest increase was recorded by personal computers, of which 1988 production grew 2.3-fold over the previous year. In the auxiliary memory device sector, hard disk drives (HDDs) recorded the greatest increase. Dot matrix units accounted for most of the printers manufactured, but production of laser printers is expected to increase in the future. Rapid increases in production were recorded by monitors and printers in 1987 and by personal computers in 1988. This was due to increased competitiveness resulting from a depreciated won, low interest rates, and low crude oil prices. There was also a shift of production from Japan, and Korea succeeded in taking over the market for low-end products previously held by Japan.

Table IV.5-21 Production by Product

(Unit: US\$1,000)

| | 1984 | 1985 | 1986 | 1987 | 1988 |
|--------------------------|----------------|----------------|----------------|------------------|------------------|
| CPU's | 150,245 | 217,019 | 486,526 | 547,508 | 1,172,462 |
| Personal Computers | 10,333 | 183,222 | 435,911 | 444,092 | 1,010,282 |
| Auxiliary memory devices | 7,983 | 14,134 | 11,852 | 75,797 | 61,452 |
| FDD | 7,874 | 13,982 | 5,671 | 5,839 | 24,100 |
| HDD | 0 | 28 | 6,168 | 15,711 | 26,599 |
| Printers | 15,058 | 21,271 | 44,198 | 57,256 | 133,419 |
| Line | 1,477 | 1,374 | 2,329 | 1,869 | 2,873 |
| Dot | 13,520 | 19,897 | 41,665 | 51,604 | 127,856 |
| Laser | 0 | 0 | 214 | 980 | 2,690 |
| Terminals | 248,651 | 249,761 | 317,645 | 712,459 | 986,267 |
| CDT monitors | 64,833 | 176,827 | 201,559 | 686,863 | 793,482 |
| I/O devices | 319 | 354 | 4,502 | 34,773 | 31,775 |
| Total | 428,352 | 519,312 | 880,175 | 1,459,558 | 2,430,522 |

Note: Totals indicate values for all products in the computer industry.

Source: Association of Korea Electronic Industry Promotion

(Investment)

Planned investment for the computer industry in 1988 totaled 255 billion won, of which 145 billion won (56.9%) was for operating capital, 73 billion won (25.7%) for capital investment, and 37 billion won (14.5%) for research and development. Investment in R&D had been falling since 1985, but in 1988 it again rose 42.1% over the previous year.

Table IV.5-22 Computer Industry Investment

(Unit: million won, %)

| Type of investment | 1985 | 1986 | 1987 | 1988 (est.) | Increase ratio '87/'86 |
|---------------------------------|-------------------|------------------|-------------------|-------------------|------------------------|
| Total investment | 187,696 (100) | 103,227 (100) | 191,936 (100) | 255,000 (100) | 85.9 |
| Plant and facility expenditures | 54,589 (29.1) | 52,088 (50.5) | 58,053 (30.2) | 73,000 (25.7) | 11.5 |
| Operating expenditures | 103,119 (54.9) | 32,433 (31.4) | 107,855 (56.2) | 145,000 (56.9) | 232.5 |
| R&D expenditures | 29,988 (16.9) | 18,706 (18.1) | 26,028 (13.6) | 37,000 (14.5) | 39.1 |

Source: Association of Korea Electronic Industry Promotion

(Present Status of the Component Industry)

The breakdown of 1988 demand for personal computer components in Korea based on bit size was as follows: 8-bit machines, US\$25.98 million (4.9%), 16-bit machines, US\$529.48 million (94.9%), and 32-bit machines, US\$5.21 million (1.0%), for a total of US\$560.67 million. 50.4% of this figure, or US\$282.52 million, consisted of imports (33 items in 13 categories), indicating that there more imported parts than locally-produced ones. ICs were the major import, accounting for US\$207.42 million, or 73.4% of the total, followed by switching power supplies (US\$27.34 million, or 9.7%), and keyboards (US\$19.75 million, or 7.0%).

The leading suppliers for these components were the U.S., Japan, Taiwan, Hong Kong and Thailand, with the U.S. (50%) and Japan (17.9%) maintaining the largest shares.

Table IV.5-23 Reasons for Component Imports

| Reason for import | Components |
|--|--|
| Not produced locally | Cpu Main Board, Key Board Connector, I/O Card, MLCC, Micro Processor, Chip Set, Controller IC, MASKRAM, SRAM EPROM |
| Local products of insufficient quality | Switching Power Supply, Key Board Assembly, Video board, RTC IC, PGA Socket, Delay Line |
| Local products too expensive | TTL IC, DRAM, DLCC IC-Socket, Tantalum Condenser, Monolithic Condensers |
| Other | HDD, FDD, Switches |

Source: Association of Korea Electronic Industry Promotion

Table IV.5-24 Local Production of Components

| Component | FDD | | HDD | |
|------------------------|-------|------------------|-------|------------------|
| | Share | Local production | Share | Local production |
| Spindle Motor | 22% | O | 14% | O |
| Stepper Motor | 10% | X | 9% | X |
| Head Ass'y | 23% | O | 22% | O |
| Custom I.C | 10% | X | 8% | X |
| PCB Ass'y | 17% | O | 18% | O |
| Other Mechanical Parts | 18% | O | 14% | O |
| Disk | — | — | 15% | O |
| Local content ratio | 80% | | 83% | |

Source: Korea Information Industry Federation

Note: Share = Price of the part/price of total parts for the product

(Export Trends)

Due to the limited scale of the domestic market, export ratios were high for all of the products. This was particularly true of CPUs and terminals, for which 1988 export ratios were 97.3% and 81.7%, respectively. In the printer sector, where firms have little production experience and production scale is limited, most of the products are absorbed by local demand, and the export ratio is a mere 11.8%.

When broken down by export destination, the overwhelming majority of CPUs and terminals are sent to the U.S. A loss of profitability in the U.S. market and the slowdown of growth in the market itself, however, are forcing companies to diversify, and the U.S. share of Korean exports is growing smaller each year. Between 1984 and 1988, for example, the figure for CPUs dropped from 62.1% to 36.8%, while the

share for terminals fell from 87.9% to 58.2%. Japan is the largest destination for Korean printers, but this is the result of local firms producing compact printers under OEM agreements with Japanese manufacturers. Export trends for the five-year period 1984-1988 are shown in Table IV.5-25.

Table IV.5-25 Exports by Product and Distination

(Unit: US\$1,000)

| | 1984 | 1985 | 1986 | 1987 | 1988 |
|---------------------------|---------|---------|---------|---------|-----------|
| (CPUs) | | | | | |
| U.S. | 51,016 | 10,084 | 6,403 | 273,823 | 419,907 |
| Japan | — | 53 | 135 | 4,895 | 3,100 |
| U.K. | 16,170 | 40,163 | 86,002 | 44,850 | 145,208 |
| Total | 82,102 | 158,111 | 403,711 | 496,149 | 1,140,662 |
| (Printers) | | | | | |
| U.S. | 5 | 12 | 12,042 | 209 | 2,841 |
| Japan | — | — | — | 2,030 | 6,716 |
| U.K. | — | — | — | 4 | 826 |
| Total | 124 | 66 | 12,087 | 3,397 | 15,685 |
| (Terminal devices) | | | | | |
| U.S. | 174,078 | 186,174 | 193,361 | 351,648 | 469,020 |
| Japan | 153 | 738 | 235 | 6,880 | 17,648 |
| U.K. | 14,315 | 8,475 | 24,359 | 42,627 | 60,861 |
| Total | 198,077 | 221,614 | 272,856 | 545,274 | 806,077 |

Note: The CPU category includes word processors, analog computers, and other types of computers in addition to personal computers.

"Terminal devices" indicates terminals and monitors.

Source: Association of Korean Electronic Industry Promotion

(Future Outlook)

Since beginning commercial production in 1983, the Korean computer industry has succeeded in achieving actual annual growth exceeding 60%. High growth is expected for this promising industry in the future as well.

The hardware sector is expected to grow at an annual rate of 25% during the 1990s, leading to production totaling \$33.99 billion by the year 2001, an increase of approximately 65 times over the \$519 million of 1985. In light of the continued growth predicted of world computer markets, exports are expected to increase from the \$400 million of 1985 to \$24.96 billion by 2001. Domestic demand as well is expected to show a 35-fold increase to \$14.34 billion in 2001.

In terms of production items and technology, laser printers are expected to replace dot matrix machines as the industry standard, floppy disk drives (FDDs) will

move from the SKD to the CKD stage, and mini-FDDs will shift from standard to slim-sized units. In the CPU sector, Korea will enter the area of advanced computer technologies. Goals for the first stage, up to 1992, include the development of fixed workstations and multi-processor systems, while during the second stage (1993-1997) mobile workstations and large multi-processor systems are to be developed. During the third stage (1998-2002) there are plans for development of portable workstations and large network computer systems.

Maintaining this level of growth, however, will require thoroughgoing cooperation between the government and industry and the early establishment of an independent foundation for the industry via technological development. There are two major short-term objectives: (1) a shift from OEM production, which currently accounts for 80% of all exports, to shipments under the brand names of Korean manufacturers; and (2) the achievement of competitiveness in leading import items by an aggressive localization policy. Forecasted local production ratios for various products are given in the following Table.

Table IV.5-26 Forecast of Local Content by Product

(Unit: %)

| Product | 1986 | 1987 | 1989 | 1991 |
|-----------------------|------|------|------|------|
| Medium-size computers | 30 | 40 | 60 | 75 |
| Mini computers | 30 | 50 | 65 | 85 |
| Micro computers | 35 | 55 | 65 | 90 |
| Personal computers | 50 | 70 | 80 | 90 |
| FDD | 30 | 70 | 85 | 95 |
| HDD | 10 | 55 | 65 | 90 |
| Printers | 35 | 50 | 60 | 75 |
| Intelligent terminals | 50 | 80 | 90 | 95 |

Source: Ministry of Commerce and Industry

Medium- and long-term targets include the development and accumulation of relevant technology. The basic plan for the mid- and long-term development of the Korean computer industry as drawn up by academics and electronics industry experts based around the country's Ministry of Commerce and Industry is as shown below.

Table IV.5-27 Basic Plan for Medium- and Long-term Development Policy

| Product | Medium-term development | Long-term development |
|---|--|--|
| (Information equipment industry) | | |
| Personal computers | <ul style="list-style-type: none"> • High growth (centered around IBM compatible machines) Balanced increase in demand at home and abroad • Development and commercialization of high-performance machines (32-bit, 64-bit) • Development of operating systems | <ul style="list-style-type: none"> • High growth centered around high-performance machines • Operating systems |
| Mini-computers | <ul style="list-style-type: none"> • Introduction of technology and commercialization of strategic machines • Import replacement, commercialization of operating systems | <ul style="list-style-type: none"> • Development and proliferation of strategic machines • International cooperation and penetration of overseas markets |
| Mainframe computers | <ul style="list-style-type: none"> • Super system R&D | <ul style="list-style-type: none"> • Development of supercomputers |
| Peripherals | <ul style="list-style-type: none"> • High growth Development of key components • Development and commercialization of high-performance equipment Large-capacity optical disks High-speed laser printers High-resolution flat panel terminals Uninterruptive power supplies | <ul style="list-style-type: none"> • High growth for high-performance equipment |

3) Domestic Market

The size of Korea's domestic market for computer-related products remains limited, amounting to \$416.41 million in 1988. The government continues to formulate policies for the boosting of domestic demand, however, and the computer industry has grown at an annual pace exceeding 50% for the past several years.

Among the policies to spur domestic demand are a 1987 plan to increase the use of administrative computer network-standard workstations and, for use in residence registration, AT machines; and a 1989 plan to increase the use of computers in primary, lower, and upper secondary schools. As a result, the government plans to install a total of 275,497 personal computers in 8,887 schools around the country during 1988-96. Furthermore, the country will attempt to achieve the goal of one terminal in every household during the first decade of the 21st century through a planned model household information network.

Domestic demand for major computer-related products during 1984-88 was as shown in Table IV.5-28.

Table IV.5-28 Domestic Demand by Product

(Unit: US\$1,000)

| | 1984 | 1985 | 1986 | 1987 | 1988 |
|--------------------|----------------|---------------|----------------|----------------|----------------|
| CPUs | 52,653 | 41,671 | 89,989 | 122,852 | 206,481 |
| Personal computers | 32,547 | 24,172 | 46,474 | 72,916 | 173,788 |
| Printers | 15,252 | 18,515 | 30,051 | 45,322 | 101,105 |
| Line | 1,454 | 1,443 | 1,585 | 4,468 | 2,201 |
| Dot | 13,737 | 17,072 | 28,112 | 39,671 | 95,975 |
| Laser | 0 | 0 | 354 | 1,184 | 2,929 |
| Terminal devices | 27,142 | 18,308 | 21,440 | 39,772 | 821,919 |
| CRT monitors | 1,762 | 3,608 | 3,954 | 12,300 | 34,688 |
| I/O devices | 163 | 9 | 7 | 284 | 5,405 |
| Total | 105,024 | 88,555 | 150,912 | 218,054 | 416,307 |

Note: The totals indicate production value for the computer industry as a whole and include other products as well.

Source: Association of Korean Electronic Industry Promotion

4) Leading Manufacturers

Computer-related manufacturers in Korea numbered only 27 in 1982, but this figure jumped to 52 in 1983 and to 71 the following year. Although this number began to drop starting in 1985, there were 84 firms in operation as of the end of 1988. When broken down by production items, these companies are concentrated in the personal computer, terminal, and monitor sectors.

Table IV.5-29 Number of Computer Manufacturers

| | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 |
|-----------------------|------|------|------|------|------|------|------|
| Computers | | | | | | | |
| Minicomputers | | 1 | 2 | 4 | 4 | 4 | 4 |
| Microcomputers | 8 | 11 | 13 | 8 | 10 | 8 | 9 |
| Personal computers | 11 | 29 | 42 | 28 | 29 | 31 | 44 |
| Peripherals | | | | | | | |
| FDD | | 11 | 15 | 12 | 6 | 6 | 13 |
| Printer | 9 | 13 | 17 | 15 | 10 | 10 | 26 |
| Terminal | 11 | 17 | 19 | 18 | 8 | 17 | 22 |
| Banking | 1 | 2 | 3 | 6 | 4 | 4 | 4 |
| CDT Monitors | 9 | 11 | 12 | 13 | 14 | 18 | 22 |
| Communication devices | | | | | | | |
| Modem | 4 | 6 | 6 | 7 | 9 | 9 | 12 |
| Multiplex | 1 | 3 | 5 | 6 | 5 | 5 | 8 |
| Total | 27 | 52 | 71 | 52 | 54 | 77 | 84 |

Note: Totals exclude duplications.

Source: Association of Korean Electronic Industry Promotion

Table IV.5-30 provides a summary of the leading Korean manufacturers of computer-related products.

Table IV.5-30 Leading Manufacturers of Computer-related Products in Korea

(Unit: millions of won)

| Company | Equity structure | | | Value of production | | | | Parent group | Development facilities | | |
|--------------------------|------------------|-------------------|-----------------|---------------------|-----------------------|-----------------|-----|--------------|------------------------|-----------|------------------------|
| | Capital | Income on capital | Income on sales | No. of employees | Year of establishment | Internal demand | | | | Exports | Products |
| | | | | | | 27% | 73% | | | | |
| Gold Star | 270,000 | 74,509 | 60,947 | 36,395 | 1958 | * 21,883,626 | 31 | 69 | CTMP | Lucky | Central Laboratory |
| Sam Sung Electronics | 162,187 | 104,456 | 216,328 | 39,053 | 1965 | 2,900,076 | 46 | 54 | CTMPD | Samsung | General Laboratory |
| Dae Woo Electronics | 179,400 | 78,444 | 23,498 | 16,210 | 1972 | 1,109,632 | 25 | 75 | CTMPD | Daewoo | Central Laboratory |
| Hyundai Electronics | 230,000 | — | 28,433 | 9,180 | 1983 | 217,542 | 39 | 61 | CTMPD | Hyundai | Attached Laboratory |
| Tongyang Nylon | 15,721 | 191,167 | 33,404 | 4,567 | 1966 | 484,773 | 22 | 78 | CP | Hyosung | — |
| Han Dok | 18,000 | 7,495 | 8,669 | 3,365 | 1966 | ** 35,468 | 57 | 43 | CP | — | Technology Laboratory |
| Gold Star Tele-Electric | 12,000 | 18,125 | 27,327 | 2,743 | 1969 | ** 22,910 | 25 | 75 | PD | Lucky | Laboratory |
| Dae Woo Telecom | 47,379 | 28,872 | 10,402 | 2,736 | 1976 | ** 81,215 | 39 | 61 | CTMPK | Daewoo | General Laboratory |
| Oriental Precision | 22,000 | 11,053 | 4,690 | 2,148 | 1953 | * 37,531 | 30 | 70 | CTMPK | Tong Yang | Central Laboratory |
| Tri Gem Computer | 7,510 | 2,209 | 8,882 | 1,040 | 1980 | 135,420 | 36 | 64 | CP | — | Technology Laboratory |
| Koryo System | 2,455 | — | - 4,378 | 451 | 1976 | 56,000 | 84 | 16 | CTP | — | Computer Laboratory |
| Korea Computer | 4,500 | — | 1,904 | 750 | 1974 | 34,471 | 98 | 2 | CTMP | — | Technology Laboratory |
| Jeil Precision | 7,000 | 5,184 | 1,392 | 453 | 1975 | 16,165 | 8 | 92 | CT | — | Attached Laboratory |
| Tele-Video Computer | 11,313 | 4 | - 1,642 | 390 | 1983 | 25,400 | 55 | 45 | CT | Samsung | Laboratory |
| Sam Sung HP | 8,100 | — | 1,556 | 460 | 1984 | 19,911 | NA | NA | CTP | — | Attached Laboratory |
| Korea MIC | 100 | NA | — | 36 | 1984 | 3,420 | 86 | 14 | CTP | — | Technology Laboratory |
| Korea Computer | 1,800 | — | 4,186 | 210 | 1967 | 11,352 | 100 | 0 | CTMP | — | Applied Laboratory |
| Quix | 1,960 | — | 2,139 | 570 | 1981 | 11,037 | 100 | 0 | TP | Tong Yang | — |
| Union System | 245 | — | 112 | 114 | 1982 | 822 | NA | NA | TKM | — | — |
| Tongyang System | 600 | — | - 149 | 120 | 1977 | 12,064 | 88 | 12 | TKM | — | Development Laboratory |
| Magnam Electronics | 500 | — | 74 | 100 | 1984 | 2,500 | NA | NA | CD | — | — |
| Royal Computer | 150 | NA | NA | 70 | 1983 | NA | NA | NA | CM | — | — |
| Kyung Sung Semiconductor | 50 | NA | NA | 47 | 1984 | 1,300 | NA | NA | CM | — | — |

| Company | Equity structure | | | Value of production | | | | | | | Parent group | Development facilities |
|---------------------------|------------------|-------------------|-----------------|---------------------|-----------------------|-----------------|------|---------|----------|------------------------|--------------|------------------------|
| | Capital | Income on capital | Income on sales | No. of employees | Year of establishment | Internal demand | | Exports | Products | Development facilities | | |
| | | | | | | 100% | 12 | | | | | |
| Hwa Jin Computer | 150 | NA | NA | 60 | 1985 | 4,000 | 100% | 0% | TP | Attached Laboratory | | |
| Gold Star Alps | 15,000 | 5,712 | 6,854 | 4,346 | 1970 | 170,140 | 12 | 88 | K | Electronics Laboratory | | |
| Se Jin Electronics | 3,263 | 8 | 3,941 | 600 | 1972 | 25,062 | 21 | 79 | K | Technology Laboratory | | |
| Sun Hwa Keyboards | 120 | NA | NA | 26 | 1984 | 300 | NA | NA | K | Technology Laboratory | | |
| Korea Xerox | 6,850 | — | 10,065 | 1,453 | 1974 | 61,516 | 87 | 13 | P | Technology Laboratory | | |
| Sam Sung Electron Devices | 27,000 | 36,454 | 50,892 | 10,666 | 1970 | *** 46,164 | 1 | 99 | M | General Laboratory | | |
| Sam Woo Trading | 3,500 | NA | NA | 700 | 1974 | 5,460 | NA | NA | M | General Laboratory | | |
| Sangyong Computer | 1,500 | — | 347 | 530 | 1981 | 29,821 | 100 | 0 | C | Attached Laboratory | | |
| PII | 5,000 | — | - 4,325 | 404 | 1986 | 2,912 | 18 | 82 | D | Technology Laboratory | | |

Notes: 1) *Production value is limited to electronic products.

**Production value is limited to computers.

***Production value is limited to monitors.

2) Product symbols: C = CPUs; T = terminals; M = monitors; P = printers; D = disk drives; K = keyboards

Source: Compiled from the Mainichi Keizai Shimbun, Korean Chamber of Trade and Industry Directory, and Directory of Korean Companies

(2) Taiwan

1) Outline of Computer Industry Development

Although production of computer-related products began late in Taiwan, in 1980, the industry achieved dramatic growth, starting mass production of monitors in 1981 and of personal computers themselves the following year. This period was characterized by aggressive promotion of the information processing industry in Taiwan, with the government working to promote the use of computers along with the manufacture and development of hardware based on the Information Processing Industry Development Plan (1980-89), proposed in 1980. Specifically, the computer industry was designated as an industry eligible for investment incentives, incentives were provided in the areas of financial and taxation, and priority was given to Taiwanese products in government contracting.

Because Taiwan was fully open to investment by foreign companies, computer manufacturers in the country include both foreign affiliates and local-capital firms, with corporate scale falling over a broad range as well. The overwhelming majority of the local-capital firms, however, are small and medium-sized companies. This situation is in contrast to that of Korea, where the government has been responsible for directing the development of the computer industry, and is the result of the wealth of experience possessed by small Taiwanese companies in producing and exporting competitive products based on their own initiative. Although these firms have none of the advanced technologies required for product development, they are well-versed in the expertise required for assembly, and it was therefore possible for them to produce competitive products via assembly. Local-capital firms can be broadly divided into two groups: those which simply shifted their assembly operations from home electrical appliances to personal computers; and those such as Acer and Plus & Plus which were sufficiently advanced in their development capabilities to announce the development of 32-bit machines soon after the U.S. giant Compaq. Overall, however, Taiwanese manufacturers are said to lag behind their Korean counterparts in terms of quality control for mass production.

The industry's strength lies in intermediate products such as power supplies, motherboards, and keyboards. Although Korea exports more finished personal computers, when semi-assembled products are taken into account Taiwan is the world's largest exporter of personal computers.

Overseas development by Taiwanese corporations is also on the rise. Acer, which already maintains sales affiliates in West Germany, England, and France, acquired the Dutch firm Kangaroo Computer in 1990 in a move to enhance its sales

network for northwestern Europe and at the same time purchased the Computer Point chain in the U.S. On the occasion of the sale of the U.S. firm Wyse Technology, the Taiwanese government used money from its development fund, and Mitac, the second largest manufacturer of computers after Acer, provided 12% of the funds necessary to purchase the firm. Wyse is the world's largest manufacturer of terminals, and Mitac was thus able to acquire both sales channels and the use of this firm's brand name. Aquarius was quick to establish a joint venture in East Germany with an eye on establishing a presence in the emerging market there.

2) Production and Export Trends

(Production)

The Taiwanese computer industry has developed rapidly during recent years. Annual growth in production of hardware products, including computers and peripherals, averaged 60.1% during the period 1985-88. 1988 production was valued at US\$5,171 million, accounting for 2.5% of the GNP.

Table IV.5-31 shows a breakdown of production figures for 1985-88. Production remains limited to personal computers and peripherals since local-capital manufacturers do not possess the technologies required for the production of larger, more complex machines and because of a lack of initiative resulting from the limited size of the domestic market. As can be seen from Table IV.5-32, however, production volume and value are significant, even by worldwide standards.

Another characteristic of this industry is the rapid growth in exports of related components, with this trend becoming even more noted with the drop in competitiveness of personal computers and other assembled products. The expansion of component exports was made possible by technological improvements made by the industry over the ten-odd years since its birth. In the future, there are signs of a shift of assembly operations to countries offering low labour costs, thus providing a supply of components for those countries which lagged behind in starting production.

Table IV.5-31 Hardware Production Volume

| | 1985 | 1986 | 1987 | 1988 |
|--------------------|-----------|-----------|-----------|-----------|
| Personal computers | 734,923 | 668,792 | 1,465,591 | 1,693,192 |
| Terminals | 1,052,611 | 1,494,391 | 2,025,319 | 2,697,302 |
| Monitors | 3,174,589 | 4,449,313 | 6,186,148 | 6,337,448 |
| Printers | 104,096 | 85,238 | 82,690 | 63,850 |
| Disk drives | 364,325 | 563,575 | 433,542 | 416,019 |

Source: Monthly Bulletin of Industrial Production

Table IV.5-32 World Computer Market Share Held by Taiwan

(Unit: %)

| | | | 1985 | 1986 | 1987 |
|---|--------------------|--------|------|------|------|
| • Share (in terms of value) of total world production | | | 1.0 | 1.5 | 2.4 |
| • World ranking | | | 9 | 7 | 7 |
| World share in production | Personal computers | Volume | 6.3 | 7.5 | 11.6 |
| | | Value | 1.0 | 1.4 | 2.3 |
| | Monitors | Volume | 23.2 | 34.3 | 41.1 |
| | | Value | 15.6 | 31.3 | 37.3 |
| | Terminals | Volume | 22.2 | 29.7 | 31.6 |
| | | Value | 3.3 | 4.1 | 4.8 |
| | Magnetic disks | Volume | 2.1 | 2.4 | 1.9 |
| | | Value | 0.3 | 0.4 | 0.5 |
| | Printers | Volume | 3.2 | 2.4 | 1.8 |
| | | Value | 0.4 | 0.3 | 0.3 |
| | Keyboards | Volume | — | 31.0 | 35.0 |
| | | Value | — | 20.0 | 25.0 |

Source: Marketing Information Center (MIC)

(Exports)

Taiwanese exports of computers and related products hit a record-high US\$3.7 billion in 1987, and 1988 shipments were estimated to have reached the US\$5 billion mark.

Due to the limited domestic market, the industry has an overall export ratio of 96.4%, but the market is also characterized by a high degree of import substitution, with Taiwanese models accounting for 50% of local personal computer demand in terms of value and fully 90% in terms of volume.

Computers have also become the leading sector of the Taiwanese electronics industry, with their share of electronic product exports increasing from 11% in 1983 to 25% in 1985 and 34.2% in 1987.

One recent trend is the drop in the share of computer and related product production by foreign affiliates and the increase in OEM exports by local-capital firms. The percentage of exports accounted for by foreign affiliates dropped from 58% in 1985 to 44% in 1986 and 39% in 1987. The affected products were printers, magnetic disks, personal computers, and monitors. On the other hand, the percentage of exports accounted for by OEM production at local-capital firms grew from 35% in 1985 to 37% in 1986 and 41% in 1987. The figures for individual products were 23% for personal computers, 37% for monitors, 21% for printers, 23% for magnetic disks, and 61% for related components, this last figure indicating the strength of local manufacturers in the component sector.

Table IV.5-33 provides a breakdown of 1987 exports. At US\$847 million, monitors were the leading export, and Taiwan is now the world's leading supplier of monitors. Color monitors are gradually replacing B/W units as the mainstream, with Taiwanese exports split 64-36 (B/W-color) in terms of volume and 40-60 in terms of value. In addition, "related components" are fast becoming a star performer, with exports jumping to US\$1,458 million in 1987, an increase of 109% over the previous year.

The U.S. market was the largest single destination for Taiwanese exports, absorbing 51.6% of all shipments in 1987, down somewhat from the 57% of 1986. 70% of all terminal exports, a sector dominated by U.S. affiliates, was destined for the U.S. market. The leading market after the U.S. was Europe, responsible for 32% of exports overall and 50% of personal computer exports. In recent years, aggressive market development by leading local-capital manufacturers like Tatung, Acer, ADI Co., and Cal-Comp have resulted in marked growth in exports to Europe, which grew 117% in 1987 (the industry-wide average for the year was 79%). The three largest individual markets within Europe were the Netherlands (7.4%), West Germany (5.8%), and England (5.3%). The Asian-Pacific region was responsible for taking in 9.9% of Taiwanese exports.

Table IV.5-33 Breakdown of 1987 Exports of Hardware Products and Related Components by Country/Area

(Unit: %)

| Country/region | Hardware products and related components | | | | | |
|-----------------|--|----------------|----------|-----------|----------|-------|
| | Personal computers | Magnetic disks | Printers | Terminals | Monitors | |
| North America | 53.44 | 35.56 | 54.08 | 57.80 | 70.17 | 58.55 |
| U.S. | 51.62 | 33.94 | 52.92 | 57.77 | 70.04 | 56.70 |
| Canada | 1.82 | 1.62 | 1.16 | 0.03 | 0.13 | 1.85 |
| Europe | 32.02 | 50.14 | 35.34 | 32.71 | 24.18 | 30.55 |
| The Netherlands | 7.44 | 9.44 | 10.87 | 21.01 | 12.29 | 8.86 |
| W. Germany | 5.78 | 6.62 | 6.67 | 2.85 | 1.59 | 4.91 |
| U.K. | 5.25 | 7.74 | 7.07 | 3.62 | 4.40 | 6.20 |
| France | 2.93 | 5.51 | 2.56 | 0.24 | 0.99 | 2.94 |
| Italy | 1.90 | 3.18 | 1.15 | 0.44 | 1.24 | 1.71 |
| Switzerland | 1.52 | 3.40 | 1.05 | 0.81 | 0.06 | 0.64 |
| Belgium | 1.04 | 1.39 | 4.73 | 0.14 | 0.24 | 1.27 |
| Other | 6.16 | 12.86 | 1.24 | 4.60 | 3.37 | 4.02 |
| Asian, Pacific | 9.91 | 6.33 | 8.49 | 6.72 | 5.04 | 8.01 |
| Hong Kong | 2.39 | 0.36 | 2.34 | 1.05 | 0.73 | 1.85 |
| Singapore | 1.88 | 1.04 | 2.66 | 0.56 | 1.69 | 1.41 |
| Korea | 0.51 | 0.16 | 0.73 | 0.07 | 0.01 | 0.38 |
| Japan | 1.47 | 0.38 | 0.80 | 0.27 | 0.34 | 0.69 |
| Australia | 2.61 | 3.32 | 1.52 | 3.53 | 2.08 | 2.18 |
| Other | 1.05 | 1.07 | 0.44 | 1.24 | 0.19 | 1.50 |
| Other regions | 4.63 | 7.97 | 2.09 | 2.77 | 0.61 | 2.89 |
| South Africa | 1.47 | 1.78 | 0.64 | 2.21 | 0.25 | 0.91 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 |

Source: MIC

Table IV.5-34 Exports of Computers, Peripherals and Related Components
(Units: US\$million, 1,000 units)

| | 1984 | 1985 | 1986 | 1987 | 1988 | | |
|--------------------|--------------|--------------|---------------|--------------|---------------|-------------------|-------|
| | Export value | Export value | Export volume | Export value | Export volume | Est. export value | |
| Personal computers | 152 | 240 | 1,113 | 392 | 1,958 | 759 | 1,150 |
| Magnetic disks | 86 | 42 | 715 | 71 | 655 | 97 | — |
| Printers | 23 | 45 | 84 | 41 | 73 | 44 | — |
| Terminals | 207 | 225 | 1,318 | 317 | 1,530 | 414 | 480 |
| Monitors | 319 | 303 | 4,852 | 500 | 7,022 | 847 | 1,090 |
| Other peripherals | 104 | 256 | — | 44 | — | 80 | — |
| Subtotal | 891 | 1,111 | — | 1,366 | — | 2,243 | — |
| Related components | 113 | 109 | — | 697 | — | 1,458 | — |
| Total | 1,005 | 1,220 | — | 2,063 | — | 3,701 | 4,999 |

Source: MIC

3) Domestic Market

As of June 30, 1988, 349,000 personal computers had been installed in Taiwan, of which private businesses were responsible for 158,900 units (45.4% in terms of volume), followed by individuals and households, at 398,000 units (40%), educational and research institutions, at 196,000 units (5.6%), and government agencies, at 53,000 units (1.5%).

Table IV.5-35 Breakdown of Personal Computer Installations by Type of User

(Units: NT\$million, 1,000 units)

| User | 1986 | | 1987 | |
|-------------------------------|--------------|--------------|--------------|--------------|
| | Value | Volume | Value | Volume |
| Government agency | 153 | 2.6 | 201 | 5.3 |
| Public business | 587 | 11.2 | 618 | 18.8 |
| Private corporation | 3,640 | 85.6 | 5,838 | 158.9 |
| Educational/research facility | 361 | 12.4 | 467 | 19.6 |
| Household/personal | 1,619 | 94.5 | 2,080 | 139.8 |
| Other | 198 | 3.6 | 295 | 7.5 |
| Total | 6,558 | 209.9 | 9,499 | 349.9 |

Note: The household/personal category includes those units designed exclusively for game software.

Source: MIC

4) Leading Manufacturers

According to MIC, there were 293 firms engaged in the production of computers and related products in Taiwan as of January 1988. If small-scale operations were included, this total would increase to an estimated 690 companies. The leading manufacturers are summarized in Table IV.5-36.

The above-mentioned 293 firms had average paid-in capital of US\$423,000 and an average payroll of 84 employees in 1988. 127 of the firms (43.4%) were capitalized at NT\$10-30 million, 58 at NT\$5-10 million, and 29 each at NT\$30-50 million and NT\$50-100 million. In terms of the number of employees, 112 of the firms had from 10 to 50 employees, 67, 50-100 employees, and 50, 100-300 employees. 29 of the 293 companies, or roughly 10%, were either joint ventures or wholly-owned subsidiaries of foreign companies, but these firms were responsible for about 39% of all exports of computer products, reflecting the large scale of production at such firms.

Foreign affiliates engaged in hardware production are summarized in Table IV.5-37.

No individual data on the technology infusions are available, but OEM production accounts for a high 41% of all exports. Since those firms engaged in OEM production have generally introduced some kind of technology from their customers, technology infusion is thought to be quite widespread.

Percentages of total exports accounted for by OEM production in 1987 were as follows: personal computers, 23%; monitors, 37%; terminals, 22%; and printers, 4%.

Table IV.5-36 Leading Computer Manufacturers in Taiwan

| 1987 export value million | 1987 ranking | 1986 ranking | Company | Main products |
|---------------------------------|-----------------|-----------------|--------------------------------|---|
| US\$100-300 million | 1 | 2 | Tatung Co. | Personal computers, monitors, terminals, magnetic disks |
| | 2 | 3 | Wyse Technology (Taiwan) | Terminals, personal computer components |
| | 3 | 4 | Digital Equipment Taiwan | Terminals, printers, personal computers |
| | 4 | 7 | Acer | Personal computers, magnetic disks |
| | 5 | 1 | Wang Laboratories Taiwan | Personal computer workstations, terminals, computer communications products |
| | 6 | 9 | Atari Taiwan Manufacturing Co. | Personal computers, magnetic disks |
| | 7 | 5 | Philipps Electronics Ind. | Monitors, components |
| | 8 | 8 | Zenith Taiwan | Monitors, personal computers |
| US\$30-100 million | 9 | 6 | Commodore Electronics Taiwan | Magnetic disk components, personal computers |
| | 10 | 10 | Sampo Co. | Monitors, components, terminals, personal computers |
| | 11 | 17 | Cal-Comp Co. | Monitors, terminals |
| | 12 | 15 | Capetronic (Taiwan) | Monitors, terminals, components |
| | 13 | 14 | ADI Corp. | Terminals, monitors, personal computers |
| | 14 | 22 | Mitac Incorporated | Personal computers, magnetic disks |
| | 15 | 20 | Copam Electronics Co. | Personal computers |
| | 16 | 11 | Ampex Taiwan Ltd. | Terminals |
| | 17 | 56 | Datatech Enterprises Co. | Components |
| | 18 | 12 | Teco Electric & Machinery Co. | Monitors, terminals |
| | 19 | — | Orion Electric Taiwan | Monitors |
| | 20 | 26 | Taiwan Hitachi | Monitors |

Source: MIC

Table IV.5-37 Foreign-affiliate Computer Manufacturers in Taiwan

| Company | Partner/parent firm | | Products |
|--|--------------------------------|------|--|
| 1. Tatung Fujitsu | Fujitsu (Japan) | JV | Personal computers, floppy disks |
| 2. Want Laboratories Taiwan | Wang (U.S.) | 100% | Personal computers, printers, monitors, terminals |
| 3. Toppan Moore Taiwan | Toppan Moore (Japan) | 100% | Peripheral devices |
| 4. ETS Taiwan | ETS (U.S.) | 100% | Peripheral devices |
| 5. Matsushita Electric Taiwan | Matsushita Electric (Japan) | 100% | Printers |
| 6. Memolet Taiwan | Memolet Telex (U.K.) | 100% | Personal computers, monitors, terminals floppy disks |
| 7. Philipps Electronics Ind. | Philipps (Netherlands) | 100% | Monitors |
| 8. Taiwan NEC | NEC (Japan) | 100% | Personal computers, printers, monitors |
| 9. Taiwan IBM | IBM (U.S.) | 100% | Personal computers, printers, monitors |
| 10. Taiwan Telecommunications Industry | NEC (Japan) | JV | Digital devices, peripheral equipments |
| 11. Zenith Taiwan | Zenith (U.S.) | 100% | Terminals, monitors, personal computers, keyboards |
| 12. Unisysit Taiwan | Unisysuit (U.S.) | 100% | Personal computers, monitors, printers |
| 13. Kuang Yuan Co. | JVC (Japan) | JV | Monitors |
| 14. Taiwan HP | HP (U.S.) | JV | Personal computers |
| 15. Qume Co., Taiwan | QUME (U.S.) | 100% | Terminals, printers, floppy disks etc. |
| 16. C.P.C. Taiwan | C.P.C. (U.S.) | JV | Terminals, printers, monitors |
| 17. HP Taiwan | HP (U.S.) | 100% | Personal computers, printers |
| 18. Princeton Taiwan | Princeton (U.S.) | 100% | Monitors, etc. |
| 19. Ruby Tech Taiwan | Ruby Tech (U.S.) | JV | Personal computers |
| (Companies located in Hsinchu Science-based Industrial Park) | | | |
| 20. Wyse Technology (Taiwan) | Wyse Technology (U.S.) | 100% | Personal computers, terminals |
| 21. Audiotronics Taiwan | Dotronic (U.S.) | 100% | Monitors |
| 22. Logitec Taiwan | Logitec Far East (Switzerland) | 100% | Computers, input devices |
| 23. Priam Taiwan | Priam Ltd. (U.S.) | 100% | Magnetic disks |
| 24. Taiwan CMT | CMT (U.S.) | 100% | Personal computers, Peripheral equipments |
| 25. Microscience Taiwan | Microscience (U.S.) | 100% | Magnetic disks |
| 26. AST Taiwan | AST (U.S.) | 100% | Personal computers |
| 27. Kitaco Taiwan | Kitamura Electronics (Japan) | JV | Peripheral equipments |
| 28. TBM Taiwan | TBM (U.S.) | JV | Peripheral equipments |
| 29. PDC Taiwan | PDC (U.S.) | JV | Image processing system |

Source: MIC

(3) Singapore

1) Outline of Computer Industry Development

The Singaporean computer industry was born in the early 1980s as numerous foreign affiliates set up operations there.

Since achieving independence, Singapore has proceeded with a policy of industrialization based around the introduction of foreign capital. By 1972, the country had achieved virtually full-employment, and was in fact beset by a labour shortage. In order to effectively utilize its limited human resources, the country in the late 1970s began to search for ways of withdrawing from highly labour-intensive industries. The government adopted a high-wage policy starting in 1979 to stimulate the transfer of labour from labour-intensive industries and designated certain priority items for investment incentives, emphasizing the promotion of high-tech industries such as the computer sector.

In the early 1980s worldwide demand for personal computers began to grow rapidly, and various U.S. manufacturers hurried to establish a supply system. The strength of the dollar at the time, however, forced them to pursue overseas sourcing and production. Many of these firms chose Singapore, which could offer a favorable investment environment coupled with excellent incentives for high-tech industries and enthusiastic attraction efforts.

Table IV.5-38 shows a summary of the Singaporean computer industry based on industrial statistics for 1982-87. The number of companies jumped from just nine in 1982 to 58 in 1987, giving this sector the most of any in the Singaporean electronics industry. In 1987, the average added value per worker in the electronics industry as a whole was S\$58,810, while for the computer industry the figure was S\$95,946.

Table IV.5-38 Outline of Computer Industry

(Unit: S\$1,000)

| | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|-------------------------------|---------|-----------|-----------|-----------|-----------|-----------|
| No. of companies | 9 | 25 | 35 | 35 | 41 | 58 |
| No. of employees | 1,280 | 6,824 | 11,515 | 10,280 | 18,222 | 26,536 |
| Production value (S\$million) | 231.173 | 1,365.406 | 2,625.755 | 2,588.940 | 4,195.200 | 6,964.724 |
| Added value (S\$million) | 79.946 | 397.274 | 809.313 | 905.532 | 1,784.100 | 2,546.018 |

Source: Report on the Census of Industrial Production, 1982-87.

2) Production and Export Trends

(Production)

Table IV.5-39 shows a breakdown of production and export trends for 1984-1987. Production is led by foreign affiliates in all categories. In addition, production trends can vary significantly with the coming of a single manufacturer due to the limited number of companies; a major increase in production was carried out by a subsidiary of the U.S. firm Apple in 1986, and this firm alone was estimated to be responsible for 80% of all exports.

Table IV.5-39 Production and Exports of Personal Computers and Peripherals

(Unit: S\$1,000)

| | | Personal computers + keyboards | | Monitors | | Printers | |
|------|--------|-----------------------------------|---------|------------|---------|------------|---------|
| | | Production | Exports | Production | Exports | Production | Exports |
| 1984 | Volume | 132,000 | 112,000 | 131,000 | 110,000 | 39,000 | 14,000 |
| | Value | 88,000 | 70,000 | 39,900 | 31,500 | 27,500 | 12,000 |
| 1985 | Volume | 135,900 | 126,000 | 135,000 | 125,000 | 26,000 | 16,000 |
| | Value | 86,900 | 78,000 | 39,500 | 33,500 | 19,700 | 13,500 |
| 1986 | Volume | 222,900 | 210,000 | 220,000 | 207,000 | 51,000 | 35,000 |
| | Value | 139,600 | 128,000 | 64,200 | 59,000 | 39,900 | 30,000 |
| 1987 | Volume | 758,000 | 685,000 | 450,000 | 376,000 | 387,000 | 287,000 |
| | Value | 565,000 | 499,000 | 137,600 | 108,000 | 235,000 | 173,000 |

Source: Synergy Business Research & Consulting

Although not discussed in the present survey, Singapore is one of the world's few producers of hard disk drives (HDDs), with the majority of leading U.S. manufacturers already having established production plants in Singapore. As of 1989 there were 13 firms, including local-capital operations, engaged in the production of HDDs. Total export for the year was valued at S\$5.47 billion, accounting for 63% of computer industry export as a whole.

Concerning recent trends, a worsening labour shortage led Seagate Technology, Singapore's leading computer manufacturer in 1987, to build a large-scale plant in Thailand. In addition, Corner Peripherals and Maxtor transferred portions of their production processes to Malaysia and began manufacturing some finished products. Such moves are indicative of the gradual transfer of production to surrounding countries. Below is a list of the HDD manufacturers with production bases in Singapore.

HDD producers in Singapore

Maxtor
 Seagate Technology
 Corner Peripherals
 Tandon
 Miniscribe
 Cast
 CDC
 Sino-Tech
 Western Digital
 Archive
 Micropolis
 Unysis
 Wearnes Technology

(Exports)

A breakdown of exports according to product and country based on trade statistics only became possible starting in 1988. Table IV.5-40 shows a breakdown of export destinations by product for 1988-1989. Since U.S. affiliates form the mainstream of foreign computer firms operating in Singapore, and because their main objective for investment in Singapore is out-sourcing, 1989 exports to the U.S. accounted for 63.4% of the total.

Table: IV.5-40 Breakdown of Exports by Product and Destination

| | Personal computers | | Monitors | | Printers | | Keyboards | |
|-------|--------------------|------|----------------|------|----------------|------|----------------|------|
| | Destination | % | Destination | % | Destination | % | Destination | % |
| 1988 | U.S. | 61.3 | U.S. | 36.7 | U.S. | 50.7 | — | |
| | Netherlands | 29.6 | France | 10.8 | W.Germany | 15.4 | — | |
| | Hong Kong | 1.8 | W.Germany | 10.3 | Netherlands | 4.6 | — | |
| Total | S\$438 million | | S\$198 million | | S\$352 million | | --- | |
| 1989 | U.S. | 52.8 | U.S. | 41.9 | U.S. | 37.6 | U.S. | 40.9 |
| | Australia | 9.8 | W.Germany | 7.8 | W.Germany | 29.1 | W.Germany | 28.1 |
| | Hong Kong | 4.9 | Malaysia | 5.8 | Australia | 7.2 | France | 16.4 |
| Total | S\$908 million | | S\$183 million | | S\$530 million | | S\$187 million | |

Source: Singapore Import & Export

Note: 1988 figures for personal computers are included in "Microcomputer Complete Digital CPU and Digital Processor." The system of classification changed in 1989, and "Microcomputers: Desk top" was used.

(Export Pricing)

Typical export prices for popular personal computers made in Singapore at the end of 1989 were estimated from industry interviews to be as follows:

| <u>Product</u> | <u>Mean export unit price (S\$)</u> |
|--|-------------------------------------|
| • CPU (640 K RAM) + keyboard, FDD (1) | 750 |
| • CPU (1 MB RAM) + keyboard, FDD (1) | 850 |
| • CPU (1 MB RAM) + keyboard, 20-MB HDD | 1,100 |
| • B/W monitor | 250 |
| • Color monitor (excluding EGA, VGA types) | 400 |

3) Domestic Market

Table IV.5-41 shows domestic demand for personal computers and peripherals during 1984-89. Naturally, the country's population of only 2.6 million limits the size of the potential market, but the government has worked hard to promote IT (Information Technology) industries, and Singapore is the most computerized of all the Asian NIEs. Domestic demand for personal computers grew an average of 37.7% annually during 1984-87, with a similar trend being shown in the peripherals sector. The government has encouraged the introduction of computers by both manufacturers and firms in the service industries, and purchasers are eligible for tax deductions. The government has also invested large amounts of money in setting up a communications network, and high growth is expected to continue in the future.

Table IV.5-41 Demand for Computers and Peripherals in Singapore

| | <u>Personal computer + keyboard</u> | | <u>Monitor</u> | | <u>Printer</u> | |
|------|-------------------------------------|------------------------------|---------------------|------------------------------|---------------------|------------------------------|
| | <u>No. of units</u> | <u>Value (S\$ thousands)</u> | <u>No. of units</u> | <u>Value (S\$ thousands)</u> | <u>No. of units</u> | <u>Value (S\$ thousands)</u> |
| 1984 | 20,000 | 18,000 | 21,000 | 8,400 | 22,000 | 15,500 |
| 1985 | 9,900 | 8,900 | 10,000 | 4,000 | 10,000 | 6,200 |
| 1986 | 12,900 | 11,600 | 13,000 | 5,200 | 16,000 | 9,900 |
| 1987 | 51,600 | 47,000 | 52,000 | 21,000 | 54,000 | 33,000 |
| 1988 | 42,000 | — | 41,000 | — | 46,000 | — |
| 1989 | 57,000 | — | 55,000 | — | 63,000 | — |

Source: Synergy Business Research & Consulting

4) Leading Manufacturers

Table IV.5-24 summarizes the leading manufacturers of computer-related products in Singapore. The majority are foreign (mainly U.S.) affiliates, but the local firm Wearnes Technology is putting up a strong challenge. This company is a subsidiary of Wearnes Brothers, which is listed on the Singapore stock exchange, and has been under an aggressive management policy that included the establishment of a research facility in the U.S. and sales-channels oversea. "ALR," the company's export brand, has become one of the leading brands in Southeast Asia.

Table IV.5-42 Major Personal Computer and Peripherals Manufacturers in Singapore

| Personal computers | Monitors | Printers | Keyboards |
|--------------------|--------------------|--------------------|-----------|
| Apple | Thomson | Printronix | HP |
| Compaq | United Electronics | HP | Nixdorf |
| Nixdorf | Mitsubishi | AMT | |
| Tata-Eixsi | | Tokyo Electric Co. | |
| Data-Mini | | Nixdorf | |
| Wearnes Technology | | | |

Table IV.5-43 Leading Computer and Peripherals Manufacturers in Singapore

| Company | Year of establishment | Paid-in capital | Parent company | No. of employees | Annual turnover | Products (in 1989) | Main markets | Sales channels | R&D activities |
|------------------------------------|-----------------------|-----------------|---------------------------------|------------------|-----------------------|---|--|---|----------------|
| 1. Apple Computer International | 1979 | S\$8,360,000 | Apple Computer (U.S.) | 800 | S\$340,247,000 (1988) | Personal computers Brand name: Apple Finished units: 720,000 Semi-finished units: 180,000 | U.S. | Through U.S. headquarters | None |
| 2. Wearnes Technology | 1983 | S\$40,000,000 | — | 150 | S\$43,724,289 (1987) | Personal computers Brand name: ALR Finished units: 240,000 FDDs: 60,000 HDDs: 60,000 | Singapore U.S. Europe Middle East | Direct exports to foreign wholesalers | None |
| 3. Digital Equipment International | — | — | Digital Equipment (Switzerland) | 720 | S\$602,675,124 (1987) | Personal computers Semi-finished units: 180,000 FDDs: 24,000 Minicomputers | U.S. | Through U.S. headquarters | None |
| 4. Compaq Asia | 1986 | S\$25,000 | Compaq Computer (U.S.) | 60 | S\$83,065,183 (1987) | Personal computers Finished units: 300,000 | U.S. | Through U.S. headquarters | None |
| 5. K.T. Technology | 1987 | S\$500,000 | — | 80 | S\$28,336,974 (1988) | Personal computers Brand name: MTC | Singapore Middle East Eastern Europe | Direct exports to foreign wholesalers and end users | None |
| 6. Hewlett Packard Singapore | 1970 | S\$240,000 | — | 2,600 | S\$384,100,000 (1987) | Personal computers Finished units: 240,000 Keyboards: 300,000 Printers: 120,000 Minicomputers | U.S. | Through U.S. headquarters | n.a. |

| Company | Year of establishment | Paid-in capital | Parent company | No. of employees | Annual turnover | Products (in 1989) | Main markets | Sales channels | R&D activities |
|-------------------|-----------------------|-----------------|------------------------|------------------|-----------------|--|--------------------------|----------------|----------------|
| 7. Aztech Systems | 1986 | S\$20,000 | — | 20 | n.a. | Personal computers Brand name: Aztech | Singapore Middle East | Direct exports | None |
| 8. Nixdorf | 1982 | US\$4,000,000 | Nixdorf (W.Germany) | 450 | — | Personal computers | — | — | — |
| 9. Tata-Eixsi | 1981 | — | Tata | 18 | — | Personal computers | — | — | — |
| 10. Thomson | 1980 | US\$2,000,000 | Thomson (France) | 120 | — | Monitors | — | — | — |
| 11. Olivetti | 1980 | US\$50,000,000 | Olivetti (Italy) | 700 | — | Printers | — | — | — |

IV-5-4. Trends in Overseas Production of Japanese and U.S. Companies

(1) Overseas Production by Japanese Companies

1) Present Status

The post-September 1985 appreciation of the yen had a large impact on the Japanese electronics equipment industry, which was forced to undergo a rapid structural transformation in order to make up for the resulting loss in export competitiveness. The basic trend was towards reduction of production costs by increasing overseas production and parts sourcing and increased dependence on domestic demand by shifting domestic production to high-added-value products and processes. The key word for overseas production during this period was "globalization," and the re-evaluation of both domestic and overseas production bases in order to achieve maximum benefits was emphasized. Production in developing nations, destined for shipment to third nations rather than for sale to the local market, was concentrated on specific products to achieve merits of scale, with single plants sometimes being made responsible for supply to the entire world, or at least the surrounding region. The electronic components industry, spurred by home electrical appliances and demand therefor, was at the center of this movement, while production of industrial equipment with high added value remained at Japanese production lines. When compared on a simple volume base, there is a huge gap in terms of demand for home appliances and industrial equipment. The production of industrial electronics equipment does not permit the establishment of as many production bases due to considerations of investment return, and also requires advanced production technology.

Overseas production by the industrial equipment industry was spurred by the enactment of protectionist legislation in the U.S. and Europe, the two leading export markets for such products, and in general manufacturers were forced to establish operations in these markets in order to retain their market shares. The following two are typical of the measures enacted.

U.S.: In retribution for alleged dumping of semiconductor products, imports of personal computers from Japan were slapped with a 100% duty starting in July 1987.

EC: The levying of an anti-dumping duty on Japanese printers was decided upon in 1987. In addition, the pricing of Japanese personal computers is now being closely monitored.

The following is a summary of overseas production projects carried out by Japanese manufacturers. The greatest concentration of such investment was seen during 1987-89, with the U.S. and Europe being the most common destinations. In the case of

intermediate components, however, plants were commonly established in the Asian NIEs, other Southeast Asian nations, and China with the objective of exporting to plants in the U.S. and Europe.

(Personal Computers)

Overseas production of personal computers by Japanese firms is summarized in Table IV.5-44. These projects were concentrated in 1987.

Table IV.5-44 Overseas Production of Personal Computers by Japanese Companies

| Company | Location | Date operations were begun | Production volume, etc. |
|---------------------|----------------------|----------------------------|--|
| NEC | U.S. (Georgia) | | 7,000 units/month |
| | U.S. (Massachusetts) | Early 1988 | 5,000 units/month |
| Ricoh | Taiwan | 1988 | *Licensed production |
| Seiko Epson | Korea | January 1987 | 120,000 units/year *Licensed production |
| | U.S. (Oregon) | July 1987 | 5,000 units/month |
| | U.K. (Telford) | Sep. 1988 | 2,000 units/month |
| Toshiba | U.S. (California) | July 1987 | 20,000 units/month |
| Hitachi | U.S. (Oklahoma) | Early 1990 | 10,000 units/month |
| Matsushita Electric | U.S. (Illinois) | August 1988 | Several thousand units/month |
| | FRG (Paderborn) | | (Laptops) |
| Sharp | U.S. (Tennessee) | August 1987 | 6,000 units/month |
| Sanyo Electric | U.S. (New Jersey) | August 1987 | 1,000 units/month |

Source: Compiled from "Summary of Overseas Investment 1989," "Toyo Keizai, and newspaper articles

The major bottlenecks to re-imports of products produced overseas by Japanese companies have been the shortness of the product life cycle for personal computers and the high level of products demanded by Japanese users. The market is also limited by the dominance of the NEC 9800 series and compatible machines, which differs from the IBM standard found in the rest of the world. Thus it is impossible to hope for merits of scale, and the re-imports of personal computers from overseas production basis for sale on the Japanese market would be extremely unlikely.

(Keyboards)

Table IV.5-45 provides a summary of overseas production of keyboards by Japanese manufacturers. The labour-intensive character of this type of production has caused many of these companies to turn to developing nations with low labour costs. There is already a significant quantity of imports from Thailand, Malaysia, and Taiwan,

but since local corporations are also technically capable of this kind of production, many firms are turning away from establishment of their own operations and opting for sourcing from local companies instead.

Table IV.5-45 Overseas Production of Keyboards by Japanese Companies

| Company | Location | Date operations were begun | Production volume, etc. |
|------------------------|----------------|----------------------------|---|
| Alps Electric | Korea | Sep. 1970 | Capital: 9 billion won |
| | Taiwan | June 1971 | Capital: NT\$360 million |
| Omron Tateisi Electric | U.K. | Feb. 1988 | Capital: £800,000 |
| Casio Computer | India (Gujrat) | | 50,000 units/year *Licensed production |
| Minebea | Thailand | | 200,000 units/month |
| Fujitsu | Malaysia | 1986 | 100,000-120,000 units/month |
| Mitsumi Electric | Malaysia | 1986 | 120,000-130,000 units/month |

Source: Compiled from "Summary of Overseas Investment 1989," "Toyo Keizai, and newspaper articles

(Monitors)

Overseas production of monitors by Japanese manufacturers is summarized in Table IV.5-46. Just as in the case of keyboards, most of these operations were established with the objective of reducing labour costs. Re-imports to Japan are hindered by the fact that Japanese demand centers around high-end products, and most of the exports are to third nations. In some cases the manufacturers have shifted the production of televisions to countries offering lower labour cost and then started production of monitors in order to increase added value.

Table IV.5-46 Overseas Production of Monitors by Japanese Companies

| Company | Location | Date operations were begun | Production volume, etc. |
|---------------------|-----------------|----------------------------|-----------------------------|
| Hitachi | Taiwan | March 1971 | 20,000 units/month (colour) |
| Stanley Electric | U.S. (Michigan) | Nov. 1986 | Capital: \$8.7 million |
| Mitsubishi Electric | Singapore | | 20,000 units/month (colour) |
| Matsushita Electric | Taiwan | | 40,000 units/month (B/W) |
| Sony | Taiwan | | 5,000 units/month (B/W) |
| Funai Electric | Taiwan | | 4,000 units/month (B/W) |
| Silver Electronics | Taiwan | | 5,000 units/month (B/W) |

Source: Compiled from "Summary of Overseas Investment 1989," "Toyo Keizai, and newspaper articles

(Printers)

Overseas production of printers by Japanese manufacturers is summarized in Table IV.5-47. The overwhelming majority of such projects is concentrated in Europe and the U.S., but some firms have established operations in China, India, and Indonesia. All of these operations are either technical tie-ups or joint ventures, and they are thought to be the result of requests from the local partners. Although these nations are developing countries and current internal demand is insufficient, their huge populations gives them great potential as latent markets. Since the adoption of import substitution policies is also a possibility, investment in these nations is thought to be a move at securing markets for the future.

Table IV.5-47 Overseas Production of Printers by Japanese Companies

| Company | Location | Date operations were begun | Production volume, etc. |
|---------------------|----------------------|----------------------------|--|
| NEC | U.S. (Massachusetts) | Early 1988 | 5,000 units/month (laser printers) |
| Fujitsu | U.K. (Telford) | Nov. 1987 | 30,000 units/month |
| | Thailand | Jan. 1990 | Capital: ¥3 billion |
| Canon | Spain (Madrid) | Jan. 1987 | 2,000 units/month |
| | Italy | April 1987 | *Joint venture with Olivetti (laser printers) |
| | U.S. (Virginia) | | 20,000 units/month (laser printers) |
| | France | Oct. 1987 | 3,000 units/month (laser printers) |
| Matsushita Electric | U.K. | August 1986 | 15,000 units/month |
| Oki Electric | U.K. | Dec. 1987 | 30,000 units/month |
| Seiko Epson | China | April 1986 | (Miniature printers) |
| | Indonesia | 1988 | 40,000 units/month *Licensed production |
| Citizen Watch | U.K. (Oregon) | | 50,000 units/month |
| | U.K. (Telford) | March 1988 | 30,000 units/month |
| | France | 1989 | 8,000 units/month |
| | Korea | 1978 | (Miniature printers) |
| Star Precision | India | | *Licensed production |
| | U.K. | Oct. 1987 | 30,000 units/month |
| | China | 1990 | 30,000 units/month |
| | India (Bombay) | | 2,000 units/month *Licensed production |
| Brother Industries | U.K. (Wales) | March 1988 | 10,000 units/month (Miniature printers) |
| | Korea | | |
| Alps Electric | U.K. | Late 1987 | 10,000 units/month |
| | Korea | Sep. 1987 | *Joint venture (Miniature printers) |
| Shinwa Digital | Korea | August 1988 | 10,000 units/month *Licensed production |
| Tokyo Electric | U.S. (California) | Nov. 1988 | 10,000 units/month |
| | FRG (Braunschweig) | | 2,000 units/month |
| | Singapore | | |

Note: If not otherwise indicated, the printer type can be assumed to be dot impact.
Source: Compiled from "Summary of Overseas Investment 1989," Toyo Keizai, and newspaper articles

2) Questionnaire Survey of Japanese Firms Concerning Overseas Production

| | |
|--------------------------------|------------------------|
| Survey period: | November-December 1989 |
| Number of questionnaires sent: | 37 |
| Number of valid responses: | 20 |
| Response rate: | 54.1% |

(a) Exports

Export ratios at the responding companies were as follows:

| | |
|--------|--|
| <30% | 11 firms (of which one had no exports) |
| 30-60% | 4 firms |
| ≥60% | 5 firms |

The leading markets for those firms engaged in exports were the U.S. (indicated by 89.5% of the respondents), Europe (73.7%), Asia (36.8%), and Oceania (21.1%), indicating the importance to Japanese manufacturers of markets in the developed nations of Europe and the U.S.

(b) Distribution of Overseas Production

Table IV.5-48 provides a summary of production plants for computer-related products (excluding semiconductor manufacturing plants) maintained by survey respondents.

17 of the responding firms (of which three were not engaged in overseas production) reported overseas production ratios of less than 30% for the respective products; and three firms, ratios of 30-50%. Thus, production at these firms is concentrated at plants in Japan.

Table IV.5-48 Overseas Production of Computer-related Products

| | Personal computers | Monitors | Printers | Keyboards | Other | Total number of production bases |
|--------------|-----------------------|----------|---------------|--------------|---------------|-------------------------------------|
| U.S. | 6 (3) | 0 | 4 | 0 | 9 | 17 (3) |
| Europe | 2 (1) | 0 | 7 (1) | 2 | 0 | 7 (1) |
| Korea | 1 (1) | 0 | 2 (2) | 1 (1) | 2 (2) | 6 (6) |
| Taiwan | 2 (1) | 0 | 0 | 1 (1) | 0 | 3 (2) |
| Singapore | 1 | 0 | 1 | 0 | 1 | 3 |
| Malaysia | 0 | 0 | 0 | 1 | 0 | 1 |
| Thailand | 0 | 0 | 0 | 0 | 2(1) | 2 (1) |
| Indonesia | 0 | 0 | 1 (1) | 0 | 0 | 1 (1) |
| Philippines | 0 | 0 | 0 | 0 | 1 | 1 |
| China | 0 | 0 | 2 (2) | 0 | 0 | 2 (2) |
| India | 0 | 0 | 1 (1) | 0 | 0 | 1 (1) |
| Total | 12 (6) | 0 | 18 (8) | 5 (2) | 17 (3) | — |

Note: Figures in parentheses indicate the number of joint ventures, technical tie-ups, and OEM production agreements. Since a variety of products are sometimes produced at the same plant, the total number of plants is sometimes less than the individual total would suggest.

(c) Forecast for Overseas Production

Regardless of future plans at their own companies, respondents' views concerning the question of which countries/areas would see an increase in overseas production of computers and peripherals are summarized in Table IV.5-49.

The U.S. was by the far the most commonly noted. Overall, there is a trend towards increased local production of personal computers and printers in Europe and the U.S. due to trade friction, while overseas production of keyboards and monitors is expected to rise in Malaysia and Thailand because of the labour-intensive nature of this type of production. Some increase is expected for all products in the NIEs. This is a reflection of two facts: first, despite increased production costs and reduced competitiveness on the international market, these nations have accumulated a great deal of valuable experience as suppliers of keyboards and monitors; and second, improvements in the technical standards of firms in these countries have made them more suitable as production bases for personal computers and printers. In terms of the total number of production plants, Malaysia is third following Europe and the U.S. Concerning peripherals, Malaysia is thought to have the potential to become a leading supplier of low-priced products, following in the footsteps of Korea and Taiwan.

Table IV.5-49 Forecast for Overseas Production

| | Personal computers | Monitors | Printers | Keyboards | Total |
|---------------------------|--------------------|----------|----------|-----------|-------|
| U.S. | 18 | 5 | 10 | 4 | 37 |
| Europe | 10 | 7 | 9 | 3 | 29 |
| Taiwan | 5 | 6 | 6 | 6 | 23 |
| Korea | 3 | 6 | 7 | 5 | 21 |
| Singapore | 4 | 5 | 4 | 6 | 19 |
| Malaysia | 1 | 8 | 3 | 13 | 25 |
| Thailand | 2 | 7 | 3 | 9 | 21 |
| Central and South America | 0 | 2 | 0 | 3 | 5 |
| Total | 43 | 46 | 42 | 49 | 180 |

Ten responses were obtained from nine companies concerning future plans for overseas production.

| Location | Products |
|----------|---|
| U.S. | (1) Personal computers, (2) printers, (3) workstations |
| Europe | (1) Personal computers, (2) personal computers, (3) undecided |
| Taiwan | (1) Terminals, (2) monitors |
| Malaysia | (1) Monitors, (2) parts for printers |

(d) Evaluation of Malaysia as an Offshore Production Base

In contrast to the predictions obtained in the above-described question, companies were rather pessimistic in evaluations of Malaysia as a candidate for their own overseas production operations, as can be seen from Table IV.5-50. (The figures in the Table indicate the number of companies answering affirmatively.)

Finished product sectors in which Malaysia was indicated as a possible candidate, regardless of the time frame, were monitors (noted by four firms) and keyboards (three firms), while in the field of intermediate components the results were: monitors, four firms; keyboards, five firms; and printers, four firms. At present, therefore, there is greater potential for investment in component production operations.

Table IV.5-50 Evaluation of Malaysia as a Potential Production Base

| Response | Personal computers | Monitors | Keyboards | Printers |
|------------------------------------|--------------------|----------|-----------|----------|
| Finished products | | | | |
| Unthinkable for the time being | 12 | 11 | 10 | 14 |
| Possible 4-5 years into the future | 1 | 1 | 2 | 1 |
| Possible within 2-3 years | 0 | 2 | 1 | 0 |
| May or is now being considered | 0 | 0 | 0 | 0 |
| Concrete plans | 0 | 1 | 0 | 0 |
| Intermediate components | | | | |
| Unthinkable for the time being | 9 | 10 | 7 | 10 |
| Possible 4-5 years into the future | 2 | 2 | 4 | 1 |
| Possible within 2-3 years | 1 | 1 | 1 | 3 |
| May or is now being considered | 0 | 1 | 0 | 0 |
| Concrete plans | 0 | 0 | 0 | 1 |

(e) Importance of Criteria for Overseas Production

What criteria are emphasized by companies when selecting a location for overseas production? Table IV.5-51 shows the results of company evaluations of various criteria based on the following rating system:

- A. Extremely important 3 pts
- B. Relatively important 2 pts
- C. Not particularly important 1 pt

The "basic conditions" required of an investment environment (i.e., infrastructure, political stability, and labour situation, etc.) were of course highly ranked, with most companies considering this item to be extremely important. This was followed by high rankings for "local sourcing," "local market," and "hiring of engineers." "Low wages" received a total of 41 points, placing it almost exactly in the middle. Only 26.3% of the respondents considered this to be extremely important, however, significantly less than the figures for the first four criteria. "Investment incentives" were considered by the respondents to be the least important, and the end result was that those areas in which the industrialized nations are at an advantage were considered to be the most important.

Table IV.5-51 Importance of Conditions for Overseas Production

| Condition | Evaluation | Percentage of As |
|---|------------|------------------|
| Large domestic market | 43 | 70.6 |
| Good availability of local components | 47 | 66.7 |
| Inexpensive labour | 41 | 26.3 |
| Easy hiring of engineers | 42 | 44.4 |
| Difficulty of exports from Japan | 35 | 41.2 |
| Outstanding conditions (infrastructure, political stability, labour situation, etc.) | 46 | 70.6 |
| Availability of investment incentives (tax exemptions, etc.) | 35 | 23.5 |
| Future potential | 39 | 33.3 |

Note: "Percentage of As" indicates the percentage of responding companies who gave the respective condition an "A" rating.

In general, condition facilitating the location of companies in the computer industry are as follows: (1) a high concentration of industry; (2) the availability of plentiful labour; (3) good access to transportation routes; and (4) a high concentration or urban areas and academia. Computer plants generally include both development and manufacturing divisions. Even if basic research is carried out by a separate organization, it is generally thought to be advantageous for the applied technology and production technology divisions to be integrated with the manufacturing division.

(f) Local Sourcing of Components

Companies were asked to rank the necessity of local sourcing of major components based on the following rating system when conducting overseas production of personal computers, monitors, keyboards, and printers.

- A. Local sourcing necessary 3 pts
- B. Local sourcing preferred 2 pts
- C. Local sourcing not very important 1 pt
- D. Large possibility of in-house production 0 pts

Table IV.5-52 shows the importance of local sourcing for various components based on the total of points and the percentage of respondents giving an "A" ranking to the item in question.

In terms of total points, high rankings were given to bulky items like turning parts, plastic injection-moulded parts, and pressed metal parts together with items having a wide variety of applications, such as screws and washers, transformers, switching power supplies, and precision bearings. From the standpoint of universality, general electronic components such as diodes and transistors and resistors and capacitors also received high ratings.

Plastic injection-moulded parts and printed circuit boards boasted the largest percentage of As, with approximately 50% of all respondents indicating that local sourcing was necessary. These were followed by pressed metal components, screws and washers, transformers, switching power supplies, and precision bearings, each receiving an A ranking from about 40% of the responding firms. Parts receiving low rankings were generally products not seeing frequent use, such as LCD panels, rubber rollers, and electromagnetic clutches.

Table IV.5-52 Necessity of Local Sourcing for Main Components

| Name of part | Evaluation | Percentage of As |
|---|------------|------------------|
| Plastic injection-moulded parts | 34 | 53.3 |
| Pressed metal parts | 32 | 40.0 |
| Turning parts (axes, dowels) | 35 | 33.3 |
| Rubber rollers | 25 | 7.1 |
| Rubber belts | 28 | 14.3 |
| Rubber moulded parts | 27 | 15.4 |
| Screws, washers, etc. | 34 | 40.0 |
| Precision springs (coils, sheets) | 31 | 35.7 |
| Precision bearings (balls, sintered alloy) | 34 | 40.0 |
| IC, LSI (MP, ROM, RAM, Gate-alloys TTL, etc.) | 28 | 20.0 |
| Hybrid ICs | 25 | 6.7 |
| Printed circuit boards | 31 | 46.7 |
| Resistors, capacitors | 33 | 35.7 |
| Diodes, transistors, LEDs | 33 | 33.3 |
| Switches | 31 | 28.6 |
| Transformers | 34 | 40.0 |
| Switching power supplies | 34 | 40.0 |
| Solenoids, coils | 30 | 28.6 |
| Wire harnesses, connectors | 33 | 35.7 |
| Photocouplers | 23 | 8.3 |
| Electromagnetic clutches | 18 | 9.1 |
| DC motors, stepping motors | 24 | 23.1 |
| Fans | 25 | 36.4 |
| Liquid crystal panels | 18 | 0 |
| Piezoelectric buzzers | 20 | 9.1 |
| FDD/HDDs | 26 | 14.3 |
| CDTs | 27 | 21.4 |

Table IV.5-53 shows the results of a questionnaire survey distributed to electronics firms in Malaysia concerning local sourcing of the same components. Rankings were based on the following rating system:

- | | |
|---|-------|
| A. No problem | 3 pts |
| B. Local sourcing possible, but some problems with quality or stable supplies | 2 pts |
| C. Realization of local sourcing is strongly desired | 1 pt |
| D. Little merits for local sourcing | 0 pts |

Table IV.5-53 Possibility of Local Sourcing of Main Components in Malaysia

| Condition | Evaluation | Percentage of As |
|---|------------|------------------|
| Plastic injection-moulded parts | 190 | 40.2 |
| Pressed metal components | 172 | 41.3 |
| Turning parts (axes, dowels) | 77 | 19.0 |
| Rubber rollers | 61 | 25.8 |
| Rubber belts | 72 | 34.3 |
| Rubber moulded parts | 73 | 25.6 |
| Screws, washers, etc. | 181 | 41.5 |
| Precision springs (coils, sheets) | 115 | 28.8 |
| Precision bearings (balls, sintered alloy) | 72 | 25.0 |
| IC, LSI (MP, ROM, RAM, Gate-alloys TTL, etc.) | 107 | 31.6 |
| Hybrid ICs | 57 | 17.5 |
| Printed circuit boards | 123 | 25.7 |
| Resistors, capacitors | 168 | 42.5 |
| Diodes, transistors, LEDs | 137 | 34.3 |
| Switches | 126 | 31.3 |
| Transformers | 159 | 54.5 |
| Switching power supplies | 90 | 26.5 |
| Solenoids, coils | 110 | 26.8 |
| Wire harnesses, connectors | 126 | 30.2 |
| Photocouplers | 51 | 21.9 |
| Electromagnetic clutches | 49 | 17.2 |
| DC motors, stepping motors | 66 | 17.5 |
| Fans | 81 | 51.4 |
| Liquid crystal panels | 54 | 16.7 |
| Piezoelectric buzzers | 49 | 12.5 |
| FDD/HDDs | 36 | 20.8 |
| CRTs | 41 | 15.6 |

When the two sets of evaluations are compared, large differences can be found in the areas of turning parts, precision bearings, printed circuit boards, and switching power supplies, all of which received poor evaluations for local sourcing. Parts which received better evaluations included IC/LSI, resistors, capacitors, and transformers.

(2) Overseas Production by U.S. Companies

Although the questionnaire attempted to determine the overseas production of U.S. manufacturers, it proved impossible to obtain concrete details concerning overseas investment, such as current locations, production items, and future plans. In addition, the low response rate (41.5%) makes it difficult to assume that this survey is representative of conditions in the industry as a whole. The following section will introduce in-house and OEM production figures for various products at U.S. firms together with investment locations and time frames for those firms with overseas production operations.

| | |
|-----------------------|---------------------------------------|
| Survey period: | December 1989 - January 1990 |
| Telephone interviews: | 53 (including HDD manufacturers) |
| Valid responses: | 22 (of which nine were HDD producers) |
| Response rate: | 41.5% |

1) Summary of Survey Results

(a) Domestic Production

- 60% of the responding manufacturers produce at least 65% of their products within the U.S. 32% of the firms carried out all production in the U.S., while 9% relied entirely upon overseas operations.
- U.S. production ratios for various products were as follows:

| | |
|---------------------|-----|
| Personal computers: | 95% |
| Hard disk drives: | 32% |
| Keyboards: | 38% |
| Monitors: | 25% |

(b) Overseas Production

- Commonly-noted locations for overseas production were Asian countries/areas such as Japan, Korea, Taiwan, and Hong Kong.
- General satisfaction was noted regarding the quality of products manufactured overseas, with just two firms giving an "ordinary" rating (for personal computers produced in Japan and Korea) and one giving an "inferior" rating (for hard disk drives produced in Japan).
- Most of the companies engaged in overseas production were large manufacturers. 55% had at least 1,000 employees, and 15 of the firms boasted annual sales of \$100-500 million.

2) Production

Production was divided into (1) in-house production, (2) domestic OEM production, and (3) overseas OEM production.

(Personal Computers)

13 of the 22 responding firms were engaged in the production of personal computers, and the majority of these were in-house operations. Eight of the firms answered that 95% of their products came from plants in the U.S., while at another four nearly 90% of production was carried out overseas. Three of the 13 firms had agreements for OEM supply, and one of these was with a foreign manufacturer. Shares for the various types of production are summarized in the Tables below.

• Production ratios

| | In-house production | OEM production | Overseas OEM production |
|---------------------|---------------------|---------------------|-------------------------|
| <50% | 2 | 0% | 9 |
| 50%-90% | 1 | 10%-50% | 1 |
| 100% | 9 | >50% | 2 |
| No response | 1 | No response | 1 |
| Number of responses | 13 | Number of responses | 13 |

Investment locations and time frames are as shown below.

• Period and location of investment

| | Israel | Hong Kong | Japan | Korea | Taiwan | Total |
|-------|--------|-----------|-------|-------|--------|-------|
| 1982 | | | | | 1 | 1 |
| 1985 | | | 1 | 2 | 1 | 4 |
| 1988 | | 1 | | | | 1 |
| NA | 1 | | | | | 1 |
| Total | 1 | 1 | 1 | 2 | 2 | 7 |

(Hard Disk Drives)

Nine of the responding firms were engaged in in-house production of hard disk drives. Five of these produced approximately 80% of their products at overseas plants. There were also five firms which relied entirely upon OEM supply. Three of these had agreements with foreign manufacturers.

• Production ratios

| In-house production | | OEM production | | Overseas OEM production | |
|---------------------|----|---------------------|----|-------------------------|----|
| 0% | 5 | 0% | 7 | 0% | 2 |
| 85-95% | 1 | 5-15% | 1 | 100% | 3 |
| 95-100% | 1 | >15% | 1 | | |
| 100% | 7 | 100% | 5 | | |
| No response | 8 | No response | 8 | No response | 10 |
| Number of responses | 22 | Number of responses | 22 | Number of responses | 15 |

• Period and location of investment

| | Japan | Korea | Philippines | Singapore | Thailand | Total |
|-------|-------|-------|-------------|-----------|----------|-------|
| 1983 | 1 | | | | | 1 |
| 1985 | 1 | | | | | 1 |
| 1986 | | 1 | | 1 | | 2 |
| 1987 | | | | | | 0 |
| 1988 | | | | 1 | 1 | 2 |
| 1989 | | | 1 | | | 1 |
| NA | | | | 1 | | 1 |
| Total | 2 | 1 | 1 | 3 | 1 | 8 |

(Monitors)

Monitor production was dominated by OEM agreements, with six firms relying entirely upon OEM supply. Three of the six dealt solely with foreign manufacturers. Both of the two firms engaged in in-house production maintained overseas production facilities and had extremely high overseas production ratios.

• Production ratios

| In-house production | | OEM production | | Overseas OEM production | |
|---------------------|----|---------------------|----|-------------------------|----|
| 0% | 6 | 0% | 2 | 0% | 1 |
| 100% | 2 | 100% | 6 | 100% | 3 |
| No response | 5 | No response | 5 | No response | 7 |
| Number of responses | 13 | Number of responses | 13 | Number of responses | 11 |

• Period and location of investment

| | Hong Kong | Korea | Taiwan | Total |
|-------|-----------|-------|--------|-------|
| 1982 | | | 1 | 1 |
| 1985 | | 1 | | 1 |
| 1988 | 1 | | | 1 |
| Total | 1 | 1 | 1 | 3 |

(Keyboards)

Just as with monitors, keyboard manufacturers are heavily dependent on OEM supply, with five firms relying entirely upon such agreements. Three of these firms had contracts with foreign manufacturers, and two depended entirely on such firms. Of the three companies responding that they were engaged in in-house production, two maintained overseas production facilities.

• Production ratios

| In-house production | | OEM production | | Overseas OEM production | |
|---------------------|----|---------------------|----|-------------------------|----|
| 0% | 5 | 0% | 3 | 0%<100% | 1 |
| 100% | 3 | 100% | 5 | 100% | 2 |
| No response | 5 | No response | 5 | No response | 7 |
| Number of responses | 13 | Number of responses | 13 | Number of responses | 10 |

• Period and location of investment

| | Hong Kong | Korea | Taiwan | Total |
|-------|-----------|-------|--------|-------|
| 1982 | | | 1 | 1 |
| 1985 | | 1 | | 1 |
| 1988 | 1 | | | 1 |
| Total | 1 | 1 | 1 | 3 |

(Printers)

Of the 22 responding firms, four answered that they were engaged in printer production. Three of these relied entirely on OEM supply for their products, and each had a high ratio of overseas production. None of the companies maintained their own plants overseas.

• Production ratios

| In-house production | | OEM production | | Overseas OEM production | |
|---------------------|---|---------------------|---|-------------------------|---|
| 0% | 3 | 0% | 1 | 0%<100% | 1 |
| 100% | 1 | 100% | 3 | 100% | 2 |
| No response | — | No response | — | No response | — |
| Number of responses | 4 | Number of responses | 4 | Number of responses | 3 |

3) Attitudes Towards Overseas Production

The 22 firms were asked to provide comments concerning overseas production. Most of them responded positively. Many answered that Japan was the greatest destination for investment, followed by Korea, Hong Kong, Singapore and other Asian countries. A few companies suggested that production in distant regions invited problems of delivery dates and communications, while others pointed out that an increase in overseas sourcing by U.S. firms was problem.

4) Future Outlook

Only nine firms responded to this item. A frequent comment was that OEM production agreements were the best means of cutting manufacturing costs. Some felt that production operations would eventually return to the U.S., however, especially in the case of countries where labour costs accounted for a small proportion of total production costs.

IV-6. Feasibility Analysis of Investment

IV-6-1. Methodology of Feasibility Analysis

It is a precondition for the promotion of the personal computer and peripherals industries in Malaysia and the promotion of investment in this sector that personal computers and peripherals manufactured in Malaysia would have price competitiveness in the world market.

In this section, in order to evaluate the possibility of Malaysia as an industry site of personal computers and peripherals and to identify the necessary conditions for the promotion of the industry, a quite rough analysis of investment feasibility was conducted on the assumption that personal computers and peripherals plants are to be newly constructed in Malaysia.

The feasibility analysis was conducted on the following assumptions.

- i) Feasibility analysis of four different factories for four products; personal computers, monitors, printers and keyboards.
- ii) Investment by a Japanese firm
- iii) Factories would engage only in production and production-related operation and would not have sales and R&D functions.
- iv) Take-over of the production of products for the European and the U.S. markets
- v) Products are directed to exports.

Major factors in the assumption were set as follows:

Assumption for the Feasibility Analysis

| | |
|-----------------------|--|
| Project Period: | 10 years |
| Construction Period: | 1 year |
| Price: | Fixed price as of 1989 |
| Investment Incentive: | -Ten year exemption from corporate tax based on Pioneer Status -Exemption from import tax for equipment and materials |
| Exchange Rates: | 1US\$= 143.52, 1US\$=2.7027M\$ (Period average of November, 1989) |

IV-6-2 Product Item and Production Capacity

(1) Product Item

The following items were selected as subject product items of the analysis assumed to be produced in Malaysia.

1) Personal Computer

Assumed product models: IBM compatible personal computers (IBM-AT compatible)

The specifications of products are as follows:

| | Model 1 (Medium Grade) | Model 2 (Lower Grade) |
|----------------------|---|-----------------------|
| CPU (Clock Speed) | i80286 (12MHz) | |
| Main RAM | 1MB | |
| Disk Drives | 5 inch 1.2M FDD x 1 40M HDD x 1 | 5 inch 1.2M FDD x 1 |
| Bus Type | PC/AT - Bus | |
| Monitor Type | VGA (Video Graphics Array) (A monitor is not attached.) | |
| Keyboard | A 101-key keyboard is attached. | |

The reasons for choosing the above models are as follows:

- [1] The trends in the world market press an assumed plant to adopt a product strategy of producing IBM-compatibles both in exporting and in selling in Malaysia.

As for the usage of personal computers, the proportion of software cost among the cost which users bear becomes large compared to the hardware cost because the unit price of a personal computer is relatively low. Users of personal computers use application software sold on the market instead of developing original software, which is usually expensive. Users tend to buy a personal computer for which a larger amount of application software has been developed. Therefore it is one of the characteristics of the market structure that a personal computer which has a larger market share gets a higher and tighter market share.

Mass-produced personal computers in the world market adopt IBM-architecture, Apple-architecture, or NEC-architecture. Above all, IBM and IBM-compatibles hold an overwhelming share in the world market.

IBM took an open architecture policy and designed their personal computers with components made by other manufacturers instead of their original components. Therefore it is easy to procure components for IBM-compatibles. IBM's BIOS is protected by copyright, but there are many software houses which legally offer BIOS compatible with IBM's.

The personal computer to be produced in Malaysia would be an IBM compatible in order to aim at the largest market, i.e., the U.S. and European market.

- [2] It is estimated that computers using the Intel 80286 microprocessor chip as a CPU will be the predominant type of personal computer on the market for the coming several years. Although computers with the Intel 80386 chip CPU are estimated to become popular in the near future, its market share is presently not so large. In addition, it is considered easy to shift from the production of a 286 computer to a 386 computer.

[3] The demand for personal computers equipped with a hard disk drive is increasingly expanding. Therefore, it is considered necessary to produce both models; a model with HDD and a model without HDD.

[4] For a display controlling unit, VGA is regarded as the standard for 286 computers because 286 computer users require a higher resolution level.

2) Monitor

Assumed product model: Monitor for IBM personal computers and compatibles

The specifications of the model are as follows:

| | Colour Display |
|------------|------------------|
| Size | 14 inches |
| Resolution | 640 by 480 (VGA) |
| Dot Pitch | 0.31 mm |
| Frequency | 35 kilohertz |

The reasons for choosing the above model are as follows:

[1] Specifications of monitor differ according to the architecture of personal computers. For example, an Apple computer or an NEC computer can not use monitors designed for IBM computers. Production of monitors for IBM computers and IBM compatibles, which have the largest market share in the markets in the U.S., Europe, and South East Asia, seems to be the most marketable.

[2] There are quite a few different standards, in terms of resolution (frequency and dot pitch) and colours, of monitors available for use with IBM computers and IBM compatibles. Although low-resolution monochrome displays are popularly used in South East Asia, a high-resolution colour display (VGA) has become popular in the U.S.

[3] In the low-priced low-resolution display market, Taiwan and Korean makers hold an unchallenged position.

It can be concluded that production of the high-resolution colour display (VGA) is desirable in Malaysia for the above mentioned reasons.

The procurement of a CDT is the most important factor in the production of monitors. The nonexistence of display production in Malaysia in spite of the active production of TVs is due to the difficulty in procuring industrial-use CDTs. Production of VGA displays needs a high resolution CDT of the 0.31mm dot pitch level. In this analysis, it is assumed that the procurement of CDTs necessary for a VGA display in Malaysia or from the neighbouring countries would be possible at the start of production.

3) Printer

Assumed product model: Printer for IBM computer and IBM compatibles

The specifications of the model are as follows:

| | |
|-----------------|---------------------------------|
| Printing Method | Serial Impact Dot Matrix Method |
| Printing Head | 24 pins |
| Printing Speed | 120 characters per second |

The reasons for choosing the above model are as follows:

[1] Dot matrix impact-method printers are the most popular printers for personal computers because the running cost is relatively small. Non-impact printers (such as ink jet printers) and page printers, characterised by high speed and high quality, are at present not popular due to the high price although they will be even more popular as they become cheaper.

[2] Considering the trend in the U.S. and Europe markets, relatively high quality and high speed printers of around the 24 pins and 120 cps level have a high marketability and are recommended to be produced in Malaysia.

4) Keyboard

Assumed product model: Keyboard for IBM personal computer and IBM compatibles

The reasons for choosing the above model are as follows:

- The highest demand for keyboards in the world market is that for IBM compatibles. There exists a distribution market of keyboards for IBM compatibles. So it is comparatively easy to find buyers for keyboards for IBM convertibles.

(2) Sales Plan and Production Capacity

1) Sales Plan

All the products would be exported to the U.S. and European markets. The plants would take over the production presently carried out in Japan, the U.S. or Europe which sales in Malaysia is possible, it may be safe to take no account of that possibility because the possible size of such sales in Malaysia is very small.

Sales would be wholly made on an L/C basis.

2) Production Capacity

[1] Personal computer factory

i) Maximum assembly production scale

Although the annual world demand for personal computers is 21 million units in 1989, there are a limited number of personal computer makers producing more than 20 thousand AT-type personal computers in the world.

Accordingly, even if a large personal computer maker with a large market share in the world set up a plant in Malaysia, the production scale would be 20 thousand units at most.

ii) Minimum economic scale of production

Surface mounting of PCB assembly can realise high reliability of the finished product and make the size of the finished product very small to a level which conventional mounting techniques can not achieve. It, however, costs much in equipment and materials for the moment. When production in Malaysia is considered, the assembly processes combining manual processes and automated process would have advantages in production cost against the fully automated PCB mounting process using chip parts and parts for surface mounting.

The optimum production scale of a final assembly line is 500 - 700 units a day when a conventional production process is adopted,

iii) Assumed production capacity

Considering the sales plan and minimum economic scale of production mentioned above, the production capacity of a personal computer plant to be established is assumed to be 12 thousand units a month (600 units/day x 20 days).

[2] Monitor plant

i) Minimum economic scale of production

The adjusting process takes the most time in assembling monitors. This process to minimise picture distortion is a value adding process, but it requires much time. The production scale suitable to this process is 550 units/day or 11,000 units/month per assembly line.

ii) Assumed production capacity

The monitor plant is assumed to have two assembly lines and total production capacity of 22,000 units/month, taking the optimum production capacity into consideration.

| | | |
|-------------------|-----------------------|--------------------|
| Production Volume | Monitors of own brand | 12,000 units/month |
| | Monitors of OEM | 10,000 units/month |

[3] Printer plant

i) Maximum assembly production scale

The world's annual demand of printers was 12.8 million units in 1987. The production volume of printer factories of Japanese makers, major suppliers in the world market, is 80 to 200 thousand a month.

Considering such factors as the necessity of narrowing down product items, the possibility of parts procurement in Malaysia, production of parts in Malaysia, plant maintenance ability, and infrastructure, the maximum assembly production scale is assumed to be 20 thousand units/month.

ii) Minimum economic scale of production

The minimum economic scale of production is 10 thousand units/month, taking necessary overhead cost into consideration.

iii) Assembly production capacity

Production capacity of the printer plant is assumed to be 15 thousand units/month based upon the maximum assembly production scale and the minimum economic scale of production mentioned above.

[4] Keyboard plant

i) Assumed production capacity

The keyboard plant is assumed to have a production capacity of 20 thousand units a month considering the production capacity of a printing machine, that of moulding machine, and the optimum production scale of an assembly line.

IV-6-3. Production and Sales Programmes

(1) Production Programme

Based on the assumed production capacity and operation ratio at the start, annual production volume of each plant is assumed as follows.

Table IV.6-1 Production Programme of Personal Computer Factory

Unit: 1,000 units

| | 1st Year | 2nd Year | 3rd Year | 4th Year | After 5th Year |
|--------------------|----------|----------|----------|----------|----------------|
| Production | 144.0 | 144.0 | 144.0 | 144.0 | 144.0 |
| Capacity | | | | | |
| Model 1 | 72.0 | 72.0 | 72.0 | 72.0 | 72.0 |
| Model 2 | 72.0 | 72.0 | 72.0 | 72.0 | 72.0 |
| Annual Production | 100.8 | 115.2 | 136.8 | 144.0 | 144.0 |
| Volume | | | | | |
| Model 1 | 50.4 | 57.6 | 68.4 | 72.0 | 72.0 |
| Model 2 | 50.4 | 57.6 | 68.4 | 72.0 | 72.0 |
| Operating Ratio(%) | 70 | 80 | 95 | 100 | 100 |

Table IV.6-2 Production Programme of Monitor Factory

Unit: 1,000 units

| | 1st Year | 2nd Year | 3rd Year | 4th Year | After 5th Year |
|--------------------------|----------|----------|----------|----------|----------------|
| Production Capacity | 264.0 | 264.0 | 264.0 | 264.0 | 264.0 |
| Annual Production Volume | 184.8 | 211.0 | 251.0 | 264.0 | 264.0 |
| Operating Ratio(%) | 70 | 80 | 95 | 100 | 100 |

Table IV.6-3 Production Programme of Printer Factory

Unit: 1,000 units

| | 1st Year | 2nd Year | 3rd Year | 4th Year | After 5th Year |
|--------------------------|----------|----------|----------|----------|----------------|
| Production Capacity | 180.0 | 180.0 | 180.0 | 180.0 | 180.0 |
| Annual Production Volume | 126.0 | 144.0 | 171.0 | 180.0 | 180.0 |
| Operating Ratio(%) | 70 | 80 | 95 | 100 | 100 |

Table IV.6-4 Production Programme of Keyboard Factory

Unit: 1,000 units

| | 1st Year | 2nd Year | 3rd Year | 4th Year | After 5th Year |
|--------------------------|----------|----------|----------|----------|----------------|
| Production Capacity | 240.0 | 240.0 | 240.0 | 240.0 | 240.0 |
| Annual Production Volume | 168.0 | 168.0 | 168.0 | 168.0 | 168.0 |
| Operating Ratio(%) | 70 | 80 | 95 | 100 | 100 |

(2) Unit Sales Prices

The following unit sales prices, i.e., ex-factory prices, for the products of each factory were set taking into consideration ex-factory prices of the same type products produced at Japanese factories, and present transaction prices in the international market.

Table IV.6-5 Unit Sales Prices

| | Ex-factory Price (M\$) | Domestic Distribution Cost (M\$) | FOB Price (M\$) |
|-------------------|------------------------|----------------------------------|-----------------|
| Personal Computer | | | |
| Model 1 | 2,102.94 | 42.06 | 2,145.00 |
| Model 2 | 1,514.71 | 30.29 | 1,545.00 |
| Monitor | 518.69 | 10.37 | 529.07 |
| Printer | 436.27 | 8.73 | 445.00 |
| Keyboard | 96.10 | 1.90 | 97.00 |

Domestic distribution cost is estimated at 2% of ex-factory cost.

(3) CIF Prices at Overseas Markets

The CIF prices at major overseas markets of the products of each factory were calculated as follows.

Table IV.6-6 Freight and Insurance Fee

Unit: M\$

| | Personal Computer | | Monitor | Printer | Keyboard |
|-------------------|-------------------|---------|---------|---------|----------|
| | Model 1 | Model 2 | | | |
| Freight: | | | | | |
| To U.S.A. | 24.26 | 24.26 | 25.15 | 24.26 | 1.01 |
| To Europe | 24.63 | 24.63 | 25.66 | 24.63 | 1.03 |
| Insurance: | | | | | |
| To U.S.A. | 6.53 | 4.72 | 1.67 | 1.41 | 0.29 |
| To Europe | 6.53 | 4.72 | 1.67 | 1.41 | 0.29 |

Table IV.6-7 CIF Prices at Overseas Markets

Unit: M\$

| | Personal Computer | | Monitor | Printer | Keyboard |
|---------------------|-------------------|----------|---------|---------|----------|
| | Model 1 | Model 2 | | | |
| FOB Price, Malaysia | 2,145.00 | 1,545.00 | 529.07 | 445.00 | 97.00 |
| CIF Price, USA | 2,175.79 | 1,574.32 | 555.89 | 470.67 | 98.30 |
| CIF Price, Europe | 2,179.16 | 1,574.35 | 556.40 | 471.04 | 98.32 |

(4) Sales Programmes

Annual sales of each factory were projected as follows based on the above assumed production volume and unit sales price.

Table IV.6-8 Sales Programme of Personal Computer Factories

Unit: 1,000 units

| | 1st Year | 2nd Year | 3rd Year | 4th Year | After 5th Year |
|-------------------|----------|----------|----------|----------|----------------|
| Personal Computer | 182.33 | 208.38 | 247.45 | 260.47 | 260.47 |
| Model 1 | 105.99 | 121.13 | 143.84 | 151.41 | 151.41 |
| Model 2 | 76.34 | 87.25 | 103.61 | 109.06 | 109.06 |
| Monitor | 95.85 | 109.55 | 130.09 | 136.93 | 136.93 |
| Printer | 54.97 | 62.82 | 74.60 | 78.53 | 78.53 |
| Keyboard | 15.98 | 18.26 | 21.68 | 22.82 | 22.82 |

IV-6-4. Location

(1) Location Selection

The following site conditions are required for the assumed personal computer and peripherals plants.

- Location convenient for transportation of final products and materials
- Existence of parts suppliers near the assumed plants
- Abundant labour force and easy employment of engineers and technicians

Major possible sites are the Kuala Lumpur area and the Penang area which have an advantage in port facilities handling exporting products and imported parts and materials.

It is impossible to decide on a specific site for the plants because a detailed site selection survey was not conducted in this survey. The feasibility analysis is carried out with the Bangi industrial estate being assumed as the condidate plant site for the sake of cost calculation.

(2) Land Cost

The land acquisition cost at the Bangi industrial estate is as follows.

Outline of Land Purchase Conditions

| | |
|------------------|---------------------------|
| Purchase Method: | 99 years lease |
| Land Price | : M\$80.73/m ² |

A plant site is assumed at twice the building floor space, the coverage ratio being 50%.

Land costs of the assumed personal computer and peripheral factories are as follows.

Table IV.6-9 Land Costs

| | Land Area(m2) | Land Cost(M\$ Thousand) |
|---------------------------|---------------|-------------------------|
| Personal Computer Factory | 8,000 | 645.83 |
| Monitor Factory | 8,800 | 710.42 |
| Printer Factory | 4,675 | 377.41 |
| Keyboard Factory | 4,675 | 377.41 |

IV-6-5. Construction Costs

(1) Plant Construction Conditions

The conditions of plant construction were set as follows.

- Walls, ceilings, and floor are made up of formwork concrete.
- Pillarless structure is adopted for working area.
- Load capacity of floor is over 500kg/m².
- Illuminance is 500 lux.
- Asbestos or asbestos-composites is not used inside the factory.
- Floor surface is finished with plastic tiles.
- Ceiling height is 5.5m.

Air-conditioning conditions were set as follows.

- Temperature: 25-25°C
- Humidity: 55-45°C
- The cleanness of air-conditioned room: Class 100 thousand at the time of operation
- Measures are taken to avoid dew concentration on goods in carried from the airconditioned room to the warehouse and from the warehouse to outside of the factory.
- The wind velocity: 0.5m/sec or less
- Intake of fresh air: 30 m³/hour*man
- Carbon dioxide concentration: 1,000ppm or less

- Ceiling height: 3.5m
- Load conditions were set as follows.

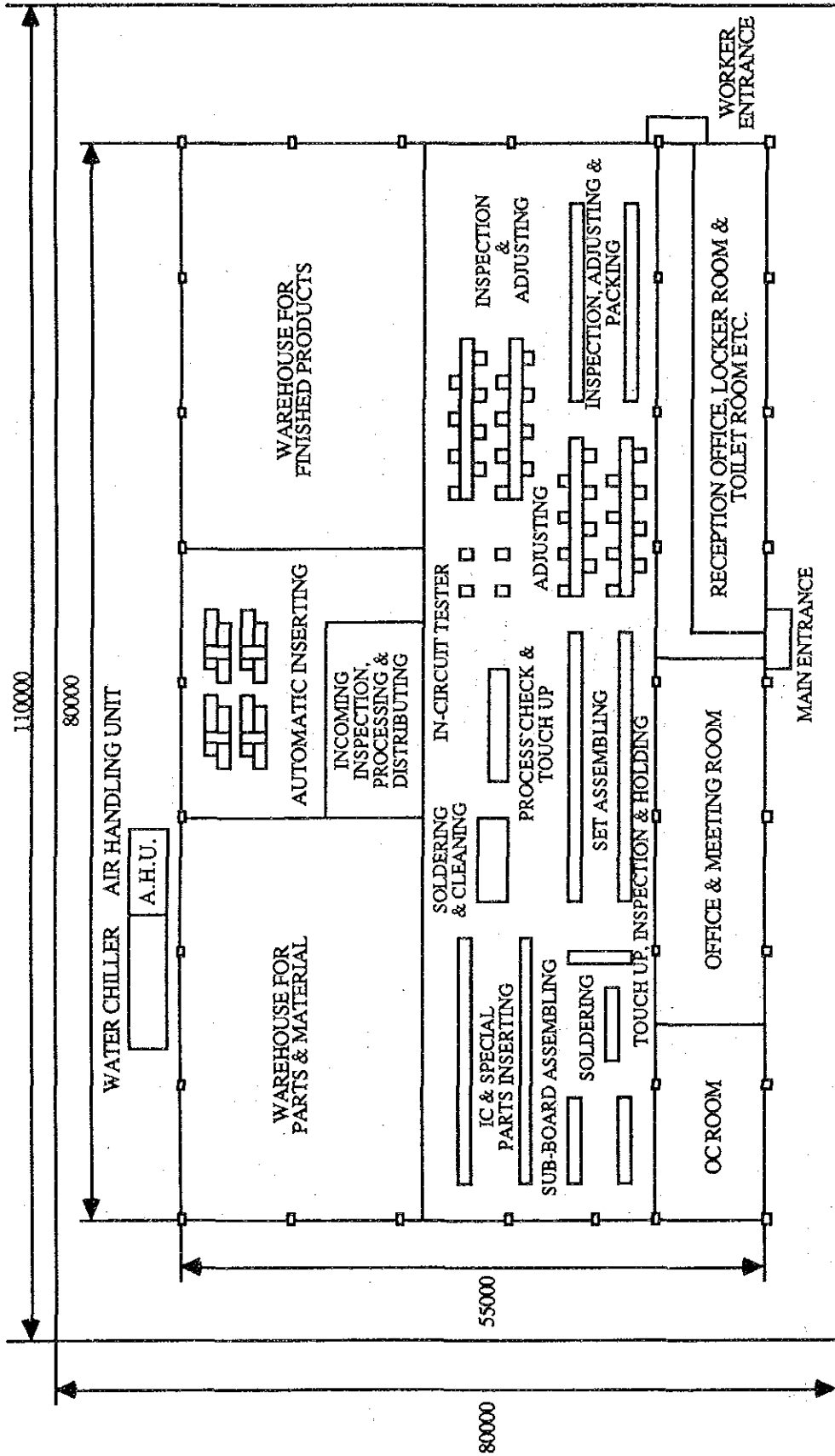
| | Personal Computer Factory | Monitor Factory | Printer Factory | Keyboard Factory |
|-------------|---------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Floor Space | 50mx80m 4,000m ² | 55mx80m 4,400m ² | 40mx80m 3,200m ² | 40mx80m 2,275m ² |
| Ventilation | 500m ³ /h | | | |
| Power Load | 1,000KWH | | | |

Layouts of the factories are illustrated in Fig.IV.6-1 to Fig.IV.6-4.

(2) Factory Construction Costs

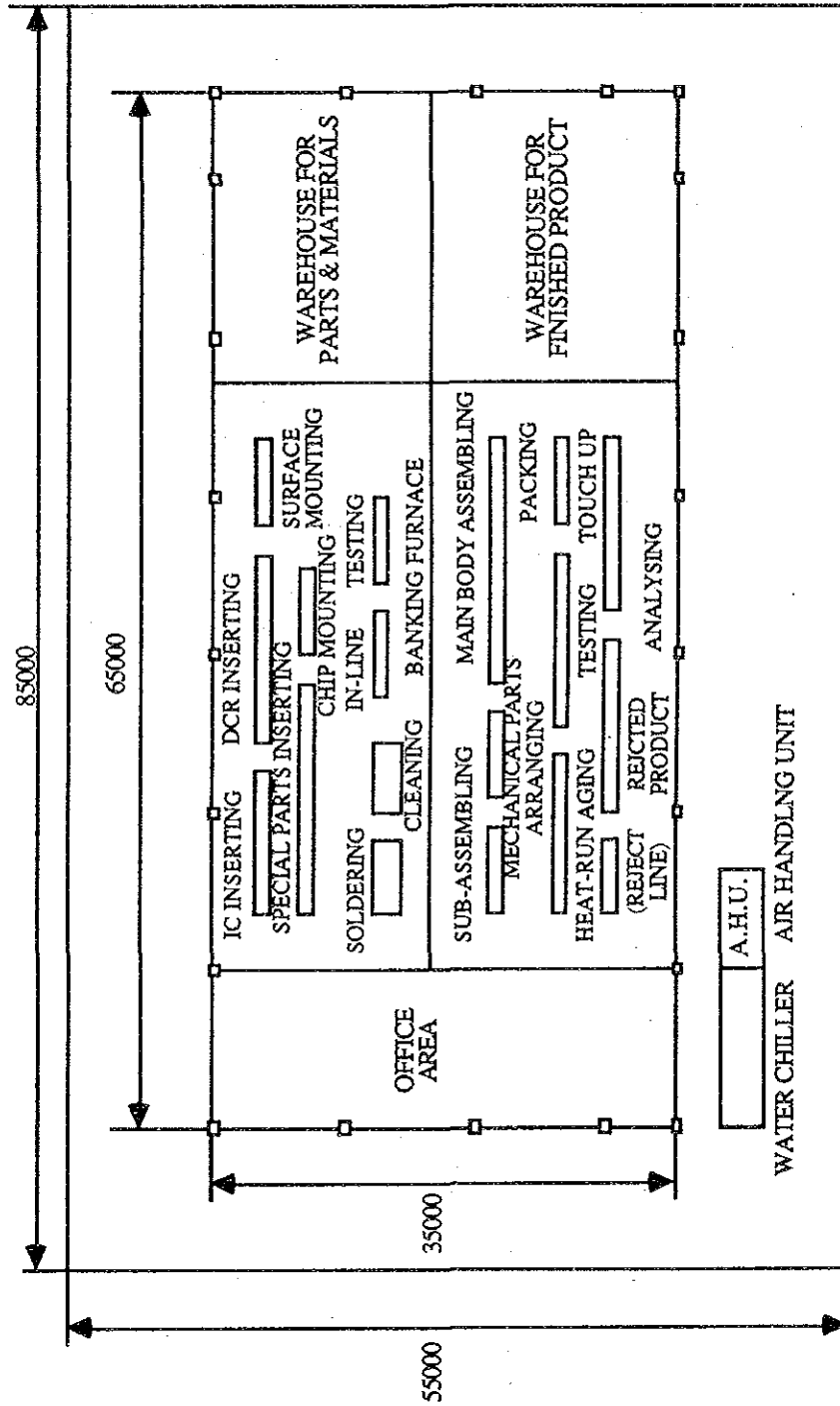
The required floor space of each factory and construction costs are outlined as follows.

Fig. IV. 6-2 Layout of the Assumed Monitor Factory



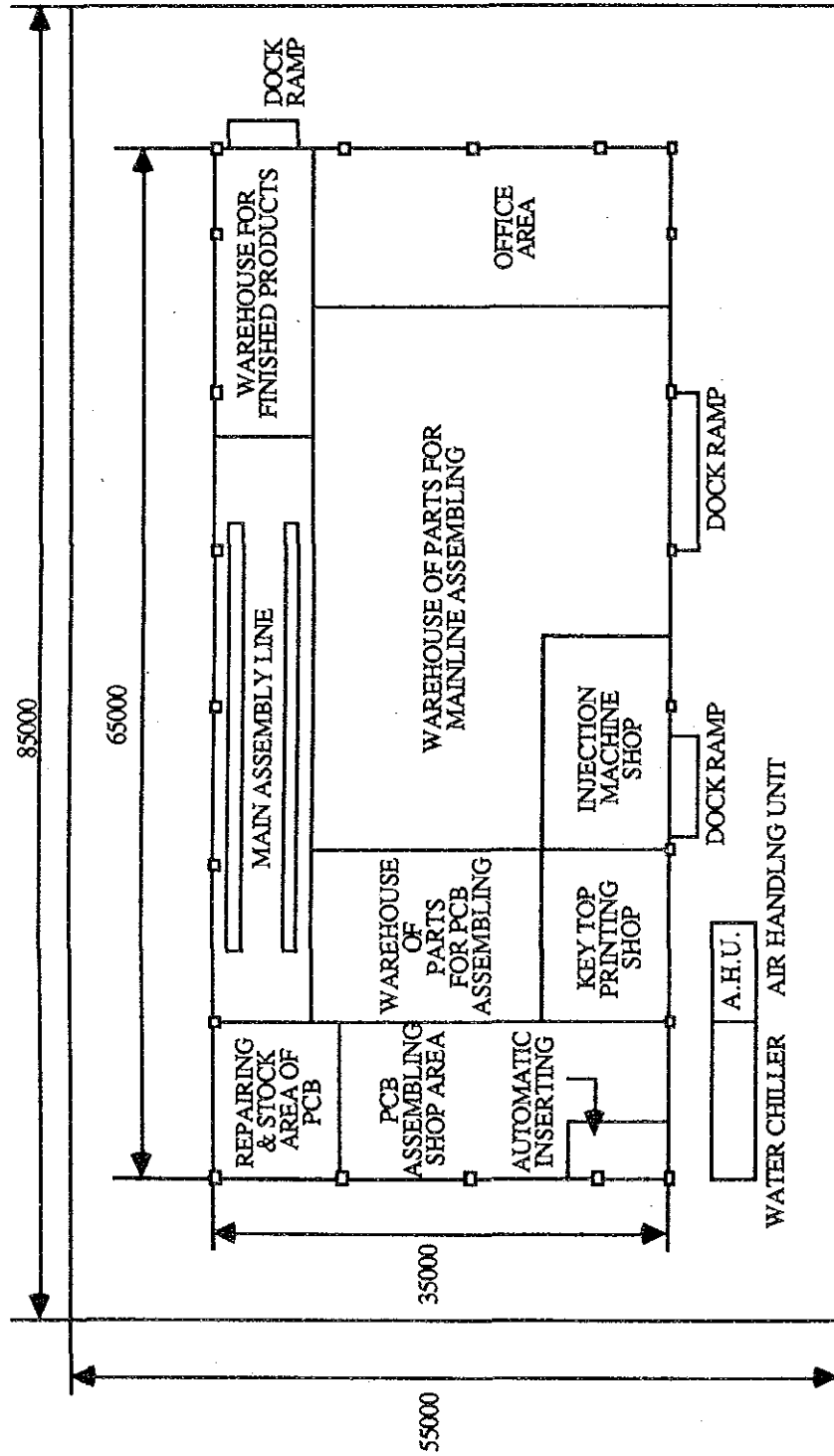
SCALE . 1:500
UNIT . mm

Fig. IV. 6-3 Layout of the Assumed Printer Factory



SCALE . 1:500
UNIT . mm

Fig. IV. 6-4 Layout of the Assumed Keyboard Factory



SCALE : 1:500
UNIT : mm

(a) Floor Space of Personal Computer Factory

| | Space |
|--------------------------|---------------------------|
| Auto-Insertion | 450m ² |
| Assembly Line | 1,200m ² |
| Parts Warehouse | 700m ² |
| Finished Goods Warehouse | 600m ² |
| Quality Control | 400m ² |
| Office, etc. | 900m ² |
| Total | 4,000m² |

(b) Floor Space of Monitor Factory

| | Space |
|--------------------------|---------------------------|
| Auto-Insertion | 300m ² |
| Assembly Line | 1,600m ² |
| Parts Warehouse | 900m ² |
| Finished Goods Warehouse | 750m ² |
| Quality Control | 150m ² |
| Office, etc. | 700m ² |
| Total | 4,400m² |

(c) Floor Space of Printer Factory

| | Space |
|--------------------------|---------------------|
| PWB Assembly | 629m ² |
| Product Assembly | 666m ² |
| Parts Warehouse | 306m ² |
| Finished Goods Warehouse | 324m ² |
| Office, etc. | 350m ² |
| Total | 2,275m ² |

(d) Floor Space of Keyboard Factory

| | Space |
|-----------------------------------|---------------------|
| PWB Assembly | 250m ² |
| Product Assembly | 280m ² |
| Key-top Printing | 100m ² |
| Plastic Moulding | 150m ² |
| Parts Warehouse(PWB Assembly) | 175m ² |
| Parts Warehouse(Product Assembly) | 795m ² |
| Finished Goods Warehouse | 160m ² |
| Quality Control | 100m ² |
| Office, etc. | 270m ² |
| Total | 2,275m ² |

(e) Factory Construction Costs

Table IV.6-10 Plant Construction Costs

Unit : M\$1,000

| | Personal Computer Factory | Monitor Factory | Printer Factory | Keyboard Factory |
|---|---------------------------------|--------------------|--------------------|---------------------|
| (1) Site works, roads, turfing, and landscaping | 432.43 | 475.68 | 252.70 | 252.70 |
| (2) Building Cost | 2,729.73 | 3,002.70 | 1,552.53 | 1,552.53 |
| (3) Air-conditioning service | 1,500.00 | 1,500.00 | 1,500.00 | 1,500.00 |
| (4) Electrical services | 1,300.00 | 1,300.00 | 1,300.00 | 1,300.00 |
| (5) Fire fighting | 100.00 | 100.00 | 100.00 | 100.00 |
| (6) Sanitary, plumbing, and water supply | 200.00 | 200.00 | 200.00 | 200.00 |
| Total | 6,262.16 | 6,578.38 | 5,282.65 | 4,905.24 |

(3) Machinery and Equipment

The procurement cost of production facilities for each factory is assumed as follows.

Table IV.6-11 Procurement Cost of Production Facilities

Unit : M\$1,000

| | Personal Computer Factory | Monitor Factory | Printer Factory | Keyboard Factory |
|---|---------------------------------|--------------------|--------------------|---------------------|
| FOB Price, Japan | 4,199.43 | 3,788.90 | 17,329.26 | 4,506.69 |
| Transportation, Insurance, and Installation Cost (FOB Price x 10%) | 419.94 | 378.89 | 1,732.93 | 405.67 |
| Spares & Consumables (FOB Price x 10%) | 419.94 | 378.89 | 1,732.93 | 405.67 |
| Expense on Experts (FOB Price x 3%) | 125.98 | 113.67 | 519.80 | 121.70 |
| Total | 5,165.30 | 4,660.35 | 21,314.98 | 4,989.72 |

As the production of printers is quite a new type of manufacture in Malaysia, the printer factory in study is assumed to procure up-to-date equipment and the equipment cost of the printer factory becomes far larger than those of the other factories.

(4) Moulds and Jigs

Investment for renewal of moulds and jigs would be made every 2 years.

Table IV.6-12 Moulds and Jigs Costs

Unit : M\$1,000

| | Personal Computer Factory | Monitor Factory | Printer Factory | Keyboard Factory |
|---|---------------------------------|--------------------|--------------------|---------------------|
| Investment in Moulds and Jigs Every 2 Years | 725.01 | 611.08 | 10,357.34 | 1,575.14 |

(5) Office Equipment, Vehicles, and Others

The cost of equipment besides production equipment such as office equipment, vehicles, etc., is estimated as follows.

Table IV.6-13 Office Equipment, Vehicles, and Others Costs

Unit : M\$1,000

| | Personal Computer Factory | Monitor Factory | Printer Factory | Keyboard Factory |
|--|---------------------------------|--------------------|--------------------|---------------------|
| Office Equipment, Vehicles, and Others | 400.0 | 400.0 | 400.0 | 400.0 |

(6) Depreciation

The following depreciation methods are adopted for the calculation of depreciation expenses.

Depreciation Method

| | |
|-------------------------------|-------------------------------------|
| Building | 35 Years Straight Line Depreciation |
| Auxiliary Facilities | 15 Years Straight Line Depreciation |
| Production Facilities | 10 Years Straight Line Depreciation |
| Moulds and Jigs | 2 Years Straight Line Depreciation |
| Office Equipment and Vehicles | 5 Years Straight Line Depreciation |

The annual depreciation expenses can be calculated as follows based on the above mentioned depreciation methods.

Table IV.6-14 Depreciation Expenses for the First Year

Unit : M\$1,000

| | Personal Computer Factory | Monitor Factory | Printer Factory | Keyboard Factory |
|--------------------------------------|---------------------------------|--------------------|--------------------|---------------------|
| <i>Building</i> | 77.99 | 85.79 | 44.36 | 44.36 |
| <i>Auxiliary Facilities</i> | 206.67 | 206.67 | 206.67 | 206.67 |
| <i>Production Facilities</i> | 516.53 | 516.53 | 516.53 | 516.53 |
| <i>Moulds and Jigs</i> | 362.51 | 305.54 | 5,178.67 | 787.57 |
| <i>Office Equipment and Vehicles</i> | 80.00 | 80.00 | 80.00 | 80.00 |
| Total | 1,243.70 | 1,144.03 | 7,561.19 | 1,617.57 |

IV-6-6. Materials Purchase Programme

According to the results of the survey on the availability of parts in Malaysia, parts and materials procurement programme by source of suppliers: Malaysia; neighbouring Asian countries/areas such as Taiwan and Singapore; and Japan was made for each factory. These material purchase programmes are based on the assumption that investment by foreign parts suppliers in Malaysia and its neighbouring countries and the development of supporting industries in this area would continue to advance steadily in the future.

Material costs per unit are estimated as follows.

Table IV.6-15 Unit Material Cost

| | Unit: M\$ | |
|----------------------------------|-------------------|-------------------|
| | 1st Year | 10th Year |
| Personal Computer Model 1 | | |
| Model 1 | 2,065.92 (100.0%) | 1,892.07 (100.0%) |
| Materials/Malaysia | 256.38 (12.4%) | 1,046.24 (55.3%) |
| Materials/Other Asia | 1,239.83 (60.0%) | 682.07 (36.0%) |
| Materials/Japan | 569.71 (27.6%) | 163.76 (8.7%) |
| Model 2 | 1,481.82 (100.0%) | 1,324.19 (100.0%) |
| Materials/Malaysia | 256.38 (17.3%) | 770.41 (58.2%) |
| Materials/Other Asia | 655.73 (44.3%) | 390.02 (29.5%) |
| Materials/Japan | 569.71 (38.4%) | 163.76 (12.4%) |
| Monitor | 490.72 (100.0%) | 458.38 (100.0%) |
| Materials/Malaysia | 101.35 (20.7%) | 273.08 (59.6%) |
| Materials/Other Asia | 196.76 (40.1%) | 170.57 (37.2%) |
| Materials/Japan | 192.61 (39.3%) | 14.73 (3.2%) |
| Printer | 363.42 (100.0%) | 458.38 (100.0%) |
| Materials/Malaysia | 70.75 (19.5%) | 108.19 (32.3%) |
| Materials/Other Asia | 57.27 (15.8%) | 99.54 (29.8%) |
| Materials/Japan | 235.40 (64.8%) | 126.80 (37.9%) |
| Keyboard | 72.22 (100.0%) | 66.40 (100.0%) |
| Materials/Malaysia | 39.75 (55.0%) | 63.15 (95.1%) |
| Materials/Other Asia | 0.00 (0.0%) | 0.00 (0.0%) |
| Materials/Japan | 32.47 (45.0%) | 3.24 (4.9%) |

Annual material costs are calculated as follows according to the unit material costs and the production programmes.

Table IV.6-16 Material Costs Estimates

Unit : M\$1,000

| | Personal Computer Factory | Monitor Factory | Printer Factory | Keyboard Factory |
|-----------|---------------------------------|--------------------|--------------------|---------------------|
| 1st Year | 178,806 | 90,685 | 45,791 | 12,133 |
| 2nd Year | 202,228 | 102,881 | 51,870 | 13,742 |
| 3rd Year | 237,627 | 121,269 | 61,047 | 16,171 |
| 4th Year | 247,482 | 126,703 | 63,682 | 16,867 |
| 5th Year | 244,830 | 125,755 | 63,104 | 16,711 |
| 6th Year | 242,178 | 124,806 | 62,526 | 16,556 |
| 7th Year | 239,526 | 123,857 | 61,948 | 16,401 |
| 8th Year | 236,875 | 122,909 | 61,371 | 16,246 |
| 9th Year | 234,223 | 121,960 | 60,793 | 16,090 |
| 10th Year | 231,571 | 121,011 | 60,215 | 15,935 |

IV-6-7. Expenses for Indirect Material, Utilities, Other Indirect Expenses, and Administration Expense

(1) Indirect Material Expense

Considering the examples of factories in Japan and the price level of Malaysia, expenses for indirect materials are estimated as follows.

| | |
|---------------------------|--------------------------|
| Personal Computer Factory | 0.60% of production cost |
| Monitor Factory | 0.60% of production cost |
| Printer Factory | 0.55% of production cost |
| Keyboard Factory | 0.56% of production cost |

(2) Other indirect expenses

| | |
|---------------------------|-------------------------|
| Personal Computer Factory | 2.5% of production cost |
| Monitor Factory | 2.5% of production cost |
| Printer Factory | 2.5% of production cost |
| Keyboard Factory | 3.3% of production cost |

(3) Administration expense

Considering the examples of factories in Japan and the price level of Malaysia, administration expenses are estimated as follows.

| | |
|---------------------------|----------------|
| Personal Computer Factory | 0.53% of sales |
| Monitor Factory | 1.01% of sales |
| Printer Factory | 1.63% of sales |
| Keyboard Factory | 4.50% of sales |

IV-6-8. Personnel Programme

(1) Assumptions of personnel planning

The following assumptions of factory operation were set in order to estimate the number of personnel necessary for the operation of the assumed plants.

Assumptions of Factory Operation

| | |
|-----------------------|--|
| Yearly Working Days | 250 days/year |
| Working Hours | 8 hours/day |
| Interval | 60 minutes/day |
| Work Attendance Ratio | 95% |
| Work Shift | 3 shifts for automated work and aging process 1 shift for other work |

(2) Personnel and Personnel Expense

The number of personnel necessary for the operation of each assumed factory was surveyed by type of work. Personnel unit costs including fringe benefits and bonus were estimated based on statistical data and the results of field interviews in Malaysia.

Personnel unit costs were assumed to increase by 8% every 2 years.

The number of necessary personnel, personnel unit cost, and annual personnel expense calculated according to the above data are shown in Table IV.6-17 to Table IV.6-20.

The annual personnel expenses shown above were calculated on the assumption that the factory operating ratios would be 100%. However, direct labour costs for the first 3 years were downwardly adjusted to assumed operating ratios of 70% in the first year, 80% in the second year and 95% in the third year of operation. And those downwardly adjusted direct labour costs are reflected in the calculation of factory feasibility.

Table IV.6-17 Annual Personnel Cost of Personal Computer Factory*

| Section & Type of Personnel | Number | Unit Monthly Cost(1st Year) (M\$/Year) | Annual Cost for 1st Year (M\$ Thousand) | Annual Cost for 10th Year (M\$ Thousand) |
|--|------------|--|---|--|
| Direct Production | | | | |
| Un-skilled Worker | 54 | 3,990 | 215.5 | 293.1 |
| Skilled Worker | 26 | 4,550 | 118.3 | 160.9 |
| Supervisor | 5 | 10,400 | 52.0 | 70.7 |
| Japanese Engineer | 1 | 180,000 | 180.0 | 244.9 |
| Sub-total | 86 | — | 565.8 | 769.7 |
| Production Support (Technology, Production Management, Quality Control, Purchase, etc.) | | | | |
| Clerk | 9 | 4,940 | 44.5 | 60.5 |
| Staff Worker | 9 | 5,850 | 52.7 | 71.6 |
| Technician | 6 | 7,540 | 45.2 | 61.5 |
| Supervisor | 2 | 10,400 | 20.8 | 28.3 |
| Engineer | 4 | 15,600 | 62.4 | 84.9 |
| Japanese Engineer | 1 | 180,000 | 180.0 | 244.9 |
| Sub-total | 31 | — | 405.6 | 551.7 |
| Administration | | | | |
| Clerk | 6 | 4,940 | 29.6 | 40.3 |
| Staff Worker | 5 | 5,850 | 29.3 | 39.8 |
| Manager | 1 | 32,500 | 32.5 | 44.2 |
| Japanese Manager | 1 | 225,000 | 225.0 | 306.1 |
| Sub-total | 13 | — | 316.4 | 430.4 |
| Total | 130 | — | 1,287.7 | 1,751.9 |

* The factory operating ratio is assumed to be 100%.

Table IV.6-18 Annual Personnel Cost of Monitor Factory*

| Section & Type of Personnel | Number | Unit Monthly Cost(1st Year) (M\$/Year) | Annual Cost for 1st Year (M\$ Thousand) | Annual Cost for 10th Year (M\$ Thousand) |
|--|------------|--|---|--|
| Direct Production | | | | |
| Un-skilled Worker | 98 | 3,990 | 391.02 | 531.98 |
| Skilled Worker | 49 | 4,550 | 222.95 | 303.32 |
| Supervisor | 8 | 10,400 | 82.20 | 113.19 |
| Japanese Engineer | 1 | 180,000 | 180.00 | 244.89 |
| Sub-total | 156 | — | 877.17 | 1,193.38 |
| Production Support (Technology, Production Management, Quality Control, Purchase, etc.) | | | | |
| Clerk | 9 | 4,940 | 44.46 | 60.49 |
| Staff Worker | 9 | 5,850 | 52.65 | 71.63 |
| Technician | 6 | 7,540 | 45.24 | 61.55 |
| Supervisor | 2 | 10,400 | 20.80 | 28.30 |
| Engineer | 4 | 15,600 | 62.40 | 84.89 |
| Japanese Engineer | 1 | 180,000 | 180.00 | 244.89 |
| Sub-total | 31 | — | 405.55 | 551.75 |
| Administration | | | | |
| Clerk | 6 | 4,940 | 29.64 | 40.32 |
| Staff Worker | 5 | 5,850 | 29.25 | 39.79 |
| Manager | 1 | 32,500 | 32.50 | 44.22 |
| Japanese Manager | 1 | 225,000 | 225.00 | 306.11 |
| Sub-total | 13 | — | — | — |
| Total | 200 | — | 1,599.11 | 2,175.57 |

* The factory operating ratio is assumed to be 100%.

Table IV.6-19 Annual Personnel Cost of Printer Factory*

| Section & Type of Personnel | Number | Unit Monthly Cost(1st Year) (M\$/Year) | Annual Cost for 1st Year (M\$ Thousand) | Annual Cost for 10th Year (M\$ Thousand) |
|--|------------|--|---|--|
| Direct Production | | | | |
| Un-skilled Worker | 70 | 3,990 | 279.30 | 379.98 |
| Skilled Worker | 35 | 4,550 | 159.25 | 216.66 |
| Sub-total | 105 | — | 438.55 | 596.64 |
| Production Support (Technology, Production Management, Quality Control, Purchase, etc.) | | | | |
| Clerk | 4 | 4,940 | 19.76 | 26.88 |
| Staff Worker | 3 | 5,850 | 17.55 | 23.88 |
| Technician | 3 | 7,540 | 22.62 | 30.77 |
| Supervisor | 8 | 10,400 | 83.20 | 113.19 |
| Engineer | 4 | 15,600 | 62.40 | 84.89 |
| Manager | 1 | 32,500 | 32.50 | 44.22 |
| Japanese Engineer | 1 | 180,000 | 180.00 | 244.89 |
| Sub-total | 24 | — | — | — |
| Administration | | | | |
| Clerk | 6 | 4,940 | 29.64 | 40.32 |
| Staff Worker | 1 | 5,850 | 5.85 | 7.96 |
| Supervisor | 2 | 15,600 | 31.20 | 42.89 |
| Japanese Staff | 1 | 180,000 | 180.00 | 244.89 |
| Japanese Manager | 1 | 225,000 | 225.00 | 306.11 |
| Sub-total | 11 | — | 471.69 | 641.73 |
| Total | 140 | — | 1,328.27 | 1,807.10 |

* The factory operating ratio is assumed to be 100%.

Table IV.6-20 Annual Personnel Cost of Keyboard Factory*

| Section & Type of Personnel | Number | Unit Monthly Cost(1st Year) (M\$/Year) | Annual Cost for 1st Year (M\$ Thousand) | Annual Cost for 10th Year (M\$ Thousand) |
|--|------------|--|---|--|
| Direct Production | | | | |
| Un-skilled Worker | 123 | 3,900 | 479.70 | 652.63 |
| Skilled Worker | 23 | 4,550 | 104.65 | 142.38 |
| Sub-total | 146 | — | 584.35 | 795.00 |
| Production Support (Technology, Production Management, Quality Control, Purchase, etc.) | | | | |
| Clerk | 5 | 4,940 | 24.70 | 33.60 |
| Staff Worker | 6 | 5,850 | 35.10 | 47.75 |
| Technician | 4 | 10,400 | 30.16 | 41.03 |
| Supervisor | 4 | 15,600 | 41.60 | 56.60 |
| Manager | 1 | 32,500 | 32.50 | 44.22 |
| Japanese Engineer | 1 | 180,000 | 180.00 | 244.89 |
| Japanese Staff | 1 | 180,000 | 180.00 | 244.89 |
| Sub-total | 22 | — | 524.06 | 712.98 |
| Administration | | | | |
| Clerk | 2 | 4,940 | 9.88 | 13.44 |
| Staff Worker | 1 | 5,850 | 5.85 | 7.96 |
| Supervisor | 1 | 15,600 | 15.60 | 21.22 |
| Manager | 1 | 32,500 | 32.50 | 44.22 |
| Japanese Manager | 1 | 225,000 | 225.00 | 306.11 |
| Sub-total | 6 | — | 288.83 | 392.95 |
| Total | 174 | — | 1,397.24 | 1,900.93 |

* The factory operating ratio is assumed to be 100%.

IV-6-9. Calculation of Investment

(1) Initial Investment

1) Initial Fixed Investment

Based on the necessary investment costs mentioned, initial fixed investment for each factory is assumed to be as follows.

Table IV.6-21 Initial Fixed Investment Costs

Unit : M\$ 1,000

| | Personal Computer Factory | Monitor Factory | Printer Factory | Keyboard Factory |
|-------------------------------------|---------------------------------|--------------------|--------------------|---------------------|
| Land | 645.8 | 710.4 | 377.4 | 377.4 |
| Factory Construction | 6,262.2 | 6,578.4 | 4,905.2 | 4,905.2 |
| Machinery and Equipment | 5,165.3 | 4,660.4 | 21,315.0 | 4,989.7 |
| Moulds and Jigs | 725.0 | 611.1 | 10,375.3 | 1,575.1 |
| Office equipment, vehicles, etc. | 400.0 | 400.0 | 400.00 | 400.00 |
| Total | 13,198.3 | 12,960.2 | 37,355.0 | 12,247.5 |

2) Organization Expenses

Organization expenses occurring as regards the foundation are estimated at 3% of initial fixed investment.

3) Contingency Cost

The amount of 5% of initial fixed investment is assumed as contingency cost.

(2) Working Capital

Working capital is assumed to be two thirds of monthly sales.

IV-6-10. Financing Programme

Approximately one third of the initial investment and working capital for the first operation year is assumed to be procured from paid-up capital and the remaining two thirds from long-term borrowing.

Necessary funds after the start of operation are to be financed by short-term borrowing from financial institutions.

Interest rates of both long-term and short-term borrowings are assumed to be 9% per annum.

Initial Investment Financing Programme

| | Amount(M\$ Thousand) | Conditions |
|----------------------------------|----------------------|---|
| Personal Computer Factory | | |
| Paid-up Capital | 8,200 | |
| Long-term Borrowing | 16,200 | 10 years average repayment Interest rate 9% |
| Monitor Factory | | |
| Paid-up Capital | 6,500 | |
| Long-term Borrowing | 12,900 | 10 years average repayment Interest rate 9% |
| Printer Factory | | |
| Paid-up Capital | 14,500 | |
| Long-term Borrowing | 28,900 | 10 years average repayment Interest rate 9% |
| Keyboard Factory | | |
| Paid-up Capital | 4,900 | |
| Long-term Borrowing | 9,700 | 10 years average repayment Interest rate 9% |

IV-6-11. Results of Financial Analysis

Projection of long-term profit and loss for each plant based on the estimated sales and costs was calculated. The profit and loss projection are shown in Table IV.6-22 to Table IV.6-25.

Financing schedule, based on financing and borrowing conditions of the financing programme, is shown in Table IV.6-26 to Table IV.6-29.

The results of financial analysis can be summarised as follows.

Table IV.6-30 Outline of Results of Financial Analysis

| | Personal Computer Factory | Monitor Factory | Printer Factory | Keyboard Factory |
|---|---------------------------------|----------------------------|----------------------------|----------------------------|
| Total initial investment (M\$ thousand) | 14,254 | 13,997 | 40,343 | 13,227 |
| Annual sales (10th Year) (M\$ thousand) | 260,471 | 136,935 | 78,529 | 22,824 |
| Annual sales/total initial investment (10th Year) (Times) | 18.3 | 9.8 | 1.9 | 1.7 |
| Net operating profit | From 4th year of operation | From 3rd year of operation | From 3rd year of operation | From 2nd year of operation |
| Operating profit ratio (10th Year) (%) | 6.4 | 5.2 | 6.9 | 7.0 |
| Year when accumulated losses are wiped out | 8th year | 5th year | 7th year | 5th year |

Table IV. 6-22 Long-Term Flow of Profit and Loss Projection of Assumed Personal Computer Factory

(Unit: M\$ Thousand)

| | 1st Year | 2nd Year | 3rd Year | 4th Year | 5th Year | 6th Year | 7th Year | 8th Year | 9th Year | 10th Year |
|-------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Sales | 182,329 | 208,376 | 247,447 | 260,471 | 260,471 | 260,471 | 260,471 | 260,471 | 260,471 | 260,471 |
| Direct Material Cost | 178,806 | 202,228 | 237,627 | 247,482 | 244,830 | 242,178 | 239,526 | 236,875 | 234,223 | 231,571 |
| Indirect Material Cost | 1,119 | 1,264 | 1,485 | 1,546 | 1,530 | 1,514 | 1,499 | 1,482 | 1,466 | 1,450 |
| Direct Labour Cost | 396 | 453 | 580 | 611 | 660 | 660 | 713 | 713 | 770 | 770 |
| Indirect Labour Cost | 406 | 406 | 438 | 438 | 473 | 473 | 511 | 511 | 552 | 552 |
| Expenses Depreciation Expense | 1,117 | 1,117 | 1,117 | 1,117 | 1,117 | 1,268 | 1,268 | 1,268 | 1,268 | 1,268 |
| Others | 4,663 | 5,268 | 6,186 | 6,441 | 6,375 | 6,375 | 6,375 | 6,375 | 6,375 | 6,375 |
| Manufacturing Cost | 186,506 | 210,736 | 247,433 | 257,635 | 254,985 | 252,468 | 249,891 | 247,223 | 244,653 | 241,985 |
| Gross Margin | -4,177 | -2,360 | 14 | 2,836 | 5,486 | 8,002 | 10,579 | 13,248 | 15,817 | 18,486 |
| Labour Cost | 316 | 316 | 342 | 342 | 369 | 369 | 399 | 399 | 430 | 430 |
| Expenses Depreciation Expense | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 |
| Others | 966 | 1,104 | 1,311 | 1,380 | 1,380 | 1,380 | 1,380 | 1,380 | 1,380 | 1,380 |
| Administration Expenses | 1,409 | 1,547 | 1,779 | 1,848 | 1,876 | 1,876 | 1,905 | 1,905 | 1,937 | 1,937 |
| Operating Profit | -5,586 | -3,907 | -1,765 | 987 | 3,610 | 6,127 | 8,674 | 11,342 | 13,880 | 16,548 |
| Non-Operating Expenses | 1,385 | 1,307 | 1,517 | 1,740 | 1,639 | 1,331 | 785 | 219 | 0 | 0 |
| Net Profit | -6,971 | -5,214 | -3,282 | -752 | 1,971 | 4,796 | 7,889 | 11,124 | 13,880 | 16,548 |

Table IV. 6-23 Long-Term Flow of Profit and Loss Projection of Assumed Monitor Factory

(Unit: M\$ Thousand)

| | 1st Year | 2nd Year | 3rd Year | 4th Year | 5th Year | 6th Year | 7th Year | 8th Year | 9th Year | 10th Year |
|-------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Sales | 95,854 | 109,548 | 130,088 | 136,935 | 136,935 | 136,935 | 136,935 | 136,935 | 136,935 | 136,935 |
| Direct Material Cost | 90,685 | 102,881 | 121,269 | 126,703 | 125,755 | 124,806 | 123,857 | 122,909 | 121,960 | 121,011 |
| Indirect Material Cost | 574 | 680 | 766 | 800 | 794 | 789 | 783 | 778 | 772 | 767 |
| Direct Labour Cost | 614 | 702 | 900 | 947 | 1,023 | 1,023 | 1,105 | 1,105 | 1,193 | 1,193 |
| Indirect Labour Cost | 406 | 406 | 438 | 438 | 473 | 473 | 511 | 511 | 552 | 552 |
| Expenses Depreciation | 1,044 | 1,044 | 1,044 | 1,044 | 1,044 | 1,044 | 1,044 | 1,044 | 1,044 | 1,044 |
| Others | 2,393 | 2,710 | 3,190 | 3,332 | 3,310 | 3,310 | 3,310 | 3,310 | 3,310 | 3,310 |
| Manufacturing Cost | 95,715 | 108,392 | 127,607 | 133,264 | 132,399 | 131,445 | 130,611 | 129,656 | 128,832 | 127,877 |
| Gross Margin | 139 | 1,156 | 2,481 | 3,671 | 4,536 | 5,490 | 6,324 | 7,279 | 8,103 | 9,058 |
| Labour Cost | 316 | 316 | 342 | 342 | 369 | 369 | 399 | 399 | 430 | 430 |
| Expenses Depreciation | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Others | 970 | 1,109 | 1,317 | 1,386 | 1,386 | 1,386 | 1,386 | 1,386 | 1,386 | 1,386 |
| Administration Expenses | 1,387 | 1,525 | 1,759 | 1,828 | 1,855 | 1,855 | 1,885 | 1,885 | 1,917 | 1,917 |
| Operating Profit | -1,248 | -369 | 722 | 1,843 | 2,680 | 3,635 | 4,440 | 5,394 | 6,187 | 7,141 |
| Non-Operating Expenses | 1,103 | 987 | 871 | 406 | 0 | 0 | 0 | 0 | 0 | 0 |
| Net Profit | -2,351 | -1,356 | -148 | 1,437 | 2,680 | 3,635 | 4,440 | 5,394 | 6,187 | 7,141 |

Table IV. 6-24 Long-Term Flow of Profit and Loss Projection of Assumed Printer Factory

(Unit: M\$ Thousand)

| | 1st Year | 2nd Year | 3rd Year | 4th Year | 5th Year | 6th Year | 7th Year | 8th Year | 9th Year | 10th Year |
|-------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Sales | 54,971 | 62,824 | 74,603 | 78,529 | 78,529 | 78,529 | 78,529 | 78,529 | 78,529 | 78,529 |
| Direct Material Cost | 45,791 | 51,870 | 61,047 | 63,682 | 63,104 | 62,526 | 61,948 | 61,371 | 60,793 | 60,215 |
| Indirect Material Cost | 307 | 341 | 394 | 409 | 406 | 403 | 400 | 397 | 394 | 391 |
| Direct Labour Cost | 307 | 351 | 450 | 474 | 512 | 512 | 552 | 552 | 597 | 597 |
| Indirect Labour Cost | 418 | 418 | 451 | 451 | 488 | 488 | 527 | 527 | 569 | 569 |
| Expenses Depreciation Expense | 7,523 | 7,523 | 7,523 | 7,523 | 7,523 | 7,523 | 7,523 | 7,523 | 7,523 | 7,523 |
| Others | 1,393 | 1,551 | 1,791 | 1,860 | 1,847 | 1,832 | 1,819 | 1,804 | 1,792 | 1,777 |
| Manufacturing Cost | 55,739 | 62,054 | 71,656 | 74,399 | 73,879 | 73,283 | 72,770 | 72,173 | 71,666 | 71,070 |
| Gross Margin | -768 | 769 | 2,946 | 4,131 | 4,650 | 5,246 | 5,760 | 6,356 | 6,863 | 7,459 |
| Labour Cost | 472 | 472 | 509 | 509 | 550 | 550 | 594 | 594 | 642 | 642 |
| Expenses Depreciation Expense | 119 | 119 | 119 | 119 | 119 | 119 | 119 | 119 | 119 | 119 |
| Others | 896 | 1,024 | 1,216 | 1,280 | 1,280 | 1,280 | 1,280 | 1,280 | 1,280 | 1,280 |
| Administration Expenses | 1,486 | 1,614 | 1,844 | 1,908 | 1,949 | 1,949 | 1,993 | 1,993 | 2,040 | 2,040 |
| Operating Profit | -2,254 | -845 | 1,102 | 2,222 | 2,701 | 3,297 | 3,767 | 4,363 | 4,823 | 5,419 |
| Non-Operating Expenses | 2,471 | 2,211 | 1,951 | 910 | 0 | 0 | 0 | 0 | 0 | 0 |
| Net Profit | -4,725 | -3,056 | -848 | 1,312 | 2,701 | 3,297 | 3,767 | 4,363 | 4,823 | 5,419 |

Table IV. 6-25 Long-Term Flow of Profit and Loss Projection of Assumed Keyboard Factory

(Unit: MS Thousand)

| | 1st Year | 2nd Year | 3rd Year | 4th Year | 5th Year | 6th Year | 7th Year | 8th Year | 9th Year | 10th Year |
|-------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Sales | 15,977 | 18,259 | 21,683 | 22,824 | 22,824 | 22,824 | 22,824 | 22,824 | 22,824 | 22,824 |
| Direct Material Cost | 12,133 | 13,742 | 16,171 | 16,867 | 16,711 | 16,556 | 16,401 | 16,246 | 16,090 | 15,935 |
| Indirect Material Cost | 85 | 98 | 116 | 122 | 122 | 122 | 122 | 122 | 122 | 122 |
| Direct Labour Cost | 409 | 467 | 600 | 631 | 682 | 682 | 736 | 736 | 795 | 795 |
| Indirect Labour Cost | 524 | 524 | 566 | 566 | 611 | 611 | 660 | 660 | 713 | 713 |
| Expenses Depreciation Expense | 1,443 | 1,443 | 1,443 | 1,443 | 1,443 | 1,443 | 1,443 | 1,443 | 1,443 | 1,443 |
| Others | 502 | 593 | 679 | 705 | 704 | 700 | 699 | 695 | 694 | 690 |
| Manufacturing Cost | 15,096 | 16,867 | 19,575 | 20,334 | 20,273 | 20,114 | 20,061 | 19,902 | 19,858 | 19,698 |
| Gross Margin | 880 | 1,392 | 2,108 | 2,490 | 2,551 | 2,710 | 2,763 | 2,922 | 2,966 | 3,125 |
| Labour Cost | 289 | 289 | 312 | 312 | 337 | 337 | 364 | 364 | 393 | 393 |
| Expenses Depreciation Expense | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 |
| Others | 719 | 822 | 976 | 1,027 | 1,027 | 1,027 | 1,027 | 1,027 | 1,027 | 1,027 |
| Administration Expenses | 1,118 | 1,220 | 1,397 | 1,449 | 1,474 | 1,474 | 1,501 | 1,501 | 1,530 | 1,530 |
| Operating Profit | -237 | 172 | 710 | 1,041 | 1,077 | 1,236 | 1,262 | 1,421 | 1,436 | 1,596 |
| Non-Operating Expenses | 829 | 742 | 655 | 306 | 0 | 0 | 0 | 0 | 0 | 0 |
| Net Profit | -1,067 | -570 | 50 | 736 | 1,077 | 1,236 | 1,262 | 1,421 | 1,436 | 1,596 |

Table IV. 6-26 Cash Flow Estimate of Assumed Personal Computer Factory

(Unit: M\$ Thousand)

| | Before Operation | 1st Year | 2nd Year | 3rd Year | 4th Year | 5th Year | 6th Year | 7th Year | 8th Year | 9th Year | 10th Year |
|--|---------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Carry-Over from Previous Year | 0 | 10,146 | 2,815 | 92 | 31 | 10 | 90 | 43 | 924 | 9,506 | 33,561 |
| Capital Payment | 8,200 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sales Revenue | 0 | 182,329 | 208,376 | 247,447 | 260,471 | 260,471 | 260,471 | 260,471 | 260,471 | 260,471 | 260,471 |
| Manufacturing Cost | 0 | 186,506 | 210,736 | 247,433 | 257,635 | 254,985 | 252,468 | 249,891 | 247,223 | 244,653 | 241,985 |
| Administration Expenses | 0 | 1,409 | 1,547 | 1,779 | 1,848 | 1,876 | 1,876 | 1,905 | 1,905 | 1,937 | 1,937 |
| Expenses | 0 | 187,915 | 212,284 | 249,212 | 259,483 | 256,860 | 254,344 | 251,796 | 249,128 | 246,590 | 243,922 |
| Operating Balance | 0 | -5,586 | -3,907 | -1,765 | 987 | 3,610 | 6,127 | 8,674 | 11,342 | 13,880 | 16,548 |
| Corporate Tax Payment | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Working Capital at the Beginning of Year | 0 | 0 | 10,129 | 11,576 | 13,747 | 14,471 | 14,471 | 14,471 | 14,471 | 14,471 | 14,471 |
| Working Capital at the End of Year | 0 | 10,129 | 11,576 | 13,747 | 14,471 | 14,471 | 14,471 | 14,471 | 14,471 | 14,471 | 14,471 |
| Working Capital Balance | 0 | -10,129 | -1,447 | -2,171 | -724 | 0 | 0 | 0 | 0 | 0 | 0 |
| Fixed Investment | 14,254 | 0 | 0 | 725 | 0 | 725 | 1,907 | 725 | 0 | 725 | 0 |
| Depreciation | 0 | 1,244 | 1,244 | 1,244 | 1,244 | 1,244 | 1,394 | 1,394 | 1,394 | 1,394 | 1,394 |
| Fixed Investment Balance | -14,254 | 1,244 | 1,244 | 519 | 1,244 | 519 | -512 | 669 | 1,394 | 669 | 1,394 |
| Long-term Borrowing | 16,200 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Principal Repayment | 0 | 1,620 | 1,620 | 1,620 | 1,620 | 1,620 | 1,620 | 1,620 | 4,860 | 0 | 0 |
| Interest | 0 | 1,385 | 1,239 | 1,094 | 948 | 802 | 656 | 510 | 219 | 0 | 0 |
| (Amount Borrowed) | 16,200 | 14,580 | 12,960 | 11,340 | 9,720 | 8,100 | 6,480 | 4,860 | 0 | 0 | 0 |
| Long-term Borrowing Balance | 16,200 | -3,005 | -2,859 | -2,714 | -2,568 | -2,422 | -2,276 | -2,130 | -5,079 | 0 | 0 |
| Short-term Borrowing | 0 | 0 | 1,500 | 7,900 | 9,700 | 8,900 | 6,100 | 0 | 0 | 0 | 0 |
| Principal Repayment | 0 | 0 | 0 | 1,500 | 7,900 | 9,700 | 8,900 | 6,100 | 0 | 0 | 0 |

| | | | | | | | | | | | |
|--------------------------|--------|--------|--------|-------|--------|--------|--------|--------|--------|--------|--------|
| Interest | 0 | 0 | 68 | 423 | 792 | 837 | 675 | 275 | 0 | 0 | 0 |
| (Amount Borrowed) | 0 | 0 | 0 | 1,500 | 7,900 | 9,700 | 8,900 | 6,100 | 0 | 0 | 0 |
| Balance | 0 | 0 | 1,433 | 5,977 | 1,008 | -1,637 | -3,475 | -6,375 | 0 | 0 | 0 |
| Financing Balance | 16,200 | -3,005 | -1,427 | 3,264 | -1,560 | -4,059 | -5,751 | -8,505 | -5,079 | 0 | 0 |
| Total Balance | 10,146 | -7,931 | -2,722 | -61 | -21 | 80 | -47 | 881 | 8,582 | 24,055 | 51,504 |
| Carry-Over for Next Year | 10,146 | 2,815 | 92 | 31 | 10 | 90 | 43 | 924 | 9,506 | 33,561 | 85,065 |

Table IV. 6-27 Cash Flow Estimate of Assumed Monitor Factory

(Unit: M\$ Thousand)

| | 1st Year | 2nd Year | 3rd Year | 4th Year | 5th Year | 6th Year | 7th Year | 8th Year | 9th Year | 10th Year |
|--|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Carry-Over from Previous Year | 0 | 5,403 | 2,984 | 3,705 | 5,364 | 11,009 | 26,398 | 57,768 | 122,075 | 250,870 |
| Capital Payment | 6,500 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sales Revenue | 0 | 95,854 | 109,548 | 130,088 | 136,935 | 136,935 | 136,935 | 136,935 | 136,935 | 136,935 |
| Manufacturing Cost | 0 | 95,715 | 108,292 | 127,607 | 133,264 | 131,445 | 130,611 | 129,656 | 128,892 | 127,877 |
| Administration Expenses | 0 | 1,387 | 1,525 | 1,759 | 1,828 | 1,855 | 1,885 | 1,885 | 1,917 | 1,917 |
| Expenses | 0 | 97,102 | 109,917 | 129,366 | 135,092 | 133,300 | 132,495 | 131,541 | 130,748 | 129,794 |
| Operating Balance | 0 | -1,248 | -369 | 722 | 1,843 | 3,635 | 4,440 | 5,394 | 6,187 | 7,141 |
| Corporate Tax Payment | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Working Capital at the Beginning of Year | 0 | 0 | 5,325 | 6,086 | 7,227 | 7,607 | 7,607 | 7,607 | 7,607 | 7,607 |
| Working Capital at the End of Year | 0 | 5,325 | 6,086 | 7,227 | 7,607 | 7,607 | 7,607 | 7,607 | 7,607 | 7,607 |
| Working Capital Balance | 0 | -5,325 | -761 | -1,141 | -380 | 0 | 0 | 0 | 0 | 0 |
| Fixed Investment | 13,997 | 0 | 0 | 611 | 0 | 400 | 611 | 0 | 611 | 3,100 |
| Depreciation | 0 | 1,144 | 1,144 | 1,144 | 1,144 | 1,144 | 1,144 | 1,144 | 1,144 | 1,144 |
| Fixed Investment Balance | -13,997 | 1,144 | 1,144 | 533 | 1,144 | 744 | 533 | 1,144 | 533 | -1,956 |
| Long-term Borrowing | 12,900 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Principal Repayment | 0 | 1,290 | 1,290 | 1,290 | 9,030 | 0 | 0 | 0 | 0 | 0 |
| Interest | 0 | 1,103 | 987 | 871 | 406 | 0 | 0 | 0 | 0 | 0 |
| (Amount Borrowed) | 12,900 | 11,610 | 10,320 | 9,030 | 0 | 0 | 0 | 0 | 0 | 0 |
| Long-term Borrowing Balance | 12,900 | -2,393 | -2,277 | -2,161 | -9,436 | 0 | 0 | 0 | 0 | 0 |
| Short-term Borrowing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Principal Repayment | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table IV. 6-28 Cash Flow Estimate of Assumed Printer Factory

(Unit: MS Thousand)

| | 1st Year | 2nd Year | 3rd Year | 4th Year | 5th Year | 6th Year | 7th Year | 8th Year | 9th Year | 10th Year |
|--|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Carry-Over from Previous Year | 0 | 3,057 | 3,085 | 7,429 | 7,750 | 4,005 | 7,995 | 54,109 | 120,223 | 242,552 |
| Capital Payment | 14,500 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sales Revenue | 0 | 54,971 | 62,824 | 74,603 | 78,529 | 78,529 | 78,529 | 78,529 | 78,529 | 78,529 |
| Manufacturing Cost | 0 | 55,739 | 62,054 | 71,656 | 74,399 | 73,879 | 72,770 | 72,173 | 71,666 | 71,070 |
| Administration Expenses | 0 | 1,486 | 1,614 | 1,844 | 1,908 | 1,949 | 1,993 | 1,993 | 2,040 | 2,040 |
| Expenses | 0 | 57,225 | 63,669 | 73,501 | 76,307 | 75,828 | 74,762 | 74,166 | 73,707 | 73,111 |
| Operating Balance | 0 | -2,254 | -845 | 1,102 | 2,222 | 2,701 | 3,297 | 4,363 | 4,823 | 5,419 |
| Corporate Tax Payment | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Working Capital at the Beginning of Year | 0 | 0 | 3,054 | 3,490 | 4,145 | 4,363 | 4,363 | 4,363 | 4,363 | 4,363 |
| Working Capital at the End of Year | 0 | 3,054 | 3,490 | 4,145 | 4,363 | 4,363 | 4,363 | 4,363 | 4,363 | 4,363 |
| Working Capital Balance | 0 | -3,054 | -436 | -654 | -218 | 0 | 0 | 0 | 0 | 0 |
| Fixed Investment | 40,343 | 0 | 0 | 10,357 | 0 | 10,357 | 400 | 10,357 | 0 | 10,357 |
| Depreciation | 0 | 7,641 | 7,641 | 7,641 | 7,641 | 7,641 | 7,641 | 7,641 | 7,641 | 7,641 |
| Fixed Investment Balance | -40,343 | 7,641 | 7,641 | -2,716 | 7,641 | -2,716 | 7,241 | -2,716 | 7,641 | -2,716 |
| Long-term Borrowing | 28,900 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Principal Repayment | 0 | 2,890 | 2,890 | 2,890 | 20,230 | 0 | 0 | 0 | 0 | 0 |
| Interest | 0 | 2,471 | 2,211 | 1,951 | 910 | 0 | 0 | 0 | 0 | 0 |
| (Amount Borrowed) | 28,900 | 26,010 | 23,120 | 20,230 | 0 | 0 | 0 | 0 | 0 | 0 |
| Long-term Borrowing Balance | 28,900 | -5,361 | -5,101 | -4,841 | -21,140 | 0 | 0 | 0 | 0 | 0 |
| Short-term Borrowing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Principal Repayment | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table IV. 6-29 Cash Flow Estimate of Assumed Keyboard Factory

(Unit: M\$ Thousand)

| | Before Operation | 1st Year | 2nd Year | 3rd Year | 4th Year | 5th Year | 6th Year | 7th Year | 8th Year | 9th Year | 10th Year |
|--|---------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Carry-Over from Previous Year | 0 | 1,373 | 1,374 | 2,634 | 4,141 | 3,718 | 8,491 | 19,371 | 39,983 | 82,939 | 167,293 |
| Capital Payment | 4,900 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sales Revenue | 0 | 15,977 | 18,259 | 21,683 | 22,824 | 22,824 | 22,824 | 22,824 | 22,824 | 22,824 | 22,824 |
| Manufacturing Cost | 0 | 15,096 | 16,867 | 19,575 | 20,334 | 20,273 | 20,114 | 20,061 | 19,902 | 19,858 | 19,698 |
| Administration Expenses | 0 | 1,118 | 1,220 | 1,397 | 1,449 | 1,474 | 1,474 | 1,501 | 1,501 | 1,530 | 1,530 |
| Expenses | 0 | 16,214 | 18,087 | 20,972 | 21,782 | 21,747 | 21,588 | 21,562 | 21,403 | 21,387 | 21,228 |
| Operating Balance | 0 | -237 | 172 | 710 | 1,041 | 1,077 | 1,236 | 1,262 | 1,421 | 1,436 | 1,596 |
| Corporate Tax Payment | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Working Capital at the Beginning of Year | 0 | 0 | 888 | 1,014 | 1,205 | 1,268 | 1,268 | 1,268 | 1,268 | 1,268 | 1,268 |
| Working Capital at the End of Year | 0 | 888 | 1,014 | 1,205 | 1,268 | 1,268 | 1,268 | 1,268 | 1,268 | 1,268 | 1,268 |
| Working Capital Balance | 0 | -888 | -127 | -190 | -63 | 0 | 0 | 0 | 0 | 0 | 0 |
| Fixed Investment | 13,227 | 0 | 0 | 1,575 | 0 | 1,575 | 400 | 1,575 | 0 | 1,575 | 0 |
| Depreciation | 0 | 1,553 | 1,553 | 1,553 | 1,553 | 1,553 | 1,553 | 1,553 | 1,553 | 1,553 | 1,553 |
| Fixed Investment Balance | -13,227 | 1,553 | 1,553 | -22 | 1,553 | -22 | 1,153 | -22 | 1,553 | -22 | 1,553 |
| Long-term Borrowing | 9,700 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Principal Repayment | 0 | 970 | 970 | 970 | 6,790 | 0 | 0 | 0 | 0 | 0 | 0 |
| Interest | 0 | 829 | 742 | 655 | 306 | 0 | 0 | 0 | 0 | 0 | 0 |
| (Amount Borrowed) | 9,700 | 8,730 | 7,760 | 6,790 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Long-term Borrowing Balance | 9,700 | -1,799 | -1,712 | -1,625 | -7,096 | 0 | 0 | 0 | 0 | 0 | 0 |
| Short-term Borrowing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Principal Repayment | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

The financial internal rates of return (FIRR) in the case of a 10-year-project period were calculated. The FIRR for each factory is as follows.

| | <u>FIRR</u> |
|---------------------------|-------------|
| Personal Computer Factory | 11.83% |
| Monitor Factory | 10.58% |
| Printer Factory | 6.57% |
| Keyboard Factory | 7.22% |

Cashflow tables used for the calculation of IRRs are shown in Table IV.6-31 to IV.6-34.

When the internal rates of return are compared for the four assumed factories, the investment in the personal computer factory is the most favourable, followed by the monitor factory, the keyboard factory, and the printer factory.

The ratios of annual sales (10th year) to total initial investment of the personal computer factory and the monitor factory are comparatively high, 18.3 times and 9.8 times respectively, against 1.9 times for the printer factory and 1.7 times for the keyboard factory. The difference in these ratios has an influence on the results of financial analysis of the assumed factories.

For indices concerning annual operating profits, the profitability of the personal computer factory is low compared to the printer factory and the keyboard factory, however, the personal computer factory has the highest internal rate of return among the four factories. The second highest rate of return is shown by the monitor factory in spite of the fact that its operating profit, just like that of the personal computer factory, was unfavourable compared to the printer factory and the keyboard factory. The keyboard factory shows the most favourable results for indices related to annual operating profits, but it marked the third best rate of return. The internal rate of return of the printer factory is the worst among the four, which is considered to be attributable to the necessary initial investment which is relatively large against the size of sales.

These FIRRs are not necessarily high enough to invite foreign investment. But it can be said that they, at least, reach the minimum level of the project being viable.

Table IV. 6-31 Cash Flow Table of Assumed Personal Computer Factory

(Unit: MS Thousand)

| | 1st Year | 2nd Year | 3rd Year | 4th Year | 5th Year | 6th Year | 7th Year | 8th Year | 9th Year | 10th Year |
|---------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Before Operation | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cash Inflow | 183,573 | 209,620 | 248,691 | 261,714 | 261,714 | 261,865 | 261,865 | 261,865 | 261,865 | 280,397 |
| Sales | 182,329 | 208,376 | 247,447 | 260,471 | 260,471 | 260,471 | 260,471 | 260,471 | 260,471 | 260,471 |
| Depreciation | 1,244 | 1,244 | 1,244 | 1,244 | 1,244 | 1,394 | 1,394 | 1,394 | 1,394 | 1,394 |
| Salvage Value | | | | | | | | | | 18,532 |
| Cash Outflow | 198,045 | 213,731 | 252,108 | 260,207 | 257,585 | 256,250 | 252,521 | 249,128 | 247,315 | 247,315 |
| Investment Fixed Capital | 14,254 | 14,254 | | | | | | | | |
| Investment Working Capital | 10,129 | 1,447 | 2,896 | 724 | 725 | 1,907 | 725 | 0 | 725 | 0 |
| Net Increase Operating Expenses | 0 | 0 | 725 | 0 | 725 | 1,907 | 725 | 0 | 725 | 0 |
| Net Cash Flow | -14,472 | -4,110 | -3,417 | 1,508 | 4,129 | 5,615 | 9,343 | 12,737 | 14,549 | 36,475 |

Table IV. 6-32 Cash Flow Table of Assumed Monitor Factory

(Unit: MS Thousand)

| | 1st Year | 2nd Year | 3rd Year | 4th Year | 5th Year | 6th Year | 7th Year | 8th Year | 9th Year | 10th Year |
|---|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Before Operation | 0 | 110,692 | 131,232 | 138,079 | 138,079 | 138,079 | 138,079 | 138,079 | 138,079 | 145,543 |
| Cash Inflow | 0 | 96,999 | 131,232 | 138,079 | 138,079 | 138,079 | 138,079 | 138,079 | 138,079 | 145,543 |
| Sales | 0 | 109,548 | 130,088 | 136,935 | 136,935 | 136,935 | 136,935 | 136,935 | 136,935 | 136,935 |
| Depreciation | 0 | 1,144 | 1,144 | 1,144 | 1,144 | 1,144 | 1,144 | 1,144 | 1,144 | 1,144 |
| Salvage Value | 0 | 1,144 | 1,144 | 1,144 | 1,144 | 1,144 | 1,144 | 1,144 | 1,144 | 1,144 |
| | | | | | | | | | | 7,464 |
| Cash Outflow | 13,997 | 110,678 | 131,118 | 135,472 | 134,866 | 133,700 | 133,106 | 131,541 | 131,359 | 132,894 |
| Investment | 13,997 | 761 | 1,752 | 380 | 611 | 400 | 611 | 0 | 611 | 3,100 |
| Fixed Capital | 13,997 | 0 | 611 | 0 | 611 | 400 | 611 | 0 | 611 | 3,100 |
| Investment Working Capital Net Increase | 0 | 5,325 | 761 | 380 | 0 | 0 | 0 | 0 | 0 | 0 |
| Operating Expenses | 0 | 97,102 | 129,366 | 135,092 | 134,255 | 133,300 | 132,495 | 131,541 | 130,748 | 129,794 |
| Net Cash Flow | -13,997 | -5,429 | 114 | 2,607 | 3,213 | 4,379 | 4,973 | 6,538 | 6,720 | 12,650 |

Table IV. 6-33 Cash Flow Table of Assumed Printer Factory

(Unit: MS Thousand)

| | Before Operation | 1st Year | 2nd Year | 3rd Year | 4th Year | 5th Year | 6th Year | 7th Year | 8th Year | 9th Year | 10th Year |
|---|---------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Cash Inflow | 0 | 62,612 | 70,465 | 82,244 | 86,171 | 86,171 | 86,171 | 86,171 | 86,171 | 86,171 | 93,306 |
| Sales | 0 | 54,971 | 62,824 | 74,603 | 78,529 | 78,529 | 78,529 | 78,529 | 78,529 | 78,529 | 78,529 |
| Depreciation | 0 | 7,641 | 7,641 | 7,641 | 7,641 | 7,641 | 7,641 | 7,641 | 7,641 | 7,641 | 7,641 |
| Salvage Value | | | | | | | | | | | 7,135 |
| Cash Outflow | 40,343 | 60,279 | 64,105 | 84,512 | 76,525 | 86,185 | 75,632 | 85,120 | 74,166 | 84,064 | 73,111 |
| Investment Fixed Capital | 40,343 | 3,054 | 436 | 11,012 | 218 | 10,357 | 400 | 10,357 | 0 | 10,357 | 0 |
| Investment Working Capital Net Increase | 40,343 | 0 | 0 | 10,357 | 0 | 10,357 | 400 | 10,357 | 0 | 10,357 | 0 |
| Operating Expenses | 0 | 3,054 | 436 | 654 | 218 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 57,225 | 63,669 | 73,501 | 76,307 | 75,828 | 75,232 | 74,762 | 74,166 | 73,707 | 73,111 |
| Net Cash Flow | -40,343 | 2,333 | 6,360 | -2,268 | 9,645 | -15 | 10,539 | 1,051 | 12,004 | 2,106 | 20,195 |

Table IV. 6-34 Cash Flow Table of Assumed Keyboard Factory

(Unit: M\$ Thousand)

| | Before Operation | 1st Year | 2nd Year | 3rd Year | 4th Year | 5th Year | 6th Year | 7th Year | 8th Year | 9th Year | 10th Year |
|---|---------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Cash Inflow | 0 | 17,530 | 19,812 | 23,236 | 24,377 | 24,377 | 24,377 | 24,377 | 24,377 | 24,377 | 28,417 |
| Sales | 0 | 15,977 | 18,259 | 21,683 | 22,824 | 22,824 | 22,824 | 22,824 | 22,824 | 22,824 | 22,824 |
| Depreciation | 0 | 1,553 | 1,553 | 1,553 | 1,553 | 1,553 | 1,553 | 1,553 | 1,553 | 1,553 | 1,553 |
| Salvage Value | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4,040 |
| Cash Outflow | 13,227 | 17,102 | 18,214 | 22,738 | 46 | 23,322 | 21,988 | 23,137 | 21,403 | 22,963 | 21,228 |
| Investment Fixed Capital | 13,227 | 888 | 127 | 1,765 | 63 | 1,575 | 400 | 1,575.1 | 0 | 1,575 | 0 |
| Investment Working Capital Net Increase | 0 | 0 | 0 | 1,575 | 0 | 1,575 | 400 | 1,575.1 | 0 | 1,575 | 0 |
| Operating Expenses | 0 | 888 | 127 | 190 | 63 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 16,214 | 18,087 | 20,972 | 21,782 | 21,747 | 21,588 | 21,562 | 21,403 | 21,387 | 21,228 |
| Net Cash Flow | -13,227 | 428 | 1,598 | 498 | 2,531 | 1,055 | 2,389 | 1,240 | 2,974 | 1,414 | 7,189 |

IV-6-12. Sensitivity Analysis

It should be noted that the possibility of investment is heavily influenced by various market factors. Because models of computers and peripherals soon become obsolete and new models are frequently brought into the market, electronics companies tend to invest in a new plant only when profits are expected from the early stage of the project and it seems that investment will be paid back in a short period.

The following are pointed out as the factors which may affect the level of investment profitability of the four factories.

- Because personal computers and peripherals have a way of becoming obsolete in a short period, it is necessary to bring new products into the market. The project period of 10 years is too long for the product cycle of one model.
- In the study, it was assumed that the development of local parts suppliers and investments by foreign parts suppliers will continue to develop steadily. In the case where the steady development of the supporting industries is not realised, the local procurement ratio of materials will be lower. In addition, when the factory starts production of a new model, the local procurement ratio of materials will become lower at the introduction of the new model.
- All the products manufactured are assumed to be sold in the markets. There are, however, certain marketing risks.
- There is a fair possibility that the real wage increase will be higher than the assumption.
- Electronics companies often introduce new equipment before existing equipment comes to the end of a depreciation period.

In order to examine the financial stability of the assumed four projects, the sensitivity test was conducted for the following six alternative plans.

Outline of the Alternative Plans

| | | |
|----------------------|----------------------------|----------|
| Alternative Plan I | : Sales Volume in Quantity | 5% Up |
| Alternative Plan II | : " | 5% Down |
| Alternative Plan III | : Fixed Investment Cost | 10% Down |
| Alternative Plan IV | : " | 10% Up |
| Alternative Plan V | : Parts and Material Costs | 2% Down |
| Alternative Plan VI | : " | 2% Up |

For each of the alternative plans, the long-term profit and loss projection and cash-flow projection have been made and IRR has been calculated. The results of the analysis are briefly summarized as follows.

Summary of the Sensitivity Test of the Assumed Personal Computer Factory

| Original and Alternative Plans | Internal Rate of Return | Loan Repayment Period | Investment Payback Period |
|-----------------------------------|----------------------------|--------------------------|------------------------------|
| | | (After Operation) | (After Operation) |
| Original Plan | 11.83% | 8 Years | 9 Years |
| Alternative Plan I | 12.35% | 8 Years | 8 Years |
| Alternative Plan II | 11.26% | 8 Years | 9 Years |
| Alternative Plan III | 12.62% | 8 Years | 9 Years |
| Alternative Plan IV | 11.08% | 8 Years | 9 Years |
| Alternative Plan V | 24.51% | 3 Years | 6 Years |
| Alternative Plan VI | 0.17% | 10 Years | 10 Years |

Summary of the Sensitivity Test of the Assumed Monitor Factory

| Original and Alternative Plans | Internal Rate of Return | Loan Repayment Period | Investment Payback Period |
|-----------------------------------|----------------------------|--------------------------|------------------------------|
| | | (After Operation) | (After Operation) |
| Original Plan | 10.58% | 4 Years | 8 Years |
| Alternative Plan I | 11.56% | 4 Years | 8 Years |
| Alternative Plan II | 9.55% | 4 Years | 8 Years |
| Alternative Plan III | 11.98% | 4 Years | 8 Years |
| Alternative Plan IV | 9.29% | 4 Years | 8 Years |
| Alternative Plan V | 21.90% | 2 Years | 6 Years |
| Alternative Plan VI | -1.33% | - | - |

Summary of the Sensitivity Test of the Assumed Printer Factory

| Original and Alternative Plans | Internal Rate of Return | Loan Repayment Period | Investment Payback Period |
|-----------------------------------|----------------------------|--------------------------|------------------------------|
| | | (After Operation) | (After Operation) |
| Original Plan | 6.57% | 4 Years | 9 Years |
| Alternative Plan I | 8.17% | 4 Years | 8 Years |
| Alternative Plan II | 4.89% | 5 Years | 10 Years |
| Alternative Plan III | 9.56% | 4 Years | 8 Years |
| Alternative Plan IV | 3.88% | 5 Years | 10 Years |
| Alternative Plan V | 10.03% | 4 Years | 8 Years |
| Alternative Plan VI | 2.94% | 6 Years | 10 Years |

Summary of the Sensitivity Test of the Assumed Keyboard Factory

| Original and Alternative Plans | Internal Rate of Return | Loan Repayment Period | Investment Payback Period |
|-----------------------------------|----------------------------|--------------------------|------------------------------|
| | | (After Operation) | (After Operation) |
| Original Plan | 7.22% | 4 Years | 9 Years |
| Alternative Plan I | 8.93% | 5 Years | 8 Years |
| Alternative Plan II | 5.43% | 7 Years | 10 Years |
| Alternative Plan III | 9.55% | 4 Years | 8 Years |
| Alternative Plan IV | 5.15% | 5 Years | 10 Years |
| Alternative Plan V | 9.90% | 4 Years | 8 Years |
| Alternative Plan VI | 4.43% | 8 Years | 10 Years |

For the personal computer factory, the largest impact on the project profitability is the change in parts and materials cost. In case the parts and materials cost increases 2%, the IRR of the project would increase to 24.51% from 11.83% under the original assumption.

For the monitor factory as well, the change in parts and material costs has the largest impact on the project profitability. In the case the parts and materials cost increases 2%, the IRR would increase to 21.90%.

For the printer factory, the largest impact on the project profitability is the change in parts and materials cost, followed by the change in fixed investment cost and the change in sales volume.

For the keyboard factory, the largest impact on the project profitability is the change in parts and materials cost, followed by the change in fixed investment and the change in sales volume.

IV-7. Future Direction

IV-7-1. Comprehensive Evaluation

Table IV.7-1 puts together the evaluation of the possibilities for development from the present status of six areas including the current state of production and investment profitability.

Table IV.7-1 Possibility of Development

| Items | Completed products | | | | Intermediate components | | | |
|--------------------------------------|--------------------|---------|---------|----------|-------------------------|----------|----------------------|--------------|
| | PC | Monitor | Printer | Keyboard | Power supply | HDD /FDD | Motherboard assembly | Printer head |
| 1. Present status | Δ | o | Δ | oo | o | o | Δ | Δ |
| 2. Investment plan | Δ | oo | Δ | oo | Δ | o | Δ | o |
| 3. Local sourcing ratio | o | o | Δ | o | oo | o | o | Δ |
| 4. Marketability | o | o | Δ | oo | o | o | oo | o |
| 5. Investment profitability | oo | oo | Δ | o | — | — | — | — |
| 6. Possibility of foreign investment | Δ | o | Δ | oo | o | oo | Δ | o |
| Comprehensive evaluation | o | oo | Δ | oo | o | oo | o | o |

Note: oo = Strong possibility of development, o = some possibility of development, Δ = Slight possibility of development

Seen overall, large possibilities for growth are shown for keyboards, monitors, HDD/FDDs. On the other hand, it would be most difficult to promote production in Malaysia of printers, which consist of large numbers of precision mechanical parts.

The possibilities for development and the conditions required for the same are explained below by product.

(1) Personal Computers

Production of personal computers by local companies would probably be of the level of assembly of kits by the knockdown system, with the number of computers

assembled each month being only several hundred, in view of the level of technical expertise and the size of the market, even with new entries in the future.

To achieve full-scale production of personal computers in Malaysia, investment by foreign manufacturers with accumulated development technology and with markets for products of their own in the West will be necessary.

As for production of microcomputers, price competitiveness could not be achieved if parts were imported from Japan, Taiwan, etc. Therefore, the problem becomes the possibilities of procurement and the procurement costs of multi-layer substrates, IC/LSIs, power supplies, cases, keyboards, disc drives, and general electronic components.

(2) Monitors

Monitors are technically not very different from color televisions, so existing television assembly manufacturers could easily start assembling the same. The keys to the possibility of the start of new production are production costs and the existence of markets.

Taiwan and Korea currently enjoy the merits of scale in the world market due to their mass production systems. Due to this situation, it is necessary to reduce the cost of parts procurement until sufficient price competitiveness can be achieved. In particular, a major issue will be the procurement costs of CDTs, which account for about half the prime costs of manufacture, that is, whether these can be procured domestically.

In such a case, since price competitiveness could not be achieved through mass production if targeting primarily the domestic Malaysian market, it would also be necessary to secure sales outlets in the West or in Asia.

(3) Printers

Printers are assemblies of numerous mechanical components requiring extremely high precision technology, so advanced manufacturing technology is required for their production. Therefore, Japanese companies are key suppliers in the world market. Even the NIEs are not currently able to produce printers sufficiently well.

As a result, considering the current gap in technology, the fastest strategy, in the short term, would be to promote investment by foreign printer manufacturers. Due to import restrictions in the advanced countries, however, Japanese companies are establishing production bases in the West. The possibility of them moving their production bases to Southeast Asia is considered lower than that of other products.

Still, if Japanese companies continue to increasingly specialize in higher grade items, ASEAN may come into its own as a base for production of the lower grades. In such a case, the question will be whether the indigenous companies can reach the technical level enabling OEM production through technical tie-ups with foreign printer manufacturers.

Looking at costs, the key to whether production of printers is possible in Malaysia lies in whether the heads and other key components can be produced domestically. The supporting industries will have to improve their technology to do this as the gap between the level of technology of the supporting industries and the level of technology demanded is great.

(4) Keyboards

Keyboards are currently being produced domestically in Malaysia and represent a field enabling easy entry by other companies in the future.

The production of keyboards is an extremely labor intensive process. There are few technical limitations, even judging from the technical level of Malaysia's assembly manufacturers.

The key to whether there will be more active production of keyboards in Malaysia in the future lies in whether price competitiveness can be maintained with respect to other low labor cost countries.

(5) Disc Drives

Hard disc drives and other disc drives are already being produced in Southeast Asia. At the present time, several powerful foreign manufacturers are establishing disc drive component factories in Malaysia as branch factories of disc drive factories in Singapore. If production of hard disc drives themselves is shifted to these factories, one may expect to see increased exports, improved local procurement of parts by computer assembly manufacturers (hard disc drives accounting for about 30% of the prime costs of a personal computer), and ripple effects to peripheral industries.

IV-7-2. Scenario of Development of Computer Industry

(1) Patterns of Corporate Growth and Hoped For Contributions to Development of Computer Industry

The patterns of growth undergone by companies which have started the production of computers and their peripherals in Malaysia may be roughly divided into two groups when viewed from the investors. That is, there is a growth pattern of foreign capital companies and one of domestic manufacturers. These two patterns of growth are shown in Fig. IV.7-1. In the figure are shown the steps of growth in the growth patterns of foreign capital companies and local companies and the issues involved at each step.

The merits and demerits of the two growth patterns from the viewpoint of the expected contribution to the development of the Malaysian computer industry will be compared briefly below

Pattern of Growth of Foreign Capital Manufacturers

(Advantages)

— Quick start-up

These manufacturers already have the technology required for production and the markets for the finished goods, so once they decide to engage in production in Malaysia, the industry can be quickly and easily started up.

(Problems)

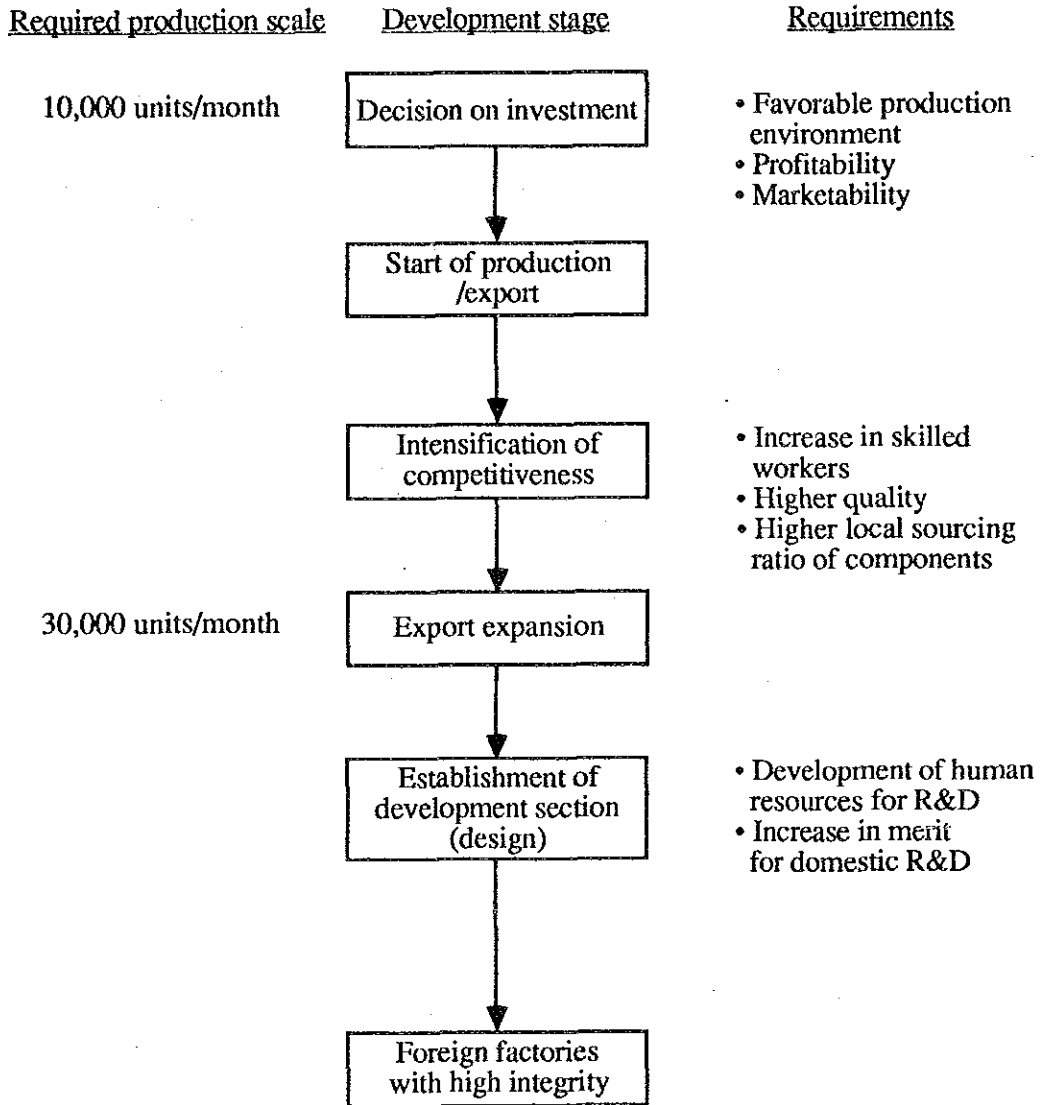
— Standing as mere production base

Overseas production factories in regions other than the West are considered as merely bases for production of export goods. In most cases, the development, sales, and other functions remain with the head office. There are two problems with this.

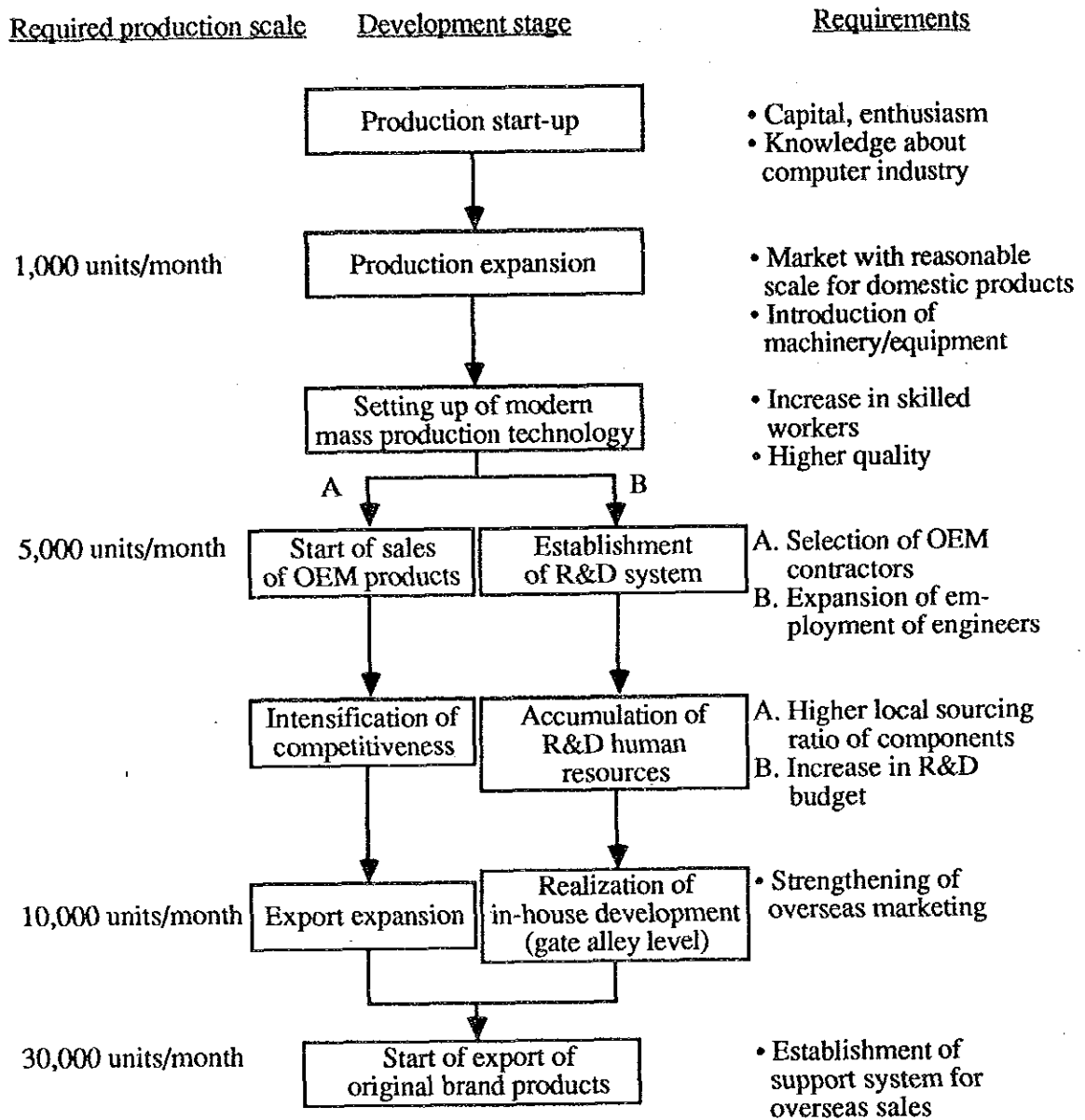
- There would be little high value added production in Malaysia itself and the transfer of technology would take a long time.
- If the merits of Malaysia as a production base were to decline, due for example to rising costs of labour, there would be the possibility of the production bases being moved to other countries.

Fig. IV.7-1 Scenario for the Development of the Computer Industry

Pattern I: Example of growth of foreign affiliated manufacturers



Pattern II: Example of growth of local manufacturers



— Necessity of Promotion of Local Participation

Such foreign capital companies would have to move on from the stage of mere production bases and become more Malaysian in nature. Multinational electronic equipment manufacturers in the long run aim at increasing the added value of their production activities in their overseas production bases as well. This assumes, however, that the local side will have accumulated the necessary experience and personnel for such higher value added production.

Pattern of Growth of Domestic Manufacturers

(Advantages)

At the start, it would be more practical for companies to aim for growth through primarily OEM production rather than production and sales under their own brands. Once a company becomes larger in size and reaches a stage where it has sufficient leeway for research and development, however, it would move to strengthen its research and development capabilities due to the need to differentiate its products from others and lower costs or aiming at more sophisticated products. The start of full-scale research and development activities could be expected to contribute tremendously to the expansion of the technology base in Malaysia and to improvement of research and development capabilities.

(Problems)

For local companies to enter the business of production of personal computers and peripherals and establish a corporate standing sufficient for stable growth, they would have to clear several hurdles, such as the acquisition of the requisite production technology, the securing of funds, and the securing of sales channels.

Whether a major corporate group or an independent venture business, production by local Malaysia companies in the field of computers has only just begun to come together. There are major obstacles which must be overcome in the development of the business.

(2) Basic Strategy for Promotion of Personal Computer and Peripheral Industries in Malaysia

The basic policies which should be taken in promoting the personal computer and peripheral industries in Malaysia are as follows:

— *Change of Emphasis in Promotional Measures in Accordance with Stage of Growth*

The emphasis in the support offered would differ depending on whether the key target of the promotion of the personal computer industry were to realize and expand production and exports or to foster and improve domestic technology to a level enabling independent development of personal computers. In the case of both foreign capital companies and local companies, it is assumed that first the companies would stabilize their operational standings through expansion of production and exports and then move on to the establishment of development systems and the strengthening of their development capabilities, as seen in the above-mentioned growth patterns. Therefore, it is considered that the emphasis in promotional measures should be shifted, in accordance with the stage of development of the industry, from support for expansion of production and exports to support for research and development..

— *Use of Foreign Capital as Driving Force for Industrial Development*

A look at the current state of affairs shows that in the field of peripherals, the foreign capital companies are engaged in relatively large scale production for export purposes. On the other hand, the local companies are producing personal computers and intermediate components, but are mainly targeting the domestic market and have small scales of production. In the short term, there is an increasing possibility of existing domestic manufacturers shifting production to Malaysia. Judging from the impact of the start of production at the time of entry, the synergistic effect on related sectors, and feasibility, it is considered that it would be effect for foreign capital manufacturers to be used as the driving force behind industrial development.

— *Strengthening of Linkage Between Foreign Capital Companies and Local Supporting Industries*

While foreign capital personal computer and peripheral manufacturers would serve as the main force behind industrial development, the local companies would have to find niches in which they can put their own strengths to good use or establish relationships with major companies through OEM production and thus pursue fields in which they can themselves grow.

Further, support must be given to such efforts of the local companies.

It will also be necessary to strengthen the linkage between the export oriented foreign capital companies, which now form an enclave sector, and domestic supporting industries and further to promote the ripple effect of the development of supporting industries to the local computer and peripheral companies.

— Necessity of Promotion of Foreign Investment and Significance of Promotion of Foreign Investment in Production of Intermediate Components

The possibility for fast development of the Malaysian personal computer and peripheral industries depends largely on foreign investment.

A look at the trends in production in the international market shows that there would be a greater chance of foreign investment in Malaysia for the production of intermediate components rather than investment for production of finished goods. Once production of export oriented intermediate components started through foreign investment, local procurement of such intermediate components would become possible. This would further be effective for reducing the prime costs of production of finished goods using such components. It would therefore be very meaningful to promote production of intermediate components at the same time as promoting investment into production of finished goods.

The basic strategy for the development of the Malaysian computer industry, in view of the above, can be summarized as follows:

- [1] The basis for industrial development would be made export oriented investment by foreign capital in the production of computers and peripherals, including intermediate components. Toward this end, activities would be strengthened to promote foreign investment in that industry.
- [2] To increase the competitiveness of production of Malaysia in the international market, the supporting industries would be promoted so as to establish a suitable foundation for production.
- [3] In the long term, a proper environment for promotion of research and development activities would be established so as to encourage both foreign capital companies and domestic companies to maintain development capabilities.
- [4] In the establishment of the proper environment for research and development, the emphasis would be laid on training the personnel to handle such research and development.

(3) Stages of Development of Computer Industry in Malaysia and Requisite Promotional Measures

1) First Stage: Promotion of Foreign Investment and Start of Production and Export

At the present time, a few computer related companies have already begun the production of keyboards, monitors, etc. in Malaysia. Further, leading foreign manufacturers are planning new investment.

To ensure the continuation of investment in the computer related field, it will be necessary to maintain investment promotional activities, establish the proper environment for investment and production, and continue effort to promote the parts industries.

— At this stage, it is assumed that foreign capital companies will indeed invest in Malaysia and start production there. The domestic market is too small, so the majority of the products of the investing companies would be exported.

— Decisions on investment are made based on individual company policies, so the measures which Malaysia should take at this stage would be the publicitisation of the superiority of Malaysia as a production base for such products and effort to attract investment. The companies targeted could include Japanese, American, and European companies and also companies of the Asian NIEs such as Taiwan, Korea, and Singapore.

— At the same time, the establishment of the proper environment for production should be promoted so as to increase the chance of investment. To raise profitability, supporting industries should be promoted to enable local procurement of parts and institutional measures such as preferential tax treatment and support in fund procurement should be established.

— After the start of production, it would be desirable to provide side support for the development of human resources through augmentation of external training organisations able to provide assistance to in-house training or to train employees themselves at low cost.

— The support for establishment of the proper environment for production and development of human resources should be applied not only to foreign capital companies but to the industry as a whole.

— On the other hand, it will also be necessary to consider how to protect domestic manufacturers. To get domestic manufacturers to produce enough to enable them to build up the experience necessary for exports, consideration may be given to preferential purchasing of their products by the government, reduction of sales taxes, and other temporary protective measures.

2) Second Stage: Expansion of Exports Through Strengthening of Product Competitiveness

At the present time, the rate of domestic procurement of parts by the computer related companies engaged in production in Malaysia is not that high. To improve the competitiveness of the products of these companies, or of companies which might invest in Malaysia in the future, in the international market, it will be important for the support industries to develop to the point where they can provide sufficient quantities of high quality parts and materials.

— At this stage, production by the investing companies will have gotten on the right track and exports will increase. The aim here would be the production of products competitive both in terms of price and quality. Toward this end, the right of local procurement parts should be raised and thorough quality control promoted.

— To promote the parts industries, the same measures as in the first stage should be continued and, further, assembly manufacturers should be encouraged to provide support to parts manufacturers. Further, to reduce costs through expansion of the scale of production, support should be given to the parts industries, in particular the indigenous companies, for opening up new markets.

3) Third Stage: Introduction of Domestic Development Activities

The research and development activities of the local personal computer assembly manufacturers are still at the rudimentary stage. Foreign computer related companies, on the other hand, do not engage in research and development in Malaysia. For the indigenous manufacturers, the key to growth is the acquisition of independent research and development capabilities. For the foreign companies too, the level of such research and development capabilities determines whether model changes of existing products and the start of production of new products can be handled by the local side. In that sense, it is highly essential to positively improve the research and development capabilities in Malaysia. For Malaysia to be able to perform advanced research and development in the field of electronics for the computer industry, it will be necessary to expend major effort to promote transfers of technology and to train the proper personnel so as to establish the requisite technological foundation.

— At this stage, the emphasis would be only not only production, but also the introduction of design functions into Malaysia. Toward this end, there would have to be enough merits for performing design in Malaysia. If a pool of technicians with design

capabilities can be established in Malaysia, this would increase the possibilities for transfer of design functions there.

— To promote the transfer of development functions to Malaysia, it would be necessary to establish the proper environment for development in Malaysia through training of personnel by domestic educational and training organisations and through institutional support for research and development.

— The number of engineers with degrees in electronic related fields should be increased and the pool of engineers able to design gate arrays should be built up. To acquire the technology, actual design work would be essential, but at the present time there are few private companies with design divisions, so public organisations would have to provide such opportunities. In the future, there may be expected to be a transfer of technology from the public organisations to private ones through a spin-out of the personnel built up in the public organisations and through joint public and private sector projects.

— Domestic manufacturers would find it more difficult to establish in-house development divisions on their own due to fund and personnel limitations, so cooperation from public organisations would be necessary.

(4) Ripple Effect of Development of Computer Industry

The ripple effect of the development of the computer industry on Malaysian industry as a whole is shown in Fig. IV.7-2.

Development of the computer industry would have an effect both on hardware and software. First, in terms of hardware, it could be expected to form an excellent environment for production of facsimile machines, copiers, and other office automation equipment, in which numerous components are similar to those of computers and peripherals, and for production of automobiles, aircraft, and other industrial equipment as a whole.

In terms of software, domestic companies are designing rudimentary mother boards even now, but as the domestic activities of the computer industry became more advanced, the level of the requisite engineers would rise to one enabling design of gate arrays and LSIs and the number of such engineers would rise as well.

In recent years, most of the R&D introduced into Malaysia by foreign capital home electric appliance manufacturers has been of a design nature. The expansion of the pool of circuit design engineers can be expected to promote the R&D activities of the electronics industry as a whole.

Fig. IV.7-3 gives an overview of the effects various support measures would have on the development of the computer industry.

Fig. IV.7-2 Ripple Effect on the Computer Industry

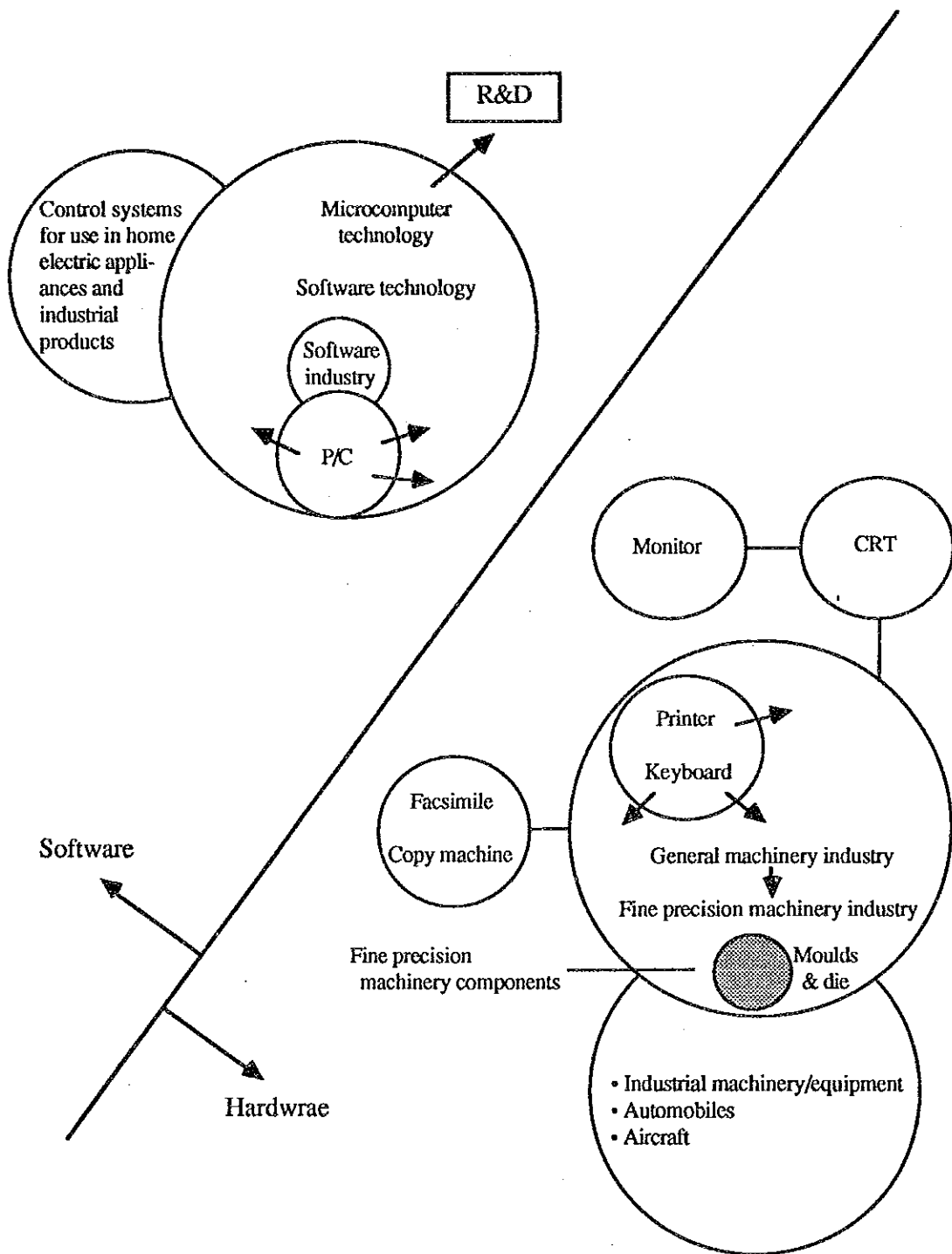
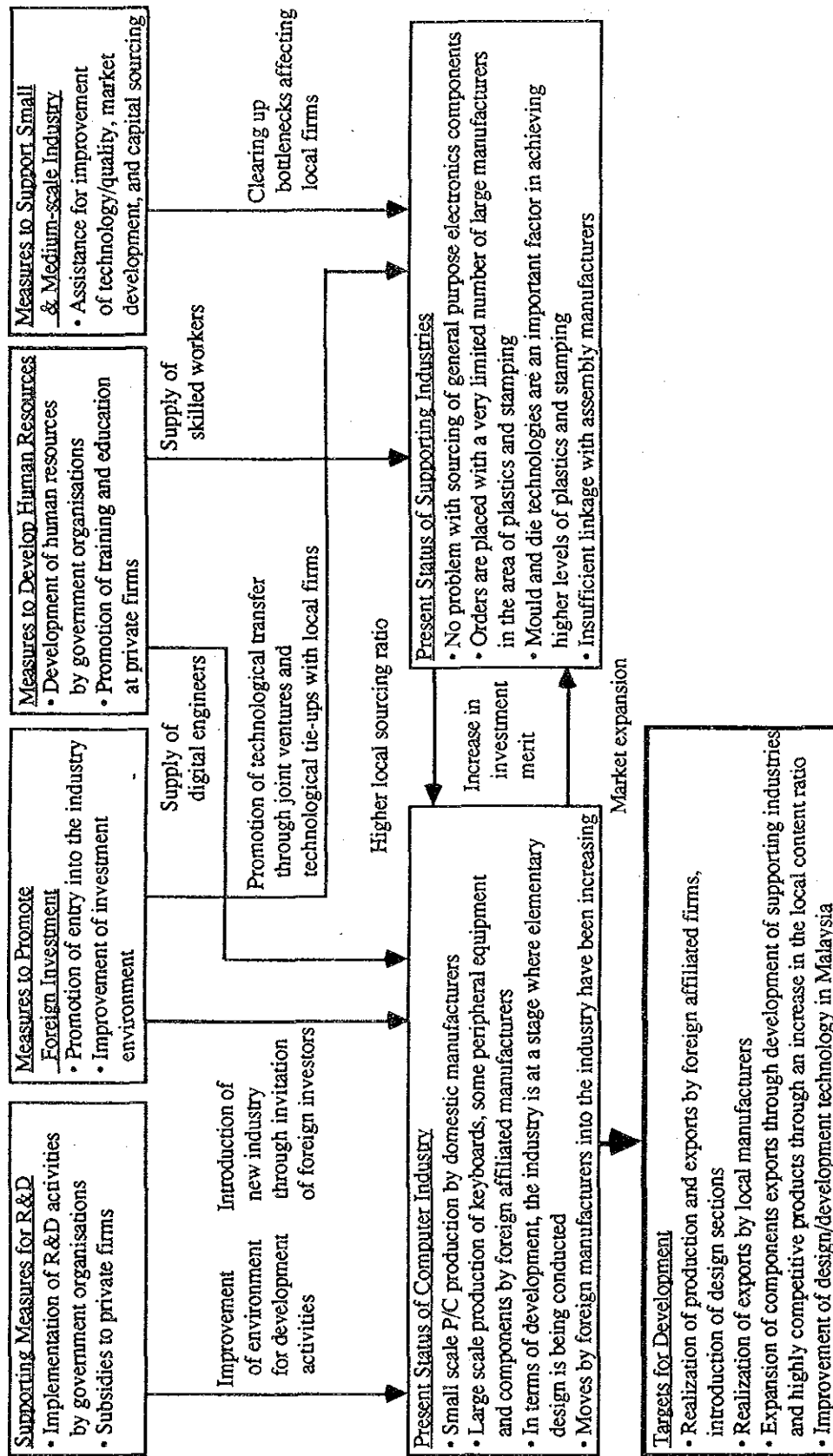


Fig. IV.7-3 Policy for Development of Malaysia's Computer Industry



IV-7-3. Measures for Realization of Scenario of Development

The process to be used to formulate the necessary assistance measures for the development of computer and peripheral industries in Malaysia based on results of the surveys in Malaysia and Japan are summarized in Fig. IV.7-4.

The issues in the development of domestic computer and peripheral industries envisioned in IV-7-1 and the measures for the same may be summarized as in Fig. IV.7-5.

Fig. IV.7-4 Possibility for Development of Computers and Computer Peripherals

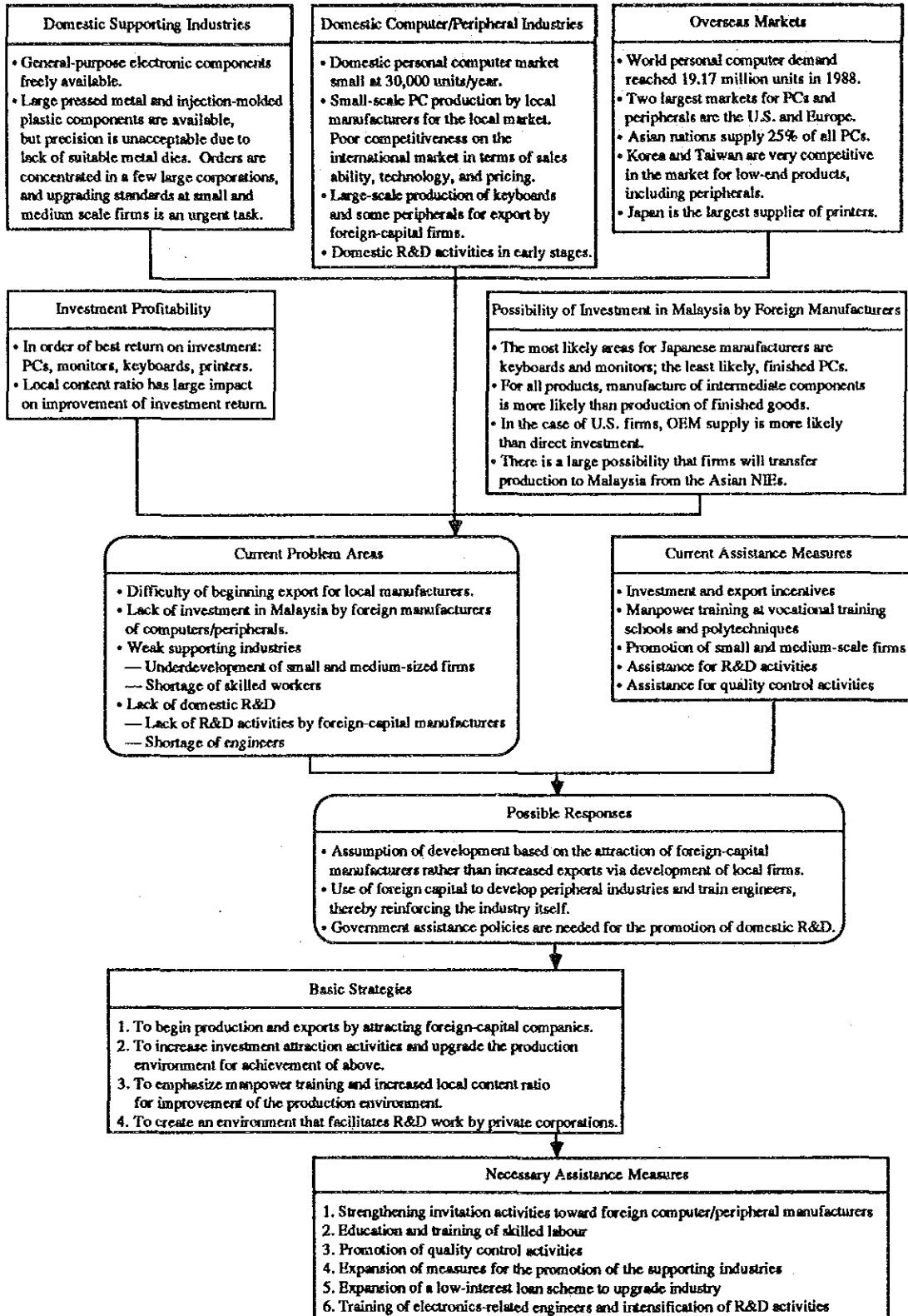
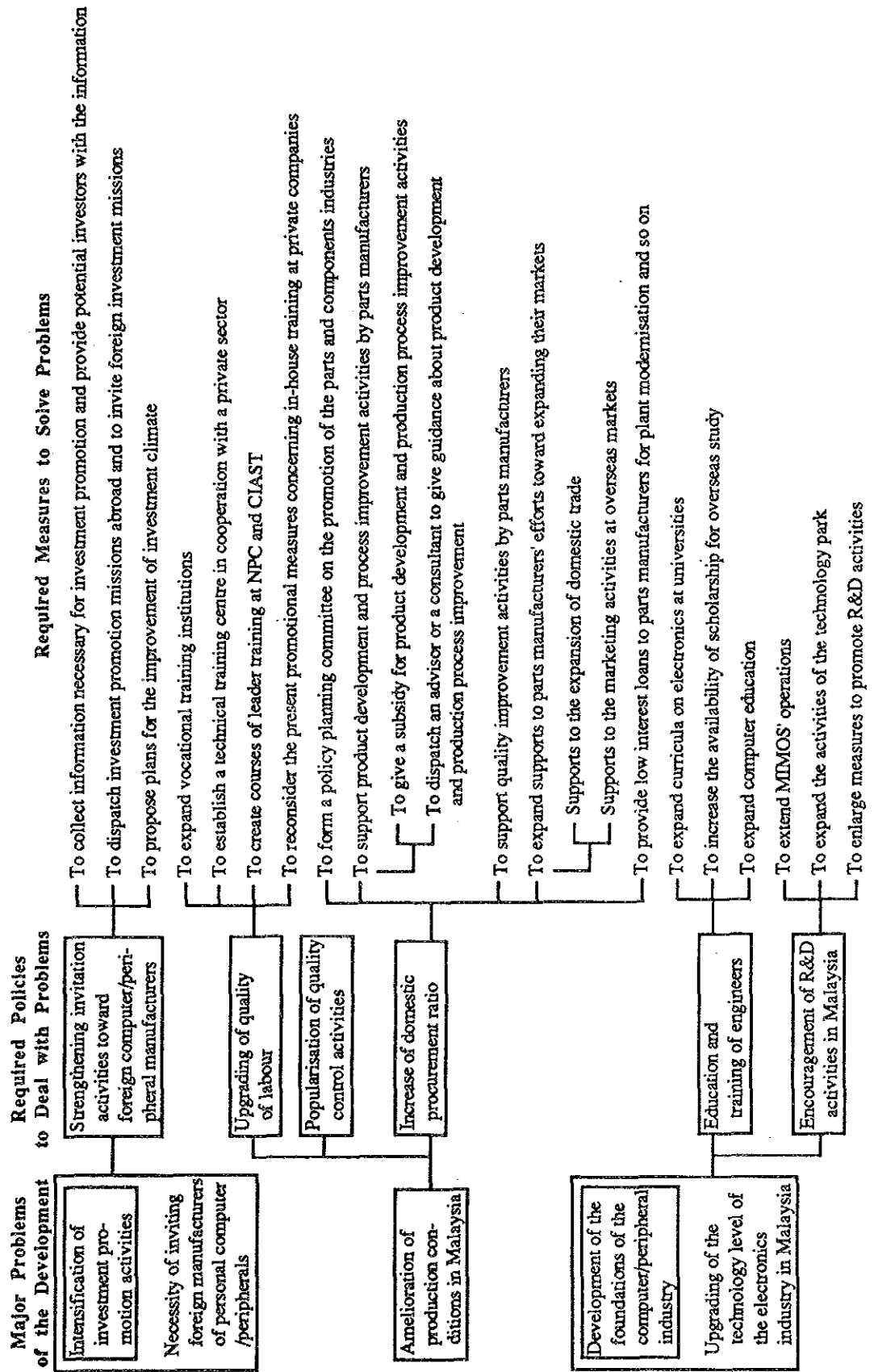


Fig. IV. 7-5 Necessary Measures to Realise the Development Scenario of Computers and Computer Peripherals Industry



**V. Comprehensive Promotion Programmes Proposed
for Each Selected Industry**

V. Comprehensive Promotion Programmes Proposed for Each Selected Industry

V-1. Comprehensive Promotion Programmes for the Casting Industry

V-1-1. Basic Strategy

The Malaysian casting industry has long developed in response to demand from the traditional Malaysian industries of tin, rubber, palm oil, and timber, but its role as a supporting industry for modern demand sectors has lagged behind that of its counterparts in neighboring countries.

In order for Malaysia to proceed down the path of modernization laid out for it by the IMP, development of a modernized and internationally competitive casting industry is critical.

The basic strategy for the development of the Malaysian casting industry based on the above ideas is given below.

Basic Strategy for the Development of the Casting Industry

1. Virtually all of the factories in the Malaysian casting industry are small businesses, and the problems facing both individual factories and the industry as a whole are numerous. Industrial promotion policies emphasizing enlargement of the production infrastructure are to be proposed.
2. Modernization of existing casting factories is to be promoted. Important elements will be (1) modernization of such production activities as plant sites, plant buildings, and equipment and facilities, (2) introduction of modern production technologies through the training of managers and engineers, and (3) modernization of company management themselves.
3. In those fields in which Malaysia has little accumulated technology, capital and technology should be actively introduced from abroad.

V-1-2. Proposed Comprehensive Promotion Programmes

Various programmes corresponding to the above-described measures for the development of the Malaysian casting industry were studied. In the end, the proposal was brought together in the following eight programmes. The process for selection of these programmes is given in Fig. V.1-1. Execution measures and their schedule are shown in Table V.1-1.

Programme 1. Expansion of Training and Education Programmes for Managers

(Objectives)

- * To provide technological assistance for new product development in order to allow diversification of demand by existing casting companies.
- * To achieve a transfer of quality control know-how in order to allow existing casting factories to compete in terms of quality on the international market.
- * To carry out guidance in modernized management techniques, thereby allowing existing casting factories to develop as subcontracting firms for the export-oriented foreign-capital assemblers.

(Content)

- * Following activities by NPC, Industry Association
 - holding seminars
 - traveling guidance
 - consulting services
- * Oversea training of managers
- * Collection and dissemination of information on modernized production management and management technique.

Programme 2. Development of Engineers and Technicians

(Objective)

- * To rationalize the production system at the many plants presently relying upon operator experience and intuition by providing engineers with practical training in the latest plant management systems and production technologies, respectively.

(Content)

- * Training seminars
 - Seminars will be held for plant managers and engineers.
- * Assistance for overseas training

In order to facilitate overseas training for plant managers and engineers, assistance will be provided in the form of advance training, etc.

- * Collection and distribution of plant management and technological information.

Information on the latest plant management methods and technologies will be collected from abroad and distributed to Malaysian companies.

Programme 3. Greater Guidance in Quality control

(Objective)

- * To improve product quality, productivity and competitive power, QC activities should be strengthened.

(Content)

- * QC activities seminars by SIRIM, NPC and the industry Association.
- * QC activities workshop session at each factory by experts.
- * Strengthening of the national standards system and promotion of company standardization by SIRIM.

Programme 4. Greater Activities by Foundry and Engineering Industries Associations

(Objectives)

- * To strengthen the organization and activities and thereby increase the exchange of technical and management information between member corporations.
- * To promote inter-corporate cooperation through Association in the areas of raw material procurement, share production, and the receipt of orders.
- * To increase exchanges with overseas companies and industry associations.

(Content)

- * Collection of information, both domestic and foreign, concerning casting technology, production, and materials, and distribution of this information to member corporations.
- * Sponsoring of quality control and technical seminars to improve the technological level of the industry as a whole.
- * Operation by Association of the common supporting facilities to be provided in the foundry and engineering industrial parks.
- * Promotion of cooperation between member corporations in the fields of raw material procurement, share production, and the joint receipt of orders.

Programme 5. Promotion of the Construction Plan for Foundry and Engineering Industrial Parks

(Objective)

- * To promote plans to construct foundry and engineering industrial parks and thereby enlarge the production infrastructure for existing casting companies in Malaysia.

(Content)

- * Modernization of the plants, equipment, and facilities at existing casting factories.
- * Strengthening of Common Facility Centre activities in the parks in order to maximize benefits.

Programme 6. Expansion of Financing Scheme for the Development of Small and Medium Scale Enterprises

(Objective)

- * To facilitate the fund-raising required by Malaysia's small casting factories for modernization of production facilities and equipment.

(Content)

- * Enlargement of the CGC loan guarantee scheme in order to facilitate access to public financial institutions by small businesses having difficulty in obtaining credit.
- * Establishment of new credit systems to support fund-raising for modernization of production facilities by small manufacturers.

Programme 7. Attraction of Investment and Promotion of Technical Tie-up

(Objectives)

- * To attract foreign casting companies to Malaysia in areas in which existing Malaysian casting companies lack necessary technology or experience.
- * To attract companies in industries with heavy demand for castings, such as the machinery industry.
- * To establish linkages between the export-oriented assembly companies and the casting industry.

(Content)

- * The collection and distribution of information on the Malaysian investment environment and industry for foreign firms considering investing in Malaysia.
- * The dispatch of overseas investment attraction missions concentrating on firms in the casting industry.

- * The strengthening of so-called "matching services" to realize capital and technology tie-ups with foreign corporations.

Programme 8. Increased Export Promotion Activities

(Objectives)

- * To collect overseas information concerning castings demand and support local companies in their efforts to break into foreign markets, thereby complementing the limited domestic market.
- * To break into overseas markets by the promotion of capital and technological tie-ups with foreign corporations.
- * To assist the export promotion efforts of local factories.

(Content)

- * Collection of foreign markets and trade inquiry information and distribution to concerned local companies.
- * Distribution to concerned local companies of information on foreign corporations desiring tie-ups with Malaysian casting companies.
- * Sponsoring of trade fairs in Malaysia and abroad and promotion of casting exports.

Fig. V.1-1 Process of Formulation of Comprehensive Programmes for Development of Casting Industry

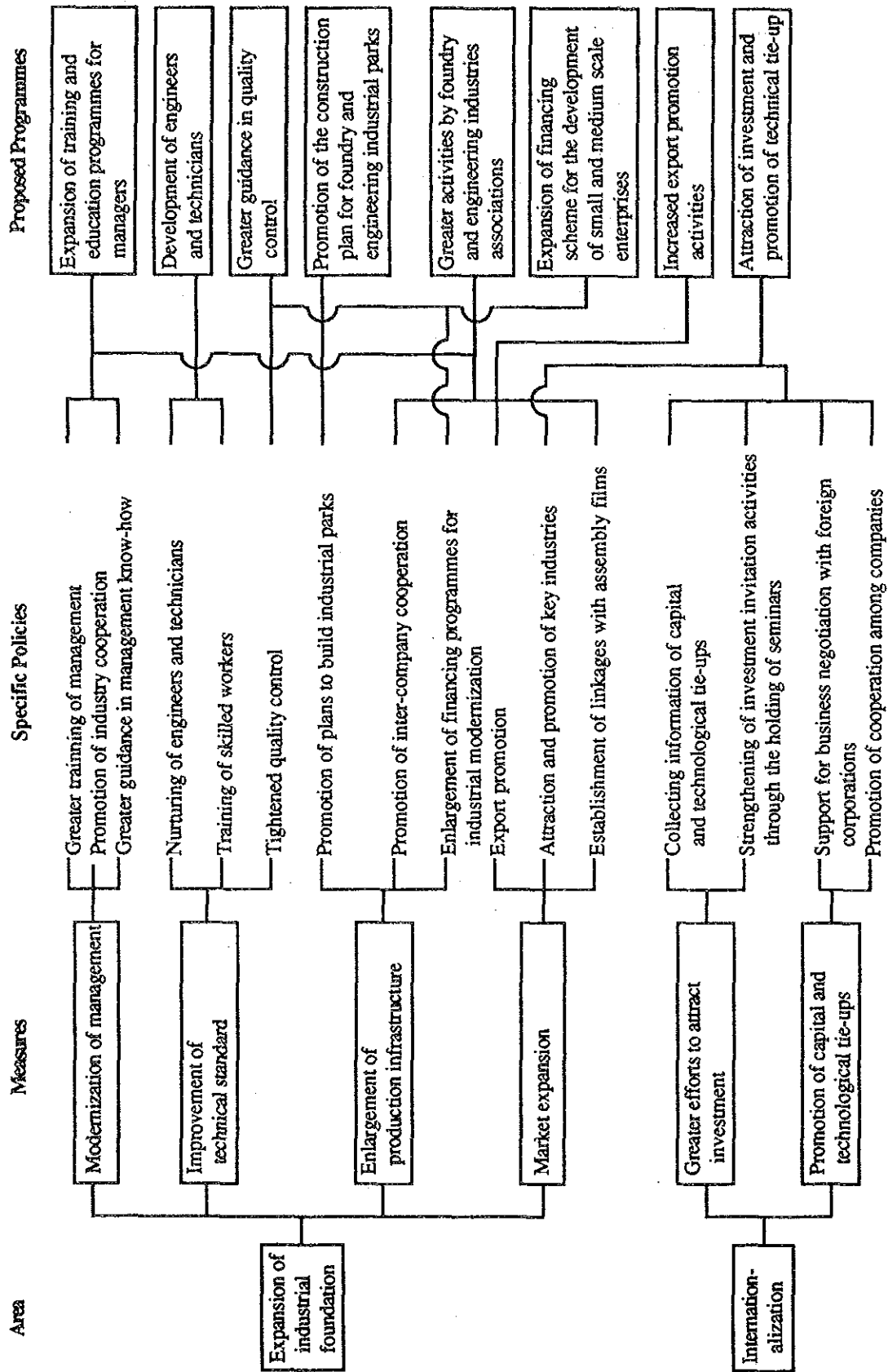


Table V. 1-1 Execution Measures and Schedules of the Proposed Programmes (Casting Industry)

| Name of the Programme and its Objectives | Contents of the Programme | Measures to be taken by Malaysian side | Execution Measures and their Schedule | | |
|---|---|--|---------------------------------------|---------------------|-------------------|
| | | | Measures | Execution Schedules | |
| | | | | Immediately | At an early stage |
| <p>1. Expansion of training and education programmes for managers</p> <ul style="list-style-type: none"> - It is urgent to conduct the education of modernized management techniques for the development of the industry | <p>1) Under the sponsorship of NPC and industry associations</p> <ul style="list-style-type: none"> - Holding seminars - Traveling guidance - Consulting services <p>2) Overseas training of top management</p> <p>3) Collection and dissemination of information on modernized production and management techniques</p> | <ul style="list-style-type: none"> - Support of NPC, Industry Association activities, etc. | ○ | ○ | |
| <p>2. Development of engineers and technicians</p> <ul style="list-style-type: none"> - To rationalize the production system at the many plants presently relying upon operator experience and intuition by providing engineers with practical training in the latest management systems and production technologies | <p>1) Training of engineers through</p> <ul style="list-style-type: none"> - Holding seminars - In-house training - Practical training in technical courses <p>2) Overseas training</p> <p>3) Collection and dissemination of information</p> | <ul style="list-style-type: none"> - Support to promotion of scheme for National Technical Development Centre - Expansion of advanced technology courses - Implementation of traveling guidance | ○ | ○ | |
| <p>3. Greater guidance in quality control</p> <ul style="list-style-type: none"> - To improve product quality, productivity and competitive power QC activities should be strengthened | <p>1) The holding of QC seminars of experts sponsored or co-sponsored by SIRIM, NPC and Industrial Associations</p> <p>2) The holding of QC workshops in individual companies</p> | <ul style="list-style-type: none"> - Expansion of SIRIM and other related organizations' activities | ○ | ○ | |

| Name of the Programme and its Objectives | Contents of the Programme | Measures to be taken by Malaysian side | Execution Measures and their Schedule | | |
|---|--|---|--|---|---|
| | | | Measures | Execution Schedules | |
| | | | | Immediately | At an early stage |
| <p>3) Strengthening of the national standards system and promotion of company standardization by SIRIM</p> <p>4. Greater activities by foundry and engineering industries associations</p> <ul style="list-style-type: none"> - To strengthen the organization and activities and thereby increase the exchange of technical and management information between member corporations - To increase exchange with overseas companies and industry association <p>5. Promotion of the construction plan for foundry and engineering industrial estates</p> <p>6. Expansion of financing scheme for the development of small and medium scale enterprises</p> <ul style="list-style-type: none"> - To facilitate the fund-raising required by Malaysia's small factories | <p>3) Strengthening of the national standards system and promotion of company standardization by SIRIM</p> <p>1) Collection of information concerning production, technologies and materials</p> <p>2) Collection of information concerning domestic and foreign markets and demands</p> <p>3) The holding of seminars on quality and technology</p> <p>4) Examination on Common Facility Centre activities</p> <p>1) Modernization of the plants and equipment at casting factories</p> <p>2) Strengthening of Common Facility Centre activities in parks</p> <p>1) Enlargement of the CGC loan guarantee scheme in order to facilitate access to public financial institutions by small businesses having difficulty in obtaining credit</p> | <ul style="list-style-type: none"> - Examination on expansion of Industrial Association activities - Collection and dissemination of information - The holding of seminars - Increase of exchanges with overseas companies and industrial association - Promotion of plans to construct foundry parks - Promotion of plans to set up Common Facility Centres - Implementation of the study on new credit systems | <p>○</p> <p>○</p> <p>○</p> <p>○</p> <p>○</p> <p>○</p> <p>○</p> <p>○</p> <p>○</p> | <p>○</p> <p>○</p> <p>○</p> <p>○</p> <p>○</p> <p>○</p> <p>○</p> <p>○</p> | <p>○</p> <p>○</p> <p>○</p> <p>○</p> <p>○</p> <p>○</p> <p>○</p> <p>○</p> |

| Name of the Programme and its Objectives | Contents of the Programme | Measures to be taken by Malaysian side | Execution Measures and their Schedule | | |
|---|--|--|---|---------------------|-------------------|
| | | | Measures | Execution Schedules | |
| | | | | Immediately | At an early stage |
| <p>7. Attraction of investment and promotion of technical tie-up</p> <ul style="list-style-type: none"> - To attract foreign casting companies to Malaysia in areas in which existing Malaysian casting companies lack necessary technology or experience | <p>2) Establishment of new credit systems to support fund-raising for modernization of production facilities by small manufacturers</p> <p>1) Information service for the invitation of investment</p> <ul style="list-style-type: none"> - Compilation of guidebook by industry - Preparation of a directory of domestic factories <p>2) Dispatch of investment invitation mission</p> <p>3) Strengthening of support and cooperation given to overseas missions</p> <p>4) Provision of a service to match partners</p> | <ul style="list-style-type: none"> - Collection of detailed information - Dispatch of PDT members - Strengthening of information service activities | <p>Issue of guidebooks</p> <p>Information collection on potential investors</p> | <p>○</p> <p>○</p> | |
| <p>8. Increased export promotion activities</p> <ul style="list-style-type: none"> - To break into overseas markets by the promotion of capital and technological tie-up with foreign corporation - To assist the export promotion efforts of local factories | <p>1) Collection of foreign market and trade inquiry information</p> <p>2) Dispatch of market study missions</p> <p>3) Dispatch of export promotion missions</p> | <ul style="list-style-type: none"> - Expansion of export promotion activities | <p>Information collection on foreign markets</p> <p>Dispatch of missions</p> | <p>○</p> <p>○</p> | |

V-1-3. Review of Priority Programmes

It is desirable that the programmes proposed for each industry in the preceding section be fully and intensively implemented. However, the reality of the situation is such that due to various kinds of restrictions, such as limited funds and staff, an order of priority has to be set for implementing these programmes.

Because none of the programmes presented here have been proposed as a result of carrying out adequate feasibility studies, it is not possible, for example, to set the order of priority on the basis of actual figures such as the FIRR which have been calculated for amounts to be invested and their effects. The alternative has therefore been to list the programmes in the following order by adding the subjective judgements of the survey team to the criteria outlined below.

(1) Existence of established organisations in charge of the programme

Higher marks are given for those programme that have already established organizations for their implementation than for those having no existing organisations in charge, due to their readiness for implementation.

(2) Maturity level of the programme

Those programmes which support some existing schemes are regarded as being at a high maturity level and are given high marks for priority ranking. Those programmes for which the plans are in the planning stage are given the evaluation of medium and those programmes which have to be started from planning are regarded as low maturity programmes and given low marks.

(3) Urgency of the needs of the programme

Those programmes for which implementation is urgently needed are given high marks, while those programmes for which implementation is needed but not urgent are given relatively low marks.

(4) Scale of investment in the programme

For those programmes that need a relatively large amount of capital investment for their implementation, their needs for the assistance from outside organisations are considered high and are given rather high marks, while those requiring small amounts of investments are given rather low marks due to the possibility of their own financing.

(5) Level of direct impact

For those programmes which have direct impact on industrial development high marks are given while for those which would have only indirect influence lower marks are given.

(6) Necessity of outside assistance

Those programmes for which supports from other organizations are needed for implementation are given higher marks than those programmes that would be implemented by the self-efforts of the existing organizations.

The results of an examination of priorities are as shown in Table V.1-2.

The selected priority programmes for the casting industry, described in Table V.1-2, were integrated into the programmes for the supporting industries, and then final priority projects were proposed as the result of compiling Three Years' Comprehensive Programmes covering all the industries.

Among them priority projects related to the casting industry are as follows.

- 1) Credit and Credit Guarantee Expansion Project for Small and Medium Scale Manufacturing Enterprises
- 2) Technical Support Project for Small and Medium Scale Manufacturers
- 3) Project for Promotion of Industry Association Activities
- 4) Project for Promotion of Industrial Standardization and Quality Control

Details regarding the above 4 priority projects are given in the Section III-5. of the separate Report, "Total Review of the Three Years' Studies".

Table V. 1-2 Results of Priority Programme Identification (Casting Industry)

| | Expansion of Training and Education Programmes for Managers | Development of Engineers and Technicians | Greater Guidance in Quality Control | Greater Activities by Foundry and Engineering Industries Associations | Promotion of the Construction Plan for Foundry and Engineering Industrial Parks | Expansion of Financing Scheme for the Development of Small and Medium Scale Enterprises | Attraction of Investment and Promotion of Technical Tie-up | Increased Export Promotion Activities |
|--|---|--|-------------------------------------|---|---|---|--|---------------------------------------|
| 1. Existence of established organizations in charge of the programme | Yes (NPC) | Yes (FTU, CIAST) | Yes (SIRIM) | Yes (MIDA, FOMFEIA) | Yes (MIDA, SEDC, FOMFEIA) | Yes (CGC) | Yes (MIDA) | Yes (MEXPO) |
| 2. Maturity level of the programme | Moderate | High | High | High | High | Moderate | Moderate | Low |
| 3. Urgency of the needs of the programme | High | Moderate | High | High | High | High | High | Moderate |
| 4. Scale of investment in the programme | Medium | Small | Medium | Medium | Large | Medium | Medium | Small |
| 5. Level of direct impact | Great | Great | Great | Great | Great | Great | Great | Moderate |
| 6. Necessity of outside assistance | Strong | Moderate | Strong | Strong | Moderate | Strong | Moderate | Moderate |
| Priority selection | A | B | A | A | A | A | B | B |

Note: A: The programme is selected as a priority programme

B: The programme is given a secondary importance