

THE MALAYSIAN ELECTRONICS INDUSTRY-TRANSITION AND TRANSFORMATION

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ABSTRACT

This paper highlights and provides an analysis of some significant trends occurring in the Malaysian electronics industry. Statistics and projections on the gross output, value added and employment in this sector are given. The analysis indicates early signs of an industry in transition. Three broad strategic imperatives that could reposition the industry domestically, regionally and globally are then presented.

INTRODUCTION

The electronics industry in Malaysia started in the late sixties and early seventies with the creation of FTZ's (Free Trade Zones) primarily for multi-national companies (MNCs) to set up their chip assembly operations in various parts of the country. After more than two decades, the industry continues to provide significant contribution to the economic development of the country. The level of technology used in the industry has increased tremendously from a largely manual system to a highly sophisticated automated operation as witnessed today. The chip assembly operation has been supplemented with other activities such as chip testing, product development and small/medium scale wafer fabrication. Malaysia is now the third largest producer of semiconductor components and the world's largest exporter. It has produced a growing number of skilled workers in these fields. Innovative processes and products have also been developed within the MNCs.

This paper serves three purposes. First, it provides a sense of perspective of electronics in the national economic and industrial structure. Since engineers and technical professionals are always called upon to respond to the urgencies of their operational tasks, they are often robbed of the ability to perceive the wider implications of their work.

Secondly, new options or strategies to propel the industry to new heights may be revealed. This is important especially for those involved in strategic management and planning. Thirdly, as a highly dynamic and potential industry, electronics offers many new business opportunities. Malaysia promotes a free enterprise economy with an emphasis on export-led growth. Such opportunities are thus open to foreign entrepreneurs as much as they apply to Malaysians.

A good understanding of growth trends is therefore essential in identifying and exploiting new opportunities. Nothing can be more wasteful than to be engaged in sunset activities when others have already ventured into sunrise industries.

GROWTH TRENDS

In the last two years the electronics industry has continued to grow rapidly as illustrated in Table 1 and Figure 1. Between 1988-89 the output increase was 40.8%, followed by an increase of 29.6% between 1989-90. Over the five years 1985-90 the compound annual growth rate was 23.2% in real terms. Value added and employment have likewise increased, each respectively by 86% and 61% in the two years between 1988-1990. A worrying trend that had been noted in the past was the slow-down in the growth of value added per worker per year. In 1989 and 1990 the respective figures were RM20,804 and RM20,796. For several years now the value added per worker has been static. Total value added has only been increased by raising the number of workers. Production functions which bring about a significant increase in added value has not been successfully introduced.

The electronics intra-industry structure has also experienced a dramatic change. The dominance of electronic components, especially semiconductors, had been a cause of grave concern prompting the Industrial Master Plan (IMP) to recommend a major restructuring scheme. Table 2 shows the respective proportions of components, consumer and industrial electronics from 1986 to 1990. It is observed that by 1990 the IMP targets scheduled for 1995 had largely been exceeded, with components reduced to 57.6% (IMP 61%), consumer electronics increased to 23.2% (IMP 24.0%) and industrial electronics increased to 19.2% (IMP 15.0%). One aberration sticks out like a sore thumb: in 1990 the number of workers at 188,659 had also exceeded the 1995 IMP target of 149,420.

Analysis of more recent data reveals other dominant trends. While the earlier statistics refer to manufactured output, the following discussion is based on export trade figures. There are

fundamental differences between the two sets of data which cannot be discussed here. Electronics export growth is actually slowing down, 31.2% between 1990-91 and 13.8% between 1991-92. Although it is too early to say if this trend will persist, the drop in growth is significant.

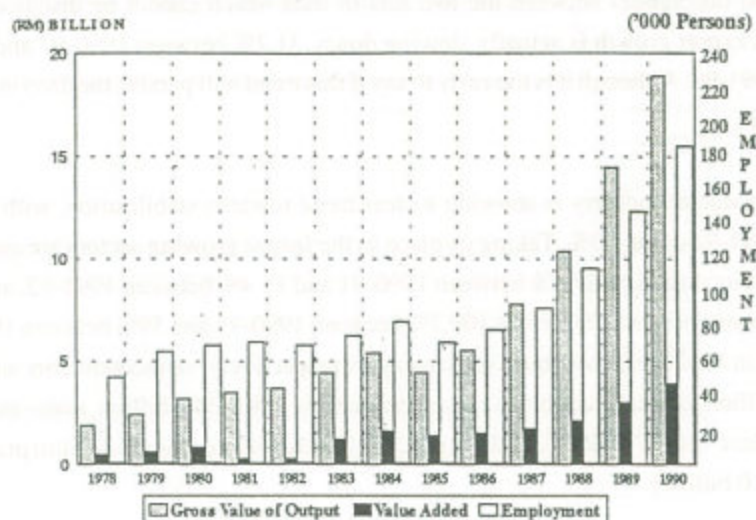
The semiconductor industry is showing a clear trend towards stabilisation, with growth between 1991-92 of only 3%. Taking its place as the fastest growing sectors are audio and video which increased by 45.5% between 1990-91 and 15.4% between 1991-92, and EDP and office equipment which grew at 109.7% between 1990-91 and 59% between 1991-92. As a result, in 1992 the three largest subsectors are respectively, semiconductors with 39% (RM13.4 billion) of total electronics exports amounting to RM34.6 billion, audio and video in second place with 27% (RM9.2 billion) and EDP and office equipment in third place with 17% (RM6.0 billion).

It should be stressed that currently the electronics industry growth rate is more than three times that for GDP. If future output is simply extrapolated, it would indicate that the electronics industry will be bigger than the country's GDP shortly after the year 2000. Of course this is an impossible situation.

TABLE 1
MALAYSIA'S ELECTRONICS INDUSTRY:
OUTPUT, VALUE ADDED, EMPLOYMENT
(1978 = 100)

YEAR	GROSS VALUE OF OUTPUT (RM1000)	VALUE ADDED (RM1000)	EMPLOYMENT (PERSONS)
1978	1,859,671	470,067	53,597
1979	2,412,045	613,166	65,013
1980	3,172,316	833,333	68,653
1981	3,468,785	283,136	70,683
1982	3,676,327	278,978	68,209
1983	4,419,430	1,214,723	75,698
1984	5,402,469	1,596,941	81,627
1985	4,428,167	1,388,459	71,924
1986	5,534,599	1,506,629	77,547
1987	7,772,679	1,732,495	89,994
1988	10,352,099	2,106,737	117,104
1989	14,574,994	3,013,374	144,848
1990	18,892,865	3,923,428	188,659

Source: Industrial Surveys, Department of Statistics, Malaysia (various issues)



Source : Industrial Surveys, Department of Statistics, Malaysia (various issues)

**FIGURE 1. MALAYSIA'S ELECTRONICS INDUSTRY:
OUTPUT, VALUE ADDED, EMPLOYMENT
(1978 = 100)**

**TABLE 2
ELECTRONICS INTRA-INDUSTRY
STRUCTURE (OUTPUT)**

YEAR	ELECTRONIC COMPONENTS (%)	CONSUMER ELECTRONICS (%)	INDUSTRIAL ELECTRONICS (%)
1986	81.5	12.3	6.2
1987	76.4	15.7	7.9
1988	71.3	18.0	10.7
1989	64.2	22.6	13.2
1990	57.6	23.2	19.2
IMP TARGET 1995	61.0	24.0	15.0

Source : Malaysian Industrial Development Authority (MIDA)

TRANSITION AND TRANSFORMATION

What is the likely future scenario? The industry seems to be in a state of transition, engendering a significant transformation into a new structure. Already in 1990 electronics contributed 24% to GDP and 39% to manufactured exports. There is general consensus that the country should not be overdependent on this sector. Future growth will therefore not be as explosive as in the past, but approach that of GDP. Proper understanding of these dynamic changes will enable the country to plan and manage proactively as well as strategically.

It can be observed that although the electronics sector continues to grow, there are early signs of a slow-down in expansion. This is a positive development as it reduces the country's dependence on electronics in relation to manufacturing and export portfolio. Future expansion should be closer to GDP growth and should exploit the evolving synergies to increase value added. Applications of electronics in other industrial and service sectors should also be encouraged.

The most marked reduction in growth is seen to be the semiconductor subsector. Emerging rapidly are EDP and office equipment and audio and video products. Vertical integration is setting in, enabling more of the components made to end up in finished goods. The rise of end-product manufacturing is spawning new support industries, such as metals and plastics, in which indigenous companies may be more ready to participate.

However, even as new manufacturing activities become dominant, the value added per worker has remained static. This indicates that the industry is still largely concerned with product assembly rather than the higher value-generating functions. As a consequence the number of workers in the industry has exceeded the IMP target for 1995 five years ahead of schedule. The low value added also points to a low level of automation. This may be acceptable for the moment, but as wage rates continue to rise, the industry will become less and less competitive. Then the spectre of relocation to low-wage countries will again loom as it did when other developing countries first began to adopt similar strategies in attracting direct foreign investment or DFI.

Other trends which are more positive should also be noted, although they are subjective observations and are less amenable to quantification. First, the level of R&D and technology development, in both depth and breadth, is rising rapidly. Both MNCs as well as indigenous companies are expending more resources to improve products and manufacturing processes. For commercial reasons many of these creative activities tend to be less widely publicised.

The more established MNCs are investing large sums of money in automation. The number of workers is being kept constant whilst increasing the quantity and quality of production, but the impact on value added will only be seen in a few years' time. However, in attempting to meet tighter specifications they have to raise the level of expertise among their workers, moving the staff profile in the direction of product and process engineering. Retraining of existing staff as well as hiring of new staff is actively pursued.

The increasing availability of parts and components locally and regionally is stimulating the growth of new end-product manufacturing. While some are involved in contract assembly, others are moving towards the development and manufacturing of products of their own design. As downstream activities expand, critical mass will be generated, drawing more component manufacturers and creating a snowball effect.

There now exists a small collection of local companies which have moved into electronics with considerable success. They are the beacon that will provide a guiding light to others looking for new opportunities. This trend should be encouraged by providing the necessary support for further expansion.

On the other hand, the government has now become very serious about building a core of local companies which can become suppliers to the traditional big manufacturers. They also have potential to become independent manufacturers in their own right. Focus is being placed on SMIs.

REPOSITIONING THE ELECTRONICS INDUSTRY

The Malaysian electronics industry has evolved over a period of twenty years, springing up from a base consisting of MNCs. The country's comparative advantage has primarily been low labour cost and strong infrastructure. However, domestic, regional and global forces are driving the industry in new directions.

There are two basic ways to view the unfolding transformation. First, a laissez-faire stand may be adopted where the industry is allowed to be driven by its inherent dynamics and each company may pick up whatever opportunities arise according to its own needs. Second, the industry may be more participative by taking positive action to control the dynamics to its own advantage. The latter approach is seen to be more beneficial in the long run. By actively repositioning the industry, more opportunities can be created, especially those that are really wanted and needed. The following subsections examine three areas of repositioning imperatives and what they imply for key participants.

VERTICAL INTEGRATION

Vertical integration can be redirected and refocused to open new opportunities for growth. Upstream, suppliers to all three dominant subsectors would need to be developed in the areas of semiconductor assembly and test, EDP and office equipment, and audio and video products. While semiconductor assembly and test are relatively well known, the latter two areas are new and require detailed analysis. Promotional activities would need to be carried out to attract new investment, either from domestic sources or DFI.

Linkages between the three major subsectors are still weak and need to be strengthened. There is little evidence to indicate that, for example, a significant proportion of the semiconductors assembled are being used to make industrial or consumer products. Yet there is considerable advantage in cultivating closer linkages between them. Apart from the particular needs of manufacturing processes such as JIT, they promote better product design, engineering and customer support.

True vertical integration will only result if most of the materials, components and services required by end product manufacturers are available from local suppliers. Wide availability of parts and components can then be expected to establish a virtuous circle, whereby the support and component industry stimulates downstream manufacturing and a strong presence of the latter, in turn, encourages further expansion of the supplier base. End-product value chains will then be established locally, sprouting new chains based on new end-products. Multiple sources for the same components will also arise, opening competition to bring costs down and quality up.

INDIGENOUS PARTICIPATION AND THE ROLE OF MNCs

A stronger indigenous presence in electronics has been a national policy since the industry's beginning. The reasons why this has not been achieved satisfactorily after twenty years continues to be debated. Incentives to promote local participation do not seem to have worked very well. More innovative strategies therefore will have to be employed.

The Vendor Development Programme is one positive move. This programme addresses the major issues faced by SMIs: technical and management skills, financial capital and marketing channels. Although the vendors can be guided to achieve the quality and cost levels required by the buying "big brother", success depends ultimately on the long-term viability of the business relationship between them.

Attracting International Procurement Offices (IPO) representing foreign companies to Malaysia is yet another new strategy. IPOs will open up global markets, increasing the economics of scale of the component suppliers. IPOs have helped suppliers to achieve international standards by providing technical and management guidance. A good track record with IPOs will also open up other non-captive markets.

More can be done. Independent initiatives should also come from the large electronics manufacturers. The ambivalence of indigenous companies towards diversification into the electronics sector is one area the large companies can help. Electronics suffers from one negative myth: that it is "high tech" in a popular sense, implying rapid product obsolescence and impossibly high R&D cost to stay alive. Few know that even within the most rapidly changing product cycles, there are many components and sub-systems which change relatively slowly and they do not require huge R&D budgets to develop.

MNCs, being the predominant players, have a powerful role to play. Although MNCs are not homogeneous, they have similarities and common interests. MNCs have for a long time nurtured the formation of local sub-contractors for their own needs. But this has been carried out largely without an industry-wide perspective, thus lacking the linkages that a more integrated approach would offer. Today's competitive pressures dictate that a more long-term view be taken with regard to partnership between MNCs and local enterprises.

With proper guidance, subcontractors can take over some lower end manufacturing processes from the MNCs. In semiconductor assembly, burn-in and test, and even complete assembly of simpler products are good examples. Similar opportunities exist in other subsectors. Even OEM and ODM functions are now ready to be taken up by subcontractors. As skills are developed, local suppliers can be entrusted with even more complex products and processes.

MNCs may also help to spawn downstream end-product manufacturing. They stand to gain as demand for semiconductor components could be increased. With the recent advent of EDP and office equipment as well as audio and video products, component producers may find it the right time to consider forming strategic alliances with locally based companies, whether indigenously owned or otherwise.

Competitive pressures will soon demand that MNCs reassess their position in relation to the countries in which they operate. They have to become more autonomous business units while maintaining their traditional links with their parent companies. Critical components and R&D, for example, will be best sourced from the parent. However, they will need to

establish more customer-oriented functions in the host countries, such as sales offices and technical support. Product design and application services should also be made available.

Such activities should not be seen merely as attempts to make MNCs better corporate citizens. They are purely business strategies to open up new opportunities and to stimulate their integration into the host country's economic system. In the process they would be enhancing their competitive position by becoming truly localised global companies.

Communication between the dominant players is the key towards forming closer links between them. The manner by which the industry evolved in Malaysia, with the MNCs on one side and the locals on the other, does not promote good communication. Even among the MNCs the situation needs improving, divided as they are according to national lines. Initiative can come from the government. There is now a case for the formation of a national body to look after the interests of the whole industry, to which membership by all parties should be mandatory.

TECHNOLOGY TRANSFER AND TECHNOLOGY DEVELOPMENT

It is often asked if there is technology transfer in the electronics industry. This question is loaded with expectations and implications. What makes it difficult to respond is the fact that technology transfer means different things to different people. Many do not know that, for example, the electronics industry cannot survive without technology transfer and, indeed, technology development.

The industry has always had an active R&D programme. For each company its R&D programme focuses on its core business, and rightly so. For instance in a semiconductor assembly plant the R&D effort will be directed at process engineering, that is, the improvement and upgrading of the assembly process.

Nevertheless, an attempt should be made to understand the expectations implied in the question. Some expect the technological level to naturally evolve from simple operational skills to adaptive reengineering and redesign, then to independent indigenous design and finally culminating in creative original design. In certain cases this has actually taken place although it cannot be expected to occur in all cases. It is often missed that technology transfer and technology development are means of achieving higher performance and not the ends. Companies will engage in such activities, and only to the necessary extent, if they result in greater quality, productivity and competitiveness in their core business.

Of greater concern is the often implied expectation that the industry will cross the technological boundaries of their present operations. Thus a semiconductor assembly plant might be expected to go upstream into chip design and wafer fabrication and downstream into end-product manufacturing. Such aspirations are indeed worthy of serious consideration for national development purposes, as the earlier discussion on vertical integration indicated. However, this issue must be tackled at a different level, separate from an individual company's agenda.

What will drive technology development into new areas is business and commercial need. The national policy is to integrate the industry by increasing the local content and to balance the contribution of components against consumer and industrial products. The fact that this transition is already in progress is a strong business reason for all companies to reposition themselves. Running at cross purposes will only put them at a disadvantage. Linkages between the subsectors should be formed without the need for government intervention. Greater integration between component suppliers and end-product manufacturers will bring about greater value added and new spin-off industries will become more viable, leading to sustainable growth.

It is time for the companies to publicise their efforts in technology transfer and technology development. Proprietary technology, by all means, should be protected. But there are ways to inform the government and other key groups about the advances made, for which actual technical details are often unnecessary. The number of staff involved in R&D, the percentage of revenue allocated, the number of local companies engaged in technology transfer programmes and significant milestones reached are only some of the possible means of quantifying their achievements.

SUMMARY AND CONCLUSIONS

The growth trends that have been described show an electronics industry in transition. This restructuring process will lead to a transformation reflecting a more balanced contribution by the three dominant subsectors: components, consumer and industrial electronics. Two new growth areas have recently emerged: EDP and office equipment and audio and video products. New opportunities have arisen for component suppliers as well as for end-product manufacturers.

The industry restructuring has not made an impact on the value added per worker. Assembly operations dominate with insufficient local R&D or engineering and design

activities. The industry has to be repositioned domestically, regionally and globally. Three broad strategic imperatives have been discussed: vertical integration, indigenous participation and the role of MNCs, and finally, technology transfer and technology development. There are initiatives that have to be made available by the government. But the industry, right down to the individual engineers and technical professionals, individually or collectively, also have an important role to play.

A more integrated approach in planning and management is urgently needed. A conducive environment has to be created which encourages communication, leading to industrial cooperation and collaboration. Critical issues in technology, human resources, industrial linkages, intellectual property and global competition may then be effectively addressed. For this purpose, what is needed most is a common vision of the future electronics industry in Malaysia. It will render greater meaning to every individual's efforts and justify long-term technology development activities.

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