

Innovation: The Way to Competitiveness

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ABSTRACT

The process of transforming Malaysia into a fully industrialised nation requires an expansion of industrial activities. In order for industries in Malaysia to sustain their competitiveness and at the same time, to create new industries, technological change and innovation are important determinants of success. This paper attempts to examine the role of innovation in achieving and sustaining competitiveness by studying the experiences of two Japanese companies using the case study method. These two companies are Kao Corporation and Matsushita Air-Conditioning Group of Companies. They are market leaders in their respective areas of business and both adopt a systematic approach to innovation management.

ABSTRAK

Proses menjadikan Malaysia sebagai sebuah negara perindustrian memerlukan pengembangan di dalam kegiatan-kegiatan perindustrian. Perubahan teknologi dan inovasi adalah penentu penting untuk menjayakan usaha yang dilakukan bagi mengekalkan tahap daya saingan industri-industri Malaysia dan pada masa yang sama menwujudkan industri baru. Kajian ini cuba meneliti peranan inovasi dalam mencapai dan mengekalkan daya saingan dengan mengkaji pengalaman dua buah syarikat Jepun melalui kaedah kajian kes. Kedua-dua syarikat ini ialah Kao Corporation dan Matsushita Air-Conditioning Group of Companies. Mereka merupakan pemimpin pasaran dalam bidang perniagaan masing-masing dan mengamalkan pendekatan yang sistematik terhadap pengurusan inovasi.

INTRODUCTION

Malaysia is in the process of transforming its economy from the present semi-industrialised status to one that is fully industrialised.

The attainment of a fully developed economy status requires a rapid pace of industrial activities and expansion. In this context, improving technological capability and the resultant technological change is critical for fostering innovation and the creation of new industries. Through innovation, firms can achieve competitive advantage by way of an improvement in the relative cost position or via the creation of differentiation thereby adding value to their products. Hence, very often, innovative companies are successful in establishing themselves as industry leaders by being the first to bring out products that meet the needs of customers. Being market driven, they also adopt a sound system of marketing management which enable them to be successful. Some examples of innovative and successful companies are: Fuji Xerox in office automation, Matsushita in room air-conditioners, and Sony and its Walkman.

Technological progress and innovation are important means for Malaysia to achieve Vision 2020. Although Malaysia has been experiencing impressive economic growth rates, it appears that this growth is due to the increases in the quantity of capital input per unit of labour rather than by improvements in technical progress. This is disturbing. Malaysia must therefore treat achievement in technological progress seriously. This paper attempts to examine the role of innovation in achieving and sustaining competitiveness by studying the experiences of two Japanese companies using the case method. The importance of functional integration in the management of innovation will also be highlighted. The organization of this paper is as follows; selected past findings are discussed in Section II after the introduction, which is then followed by an outline of the methodology used in Section III. The two case studies are presented in Section IV followed by an evaluation of the current R&D status in Malaysia in Section V. This leads to recommendations for both the public and private sectors in Section VI while the main findings of this study are summarized in the last section.

SELECTED PAST FINDINGS

According to Hayashi (1990), technology comprises all scientific knowledge deliberately and purposefully used for the production, distribution, consumption and utilization of goods, services and information, especially that which are related to mechanical

apparatus and systems. He has further divided technology into five components, known as the five M's;

1. Raw materials and resources (including energy): M1,
2. Machines and equipment: M2
3. Manpower (engineers and skilled workers): M3
4. Management (technology management and management technology): M4
5. Markets for technology and its products: M5

Hayashi argues that all these five parts are integral for the proper functioning of modern technology. Any country that aspires to achieve technological advancement must be able to integrate the five M's within the paradigm of its culture because imported technology need modification in order to achieve what it sets out to achieve. Essentially, a country would begin its road to industrialization by way of technology transfer. Eventually, this would lead to technology self-reliance. In this matter, Hayashi proposes a five-stage progress towards technology self-reliance:

1. Acquisition of operational techniques,
2. Maintenance of new machines and equipment,
3. Repairs and minor modifications of foreign technologies and equipment both in the systems and in operations,
4. Designing and planning, and
5. Domestic manufacturing (self-reliance technology).

These five stages represent the essential stages that any country must go through in order to attain technological self-reliance. Hayashi believes that it is not necessary, nor is it possible, for every country to attain complete self reliance in technology or to develop all areas of technology in an autarkic manner. Therefore, any country embarking on technology improvement must first identify its advantages, development needs, as well as its scales of technology in order to maximize economic returns.

Others (Quinn 1985; Schmitt 1985; Taylor 1990; Drucker 1985; Starr 1992; Ohmae 1994) seek to examine how technology and innovation have carved competitive advantages for corporations and how innovation can be properly managed in order to enable corporations to stay ahead in industries. Although various methods for managing innovations were proposed by these writers, the bottom-line message is the same, that is, innovation is the key to

success. For example, Ohmae (1994) believes that innovation is the way to succeed as the approach of “do more, better” has become obsolete and it can no longer bring profitability. Therefore, in the light of stiff competition and increasing emphasis on globalisation of business, corporations regardless of size cannot afford to ignore the critical role of innovation in achieving success and growth. Given its importance, what then is innovation?

Dosi, et al. (1988) defines innovation as the search for, and the discovery, experimentation, development, imitation, and adoption of new products, new production process and new organizational set-ups. Ohmae (1994) adopts a more comprehensive definition of innovation to include a process, product, or service, to any part of the business system, or even the way companies approach customers. However, according to Assael (1992) three types of innovation can be distinguished based on the degree of technological advances and changes in customer behavior:

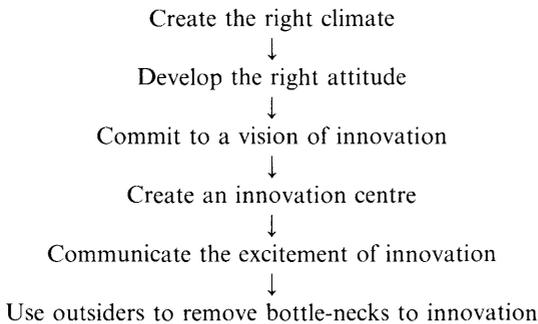
1. A continuous innovation which involves an extension of existing products with little change in technology.
2. A dynamically continuous innovation which involves minor technological advances, and
3. A discontinuous innovation that involves a major technological advancement whereby a new product and new consumption pattern can be observed.

According to Attwood (1980), innovation tends to originate in five main ways: imagination, transformation, disorder, incubation and chain reaction. The probability for innovative ideas may be relatively easy to achieve as compared to the probability for successful commercialisation as reported by Mansfield (1982). This clearly indicates that innovation entails more than mere technical advances. In fact, innovation management involves the commercialisation of innovation efforts besides the organisational environment which is conducive for the development of innovative ideas and integration of R&D activities with other functional activities. Therefore, innovation has to be examined from a broader perspective to include linkages with other functional activities, such as manufacturing, marketing and distribution.

Ohmae (1994) has identified three effective ways of generating new ideas and new product lines: (i) removing bottlenecks, (ii) creating new combinations, and (iii) maximizing strategic degrees of

freedom. Removing bottlenecks refers to identifying pressing problems that confront the organisation and investigating the causes of such problems. Solutions to problems very often involve understanding customer objectives and consumer behavior. Creating new combinations simply means looking at the possibilities for innovation in old areas of activity by coming up with new combinations, while maximising strategic degrees of freedom involves maximising differentiation in order to meet customer needs.

Ohmae (1994) further suggested a six-step approach in managing the process of innovation:



However, Ohmae recognises the fact that organisations must be able to identify the possible areas for innovation as no one organisation can have the resources to innovate in all areas. He strongly believes that innovation is the answer to the stiff competition in local and global markets. Hence, organisations which aspire to achieve excellence in performance have to recognise the importance of innovation and technological advancement as the critical means for gaining and sustaining competitive advantage.

METHODOLOGY

Both secondary and primary sources of information are sought in order to achieve the objectives of this paper. The secondary sources of information are useful in providing the theoretical and conceptual backgrounds to innovation management, as well as government policies in this matter. Company brochures, annual

reports and company publications add to the wealth of information for writing the case studies.

The primary source of information is obtained mainly through interviews with company officials from the top management of the respective companies. A questionnaire was developed for this purpose. The 12-page questionnaire cover the following issues: (a) Basic company information (e.g. name of company, paid-up capital, number of branches world-wide, number of full-time employees, and educational background of managers), (b) the amount spent on R&D (e.g. as a percentage of sales, as a percentage of profits, etc), (c) the level of technology advancement compared to industry norm, (d) the types of innovation emphasised and the contribution of each type of innovation towards success, and (e) the management of innovation (e.g. types of incentive programmes for promoting innovation, techniques for generating and screening ideas, etc.).

CASE STUDIES ON TWO SELECTED JAPANESE COMPANIES

This section presents case studies on two Japanese companies to illustrate how innovation management provided the competitive advantage needed for achieving industry leadership in the markets that they serve. The in-depth investigations of these companies seek to examine and to understand the process of innovation management. Apart from this, it is hoped that these case studies will also shed some light on how successful commercialisation of products can help to capture market share. For example, through innovation, products which are considered “mature” in the product life cycle can be given a new lease in life which then serves to prolong the product life cycle.

CASE 1: KAO CORPORATION

Kao Corporation was founded in Japan in 1980 by Mr Tomirou Nagase. Its first product was “Kao toilet soap”. The company then was known as Nagase Shoten. Kao Soap Company Ltd. was formed in 1954 with the merger of two affiliated Kao companies. Although Kao first started as a soap manufacturer, it soon expanded its product line to include Kao Shampoo and Beads, a powdered laundry soap. During Japan’s rapid economic growth in the 1960s,

expansion of product lines soon took place to include an entire line of cleansers for use throughout the home.

Kao's expansion into overseas markets began in 1957 when the company first exported Feather Shampoo to Thailand. Its involvement in overseas markets was restricted to Southeast Asia until 1986 when it first established Kao Corporation of America in North America. Now, Kao's presence spreads across as many as 18 countries worldwide. From its humble beginnings as a soap manufacturer, today Kao is a transnational corporation with a wide spectrum of diverse activities in household products, personal care products, kitchen and laundry products, cooking oils, industrial products (edible oils and fats, fatty acids and glycerin), chemical products (surfactants, urethane prepolymers, synthetic resin plasticizers, polyesters, toners, etc.), and floppy disks.

Kao (Malaysia) Sdn Bhd Kao (Malaysia) Sdn Bhd was established in 1973 with a paid-up capital of RM8 million. Its major shareholders are Kao Corporation Japan (45 per cent), Boustead Holdings (45 per cent), and Felda Corporation (10 per cent). Kao Feather Powder Shampoo, the first product to be launched in Malaysia was well received. Today, it is one of the leading manufacturers and distributors of toiletries and hygiene products in Malaysia. The products include detergent, an array of shampoos, rinses, skin care products, sanitary napkins, disposable diapers and MD computer diskettes.

The rapid growing local demand for Kao's products has necessitated expansion programmes which include a new factory costing RM12 million in Port Klang. In addition, through a joint venture between Kao Corporation and Palmco Holdings, Fatty Chemical (Malaysia) Sdn Bhd was established in 1988 to develop palm oil operations and it is on its way to becoming one of the global Kao group key suppliers of intermediate materials.

Management of Kao (Malaysia) Sdn Bhd Figure 1 shows the formal organisational structure of Kao Malaysia. The company is organised on functional basis with six functional departments: EDP, sales department, manufacturing and production, R&D, logistics and sales administration, and finance and administration.

Currently there are 280 full-time employees in Kao Malaysia with a total of 26 managers at the different levels of management (Table 1).

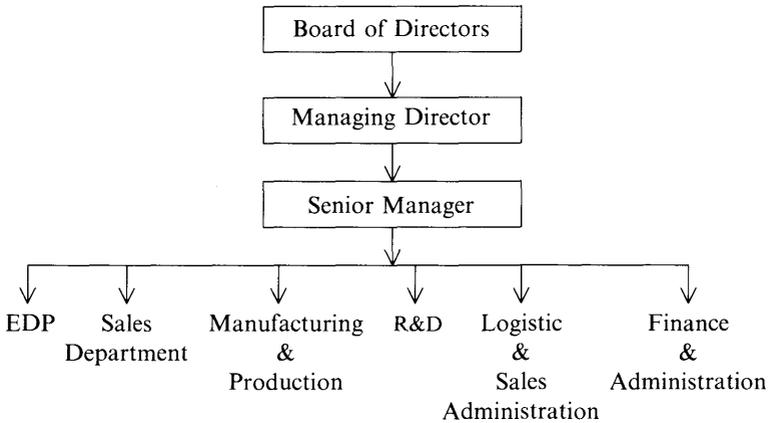


FIGURE 1. Organisational Structure of Kao Malaysia.

Source: Survey of authors

TABLE 1. Kao Malaysia: Number of managers by level and function

Management Level	Management Function					Total
	Finance	Marketing	R&D	Production	Personnel	
Senior	1	-	1	2	1	5
Middle	1	4	-	4	1	10
Junior	1	5	-	4	1	11
Total	3	9	1	10	3	26

Source: Survey of authors

Kao (Malaysia) Sdn. Bhd. emphasises the important roles of production and marketing as indicated by the strong management team in these two functions. Despite having only one manager for R&D at the senior management level, R&D remains an important function as Kao widely practices functional integration. In terms of professional qualifications and educational backgrounds, managers at the different levels are from diverse disciplines as shown in Table 2. All managers at the top management level are either with

TABLE 2. Kao Malaysia: Professional qualifications and educational backgrounds of managers by level

Management Level	Engineering	Science	Business Administration	Arts/ Soc. Sc	Other	Total
Senior	2	3	-	-	-	5
Middle	4	2	4	-	-	10
Junior	-	-	2	5	4	11
Total	6	5	6	5	4	26

Source: Survey of authors

engineering or science qualifications while at the middle management, six out of ten managers are from similar backgrounds.

Kao Corporate Philosophy Kao believes it should contribute to the enhancement of people's lives by offering products which improve the quality of their lives. Consistent with this philosophy, Kao Corporation wants to offer products which generate new growth and expand markets. The only way to achieve this mission is through its emphasis on research and development for new product development and strong sales. Marketing functions are oriented to customer service because Kao holds strongly its commitment to serving customers. This is further exemplified by the broadening of its focus from one merely serving customers to one of helping them to lead a cleaner, healthier, and more beautiful lives. In Japanese, "Kao" means face and in keeping with the premium product image, the crescent moon logo, symbolic of beauty and purity is used.

According to Yoshio Maruta, Chairman of Kao Corporation Japan, besides an emphasis on cleanliness of body and mind, every aspect of Kao's business operations must reflect the absolute equality and dignity of all human beings. Specifically, Kao's corporate philosophy consist of:

1. Spirit of services to consumers
 - Cleanliness, Health, Beauty
2. Sense of absolute human equality
 - Equality
 - Non-commanding

- elimination of authoritarianism
 - Exchange and sharing of information
3. Sense of truth/pooling of wisdom
- Creativity — innovativeness
 - Action — Practice type

On the management philosophy, Kao's organisational principles stress that all individuals deserve the same respect, regardless of differences in their positions or roles. In promoting the sharing of ideas and creating the desire to improve performance at all levels, Kao strives to move away from a pyramid type organisation to a more flexible corporate management structure.

Kao Corporation: Current Activities Kao's involvement in the international market can be divided into four key regions: Japan, Southeast Asia, Western Europe and North America. Today, it has set up approximately 50 offices all over the world.

For the fiscal year ended 31 March, 1992, consolidated net sales reached a total of US\$6,631.7 million (Annual Report 1993) compared to US\$3,926.8 million in 1990 (Annual Report 1990) representing an increase in performance of 69 per cent, with all major products recording an increase in sales. In fact, according to Kao Corporation, it controls the number 1 or number 2 position in virtually every market in which it competes.

Broadly, the products manufactured by Kao can be classified into two main categories: (1) household products, and (2) chemical products. Household products can be further sub-classified into three main types, namely, personal care and cosmetics, laundry and cleaning, and hygiene and others. Personal care products and cosmetics include toilet soap, body cleansers, shampoo, hair rinse, hair care products, cosmetics and skin care products, toothpaste and toothbrushes. Under laundry and cleaning, the products are laundry, kitchen and other household detergents and laundry finishing agents. Sanitary products, disposable diapers and bath agents are classified under the category of "hygiene and others".

For the range of chemical products, edible fats and oils, fatty alcohols, glycerine and fatty acids are grouped under fatty chemicals. Specialty chemicals carry a separate range of products which include surface active agents, polyurethane systems and additives, plasticizers for synthetic resins and polyester resins. Floppy disks form another component of this product category.

As reflected by the motto of Kao Headquarters, each and everyone in the organisation strives hard to create products that benefits society. The avenues through which Kao pursues this ambition are: research and development and marketing management with an emphasis on customer service.

Research and Development Management Kao believes that research and development is the driving force for corporate success and its ability to deliver meaningful and superior products to consumers. Its commitment towards R&D and product development is supported by the establishment of four key laboratories in Japan, each specialising in different areas of research:

1. Tokyo Research Laboratories concentrate on research on cosmetics, toiletries, fragrance and flavours and colour science;
2. Wakayama Research Laboratories carry out research on fat and oil chemistry, polymer science, industrial chemicals and manufacturing processes;
3. Tochigi Research Laboratories specialise in biological science, organic chemistry, household products, hygiene products and technology of developing composite materials;
4. Kashima Research Laboratories conduct research on fat and oil chemistry, edible oils, foods, fermentation and enzyme.

Although these laboratories have distinct mandates in their areas of specialisation, the R&D headquarters at the main office play an active role in overseeing and coordinating their activities in order to maximise the effectiveness of their functions. To date Kao has seventeen laboratories world-wide. These laboratories include Recording and Imaging Science laboratories, Kao Institute for Fundamental Research and Production Technology Institute.

The international technology strategy of Kao can be described as one that adopts a three-stage model. The first stage is usually characterised by the setting up of an off shore marketing and distribution organisation which took place in 1957 with the first off shore office in Thailand. The second stage centers on the establishment of production facilities in major markets abroad, while the third stage involves the internationalisation of core corporate functions such as R&D (Sakakibara and Westney 1992). The setting up of R&D facilities in Malaysia in 1975 is a clear

indication that Kao has been involved in internationalisation of technology strategy for over two decades.

In order to coordinate research activities around the world, Kao has adopted the approach known as the “pooled” approach where R&D activities are conducted at several overseas bases with half the research being initiated by each base, making for simultaneous, parallel R&D activities within the company (Sakakibara and Westney 1992). In this manner Kao is able to benefit from the intrafirm coordination of dispersed R&D activities.

Its commitment to research and development is also evident from the composition of its staff strength. Of the 8,000 employees in Japan, one quarter or 2,000 of them are researchers performing high-level basic and applied research, product development, manufacturing technology, research and development. These researchers are given autonomy in conducting their research activities. For example, according to the managing director of Kao Malaysia, Hiroo Inoue, 80 per cent of the research activities carried out are transparent to top management, that is, the top management has complete knowledge about these research activities. The remaining 20 per cent of the research activities are termed as “warming up under the table”, are conducted without the knowledge of the top management. In other words, researchers enjoy complete freedom and flexibility in research activities. The top management will be informed when the ideas being experimented show potential of becoming an economic success. The autonomy given to researchers has enabled them to carry their activities without the fear of failure.

In addition, R&D conferences and workshops are held regularly, with both management and research staff engaging in discussions. With the strong emphasis in research and development, Kao’s technology development can be described as very advanced in the industry in which it competes.

Interdisciplinary Research and the Fusion of Science and Technology

The thrust of R&D activities in Kao are in-depth basic research, inter-disciplinary research and the fusion of science and technology (Figure 2).

The fusion of science and technology is nonlinear, complementary, and cooperative, whereas the “breakthrough” approach, an older generation of technology is a linear, step-by-step strategy of technology substitution (Kodama 1992). The Chairman of Kao

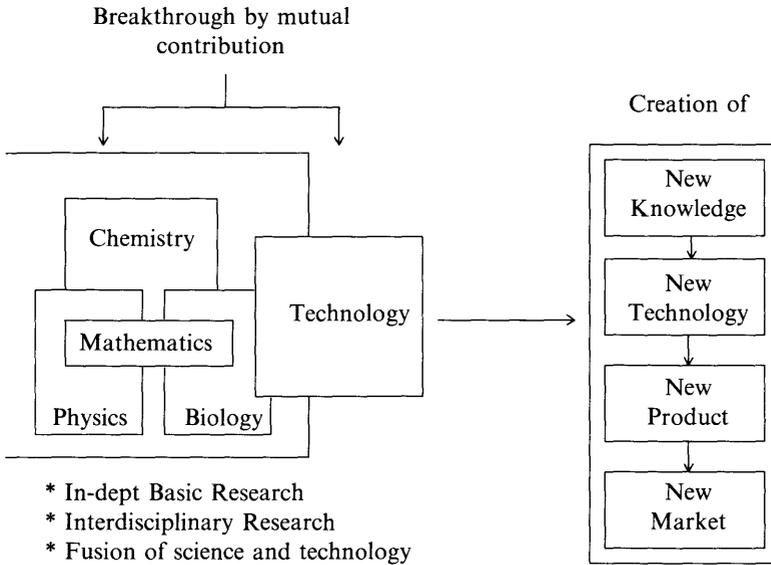


FIGURE 2. Interdisciplinary Research and Fusion of Science and Technology.

Source: Yoshio Maruta, 1992.

Corporation, Yoshio Maruta, believes that it is difficult to perform productive research unless the natural science such as chemistry, physics, biology, and mathematics are linked together by means of interfaces. With the synergistic effects of technology fusion and demand articulation, Kao is able to develop products that meet the changing needs of consumers. The development of “Kao Attack” detergent, a “bio-detergent” is a good example of how Kao returned to the basics of cleaning to satisfy market needs. At a time when the detergent market was considered mature, Kao rejuvenated the market by reexamining the concept of cleaning. The detergent sold in the market then could only remove dirt found on the surface of the cloth but not dirt trapped in cloth fiber. Realising this shortcoming, Kao introduced “bio-detergent” that is able to remove micro dirt (1/5000mm) trapped in cloth fiber. With this innovation in cleaning, Kao is able to meet consumer needs in cleaning and therefore enjoyed market leadership in the detergent industry.

The success of “Kao Attack” also demonstrates the importance of integration of management functions. If research & development were to generate an economic impact, it has to be totally integrated with other management functions such as production and marketing. A product will not be useful unless it is of value to the customers. As indicated in Figure 3, the integration of production, marketing and R&D function has led to the development of innovative products that meet customers needs.

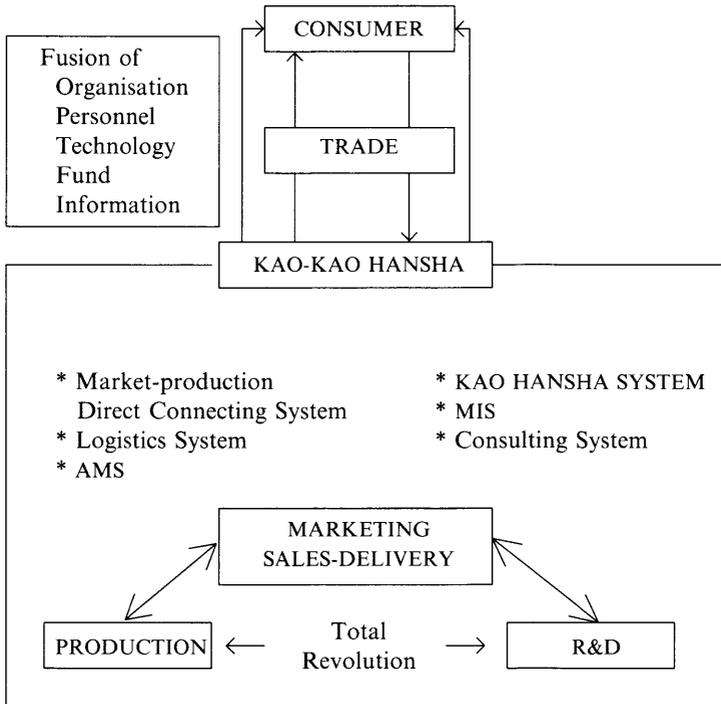


FIGURE 3. Total Integration.
 Source: Yoshio Maruta, 1992.

Types of Innovation The most important type of innovation carried out by Kao is social innovation, followed by product innovation. Process innovation is ranked as not important in view of its implications on other aspects of strategy, such as, costs and pricing. Social innovation refers to planned improvements in human resource management (Thom 1990). The strong commitment in

social innovation rests on the belief that the entire organisation cannot be better than the sum total of its staff.

While social innovation is important, product innovation will bring about product development which is in line with the corporate philosophy of Kao in enhancing people's lives through innovative products that answer actual market needs. Under product innovation, the three types of product innovations, namely, continuous innovation, dynamic continuous innovation and discontinuous innovation share almost equal importance in terms of contribution towards the success of Kao. However, dynamic continuous innovation which involves major changes in an existing product, is ranked as the most significant followed by discontinuous innovation and continuous innovation.

New Product Development In order to maximise the potential of new products, Kao also places great importance on the management of new product development. The approach adopted by Kao can be described as very pragmatic. During the technical development phase of a new product, five frequently asked questions are:

1. Is the product really useful?
2. Does it make use of Kao's own creative technology?
3. Does performance justify the cost?
4. Can the product gain support in consumer test?
5. Is the product compatible with existing retail distribution systems?

A product that fails to measure up to any of these criteria will be held back for further development. In this way, Kao is confident that it does not produce "me-too" products but products that can expand the market horizon.

Information sharing is viewed as critical in achieving success for the company and this is exemplified by the system of information sharing in Kao whereby managers and other employees alike can have access to the same information from computer screens. This open communication that transcends organisational lines is consistent with the managerial philosophy of Kao in equality. Kao believes that recognising the dignity and equality of all people is essential to providing superior customer service. Therefore, every individual in the organisation deserves the same respect, regardless of differences in their positions. Status equalisation helps substantially in promoting the sharing of ideas and creating the desire to

improve performance at all levels. In addition, every employee in the organisation is given the freedom to suggest innovative ideas through meetings or even through personal discussions with the managing director who maintains an open door system of management.

Since social innovation is accorded prime importance, great attention is given to the “people” asset. Training programmes are tailored towards the promotion of innovation, including on the job training and formal training by obtaining the services of consultants.

R&D Management in Malaysia In Malaysia, out of an employee strength of 280, 18 are involved in research and development. Although this is low compared to the staff strength in R&D in Japan, Kao Malaysia is able to enjoy the technology developed in Japan. This approach benefits the receiving country in terms of technology transfer and maintains Kao’s competitiveness globally.

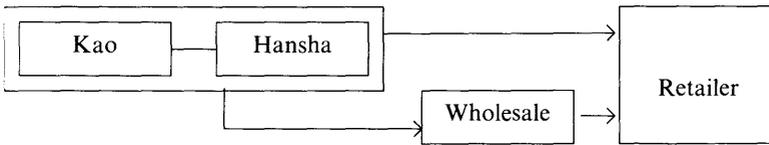
In order to maximise the effectiveness of R&D activities in Malaysia, incentive programmes such as training in Japan and internal seminars are introduced to motivate employees. In addition small group activities are found to be effective for idea generation. Consumer survey is frequently used to screen ideas generated in order to avoid “go” error and “drop” error. Joint meetings are then conducted with the various departments to achieve cross-functional integration for the success of product development.

In Malaysia, the types of R&D activities conducted include quality assurance and product development for the local market. However, basic research has yet to commence due to the shortage of qualified personnel.

Marketing Management The successful commercialisation of new products requires more than just superior products. Effective marketing programmes form the other important ingredient that will ultimately enhance the financial performances of any corporation. In this regard, Kao is committed to consumer marketing by effectively and constantly communicating with its consumers about the benefits of Kao’s products.

Apart from its commitment to consumers, Kao has also successfully maintained a strong, long-term relationship with its distribution network. This is to ensure that the products reach the ultimate consumers in a prompt and reliable manner. For example,

in Japan, Kao can simultaneously ship new products to 300,000 retail outlets or to deliver products the day after a retailer places an order. This is made possible through the implementation of a sales strategy in Japan known as the *Hansha* system. *Hansha* are independent sales firms that handle Kao products exclusively (Figure 4). This system of distribution allows for direct customer feedback and prompt response to customers' needs. The ten Kao *Hansha* handle about 80 per cent of the sales directly to retailers, acting not only as wholesalers and mediators of product distribution, but also as multifunctional organisations. *Hansha* acts as a support system that enhances the overall marketing ability of wholesalers and retailers as well as provides consultation on matters, such as merchandising, display, sales promotion and renovation of shops.



Conventional Distribution Channels

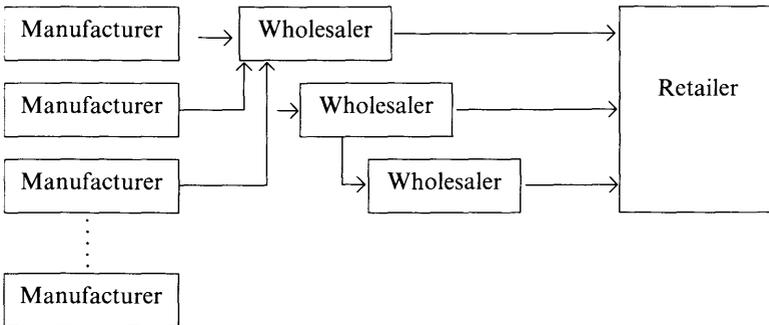


FIGURE 4. Kao vs Conventional Distribution Channels.

Source: Kao Corporation Annual Report 1993.

Figure 4 illustrates the distribution system under *Hansha*. Compared with the conventional methods or channels of distribution, the *Hansha* system obviously ensures a more speedy delivery since distribution only involves *Hansha* and retailers.

In addition to its effective distribution system, an automated information system called Kao Logistical Information System (KAOLIS) is implemented to further boost the efficiency of Kao's operations. About 900 large retail stores are directly connected to *Hansha* via an on-line computer system which strategically integrates Kao's marketing activities with its manufacturing operations and distribution system. With this integration of manufacturing, distribution and sales, Kao is able to establish efficient delivery and manufacturing systems that are well-suited to the fast-paced and constantly fluctuating consumer market.

In summary, the success of Kao clearly reflects the importance of R&D, fusion of technology and the integration of R&D with other management functions such as marketing and production. Break-down in any of these activities will create profound impact on the other activities which will ultimately cripple growth.

CASE 2: MATSUSHITA AIR-CONDITIONING GROUP OF COMPANIES

Matsushita Air-Conditioning Group of Companies (MACG) consist of four companies: Matsushita Industrial Corp Sdn Bhd (MAICO), Matsushita Compressor and Motor Sdn Bhd (MCM), Matsushita Air-Conditioning Corp Sdn Bhd (MACC), and Matsushita Air-Conditioning R&D Sdn Bhd (MACRAD). These companies were established at different times. MAICO being the first company in the group, was established in April 1972 while MACRAD was established in 1991. As at October 1, 1993 the paid-up capital for the whole group stands at RM 252.5 million.

The parent company for Matsushita Air-Conditioning Group of Companies is the Air-Conditioning Division (established in 1960) of Matsushita Electric Industrial Co Ltd. in Japan. The Air-Conditioning Division has branches in Taiwan, the Philippines, Thailand, Indonesia, Malaysia, United States, and Ivory Coast. However, only the operations in Malaysia and Taiwan carry out R&D functions.

Corporate Philosophy of Matsushita Matsushita Electric Industrial Co Ltd., founded in Osaka in 1918 by the late Konosuke Matsushita, is one of the world's premier manufacturers of a wide spectrum of products and services in 160 countries. The visionary founder set forth the following code in July 1933:

1. spirit of service through industry
2. spirit of fairness
3. spirit of harmony and cooperation
4. spirit of striving for progress
5. spirit of courtesy and humility
6. spirit of accord with natural laws
7. spirit of gratitude

These seven principles remain today, as they have been since that time, the basic watchwords for the daily work of Matsushita employees. Together with the basic business philosophy, these seven principles have supported the growth and success of Matsushita. The basic business philosophy is as follows:

Recognising our responsibilities as industrialists, we will devote ourselves to the progress and development of society and the well being of people through our business activities, thereby enhancing the quality of life throughout the world.

Current Activities of Matsushita Air-Conditioning Group of Companies The four companies under the group have their own areas of responsibilities and specialisation. Through advanced technology, the group is transforming Malaysia into the world leader in room air-conditioners exporting to more than 120 countries worldwide, including Japan. The three basic functions of management, research and development, manufacturing, as well as sales, are integral to Matsushita's emphasis on product excellence and customer's satisfaction. The continuous improvements in quality, design, size, quiet operation, and durability of products are the winning criteria for wide market acceptance.

Matsushita Industrial Corporation Sdn Bhd (MAICO) MAICO was established to produce window-type room air-conditioners. From the initial annual production of 100,000 units of air-conditioners in the 70s, production now stands at more than 1,000,000 units. The ultimate goal of MAICO is to become a comprehensive manufacturer of air-conditioner, air-conditioning equipment, servicing every aspect of the market. The types of air-conditioners produced by MAICO has undergone tremendous revolution in order to keep pace with changes in market needs. For example, the L-shaped and compact type room air-conditioners have gained praise in the US for their quiet operation and stylish design. By continuously improving

on product design, features, and performance, MAICO strives to improve the quality of living by providing comfort to mankind. To further complement the activities in MAICO, MACTEC was set up in April 1992 to develop and manufacture dies and molds. The immediate priority of MACTEC is to supply dies and molds to MAICO and MACC. In addition, with the increase in local content of its manufacturers, MACTEC will be in a position to assist local suppliers in achieving greater competitiveness in terms of cost, quality and lead time in production.

Matsushita Compressor and Motor Sdn Bhd (MCM) MCM was established in 1987 to meet the increasing worldwide demand for compressors and motors. Besides supplying to MAICO and MACC in Malaysia, MCM also exports compressors and motors. MCM now commands 35 per cent share of the world market for compressors. The factories under the charge of MCM are MCM1, MCM2 and MCM3. MCM1 is the only factory in the world with comprehensive manufacturing facilities for production, from the compressor motors to the completed compressors. MCM2 produces air-conditioners for motors and vacuum cleaner blower motor, while MCM3 began operations in October 1993 to produce hermetic motors and toroidal motors.

Matsushita Air-Conditioning Corporation Sdn Bhd (MACC) Operations in MACC commenced in October 1990 and it is responsible for the manufacturing of split room air-conditioners, from the production of component parts to the finished products.

Currently, MACC exports to Japan and other parts of the world. MACC is proud to see that all major component parts are manufactured in-house and 85 per cent of total parts are sourced from inside Malaysia. Computer-aided product design and control, and automation are indications of its emphasis on efficiency. In addition, MACC constantly introduces the most advanced equipment in order to improve the efficiency of its production line system, and hence to achieve total quality control.

Matsushita Air-Conditioning R&D Centre Sdn Bhd (MACRAD) The setting up of MACRAD for R&D activities further nudged the group ahead in achieving its ambition to attain a self reliant and self conclusive system of management. According to Matsushita, a self-conclusive and self reliant system of management should perform

the three key functions: research and development, manufacturing as well as marketing. The absence of any of these functions cannot render the management system to be self conclusive.

MACRAD is well-positioned to design and develop all the new models for MAICO and MACC for manufacture in Malaysia as well as to play a larger role regionally by lending assistance to sister companies in ASEAN in disciplines such as state-of-the-art product development, product engineering and quality assurance system.

Currently, the Matsushita Air-Conditioner Group of Companies employs a total of 5,588 local employees and 52 Japanese. The proportion of Japanese employees is less than one per cent of local employees. Of the employee strength of 5,640, about four per cent (232) are managers employed at the different management levels. A breakdown of the managers by function and level is as shown in Table 3.

TABLE 3. MACG: Number of managers by level and function

Management Level	Management Functions					Total
	Finance	Marketing	R&D	Production	Personnel	
Senior	4	2	6	36	3	51
Middle	2	10	4	28	3	47
Junior	20	20	22	61	11	134
Total	26	32	32	125	17	232

Source: Survey of authors

As the group carries out the manufacturing of room air-conditioners for the world market, it is not surprising that the production function employs the most number of managers for all management levels. With the increasing intensity of R&D activities, R&D function now employs 32 managers. Marketing being the other key management function also has a total of 32 managers at the different managerial levels to effectively market products of Matsushita Air-Conditioning Group of Companies.

Table 4 shows the educational backgrounds of managers by level. For the senior management level, 40 managers out of a total

TABLE 4. MACG: Educational backgrounds of Managers by level

Management Level	Engineering	Science	Computer Science	Business Admin.	Arts/ Soc. Sc	Others	Total
Senior	40	-	-	-	5	6	51
Middle	18	1	-	3	-	25	47
Junior	54	11	5	7	4	53	134
Total	112	12	5	10	9	84	232

Source: Survey of authors

of 51 or 78 per cent are with engineering background. However, the proportion of managers at the middle and junior level with engineering background decreases to around 40 per cent. This clearly indicates the commitment of the Group towards manufacturing and R&D functions which are integral for the success of the company.

In Japan, a total of 3,660 employees are employed under the Air-Conditioning Division. Of this number, 310 are engaged in R&D activities. Compared to the Malaysian operations, the percentage of employees in R&D in Japan is high. This is parallel with the age of R&D activities in Japan compared to the short history of R&D in Malaysia.

Innovation Management Since its founding in 1919, Matsushita has adhered to the basic philosophy of product development which is to contribute to society and improve living standards by providing products of superior quality and functionally.

The setting up of Matsushita Air-Conditioning R&D Centre Sdn Bhd (MACRAD) in April 1992 marks a new era of challenge for Matsushita Air-Conditioning Group of Companies. It also signifies a step forward in the transfer of technology from Japan to Malaysia. In its pursuit for a self reliant and self conclusive management system, MACG can now perform the three essential functions of R&D (with the setting up of MACRAD), manufacturing and marketing. The R&D activities can be carried out in a more coordinated manner compared to the pockets of R&D activities conducted previously.

MACRAD is well positioned to design and develop all the new models of room air-conditioners for MAICO and MACC. It is also hoped that MACRAD will be able to provide assistance to sister companies in ASEAN in disciplines such as the state-of-the-art product development, product engineering and quality assurance system in the future. In its strategy for intrafirm coordination of R&D, the approach taken by MACRAD resembles the “country centred” approach which concentrates all R&D activities in one country, even though R&D is undertaken on a global scale for multiple countries.

Amount of R&D spent as a percentage of sales is about five per cent for 1992 and 1993. In 1993, the percentage increase in R&D expenditure is about 20 per cent. This increase fortifies the support for R&D as an engine for growth for the company. As Matsushita is the world leader in room air-conditioners, its level of technological advancement surges ahead of the industry norm. Innovativeness provides the competitive edge for Matsushita Air-Conditioning Division of Japan and Matsushita Air-Conditioning Group of Companies in Malaysia.

In line with its high-tech operations, the manufacturing system is highly automated. However, there is a difference between the operations in Japan and Malaysia with regards to the level of automation. Malaysia still lags behind Japan in terms of automation in manufacturing processes. The desire and the strong will to improve has led to the formulation of MACRAD’s mid-term objective of *Let’s Catch Up With Japan*.

The company believes that the three essentials for any company to become excellent are product, manufacturing, and sales. However, human beings are the most important resource to make things happen. Therefore, product, process and social innovations share equal importance in Matsushita in sustaining its competitive edge.

Product Innovation For product innovation, Matsushita pays attention to two aspects: (a) market trends in terms of customers’ tastes and needs and (b) technological seeds. It adopts the market driven attitude in order to be able to create products that meet and fulfill consumer needs. Therefore, the majority of the allocation for R&D (90 per cent) is spent in applied research. At the same time, it cannot afford to ignore the importance of technological seeds which

provides information on the latest technologies. Thus, the balance of the ten per cent of allocation for R&D goes to basic research.

For most of the R&D activities conducted in MACRAD, decision making is highly decentralised. However, for new product planning, consultation with the parent company in Japan is absolutely necessary especially for products for the export market. This is because the parent company has the knowledge and the information on the export market.

Matsushita's leadership in room air-conditioners industry is a testimony of the efforts of product innovation. Guided by its strong corporate philosophy, Matsushita strived hard to improve and to emerge as the industry leader. American leadership (about 10-15 years ago) in the industry is a past glory for the United States. In order to continue to enjoy its competitive edge, product innovation of MACG has resulted in the production of the scroll-type compressor which reduces vibration to 1/10 of the vibration level of the conventional rotary-type compressor. With the reduction in vibration, the noise generated by air-conditioners using the scroll-type compressor is greatly lowered. To further prove its leadership, a small type of out-door split air-conditioners was introduced in 1992 in the Japanese market. It was so well received by consumers that its competitors such as Toshiba and Hitachi are unable to produce air-conditioners that can match the performance of this new model. The reduction in size of this model represents a 20 per cent reduction of the original model. It is only 540 cm by 540 cm. The compact size, quiet operation, durability and the overall quality are the main characteristics of room air-conditioners produced by MACG to meet customers needs and satisfaction.

Process Innovation Process innovation is equally important in order to ensure that products of high quality are produced. Quality control system is installed to satisfy customers with products that not only meet their satisfaction but delight them. For example, at MCM, stringent quality inspections are performed everyday under the actual running conditions. In addition, an in house-factory inspection system using equipment that can thoroughly examine every stage of the production process is installed. MACG adopts an uncompromising attitude towards quality which is the hallmark of its full range of products for the Group.

Social Innovation Man, machine and money are required for production. The importance of social innovations is evident from the human resource development programmes initiated by MACG. In its Human Resource Development Policy, MACG states: "We make people before we make a product".

A systematic training and development programme is introduced. To further facilitate training, a training institute known as the Masters Institute of Technology (M.I.T.) is established to meet the training demand of MACG. Two types of training, on-the-job training and off-the-job training, are conducted simultaneously to allow employees to benefit from the interactive effects of these two types of training. In addition to in-house training, employees are also sent to Japan for skills and knowledge upgrading.

Apart from training programmes, small group activities such as Quality Control Circles (QCC) form an important part of the development programme. QCC presentations are held three times a year in order to motivate and encourage continuous improvement in performance. For the technical staff, competitions in welding, technical drawing, etc. are also conducted to encourage constructive competition among staff to further improve their skills. The healthy competition helps to motivate employees in Matsushita to achieve excellence in their jobs.

Reward system is also introduced in innovation management. Monetary reward is given to any employee who develops new technology, for which patent is applied. This recognition has proved to be successful for the new idea generation, development and hence innovations.

Information Sharing System In this high-tech era, availability of information at the right time and the right place is vital for decision making in management. Similarly, for innovation management, information is crucial. For example, patent information, technical reports, and information on other products are important sources of information on the existing technology for any industry. In order to develop the state-of-the-art technology, these information must be made available, in particular, to those who are involved in R&D activities. In Matsushita, computer link-ups are extensive. In the case of MACG, although the telecommunication system in Malaysia is less developed compared to developed countries, an arrangement is made with its parent company in Japan to obtain information. Technical reports, patent registration reports etc. are compiled and

summarised in Japan and disseminated to Malaysia. Counterparts in Malaysia will then request for detailed reports if necessary. This arrangement helps to keep MACG personnel informed of the latest development in the industry.

New Product Development The process of new product development involves eight stages before the new product is marketed. Based on the market trend and data analysis, new ideas are analysed using the latest technologies. New product features will then be created according to market trends, demand analysis reports and final results of the research activity. The third step involves research whereby theories are formed on how the main components such as compressor, heat exchanger, fan and electronic devices work effectively by applying computerised simulation technology. In the subsequent step (the fourth step), basic product characteristics of refrigerant circulation system, air flow system and structural strength etc. are developed and designed. At the stage of prototype sample making (the fifth step), the product begins to take shape. At this step too, the prototype is subjected to extreme experiments to gauge its viability. After having passed this stage, the next stage (the sixth step) is evaluation in which various environmental tests are carried out using hi-tech experimental equipment to ensure the reliability of designed products before specifications are determined and confirmed. For example, high humidity testing is conducted to test the water disposal performance of the product. The noise level is also tested in order to ensure that the air-conditioners operate only at minimum level of noise. Next (the seventh step), precision machines with CAD/CAM are used in the production of dies and molds. Mass production in which products are manufactured for worldwide distribution is the final stage of the new product development process (Figure 5).

This systematic process enables the company to avoid the “go” error and the “drop” error as any of these errors would incur great loss to the company.

Innovation management in MACG is comprehensive, that is, management pays attention to every aspect of the operations. Thus, product, process and social innovation are not left to chances but are carefully planned. For product innovation, MACG concentrates on continuous product innovation to improve the overall performance of room air-conditioners to meet consumer demand that is becoming more sophisticated.

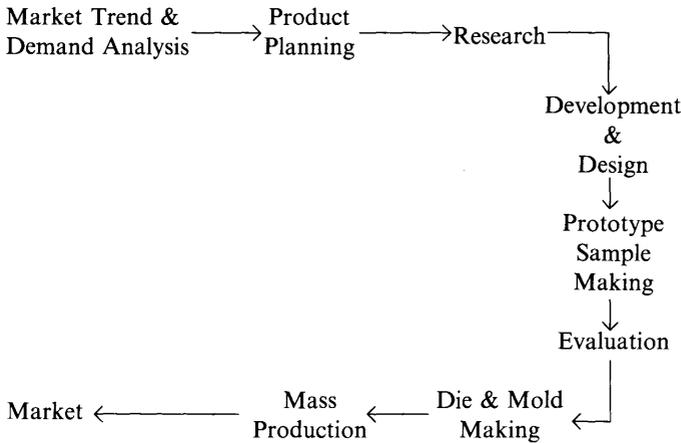


FIGURE 5. Process of new product development.
 Source: Adapted from a brochure published by MACRAS.

The international technology strategy of MACG can best be described as in the fourth stage in which MACRAD embarks on new product development (Sakakibara and Westney 1992). The R&D facility in Malaysia epitomises what is generally defined as the internationalisation of R&D. It would be safe to predict that MACRAD will eventually move on to the stage in which strategic mandate encompasses basic research.

Marketing Management Innovation management is absolutely necessary but not sufficient to ensure product success. Marketing management plays an important role in the successful commercialisation of products. For effective marketing management, Matsushita Air-Conditioning Group of Companies implement geographical segmentation and introduce multi-channels of distribution to reach its customers. Based on geographical segmentation, the room air-conditioners market can be divided into two: domestic market and export market. MAICO handles all the domestic sales while the Air-Conditioning Division of the parent company in Japan handles the export sales.

At the domestic level, two categories of dealers can be distinguished. The first category consist of the National Shops that sell exclusively Matsushita products. The second type of distribution is through the appointment of dealers who mix brands.

A total of 250 dealers are appointed for the distribution of room air-conditioners in Malaysia.

As export sales remain the responsibilities of the parent company in Japan, sales personnel are sent out to the different markets all over the world to get orders, fix price and close transactions. Sales deals closed by these sales personnel are transmitted to Malaysia where the Group will sell direct to the end buyers in the world. In this case the end buyer can be dealers or agents depending on the system of distribution in the buyer company. With clear responsibilities on marketing management and emphasis on innovation management, MACG is able to command sustained industry leadership in room air-conditioners.

CURRENT STATUS OF R&D IN MALAYSIA

In order to achieve technology self-reliance just as in the case of the industrialised nations, Malaysia needs to conduct an audit of her advancement in technology. For this purpose, some basic questions that need further and serious attention include: What is our position in the technological advancement map vis-a-vis our competitors? Which direction do we want to go? What strategy/strategies need to be adopted in our quest for technological leap?

In order to answer these questions, it is perhaps useful to examine the current status of R&D in Malaysia. A comparison of R&D expenditure as a percentage of GNP of selected countries in 1990 show that Malaysia lags far behind, spending only 0.8 per cent of GNP against top spenders such as United States of America, Japan and Germany with R&D expenditures of around 3 per cent of GNP (Table 5). Comparisons of Malaysia with the newly industrialised economies like Taiwan (1.3 per cent) and Korea (1.8 per cent) shows that R&D expenditure of Malaysia in GNP is miniscule (Table 5). Although the government's allocation for R&D registered an increase of RM 174 million representing an increase of 43 per cent, from the Fifth Plan (RM 414 million) to the Sixth Plan Period (RM 588 million), the amount is still relatively low compared to other countries such as Korea and Japan. Out of this allocation, 50 per cent goes to agriculture, 34 per cent for industry and 17 per cent for other sectors (Sixth Malaysian Plan).

Of the amount allocated for the Sixth Plan Period, RM 257 million will be directed to universities to carry out basic research. Public research agencies will concentrate on applied and develop-

TABLE 5. Shares of R&D expenditure in GNP 1990 (%)

Country	Share
Malaysia	0.8
Taiwan	1.3
Korea	1.8
Japan	2.9
Germany	2.9
Singapore	1.0
U.S.A.	3.0
U.K.	2.5
Italy	1.6

Source: Abdul Aziz Abdul Rahman, Mad Nasir Shamsudin. 1993.

ment research, while the private sector is entrusted with the responsibility of commercialising research efforts. However, private sector involvement in R&D remains weak. Of the total national R&D expenditure, the private sector contributed only about 10 per cent compared with 45 per cent and 70 per cent in the case of South Korea and Japan respectively (Anuwar 1992). Therefore, the private sector, being the major engine for industrialisation, must increase its involvement in R&D through the various incentives provided by the government. The private sector should realise that R&D is important for sustaining competitive edge under intense global competition. After all, the industries are the ones to reap the harvest of the fruits from the R&D seeds.

In 1989, the Malaysian Government conducted a survey on R&D and found that the private sector involvement was low in terms of the number of personnel engaged in R&D activities. Of the total 13,605 R&D personnel, only 1,835 were in the private sector – 423 scientists and 1,412 supporting staff (Abdul Aziz and Mad Nasir 1993).

One of the major factors that hindered R&D in Malaysia is the shortage of scientists and technical personnel. This view has also been put forward strongly by the companies that were interviewed for the purpose of the study. The insufficient stock of skills, especially of the scientific and engineering type, has limited large-scale development of technological ability.

To date, the responsibility to carry out R&D lies largely with the public sector. So far, public sector R&D has played a significant role

in maintaining competitiveness in agro-based industries such as rubber and oil palm. To a large extent, the public sector efforts has also spawned off downstream secondary industries. However, R&D activities seem to end here. The broader secondary manufacturing industries which are diverse and often dominated by SMEs do not take R&D seriously by establishing linkages with public sector R&D activities. This implies a lack of interactive effects between the public and private sector with regards of R&D. Research and development activities of the private sector remains weak.

The historical perspective could probably offer some explanation for the insufficient private sector R&D activities. The economic development of Malaysia has been dependent on the activities of transnational corporations (TNCs). These corporations are dependent on their parent companies for technology support, although of late, an increasing number of these corporations have set up R&D facilities in Malaysia. However, R&D spending by these TNCs is considered low compared to the amount expended by their head offices. Expenditure on R&D by TNCs in this country range from 0.05 per cent to 3 per cent of their total sales revenue whereas their head offices spend about 3 per cent to 43 per cent of their total sales revenues (Business Times April 26, 1994).

The large companies in Malaysia have also taken the short-cut to R&D by purchasing technology form overseas. This further explains the insufficient R&D activities. In addition, the small and medium enterprises (SMEs) are at a disadvantage as they are financially too weak to engage in research and development.

Recognising technological advancement as the impetus for industrialisation, the Industrial Master Plan 1986-1995 was launched in 1986. One of the objectives is to build up the foundation for leap-frogging towards advance industrial country status by increasing indigenous technological capability and competitiveness. In 1987, an Action Plan for Industrial technology development to support the implementation of the Industrial Master Plan was formulated. Industrial Technology Development Plan is intended to provide a strong technological foundation for industrialisation. In addition, the Government has also set up Malaysian Technology Development Corp (MTDC) to assist in the commercialisation of public sector research and to encourage the growth of technology-based enterprises.

RECOMMENDATIONS

In this section, policy implications as well as suggestions to the private sector will be discussed.

Firstly, in terms of policy implications, government support for R&D has always been an important part of any innovation system. In the case of Malaysia, the government must further fine-tune its policies towards the development of R&D activities in order to enhance resources needed for innovation. This is because policies, general and specific, can produce a great impact on innovation. In the process of providing support, the government must adopt the long-term commitment approach while the private sector must be made to think the directions to follow and the goals to pursue if success is to be achieved. The type of government support that are recommended include:

1. Support for the labour market through investments in the education system;
2. Enhancement of technology transfer through foreign direct investments (FDI);
3. Support for the development of small and medium size enterprises (SMEs) as a source of supply for parts and components;
4. Provision of realistic and meaningful R&D incentives through taxation;
5. Support for infrastructure;
6. Support for human resource development;
7. Institutionalise national R&D culture.

As a long-term policy direction, the most obvious way in which the government can influence innovation is by supporting the labour market through investment in education and the direction in which this investment is directed. Currently, the emphasis on science and technology in education is inadequate. If Malaysia is to achieve an industrialised nation status, there must be an adequate pool of engineers and science graduates to absorb, adapt, and develop technological competence. Review of enrollment and output for degree courses from local public institutions for 1985-1995 indicates that enrollment in science and technical fields lags behind that of Arts although the absolute number has increased (Table 6). This situation is disturbing if one views with seriousness Vision 2020 that Malaysia aspires to achieve.

TABLE 6. Enrollment and output for degree courses from local public institutions 1985 - 1995

Course	Enrollment			Increase (%)	
	1985	1990	1995	5MP	6MP
Arts (%)	20,350 (54)	34,660 (58)	51,410 (57)	70	48
Art and Humanities ¹ Economics and	10,350	18,920	27,480	83	45
Business ² Law	9,290 710	13,450 2,290	20,840 3,090	45 223	55 35
Science (%)	12,330 (33)	16,450 (27)	24,210 (27)	33	47
Medicine and Dentistry Agriculture and Related	2,210	3,100	3,700	40	19
Science ³	1,150	1,460	3,140	27	115
Pure Science ⁴	3,430	5,180	6,770	51	31
Others ⁵	5,540	6,710	10,600	21	58
Technical (%)	5,160 (14)	8,920 (15)	14,050 (16)	73	58
Engineering Agriculture and Town Planning	4,050 610	7,490 950	11,270 1,920	85 56	50 102
Surveying	310	300	590	-3	97
Others	190	180	270	-5	50
Total	37,840	60,030	89,670	59	49

Source: Sixth Malaysia Plan, 1991-1995, Kuala Lumpur: National Printing Department, 1991.

- Notes:
1. Includes Islamic studies, language, literature and Malay culture, social sciences, library science and art and design.
 2. Includes accountancy, business management, resource economics and agri-business.
 3. Includes home science technology, human development and veterinary sciences.
 4. Includes biology, chemistry, physics and mathematics.
 5. Includes pharmacy, applied science, environment studies.

Therefore greater emphasis must be placed on science and technical courses beginning at the primary school level in order to ensure an adequate pools of students for such courses. In addition, computer courses should also be included as information technology has gained sophistication and importance as a means for achieving competitive edge.

Further, a review of foreign direct investment is necessary in order to shift emphasis from one of realisation of immediate benefits, such as job creation and overcoming constraints on availability of capital, to that of technology transfer. Emphasis on technology transfer will result in value-added in terms of technological progress. The criteria for granting foreign direct investment may have to include clauses such as manufacturing rights and technology transfer. For example, in the case of Fuji Xerox Company Ltd of Japan, the Government of Japan consented to the joint venture between Fuji Photo Film Co Ltd of Japan and Rank Xerox of United Kingdom only after joint venture agreement was amended to include manufacturing rights. The right to manufacture is vital to ensure the transfer of technology which enables the acquisition of technology within a shorter lead time.

In addition, the government should also give emphasis on the development of SMEs because they form an important backup for industries in Malaysia. Currently, the development of SMEs has been weak. The output of SMEs are of varying quality with the majority not meeting international standards. Thus there is an urgent need for SMEs to improve their manufacturing capabilities in order to produce products of acceptable quality. This is especially crucial for those producing intermediate inputs or parts or components.

The government can play a significant role in further assisting and developing the SMEs. Due to the lack of funds, facilities and expertise, SMEs hardly invest in R&D. The government can assist by linking SMEs to the research institutes through an effective system of information management. The government can act as a clearing house for information on technology, such as the monitoring of technological trends on a world-wide basis, technology forecasting, etc. so as to avoid unnecessary wastage as in the case of reinventing the wheel. SMEs will tend to benefit as information management represents an integral part of innovation management. This may encourage SMEs to begin investing in R&D as the availability of information can serve as a starting point.

In recognising the important role of incentives in encouraging R&D activities, the government has stepped up the provision of incentives to the private sector. These incentives can be further applied to encourage and cultivate the culture of R&D in organisations.

Previously, incentives available to companies undertaking R&D projects approved by the Ministry of Finance include: (a) double deductions, (b) exemptions, (c) duty exemption on raw materials and equipment used for approved projects and research institutions or companies, and (d) industrial building allowances on buildings used by approved research projects.

Several additional incentives are introduced in the 1994 budget. They are: (a) research allowances of 100 per cent on qualifying capital expenditure to approved companies, (b) research allowance of 50 per cent on qualifying capital expenditure to companies carrying out in-house R&D activities, and (c) industrial building allowances for buildings used by approved research institutions or companies. Although additional incentives are made available, they are not without restrictions. For example, if an approved research company claims research allowance, its affiliated companies will not be able to enjoy double deduction for payments made to it. Therefore, restrictions of this nature tend to affect the effectiveness of incentives.

A review of the incentives indicate that the exemptions given represent a plus factor for R&D activities undertaken by the private sector, however, they are definitely insufficient to bring about a leap in R&D. In order for incentives to be more meaningful, the government must consider a more coordinated and integrated system of incentives that would allow innovative ideas to develop from the time of its birth to the stage of commercialisation. After all, innovation as a competitive tool is only effective if it is successful in the market.

Another approach that the government can consider in promoting R&D is to encourage the setting up of engineering department or division for which expenses incurred are allowable as revenue expenses, similar to the practice in Japan. This approach has a wider application than the present incentives as it will also benefit the smaller companies which cannot afford large research facilities. SMEs, in particular, can begin with minor research under this incentive system. To prevent abuse and misuse of incentives, the

government may want to only consider deduction for incremental expenses just as in the Japanese experience. For example, in order to qualify for deduction of expenses for the year 1993, only incremental expenses are allowed deduction (that is 1993 expenses minus 1992 expenses).

Furthermore, infrastructure limitations may be a crucial factor prohibiting innovation. In other words, infrastructure must not be a constraint to the development of R&D activities. As our economy is increasingly becoming more sophisticated, a shift towards production of greater value-added products requires a change in the type of infrastructure in the future. Thus, the government must continue to invest heavily in this key dimension in order to cope with developmental changes that are likely to occur. For example, high-speed data transmission lines providing high-quality error free information transfer is very important to the nation's industrialisation.

Moreover, the importance of human resources for the development of technology and innovation cannot be disputed. This is particularly true considering the tight labour market which is being experienced by Malaysia. The issue of education and its influence on the quality of people has been discussed earlier. Hence, we now focus on human resource development.

A fund known as the Human Resources Development Fund (HRDF) has been set up to assist in training and development. This fund is intended to improve the present state of manpower requirements. The private sector should play greater role in retraining and skills upgrading of existing labour force through the HRDF. Among the steps that can be undertaken by the private sector include: (a) conduct in-house training to train and retrain workers to respond more effectively to new challenges in the work place, (b) develop greater linkages between training institutions and large companies which have resources for specialised training, (c) send employees for practical training and technology exhibitions organised overseas to gain knowledge on the state-of-the-art technology, and (d) assist SMEs in training through special training courses tailored to their needs.

At the government level, the various ministries and institutions which are involved in industrial training should come together to streamline and coordinate the types of training to achieve efficiency and effectiveness. The government may need to establish new

institutions or initiate development centres within existing institutions. Institutes such as SIRIM should be involved in the development and operation of training courses.

The facilities and the curriculum at Industrial Training Institutes (ITIs) should be upgraded in order to be more market oriented. The courses offered by ITIs should be in line with the current needs of the manufacturing sector. The question of meeting the demands of industries is pertinent in view of the urgent needs for skill upgrading.

Another important measure that these training should consider is to provide training to their trainers. For a start, they should send their trainers overseas to upgrade their training methodologies. Unless the trainers are well trained, they cannot be expected to improve the standard of their teachings.

Culture, known to be the "soft area" of management can be applied effectively to elicit commitment from the people of Malaysia and hence improve the environment for innovation. Just as in the case of Vision 2020, a unified national attitude of Malaysians towards R&D can be developed. For example, although the concept of "Zero Defects" was developed in the US, it was popularised in Japan. The Deming Prize is such a coveted honour for the Japanese that they work hard and compete constructively for the award. This has resulted in quality improvement and its ability to conquer the world market in certain industries. In the case of Malaysia, the ISO 9000 award is somewhat similar to the Deming prize of Japan. The government should actively promote the award not only to enterprises but to Malaysians at large. If respect and a positive attitude towards R&D can be institutionalised in the Malaysian culture, then we are on the right track towards achieving Vision 2020.

Secondly, the private sector should be encouraged to review their present management system and to consider adopting the following recommendations that may help boost R&D activities.

1. **Commitment to R&D** At present, the private sector commitment towards R&D is lacking, unlike the case of Japanese companies, where their commitment towards R&D is total, right from the top management to the workers at the shop floor level. These companies have a strong corporate culture that emphasise R&D through the philosophies that they uphold.

The two Japanese companies examined in this study are committed to innovation. Their commitment to innovation is clearly stated in their corporate philosophy. For example, the motto of Kao Corporation "Cleanliness is the foundation of a prosperous society" expresses the commitment to serving consumers which is carried out by mobilising all creative resources of the corporation. The emphasis on creativity has led to innovation in an effort to produce products that offer utilities to consumers. This is a useful guide to Malaysian companies that intend to build value-added to their products in gaining competitiveness. Malaysian companies can learn to emulate this virtue by including commitment to innovation in their company philosophy. This will ensure that the spirit and positive attitude towards innovation is institutionalised in the organisation.

2. ***Willingness to Spend More on R&D*** Malaysian companies need to realise that unless they are willing to spend more on R&D they will not be able to compete with innovative companies on a global basis. This study reveals that R&D expenditure incurred by Japanese companies is substantial compared to companies in Malaysia. About 5 per cent to 7 per cent of their sales are spent annually on R&D while generally, the Malaysian companies spend only 2 per cent of their sales on R&D. The only Malaysian owned company known to spend as much as 8 per cent on R&D is Sapura Holdings (Mansor 1993)

3. ***Emphasis on Continuous Product Innovation*** Great emphasis should be placed on continuous product innovation rather than discontinuous innovation. The reason is obvious. Continuous innovation will ensure that the company remains competitive in the industry in which it competes. In addition, discontinuous innovation takes years of research and experimentation, yet the fruits of research remain uncertain. However, in the long run, companies in Malaysia must conduct basic research for technological competencies.

4. ***Invest in Social Innovation*** Massive investment in social innovation should be the priority of the private sector. Companies are encouraged to send their employees for training regularly to upgrade their technical as well as creative skills. They should also be encouraged to suggest new ideas that can generate process

innovation (such as improving the production technique, minimising wastage, etc.) and product innovation. Incentive system should be set up to reward employees with innovative ideas. Human resource development should be the key for local companies in view of the tight labour market condition.

5. Management Attitudes Towards Innovation Management needs to be more open and receptive towards innovation. The Japanese management system, through consensus management, appears to be ideal in encouraging innovative ideas. In addition, employees are required to participate in technical exhibitions which are held regularly in Japan. This study found that in Japanese companies, the decision to accept or reject a new idea/product is based on consensus. If the idea fails, the whole management accepts the responsibility. In a Western management system, individuals instead of a team are responsible should new products ideas fail. This practice stifles new ideas. To encourage innovative corporate culture, Malaysian managers may need to focus on team work and its dynamics in order to promote innovative activities. In addition, with commitment towards innovation, top management should be more tolerant towards failure.

For SMEs in particular, it is recommended that firstly, link-up with public institutions involved in research and development should be set up. This arrangement is mutually beneficial as the public enterprises have access to opportunities of commercialisation, while the SMEs can tap and benefit from the expertise which would otherwise be unavailable to them.

Secondly, reward system may be of a strategic importance to SMEs in attracting capable employees. Pay is a strong incentive for risk taking and growth (Poza 1989). This is particularly true in small businesses, where career opportunities for nonfamily employees may be limited. Therefore the introduction of a bonus plan which encourages innovative ideas can be very effective to motivate employees to be innovative. Some measurements for performance may be introduced in the bonus plan. For example, return on net asset measure can be used for bonus pay out.

Thirdly, human resource policies and practices can be effective in promoting innovation. Commitment for innovation and growth cannot be achieved without the so-called "soft area" of management. In the case of family-owned businesses, a sense of belonging must be promoted so that employees whether family or non-family

employees share the same commitment towards the company. Human resource policies that are caring, promote respect and dignity and recognise individual differences have positive effects in eliciting high levels of involvement among employees. The financial benefits under the bonus plan and the positive attitude of employees towards the company would help to reinforce a “we are together” feelings that would help in promoting innovativeness and hence competitiveness in the market.

CONCLUSION

The diversity of technology has created a wide array of products – from medical instruments, home electronics, computers to automobiles – to meet the changing customer demands. Coupled with intense competition from competitors, development of new products and processes with high efficiency, quality and speed becomes imperative for gaining competitiveness in the global market that is becoming borderless.

The thrust of this study lies with innovation management. By employing the case method, innovation management in two successful Japanese companies was investigated in detail. Findings of this study clearly indicate that these Japanese companies place a great importance on R&D with emphasis on continuous product innovation and social innovation. Marketing management which is equally important for economic success is fully integrated with other management functions such as manufacturing and production suggesting that functional integration is prominent. A communication system that allows effective exchange of information represents a key issue that makes a difference to the propensity of Japanese companies to innovate and achieve success in the global market.

Recommendations for Malaysia to achieve the status of an industrialised country by the year 2020 are divided into the public and private sector. Coordinated efforts from both the public and private sector with the public sector providing the impetus for growth in R&D are crucial for success. While the private sector can be entrusted to provide a conducive and favourable environment for the development of R&D, the private sector must view with seriousness the importance of R&D for long-term competitiveness. Corporations in Malaysia must not be complacent with the recent

impressive economic achievements, but continue with full commitment towards corporate sector development through commitment to R&D in meeting the ever-changing customer demands. In short, long-term gains must not be sacrificed for immediate benefits, whether personal or otherwise.

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¹ In depth discussions with the managing director of Kao (Malaysia) Sdn. Bhd.

² In depth discussions with top executives of MACG.

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