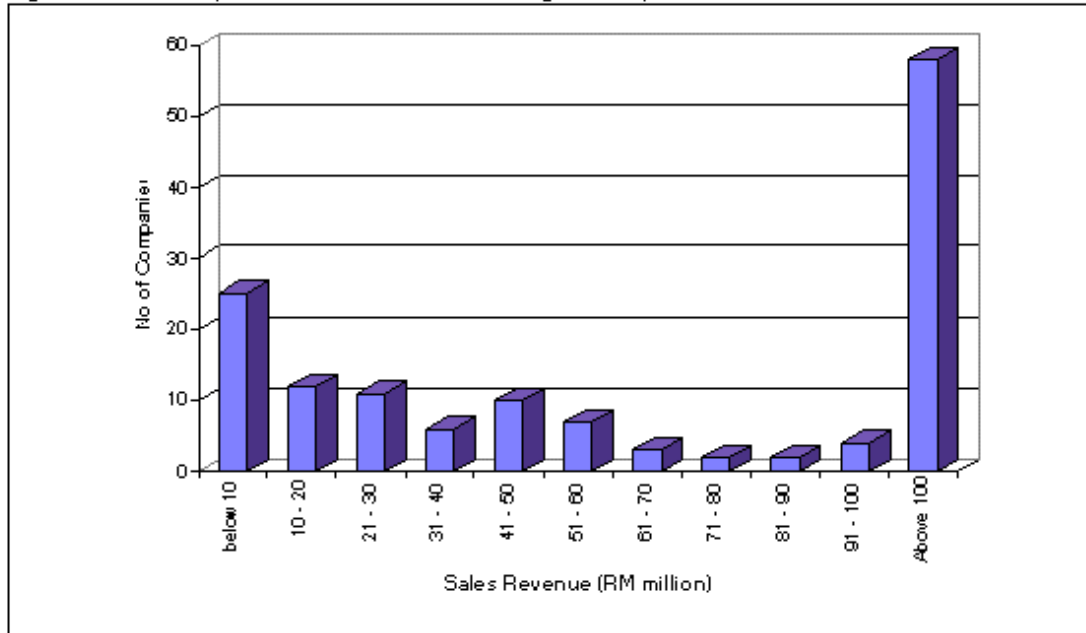


CHAPTER 5 - PRIVATE SECTOR R&D ACTIVITIES

5.1 Companies with R&D activities

A total of 140 companies reported carrying out R&D activities in 1994. Fig. 5.1 shows that a large percentage of those belongs to the category with sales revenue of more than RM100 million. Fig. 5.1 No. of Companies with R&D Activities categorised by Sales Revenue
Source : Table 5.7

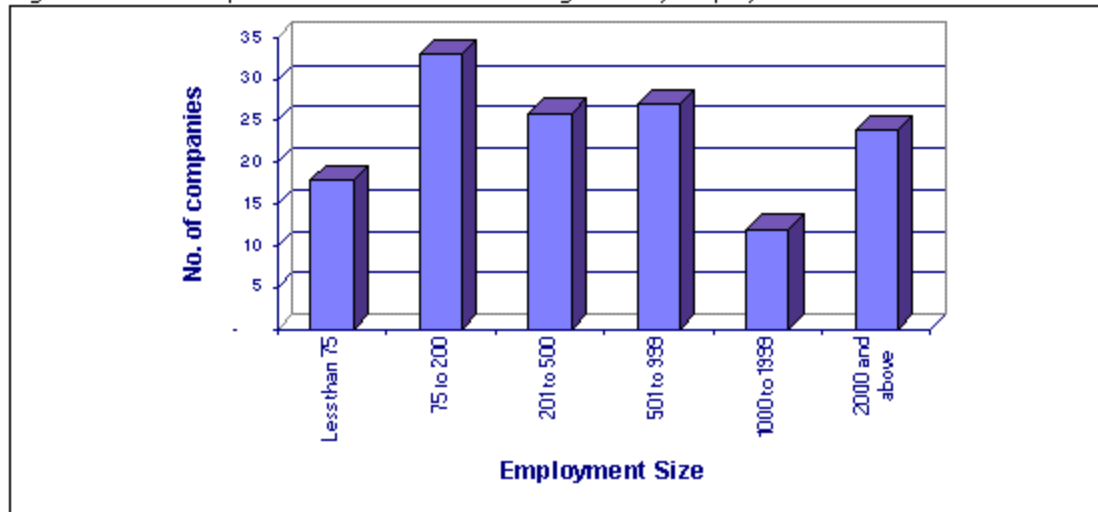
Fig. 5.1 No. of Companies with R&D Activities categorised by Sales Revenue



Source: Table 5.9

In terms of employment size, the companies were quite evenly spread out (see Fig.5.2). The biggest category, contributing 24% of the total, was those employing 75 to 200 workers. Small and medium sized companies (employing 75 workers and less) contribute only 13% of the total. Fig. 5.2 No. of Companies with R&D Activities categorised by Employment Size
Source : Table 5.2

Fig. 5.2 No. of Companies with R&D Activities categorised by Employment Size



Source: Table 5.3

Table 5.2 Private Sector R&D Expenditure (RM) by Employment Size

Employment Size	Companies		Expenditure	
	Freq	%	(RM)	%
Less than 75*	18	12.86	50,453,893	17.24
75 to 200	33	23.57	38,613,320	13.20
201 to 500	26	18.57	46,932,405	16.04
501 to 1000	27	19.29	21,982,642	7.51
1001 to 2000	12	8.57	24,321,056	8.31
Above 2000	24	17.14	110,280,065	37.69
Total	140	100.00	292,583,381	100.00

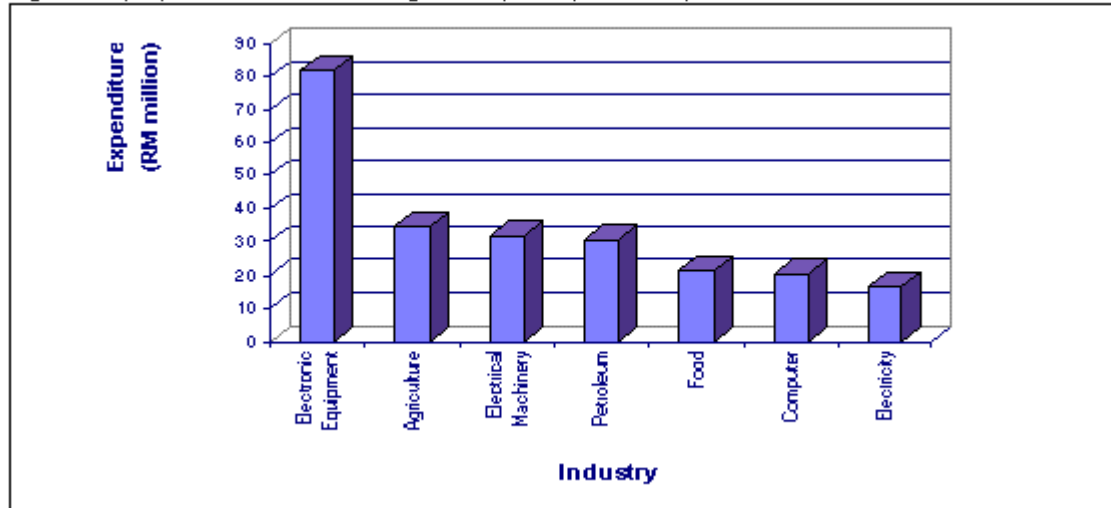
* small and medium sized companies fall within this category

5.2 Private Sector Expenditure on R&D

The private sector in Malaysia spent a total of RM292.6 million on R&D in 1994. The industry group that spent the most on R&D was the electronic equipment sector (see Fig. 5.3). It contributed 28% of total private sector R&D expenditure. The second and third biggest industry group spenders were the Agriculture and Electrical Machinery sectors respectively. By contrast, the largely locally-owned Food and Rubber & Plastic industries (combined) contributed only 11% of total R&D spending.

Fig. 5.3 Top Spenders on R&D among Industry Groups in Malaysia
 Source : Table 5.4

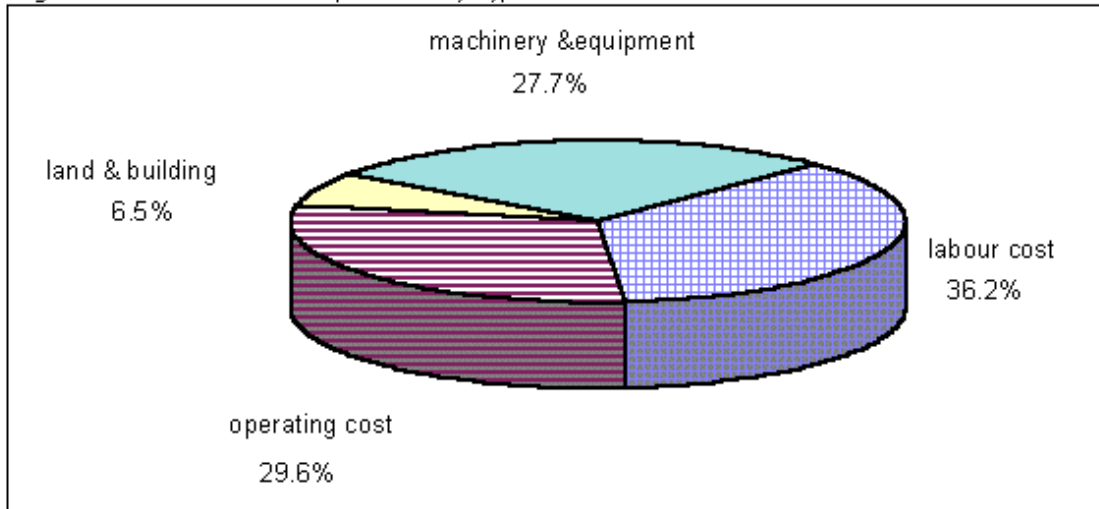
Fig. 5.3 Top Spenders on R&D among Industry Groups in Malaysia



Source: Table 5.5

In terms of the type of costs, RM105.9 million (36.2% of total) was spent on labour, RM86.5 million (29.6%) on operating cost, RM19 million (6.5%) on land and buildings and the balance on machinery and equipment (see Fig. 5.4).
 Fig. 5.4 Private Sector R&D expenditure by Type of Costs
 Source : Table 5.6

Fig. 5.4 Private Sector R&D expenditure by Type of Costs



Source: Table 5.7

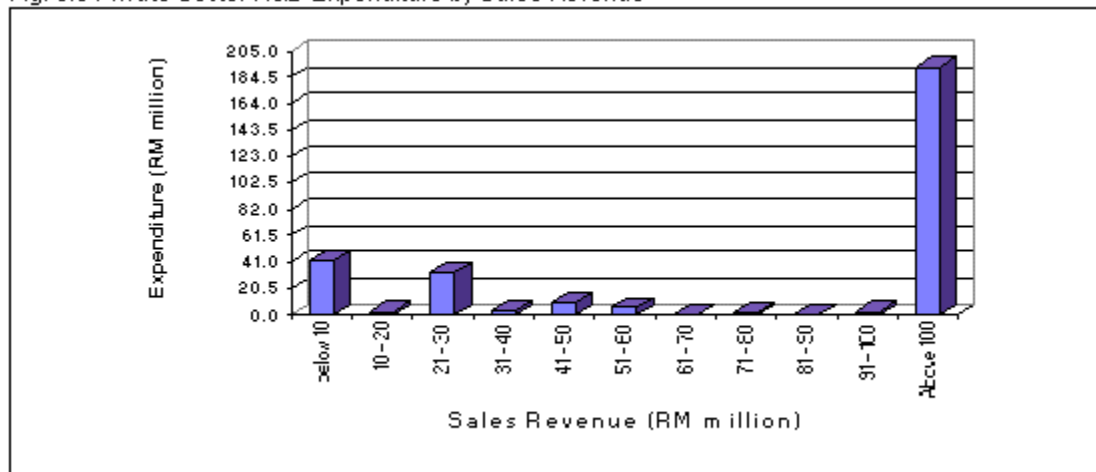
Table 5.7 indicates R&D intensity (R&D Expenditure /receipts) for the industry categories. Eight industries recorded R&D expenditure of more than 1% of

revenue; namely Telecommunication, Transport Equipment, Agriculture, Non-metallic Mineral, Electrical Machinery, Non-Electrical Machinery, Computer and other Manufacturing industry.

5.3 Private Sector R&D Expenditure by Size of Company

R&D expenditures in Malaysia in 1994 were largely incurred between two categories of companies: those with annual revenues up to RM30 million (26%); and those with more than RM100 million (66%) (see Fig. 5.5).
Fig. 5.5 Private Sector R&D Expenditure by Sales Revenue
Source : Table 5.7

Fig. 5.5 Private Sector R&D Expenditure by Sales Revenue



Source: Table 5.9

Table 5.7 Private Sector R & D Expenditure (RM) by Sales Revenue

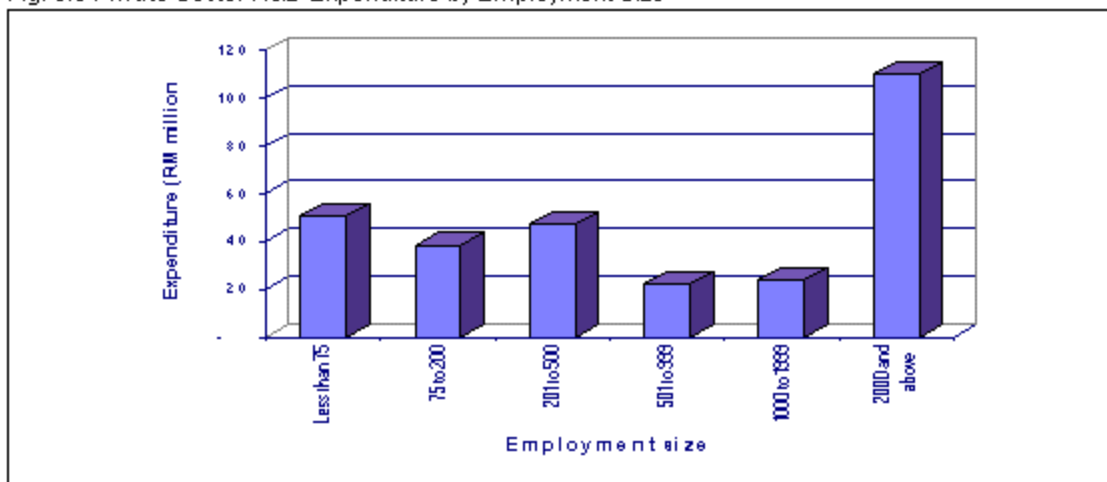
Sales Revenue (RM million)	No. of Companies	Expenditure (RM)	%
below 10	25	41,160,238	14.07
10 - 20	12	2,432,057	0.83
21 - 30	11	32,660,081	11.16
31 - 40	6	3,288,014	1.12
41 - 50	10	8,722,239	2.98
51 - 60	7	5,621,161	1.92
61 - 70	3	942,800	0.32
71 - 80	2	1,865,808	0.64
81 - 90	2	890,000	0.30
91 - 100	4	2,241,334	0.77
Above 100	58	192,759,649	65.88
Total	140	292,583,381	100.00

In terms of employment size, most of the companies that spent on R&D activities were big companies employing more than 2,000 workers(see Fig 5.6). Even though they accounted for less than 20% of the total number of companies, however, their expenditures constituted nearly 38% of the total expenditures. The small and medium sized companies (less than 75 employees) contributed 17% of the total expenditures.

Fig. 5.6 Private Sector R&D Expenditure by Employment Size

Source : Table 5.2

Fig. 5.6 Private Sector R&D Expenditure by Employment Size



Source: Table 5.3

Table 5.2 Private Sector R&D Expenditure (RM) by Employment Size

Employment Size	Companies		Expenditure	
	Freq	%	(RM)	%
Less than 75*	18	12.86	50,453,893	17.24
75 to 200	33	23.57	38,613,320	13.20
201 to 500	26	18.57	46,932,405	16.04
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Above 2000	24	17.14	110,280,065	37.69
Total	140	100.00	292,583,381	100.00

* small and medium sized companies fall within this category

5.4 Private Sector R&D Expenditure by Type of Ownership/Control

This survey recognises four categories of company ownership/control based on their capital structure:

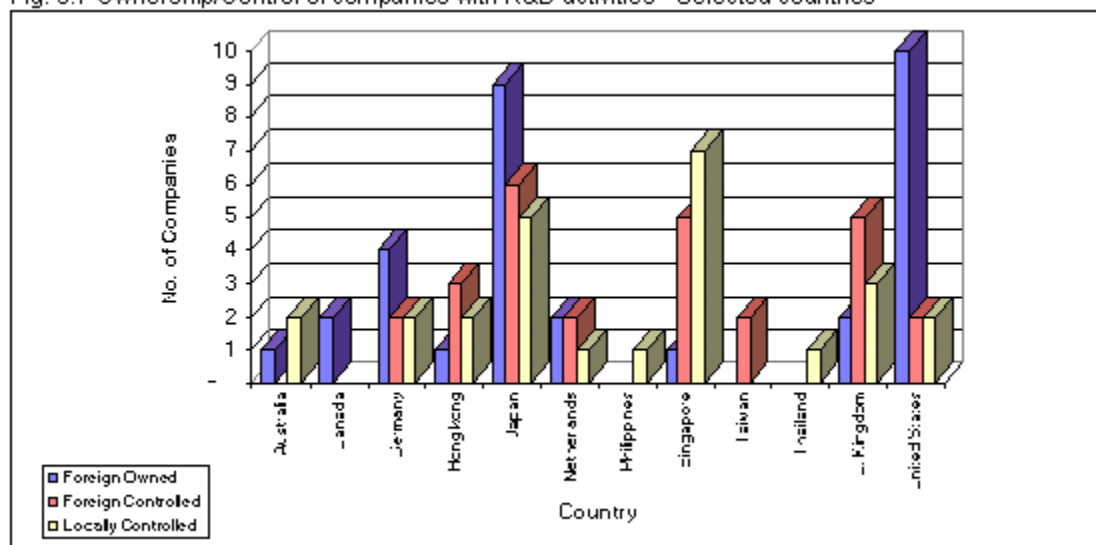
- a) Foreign owned - Foreigners own 100% of the equity;
- b) Foreign controlled - Foreigners own more than 50% of the equity;
- c) Locally owned - Locals own 100% of the equity; and
- d) Locally controlled - Local own more than 50% of the equity.

57 companies or 40.7% of the total companies that carried out R&D activities in 1994 were locally-owned. Together with those companies that were locally-controlled they made up nearly 59% of the total.

Of those which were foreign-owned or controlled, some (28%) could be identified by country (i.e. where more than 50% of equity were held by owners of one foreign country only). From Fig. 5.7 it can be seen that Japanese companies make up the biggest number of foreign owned/controlled companies who carry out R&D activities in Malaysia in 1994 (13 companies) followed by United States and German companies.

Fig. 5.7 Ownership/Control of companies with R&D activities - Selected countries
Source : Table 5.5

Fig. 5.7 Ownership/Control of companies with R&D activities - Selected countries



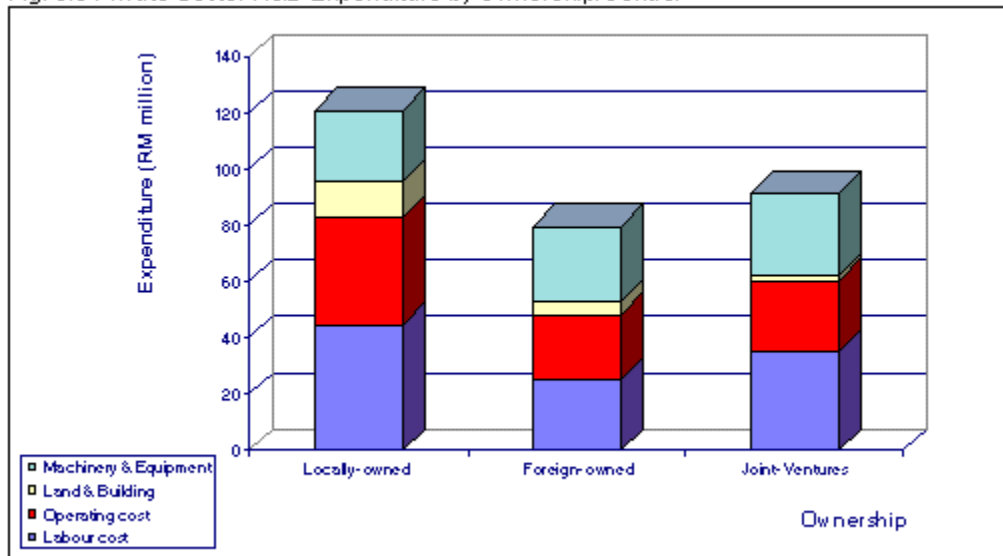
Source: Table 5.6

Most of the foreign-owned/controlled companies were in the Electronic Equipment industry whilst the majority of the locally-owned/controlled companies were in the Food as well as the Rubber and Plastic industries (See Table 5.6)

In Table 5.5, it is seen that locally-owned and controlled companies spent RM179 million (61% of total) on R&D compared to foreign owned/controlled companies which spent RM113 million on R&D (39%).

It is interesting to note also that 41% of R&D expenditure were spent by companies which were 100% owned by Malaysians (see Fig. 5.8). Locally-owned companies are also spending comparatively more on capital expenditure (39% of total capital expenditure) than foreign-owned companies (31%).
Fig. 5.8 Private Sector R&D Expenditure by Ownership/Control
Source : Table 5.8

Fig. 5.8 Private Sector R&D Expenditure by Ownership/Control



Source: Table 5.11

Japanese companies are by far the biggest spenders on R&D with 51% contribution followed by US companies (27%) (see Table 5.39). However among foreign controlled joint ventures which carry out R&D activities, US controlled companies are not significant at all. The biggest number was from Japan (18%), followed by Singapore (15%) and the United Kingdom (15%) (see Table 5.6).

5.5 R&D Expenditure by Field of Research

A breakdown of the R&D expenditure in their respective fields of research is shown in Fig. 5.4. As can be seen here, R&D expenditure in the private sector was concentrated in the areas of Engineering Sciences, Applied Sciences and Technologies and Information and Computers. Fig. 5.9 Private Sector R&D Expenditure by Major Field of Research Source : Table 5.9

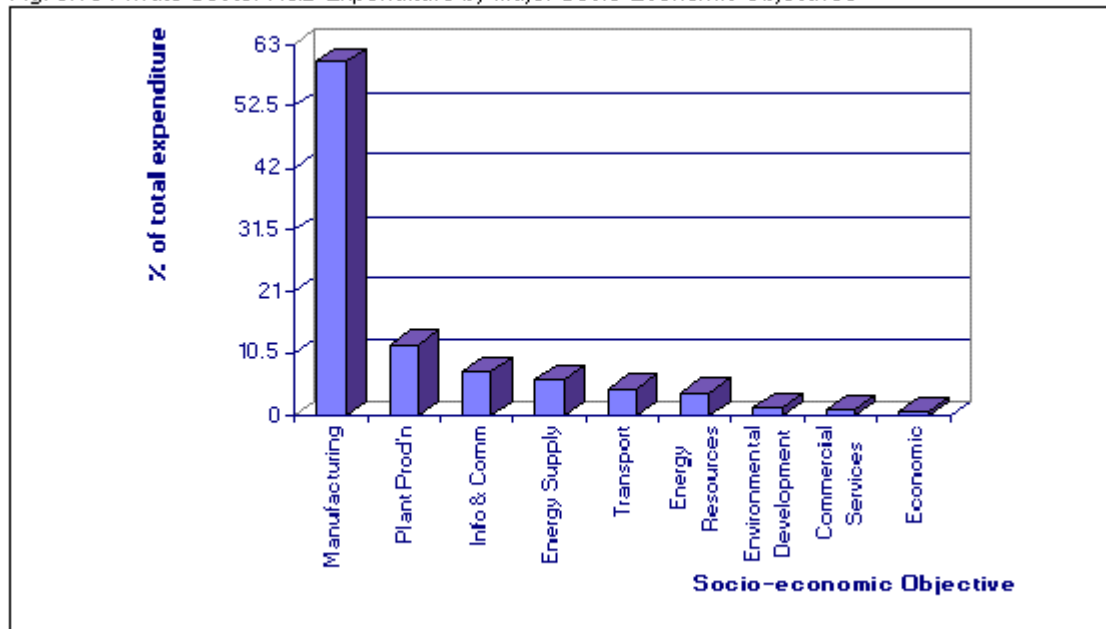
5.6 Private Sector R&D Expenditure by Socio-Economic Objective

As an objective, Manufacturing dominated Malaysian R&D expenditure, accounting for approximately 60% of the total expenditure followed by Plant production and plant primary products (12%). The objectives of Environmental Management, Defence, Education and Health were all less than 1% (see Fig.5.10).

Within Manufacturing, 'Communication Equipment' as well as 'Machinery and Equipment' were the two most important objectives.

Fig. 5.10 Private Sector R&D Expenditure by Major Socio-Economic Objectives
Source : Table 5.11

Fig. 5.10 Private Sector R&D Expenditure by Major Socio-Economic Objectives



Source: Table 5.14

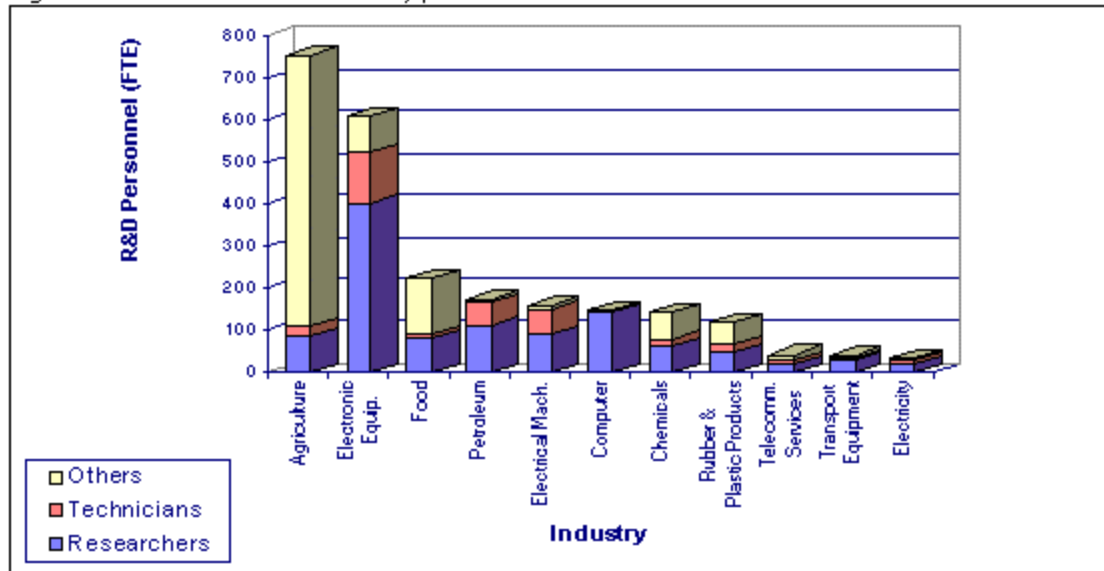
5.7 Private Sector R&D Expenditure per Researcher

The private sector spent around RM 193,000 per researcher in 1994 (see Table 5.20). The most expensive researchers were in the Telecommunication industry (RM 352,000 per researcher) followed closely by the Transportation industry (RM 332,000 per researcher).

5.8 Private Sector Human Resources by Industry

The full-time equivalent (FTE) or effort invested in R&D in the private sector is shown in Table 5.17. The researchers, technicians and support staff involved in R&D programs amounted to 2,500 in 1994. The ratio of researchers to technicians was approximately 3:1 and the ratio of researchers to other support staff was about 1:1. The highest number of researchers was in the electronic industry followed by the Petroleum industry (see Fig. 5.11).
Fig. 5.11 Private Sector R&D Effort by personnels
Source : Table 5.14

Fig. 5.11 Private Sector R&D Effort by personnels



Source: Table 5.17

Foreigners made up only 5% of total researchers effort in the country and they were mostly in the Electrical and Electronic industries.

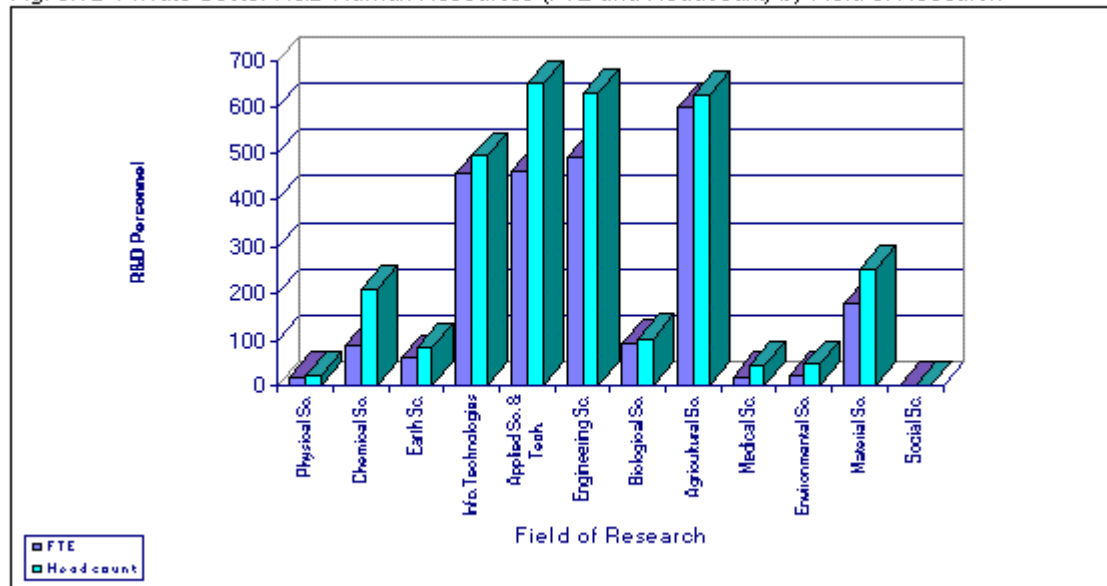
The ratio of technicians and support staff to researchers is given in Table 5.22. The Non-Electrical Machinery industry has the highest technician per researcher ratio (4:1), while the Agricultural sector has the highest support staff per researcher (8:1).

5.9 Private Sector Human Resource by Field of Research

The private sector's effort of R&D activities are focused in the field of Agricultural Science (see Fig 5.12); followed by Engineering Science, Applied Science and Technologies and Information and Computers. Fig. 5.12 Private Sector R&D Human Resources (FTE and Headcount) by Field of Research

Source : Table 5.9 and Table 5.10

Fig. 5.12 Private Sector R&D Human Resources (FTE and Headcount) by Field of Research



Source: Tables 5.12 & 5.13

Foreign researcher's contribution in the private sector are heavy on the fields to Engineering Sciences, Applied Sciences and Technologies, and Information and Computers (similar to local researcher's). This shows that technology or knowledge transfer is happening more in these areas.

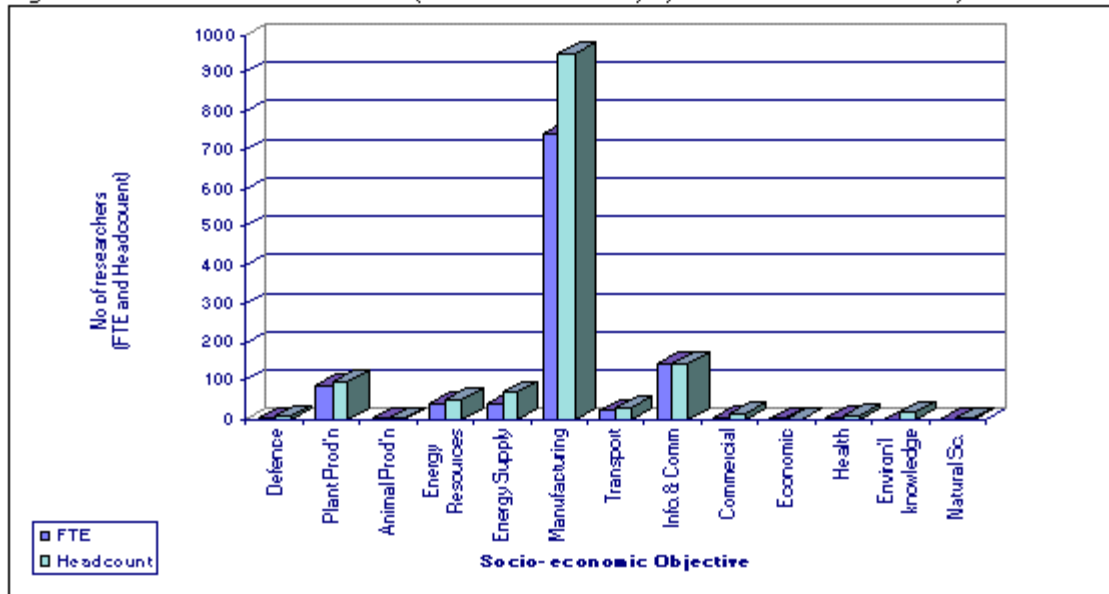
5.10 Private Sector Human Resources by Objectives

There is a similar pattern shown in terms of the researchers' efforts and headcounts by socio-economic objectives as shown in Fig. 5.13. Manufacturing dominated by contributing 66% of the total researchers' effort (in terms of headcount it contributed 67%) followed by Plant Production and Plant Primary Products.

Fig. 5.13 Private Sector Researchers (FTE and Headcount) by Main Socio-Economic Objectives

Source : Table 5.11 and Table 5.12

Fig. 5.13 Private Sector Researchers (FTE and Headcount) by Main Socio-Economic Objectives



Source: Tables 5.14 and 5.15

5.11 Qualifications and Gender of Researchers in the Private Sector

The majority of Malaysian researchers with degrees in Malaysia holds only a first degree (65%), 5% hold doctorates and 12% possess Masters qualification. The companies employed about 18% Malaysian researchers with non-degree qualification to do R&D in 1994 (see Table 5.13).

19% of researchers in Malaysia were females. The female researchers were concentrated in the Electronic Equipment, Petroleum and Chemical industries.

5.12 Private Sector Sources of Funding and R&D Linkages

The bulk of private sector sources of funding were their own companies' funds (92%). Even if external funds were obtained by R&D companies, it seemed that these funds came from their company's head office in Malaysia, e.g. the Petroleum and Transport industries. Only a minuscule (less than 1%) of their funds were derived from the Government or Industrial Technical Assistance Fund (ITAF) (see Table 5.19 for detailed breakdown).

A total of RM29.4 million was contracted out by the private sector either locally or overseas. Payments to local and foreign entities for R&D conducted were in the form of contracts and grants. In 1994, less than RM5 million or approximately 17% of total R&D contracted out was paid in the form of contracts or grants by the private sector to local institutions for conducting R&D (see Table 5.17).

Compared to local institutions there were sizeable foreign linkages as measured by the amount paid for R&D to foreign countries. As can be seen from Table

5.21, payments to foreign entities for conducting R&D totalled over RM24 million. This was equivalent to about 78% of total extramural expenditure on R&D. The country that received the largest amount was Australia followed by China and Canada.

5.13 Factors Limiting R&D Activities in the Private Sector.

The most common reason cited as being an internal factor in limiting R&D activities was 'Inadequate market research' , followed by 'Lack of R&D management know-how' and 'Lack of proven analytical technique' (See Table 5.21).

The survey also tried looking at reasons for private sector not wanting to apply for R&D incentives (see Tables 5.25 and 5.26) and the major problems faced by them pertains the definition of R&D activities. For example, more than a quarter of those who encountered problems had difficulties in trying to understand the R&D definition and more than one fifth mentioned that the scope of eligibility was too narrow. It was interesting also to note here that about 44% (combined) of the total respondents were not aware of the R&D incentives plus not knowing how to apply for them (see Tables 5.27 and 5.28).

Table 5.26 Problems Faced by Companies when Applying for R & D Incentives by Revenue Size

Revenue (RM Million)	Limiting factors					Total
	a	b	c	d	e	
below 10	2	3	3	4	4	16
10 - 20	2	-	1	1	-	4
21 - 30	-	-	1	-	2	3
31- 40	1	-	1	1	1	4
41 - 50	-	-	1	1	-	2
51 - 60	2	-	-	2	1	5
61 - 70	-	-	-	-	-	-
71 - 80	-	-	-	-	-	-
81 - 90	-	1	1	-	-	2
91 - 100	-	-	-	1	-	1
Above 100	5	4	6	6	5	26
Total	12	8	14	16	13	63

- a. Procedure for application is not clear
- b. Information requested is company's secret
- c. The scope of eligibility is narrow
- d. The definition of R & D for the incentives
- e. Others

Table 5.28 Reasons why Companies Are Not Enjoying R & D Incentives by Revenue Size

Revenue (RM million)	Reasons					Total
	a	b	c	d	e	
below 10	6	4	5	-	9	40
10 - 20	4	-	3	-	6	17
21 - 30	2	3	-	-	1	8
31 - 40	2	1	2	-	1	10
41 - 50	3	-	1	-	4	10
51 - 60	-	1	3	-	2	11
61 - 70	1	-	-	-	2	3
71 - 80	1	-	-	-	1	2
81 - 90	-	-	-	-	2	4
91 - 100	1	-	-	-	1	3
Above 100	7	3	5	1	17	59
Total	27	12	19	1	46	167

- a. Not aware of the availability of the incentives
- b. Application was not approved by the Government
- c. Do not know how to apply
- d. Not interested in the incentives
- e. Others

The most common reason cited as being an external factor in limiting R&D activities was 'Shortage of R&D personnel with requisite expertise' followed by 'Increasing competition', 'Technology advances' and 'Increasing labour cost' (see Table 5.22). The first common reason is not a surprise but the second factor is indeed a surprise because one would have thought that an increase in the level of competition would spur companies to spend more on R&D in order to maintain competitiveness.

The most commonly enjoyed R&D incentives by private sector was the 'Double Deduction on revenue expenditure for approved research project'. This was enjoyed by 46.3 % of the total companies who enjoyed incentives in one way or another. They were also mostly large companies with revenues exceeding RM100 million (see Table 5.24) and fall under the Chemicals industry (see Table 5.23).

Table 5.24 Types of R & D Incentives Enjoyed by Companies by Revenue Size

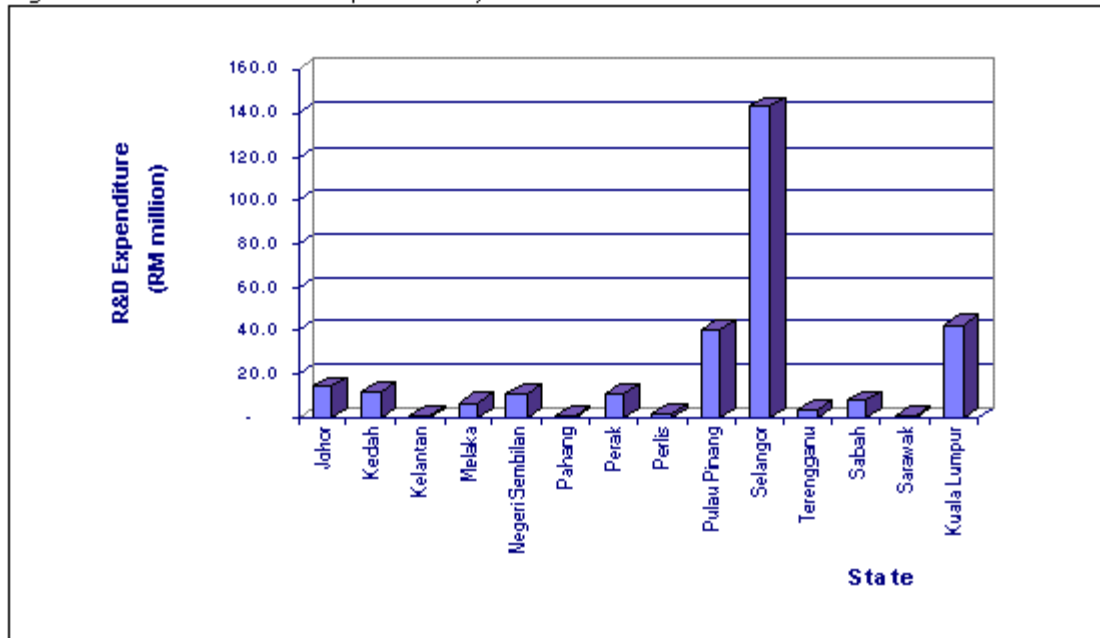
Revenue (RM million)	Types of R&D Incentives									Total
	a	b	c	d	e	f	g	h	i	
below 10	6	2	-	5	2	-	-	-	-	15
10 - 20	1	-	-	1	-	-	-	-	-	2
21 - 30	4	-	-	3	-	-	-	-	-	7
31 - 40	1	-	-	1	-	-	-	-	-	2
41 - 50	2	1	-	-	-	-	-	-	-	3
51 - 60	-	1	-	1	-	-	-	-	-	2
61 - 70	-	-	-	-	-	-	-	-	-	0
71 - 80	-	-	-	-	-	-	-	-	-	0
81 - 90	-	1	-	-	-	-	-	-	-	1
91 - 100	1	-	-	3	-	1	-	-	-	5
Above 100	16	2	-	8	1	1	-	-	2	30
Total	31	7	-	22	3	2	-	-	2	67

- Double deductions on revenue expenditure for approved research projects
- Double deductions on expenses for the use of facilities and services of approved research institution/companies
- Double deductions on cash contribution to approved research institutions
- Exemption of import duty, excise duty and sales tax on machinery/equipment, materials, raw materials and component parts and samples used for R & D activities.
- Industrial Building Allowances for R & D activities.
- Full income tax exemption of 5 years for contract R & D Company
- 100 % Investment Tax Allowance for 10 years for Contract R & D Company
- 100 % Investment Tax Allowance for 10 years for R & D Company
- 50 % Investment Tax Allowance for 10 years for In-house R & D

5.14 Private Sector R&D Activities by Geographical Location

Figure 5.14 shows that R&D companies in Selangor spent the most (49%) for its R&D activities in 1994. However it is a decrease of 3% from the 1992 data.
 Fig. 5.14 Private Sector R&D Expenditure by Location
 Source : Table 5.15

Fig. 5.14 Private Sector R&D Expenditure by Location

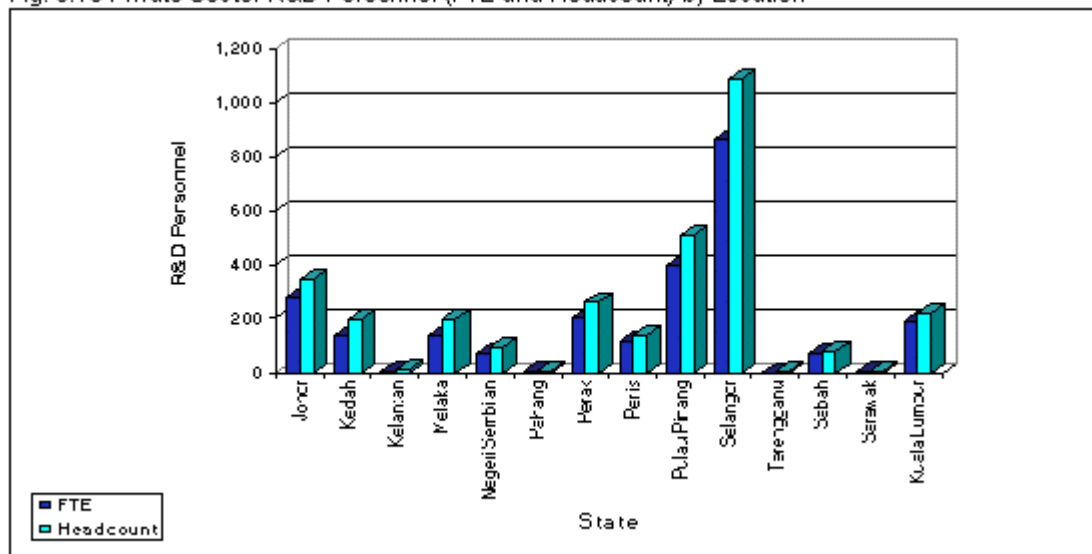


Source: Table 5.18

Kuala Lumpur shows a good sign of increase from 5% in 1992 to 15% in 1994. Meanwhile Pulau Pinang's contribution decreased from 25% in 1992 to 14% in 1994.

In terms of R&D efforts by the researchers, Selangor shows the highest input in 1994 (see Fig 5.15); followed by Pulau Pinang, Kuala Lumpur and Johor. Fig. 5.15 Private Sector R&D Personnel (FTE and Headcount) by Location Source : Table 5.15

Fig. 5.15 Private Sector R&D Personnel (FTE and Headcount) by Location



Source: Table 5.18

A total of 1,146 research individuals (headcount) were engaged in R&D. Researchers in the private sector spent about 82% of their time (1,167 efforts against 1,416 headcounts) doing research in 1994. The balance was for non-R&D activities.