

7.1 Companies with R & D Activities

R&D activities in private sector show encouraging sign. A total of 228 companies engaged in R&D activities in 1998. This registered an increase of 44.3% in the number of companies carrying out R&D activities. Most of the companies, i.e., nearly 71%, are those belong to the category with sales revenue less than RM100 million.

An interesting scenario that can be observed in private sector R&D activities in 1998 is that many companies carried out their R&D activities in high technology industry. For instance, 29% of the spending was concentrated in industries related to electronic equipment and components, while about 14.7% in other manufacturing industries. Industries related to transport equipment spent 13.3% of the total R&D private sector expenditure. [see Fig 7.1, Table 7.4]

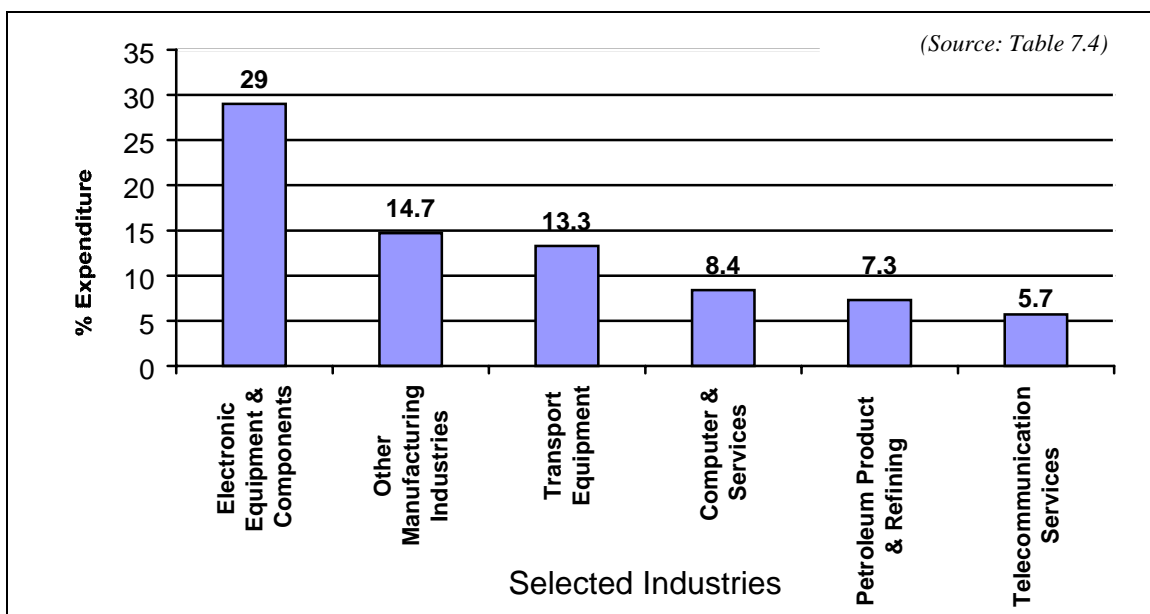


Fig. 7.1 : Total Expenditures for Selected Industry

7.2 R&D Expenditures

The private sector R&D expenditure in Malaysia continued to show significant growth, reaching an estimated RM746.1 million in 1998, up 86.5% from 1996 [see Fig 7.2]. This represents healthy commitment by the private sector despite the economic crisis. While 34.8% (or RM260.2 million) of the total R&D spending went to operating cost, about RM215.7 million (or 28.9%) was spent for purchasing machinery and equipment [see Fig. 7.3]. A total of RM69.6 million (9.3%) has been outsourced by private sectors to other organisations to carry out R&D activities, either locally (RM12.6 million) or overseas (RM57 million) [see Table 7.29 and Table 7.35].

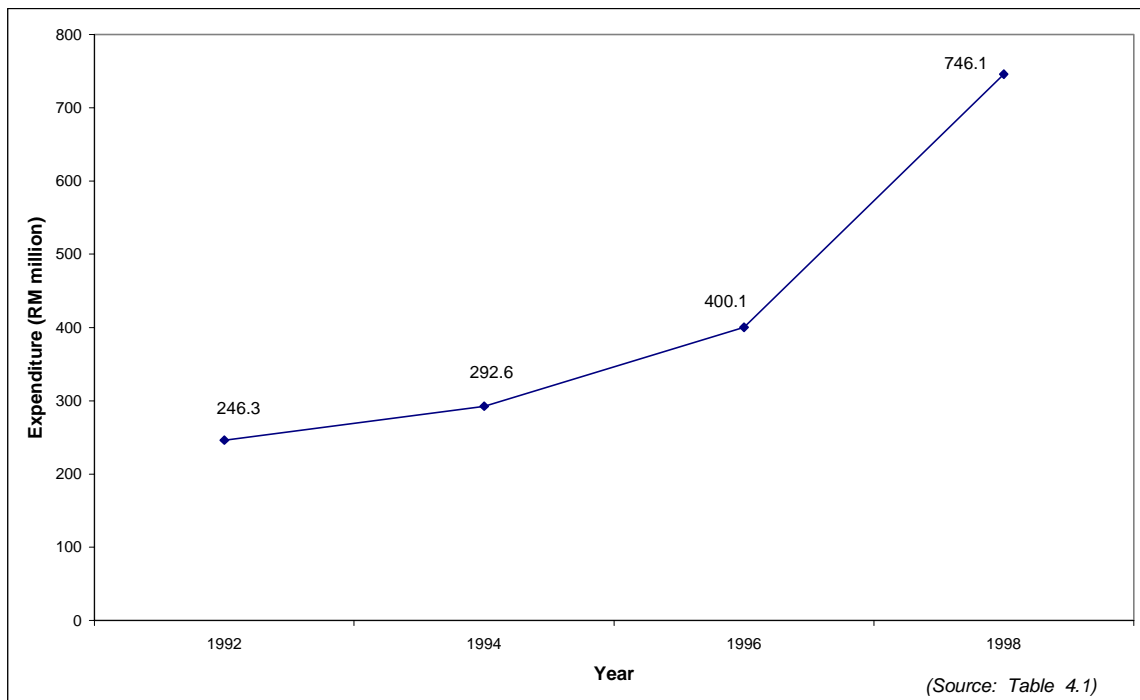


Fig. 7.2 : Comparison of Total Expenditures in 1992 – 1998

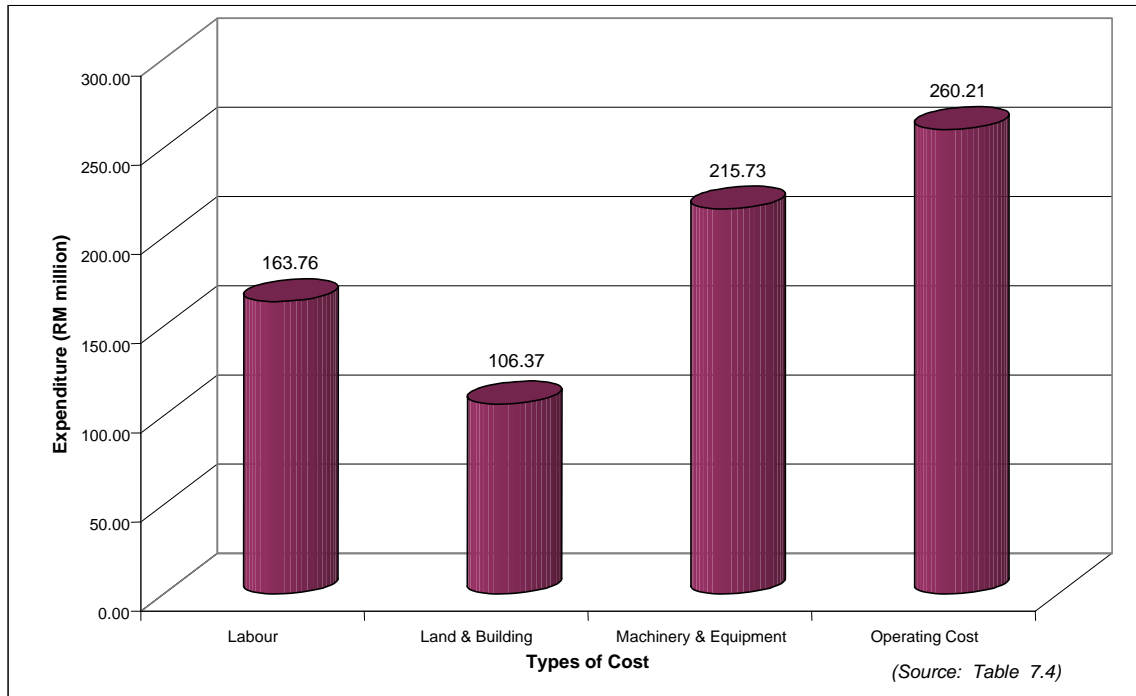


Fig. 7.3 : R&D Expenditures by Type of Costs

It is interesting to note that private sector's commitment to R&D does not depend on sales revenue. The companies with relatively small sales revenue (RM 10 million and less) spent on average RM1.98 million per company on R&D while these companies with sales revenue between RM 10 million to RM100 million spent on average of RM 3.6 million per company on R&D activities [see figure 7.4].

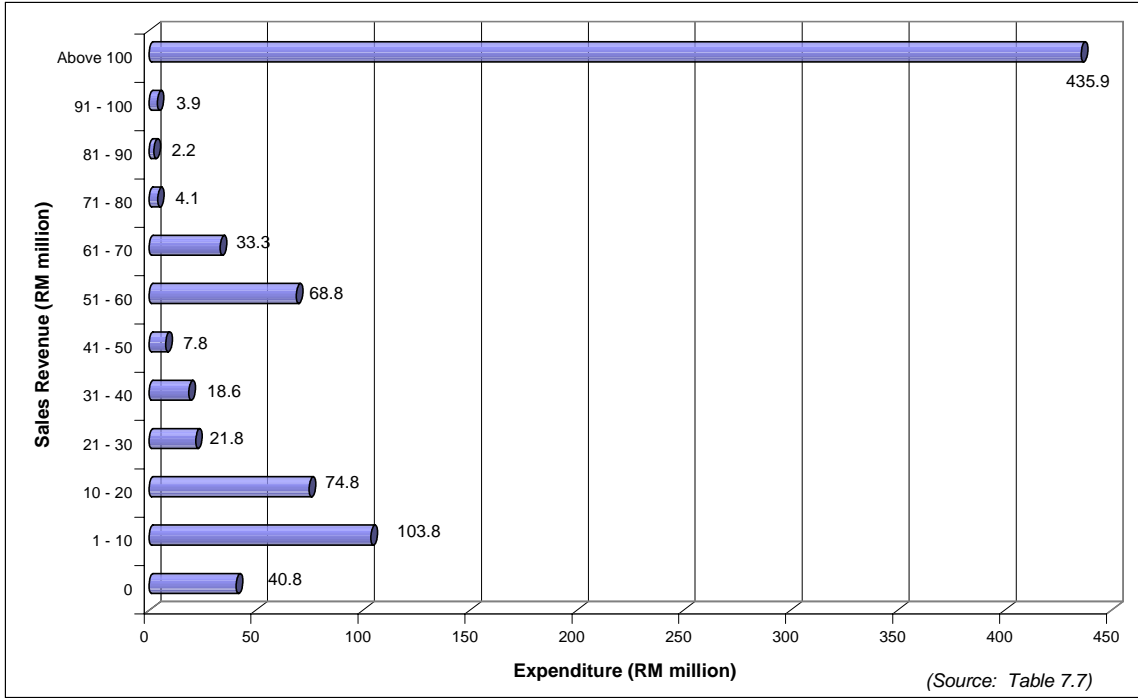


Fig. 7.4 : R&D Expenditure by Sales Revenue

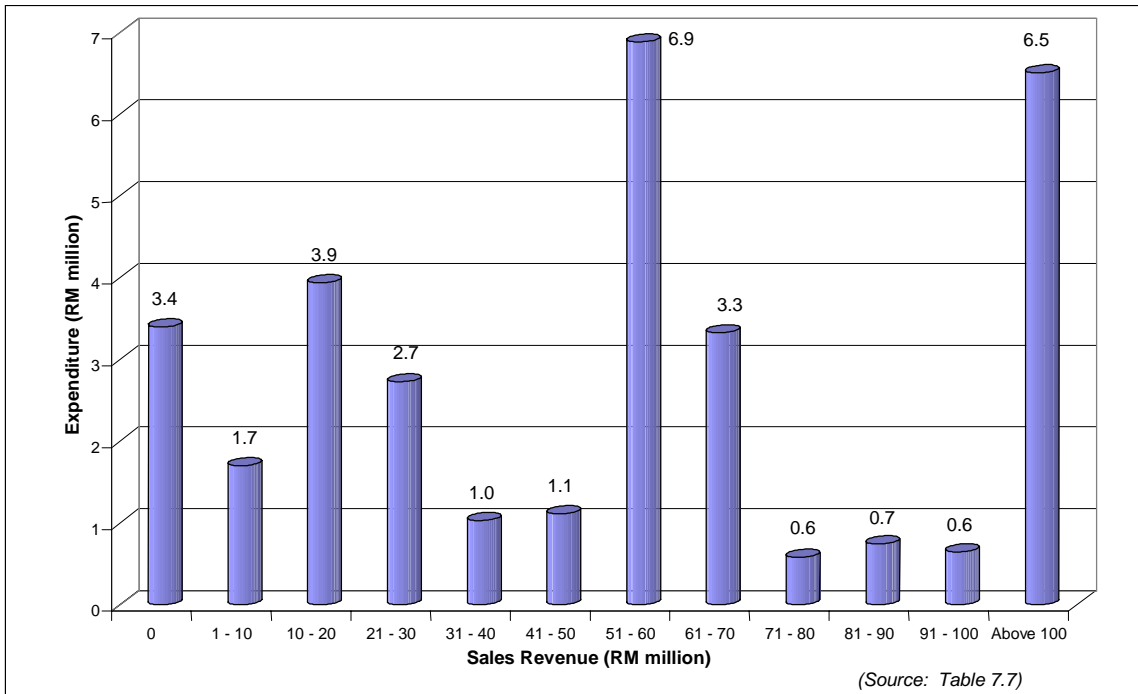


Fig. 7.5 : R&D Intensity for the Industry Categories

7.3 R&D Expenditure by Size of Company.

In 1998, about 32% of the companies carrying out R&D activities were small- and medium-sized companies (employing 75 workers or less). These companies contributed 10.8% of the total private sector R&D expenditure, while larger companies (employing more than 2000 workers) contributed 34.8% of the total spending [see Table 7.3].

7.4 R&D Expenditure by Type of Ownership/Control

The type of ownership/control of a company can be categorised as follows;

- (i) Foreign owned, i.e., foreigners own 100% of the equity;
- (ii) Foreign controlled, i.e., foreigners own more than 50% of the equity;
- (iii) Locally owned, i.e., locals own 100% of the equity;
- (iv) Locally controlled, i.e., locals own more than 50% of the equity.

There were 113 (49.5%) locally owned and 42 (18.9%) locally controlled companies carrying out R&D in 1998. These companies contributed about 62.1% of the total R&D private sector expenditure (including the outsourced fund). There were 43 foreign owned and 30 foreign controlled companies carrying out R&D in 1998, respectively. They attracted RM 308.7 million (37.8%) of the total R&D expenditure (including the outsourced fund). [See Table 7.5]. Foreign companies spent most of their R&D allocation to carried out R&D activities in high-tech related industries such as Electronic Equipment and Components as well as Computer Related Services. Trend of R&D expenditure by local companies on the other hand was not as focused as seen in foreign companies but in stead the expenditure was well distributed on wide range of industries [see Table 7.6]

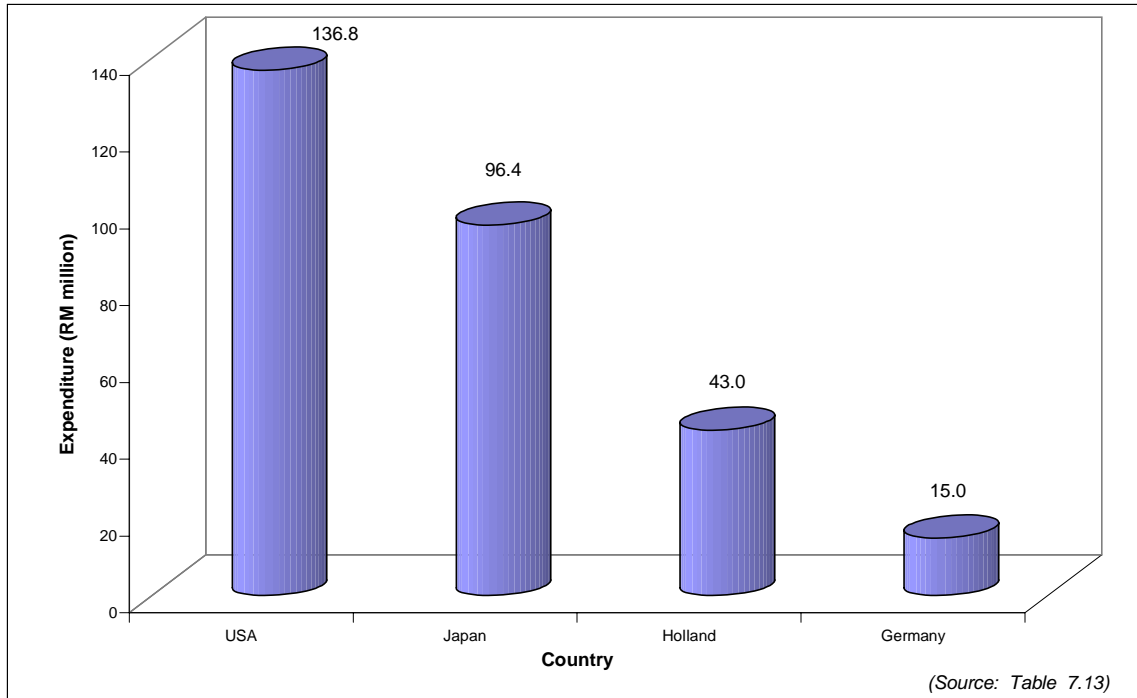


Fig. 7.6 : R&D Expenditure for Selected Foreign owned/controlled Companies

7.5 R&D Expenditure by Field of Research (FOR)

On a grouping basis, Applied Sciences and Technologies received the biggest portion (39.1%, RM 291.7 million) of the private sector R&D expenditure in 1998. This is followed by Engineering Sciences (30.9%, RM 230.5 million), and Information, Computer and Communication Technologies (20.9%, RM 156.4 million). [see Fig. 7.7]

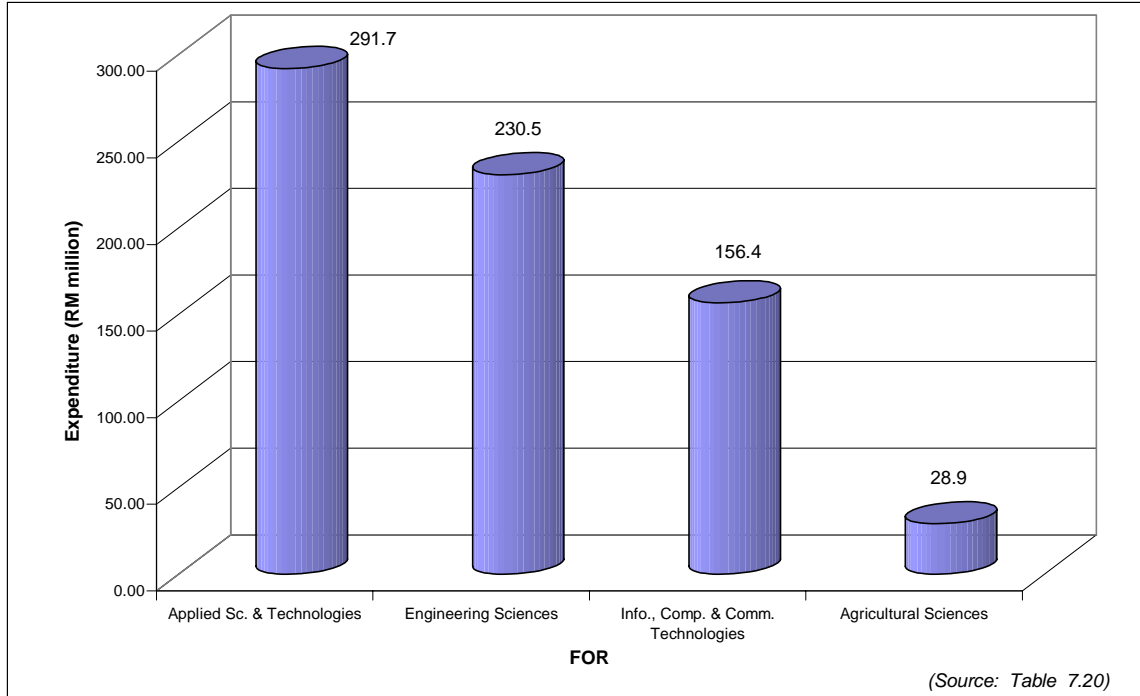


Fig. 7.7 : Total Expenditure for Selected FOR

7.6 R&D Expenditure by Socio-Economic Objective (SEO)

As seen in 1996, manufacturing sector attracted the biggest share (RM 506.1 million, 67.8%) of the private sector R&D expenditure. Information and Communication services and Energy Resources received 11.1% (RM 83.1 million) and 10.2% (RM76.0 million) of the total expenditure. [see Fig 7.8].

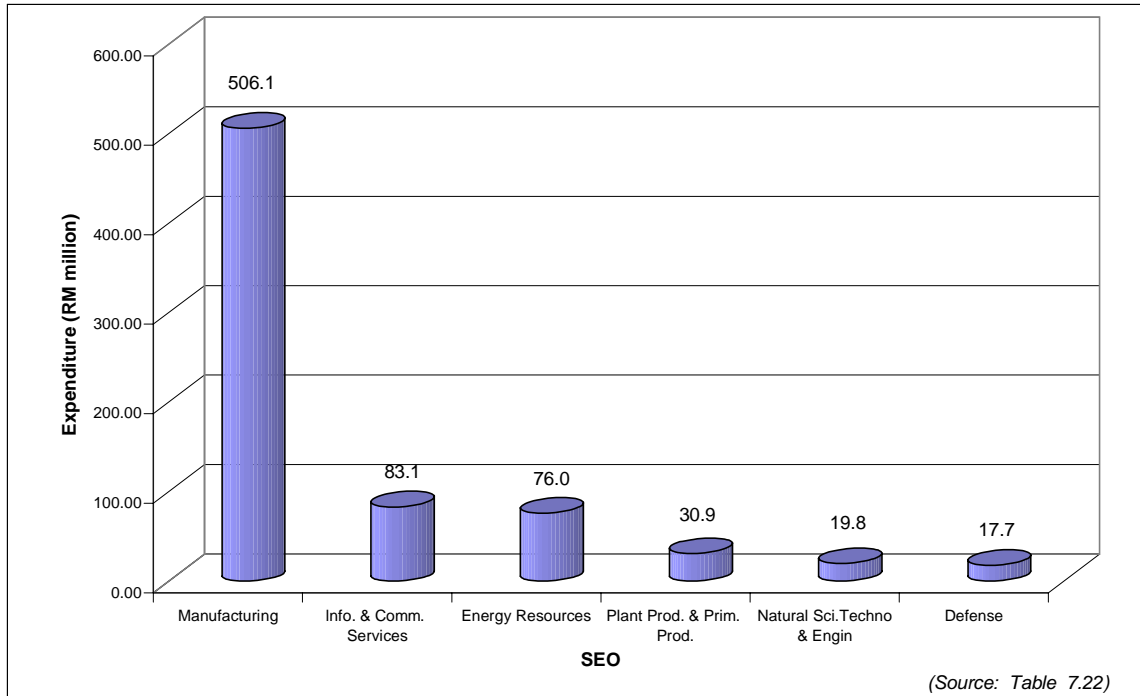


Fig. 7.8 : Total Expenditures for Selected SEO

7.7 R&D Expenditure Per Research Personnel

The cost per research personnel in 1998 was RM39,385.42, up 36% from the cost in 1996. Amongst the most expensive research personnel were those in Petroleum Products & Refining (RM59,989.05), Electrical Machinery & Appliances (RM59,787.23) and Computer and Related Services (RM57,883.05). [see Table 7.14].

7.8 Research Personnel by Industry

The private sector employed 4158 research personnel in 1998. This consists of 2287 researchers and 1871 support staff (including technicians) which gives the ratio of researchers to support staff about 1.2 : 1. The highest number of researchers was in Electronic equipment and Components (492) and this followed by Electrical Machinery and Appliances (271), Computer and Related Services (262), and Other Manufacturing Industries (166) [see Table 7.19].

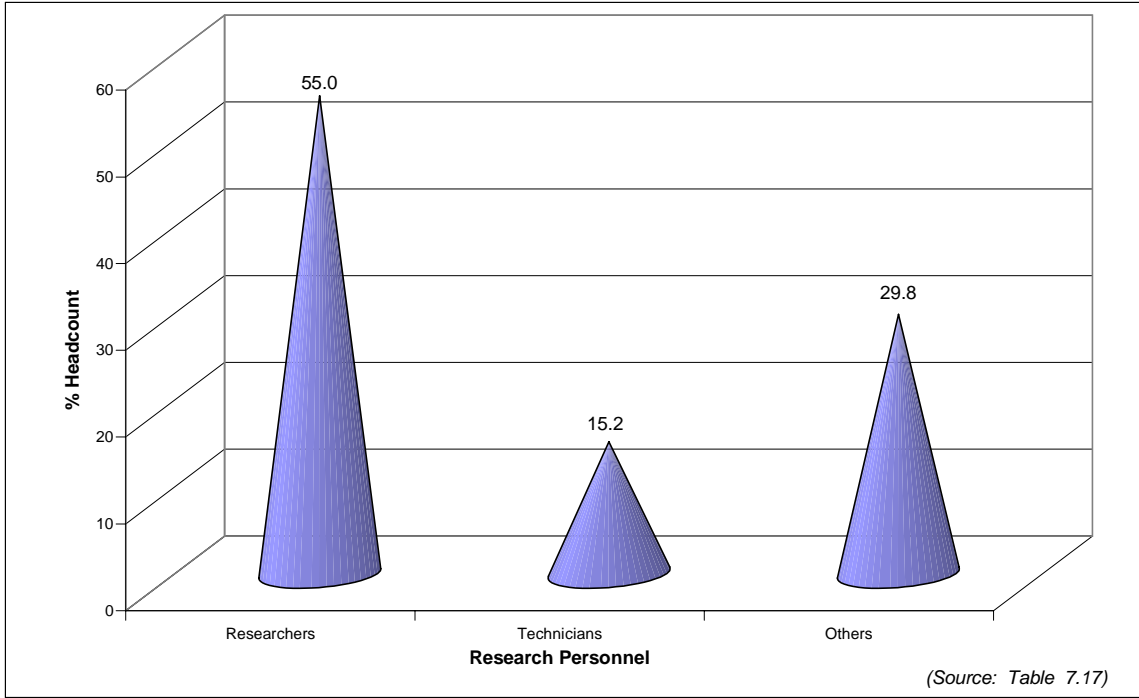


Fig. 7.9 : Percentage Breakdown of Headcount among R&D personnel

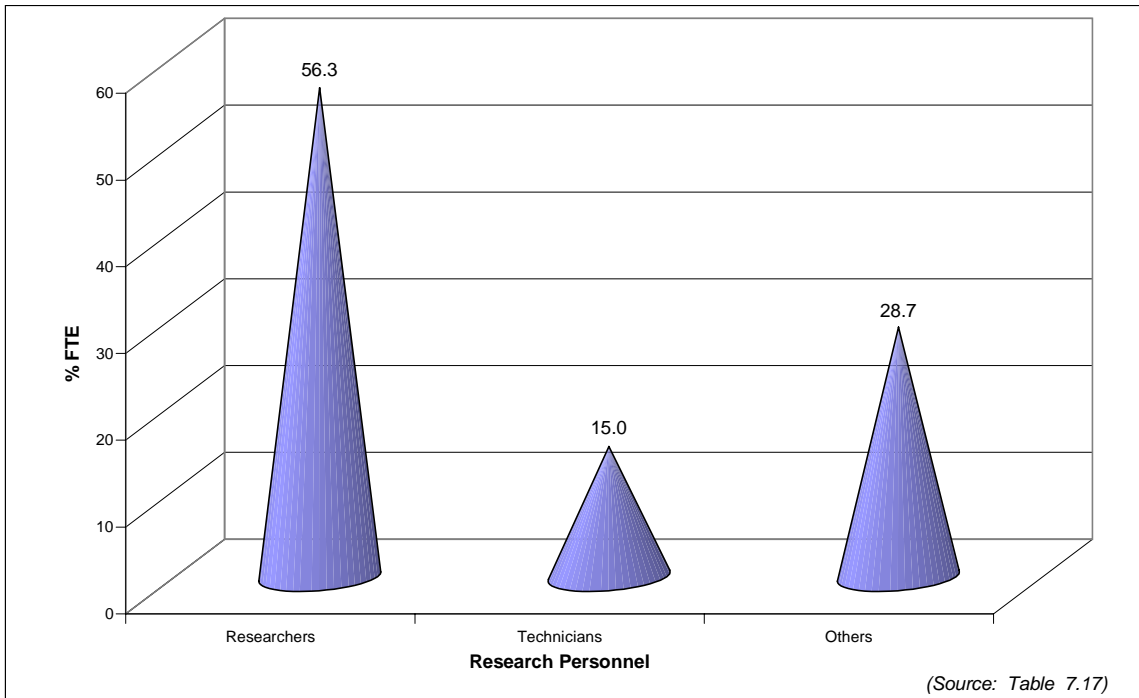


Fig. 7.10 : Percentage Breakdown of FTE among R&D personnel

7.9 Research Personnel by Field of Research

The deployment of local research personnel (in terms of FTE) in the private sector R&D activities in 1998 focused on three major field of research (FOR), namely, Applied Sciences and Technologies (39.1%), Engineering Sciences (30.9%) and Information, Computer and Communication Technologies (20.9%). These major areas of research were also the focus of foreign research personnel. [see Fig. 7.11].

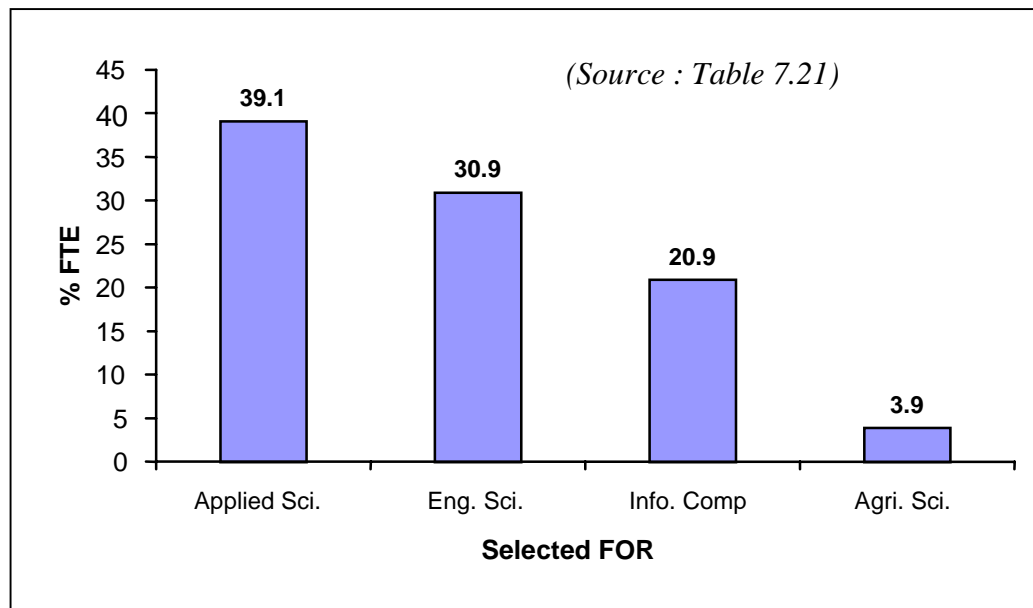


Fig. 7.11 : The percentages of FTE of Selected R&D (FOR) priorities

7.10 Research Personnel by Socio-Economic Objectives (SEO)

In 1998, there was a strong indication that most research effort (based on local research personnel's FTEs) concentrated in Manufacturing (67.8%), Information and Communication services (11.1%), Energy Resources (10.2%), Plant Production and Plant Primary Product (4.2%). This is illustrated as shown in Fig. 7.12. A similar scenario can be observed in the case of foreign research personnel.

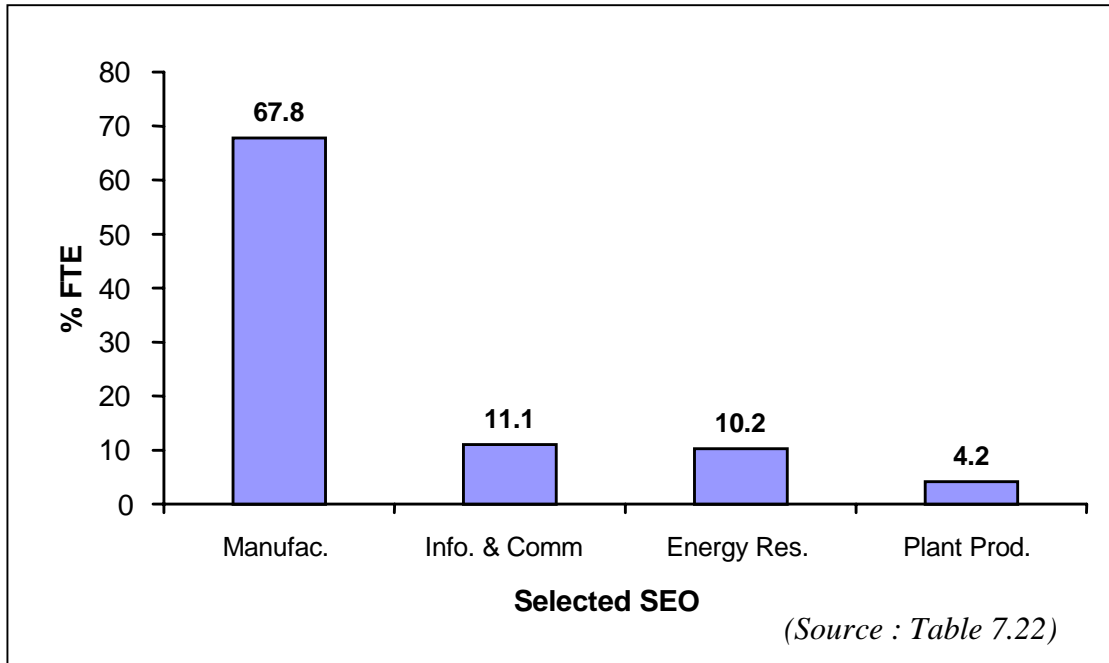


Fig. 7.12 : The percentages of FTE of the selected R&D (SEO) priorities.

7.11 Qualifications and Gender of Research Personnel

The majority of local researchers (1738) hold university degrees with first degree (80.6%), Masters degree (13.1%), and PhD degree (6.3%). About 23.6% of the local researchers were females [see Table 7.18].

7.12 Sources of Funding and R&D Linkages

The majority portion (83.4%) of the private sector's funding came from their own funds. Some other bulk of the funding were obtained from external sources (either from other company's locally based (8.3%) or overseas (4.8%)) and also from government agencies (2.4%) and Industrial and Technical Assistance Fund (ITAF) (0.3%) [see Table 7.9].

In 1998, a total of RM 56.99 million and RM 12.65 million were contracted out to overseas and local organisations, respectively [see Table 7.29]. Fig. 7.13 illustrates the funds contracted out to overseas companies as compared to the total outsourced funds over the period 1992-98. Industries related to Transport Equipment and Electronic Equipment and Components received the major bulk (77.2%) of the funds contracted out overseas in the form of contracts and commissions. The countries that attracted the major portion of the outsourced funds were Italy (52.6%, RM30.0 million), Japan (21.9%, RM12.5 million), and U.K (16.7%, RM9.6 million). [see Fig. 7.14].

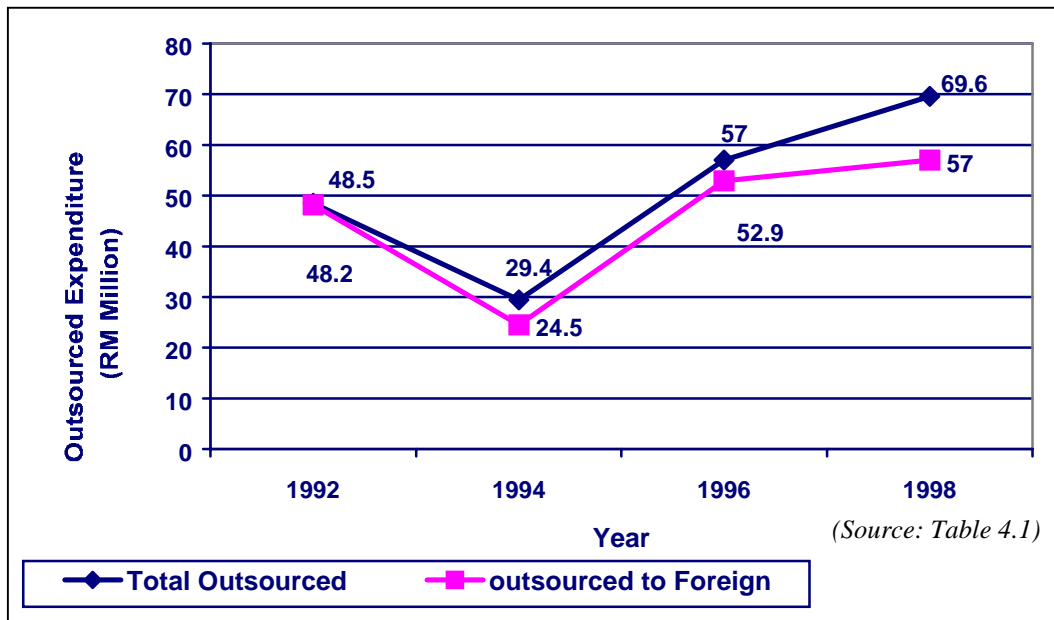


Fig. 7.13 : Comparisons of Outsourced Expenditures (RM million) to foreign Companies in 1992-1998.

Local institutions also benefited from the outsourcing of funds by the private sector. Of the amount of RM 12.6 million, 36.2% of the fund went to universities (involving 33 research projects), 37.4% to research institutes (involving 21 research projects), 25.9% to private companies (involving 26 research projects), and the rest (0.4%) to others (involving 7 research projects). [see Table 7.29].

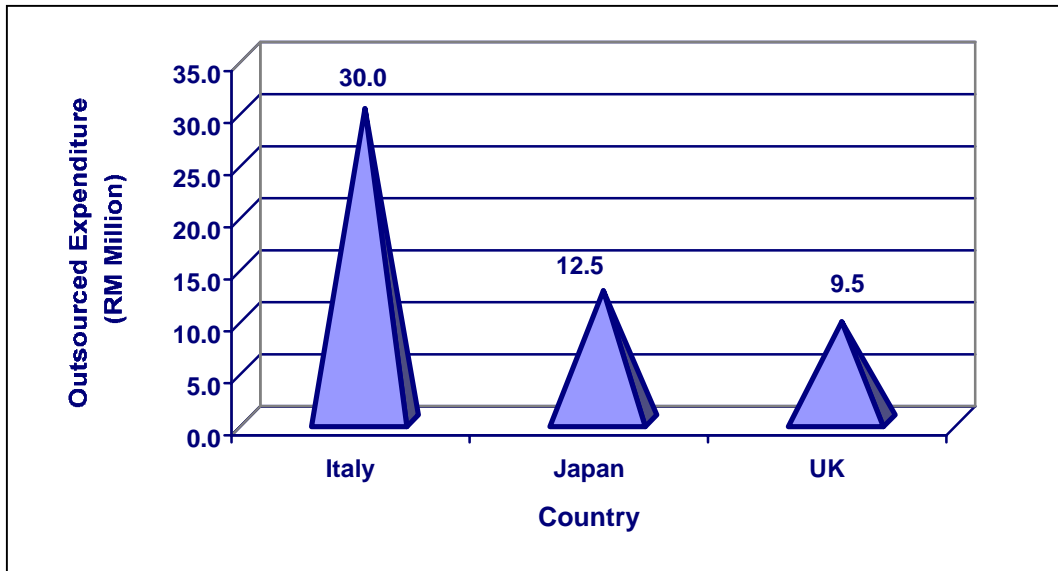


Fig. 7.14: The R&D outsourced expenditures to foreign companies

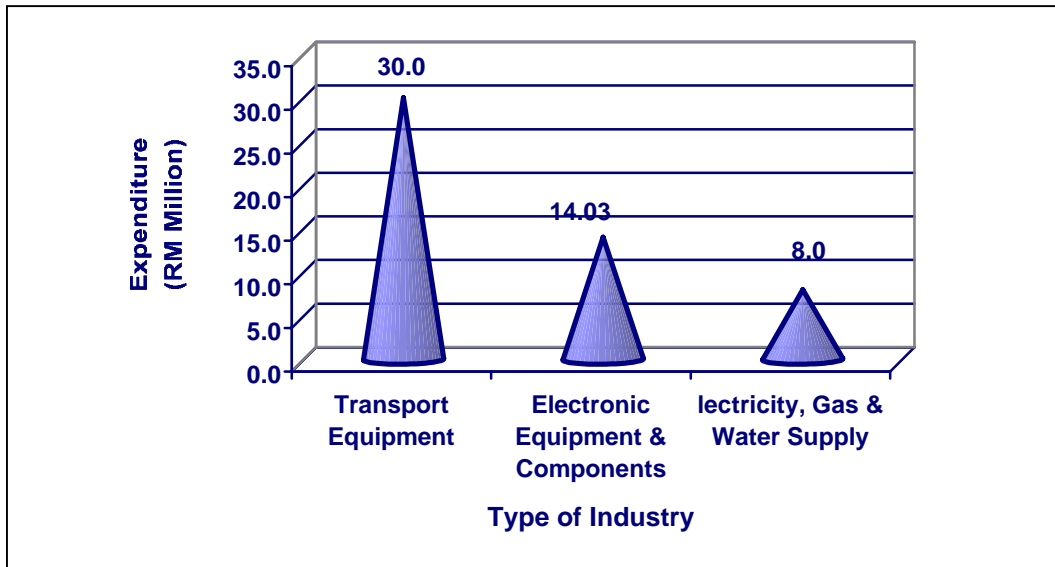


Fig. 7.15 : Outsourced expenditure to foreign companies for selected industries in Malaysia

7.13 Factors Limiting R&D Activities

It is interesting to note that the major (internal) factors cited as limiting R&D activities in the private sector are 'Lack of skilled R&D personnel', 'Limited financial resources', 'Inadequate Market Research', and 'Lack of infrastructure for R&D'. The external factors that were also perceived as limiting the R&D activities are 'Shortage of R&D personnel with requisite expertise', 'Increasing Capital Cost', and 'Increasing Competition'. These are the same external factors that were cited in the 1996 survey. [see Fig 7.16 below]

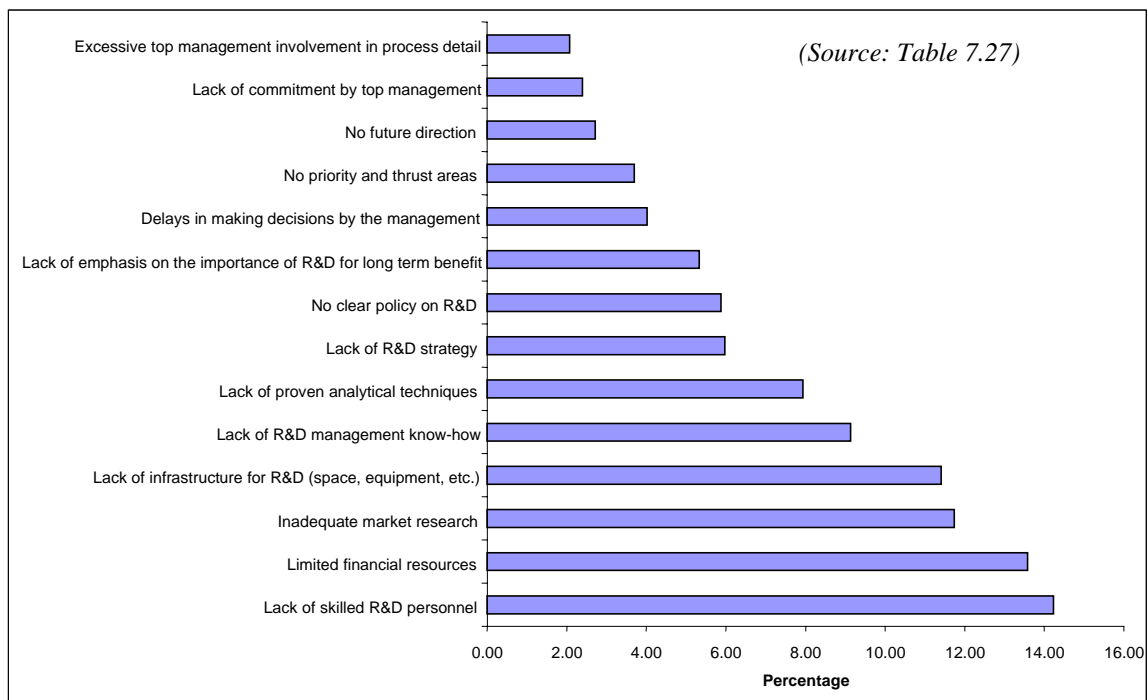


Fig 7.16 : Internal Factors Limiting R&D Activities of the Private Sectors

Most of the companies have taken necessary actions to address most the issues pertaining to the internal and external factors. Out of 228 companies surveyed, 175 (76.7%) of them have taken necessary actions to tackle internal factors while 129 (56.6%) companies have addressed the issues of external factors. [see Fig 7.17]

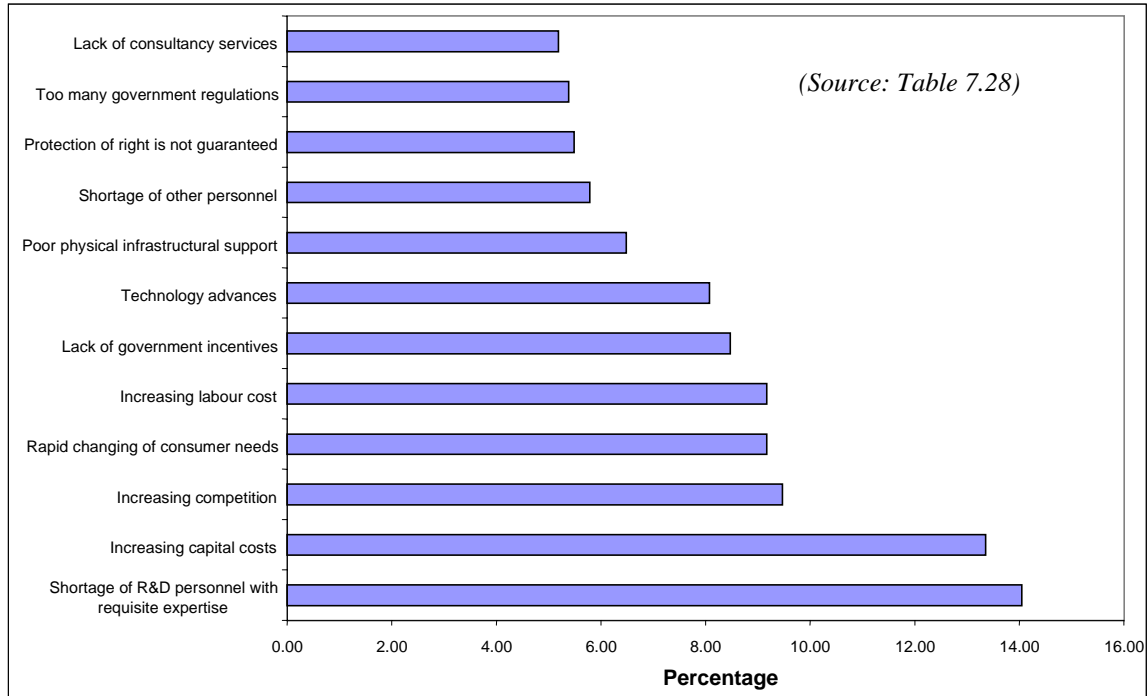


Fig 7.17 : External Factors Limiting R&D Activities of the Private sectors

7.14 R&D Activities by Geographical Locations

Most significant growth of R&D activities were recorded in Selangor, Penang and Johor. These states attracted 81.4% of the total private sector R&D expenditure in 1998. The R&D spending in Selangor increased from RM257.5 million in 1996 to RM346.8 million in 1998, Penang from only RM56.5 million in 1996 to RM198.1 million in 1998 and Johor from merely RM11.9 million in 1996 up to RM 62.5 million in 1998. [see Fig 7.18 and Table 7.10].

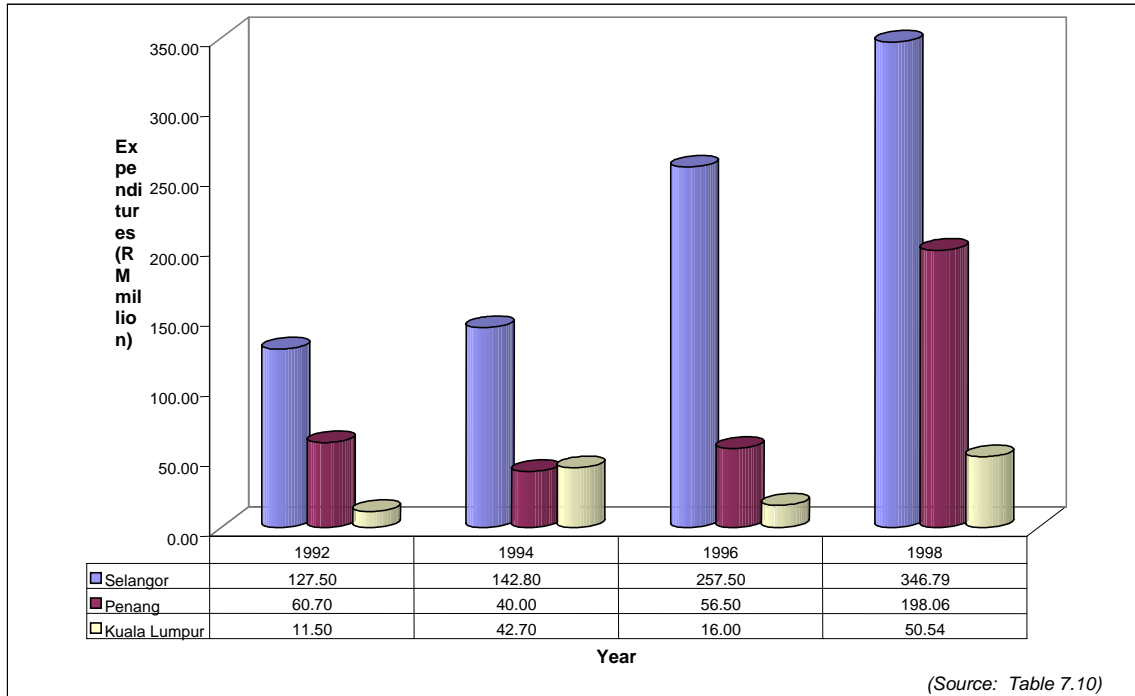


Fig. 7.18 : Comparison of Total Expenditures for Selected States in 1992 – 1998.

7.15 The R&D Expenditure by Types of Research

Of the total Private sector R&D expenditure (RM746.1 million), nearly 51% (RM 378.4 million) was devoted to Experimental Development. This is followed by Applied Research which accounted for 46.3% (RM 345.6 million), with the remaining directed toward Basic Research (RM 22 million) [see Table 7.36(a)]. A total of 538 projects were carried out under Experimental Development, while a much higher number of projects (1483) were involved in Applied Research and only 138 projects were carried out under Basic Research. Both Experimental Development and Applied Research activities were concentrated in Electronic Equipment and Components industry while most Basic Research activities were carried out in Other Manufacturing industries [see Table 7.36(b)].

7.16 The Future Plans for R&D Activities

It is most encouraging to see that all the companies carrying out R&D activities in 1998 have plans to continue the activities in the year 2000 with the expected R&D expenditure amounting to RM1,731.9 million. Most of the activities are expected to be concentrated in several industries, namely, Agriculture, Livestock and Fishery, Electronic Equipment and Components as well as Transport Equipment.

An important element that determines the running and success of R&D activities is manpower, i.e., researchers and research personnel. The private sector is expected to employ 252 local scientists and 56 foreign scientist to carry out R&D activities in the year 2000. These research scientists will be deployed mostly in industries relating to electronic, IT, rubber and plastic products and manufacturing.