

4.1 Profile of National R&D Activities

Despite the economic crisis, the national R&D activities in 1998 recorded a strong growth (i.e., more than double the figure in 1996) in the gross expenditure (GERD). The increase was from RM 549.1 million in 1996 to RM 1,127.0 million in 1998 [Fig 4.1(a)].

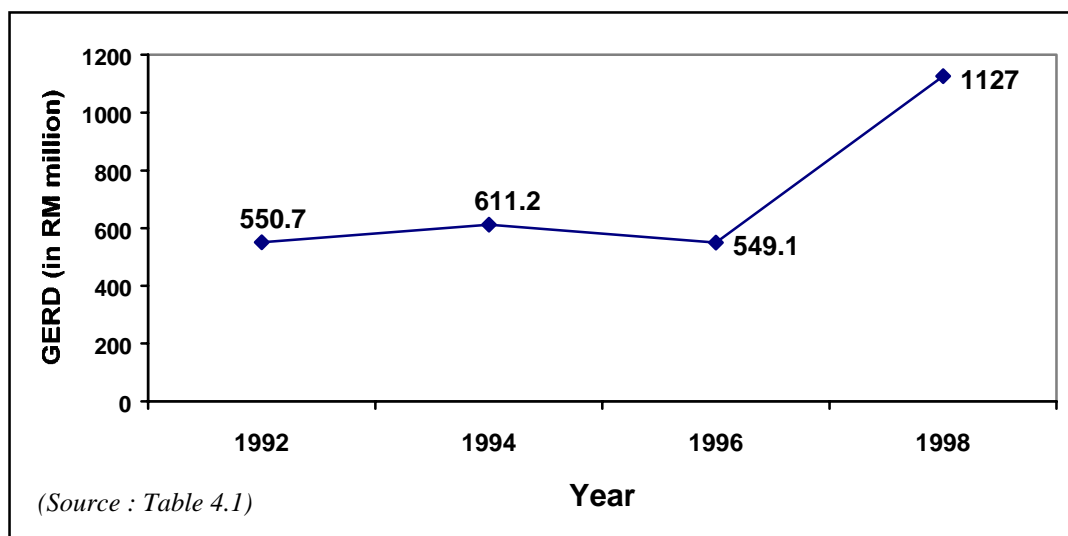


Fig. 4.1(a): The National GERD (in RM million) over the period 1992-1998

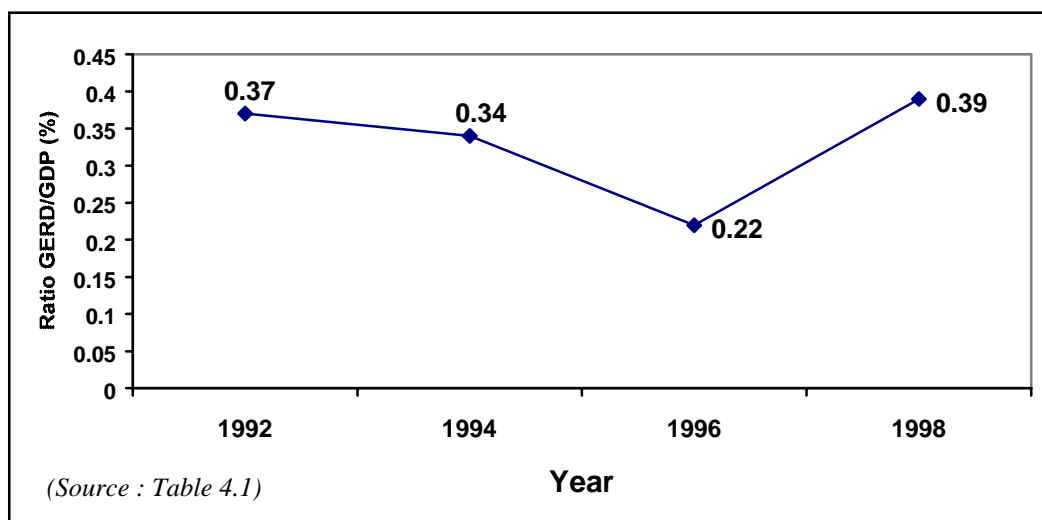


Fig. 4.1(b): The GERD/GDP (%)

This has resulted in the rise of the GERD/GDP¹ ratio, from only 0.22% in 1996 to 0.39% in 1998 [Figure 4.1 (b)]. However figure is still considered low, since at least 1% of GDP is usually the accepted level at which R&D can begin to effectively support socio-economic development in the country. The significant increase in the GERD in 1998 is quite unexpected as it was anticipated that the economic downturn would have an adverse impact on the R&D activities.

4.2 Source of Funding

It is interesting to note that the major source of funding for R&D for the private sector came from their 'own funds' and the GRI from the Federal Government. Overall, 'own funds' accounted for about 65.7% of the total national GERD. In the case of IHL, the state and local government contributed the major portion of the total IHL R&D expenditure. IRPA grants contributed about 4.9% of the total national GERD. [see Figure 4.2].

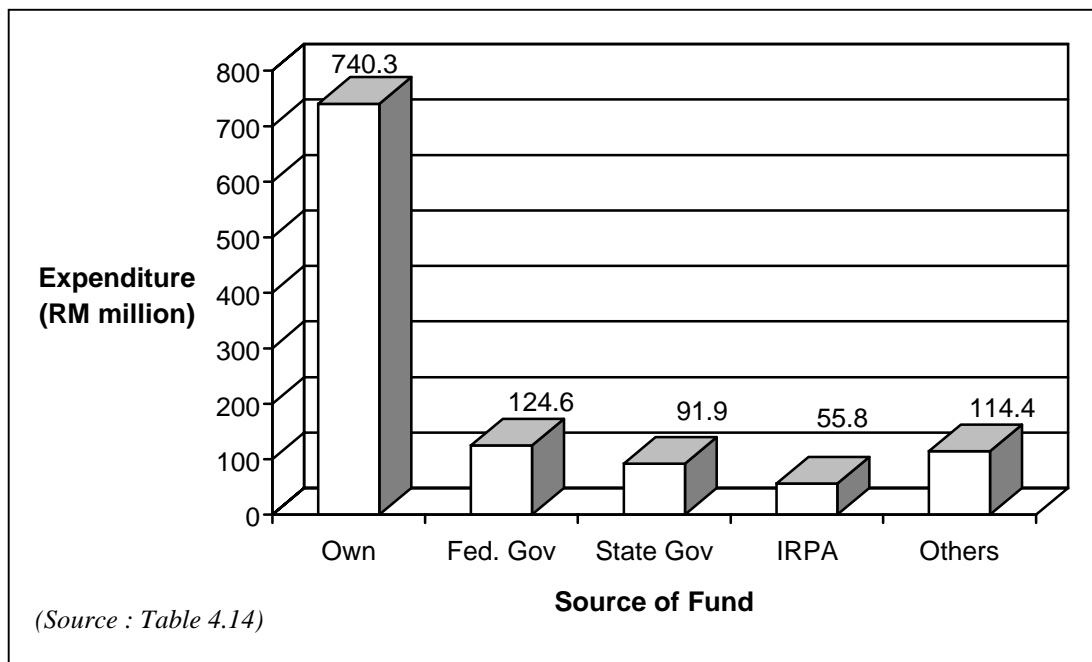


Fig 4.2 : Source of Fund for R&D activities

¹ GDP at Current Prices

4.3 R&D Spending by Sector

The private sector spent RM 746.1 million for R&D activities in 1998 and this is almost twice the amount spent in 1996. Since 1992, the private sector has been providing the larger share of financial support for R&D. This sector contributed 66.2% of the total GERD in 1998 compared to 72.9% in 1996. Even though the private sector proportion of the total expenditure fell slightly, its contribution in real terms remains the highest among all the sectors.

The GRI and IHL sectors also recorded significant growths in their R&D expenditures, amounting to RM 247.3 million and RM 133.6 million, respectively [Figure 4.3(a)]. The GRI have increased their share to 21.9% (from 19.8% in 1996) of the total GERD and the IHL contributed 11.9% share compared to only 7.4% in 1996 [see Table 4.1]. The slight decrease in the percentage of contribution by the private sector was somewhat due to the increased contributions in the GERD by the GRI and IHL. Capital cost contributed the most, i.e., 43.2% of the total spending, followed by Operating cost (34.9%) and Labour cost (21.9%) [see Table 4.3].

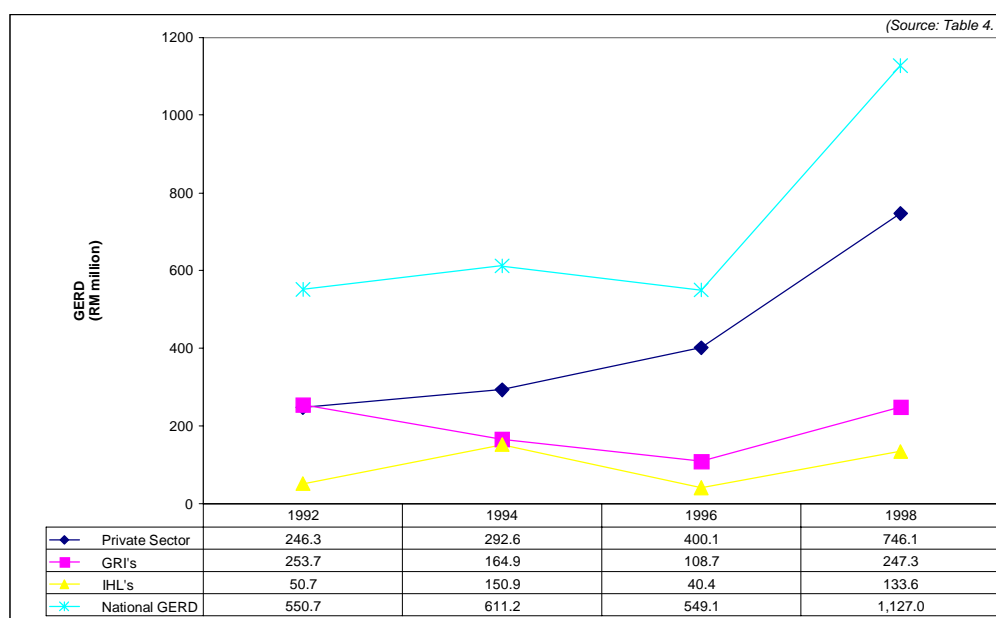


Fig. 4.3 (a) : The Total Expenditures on R&D by Sectors

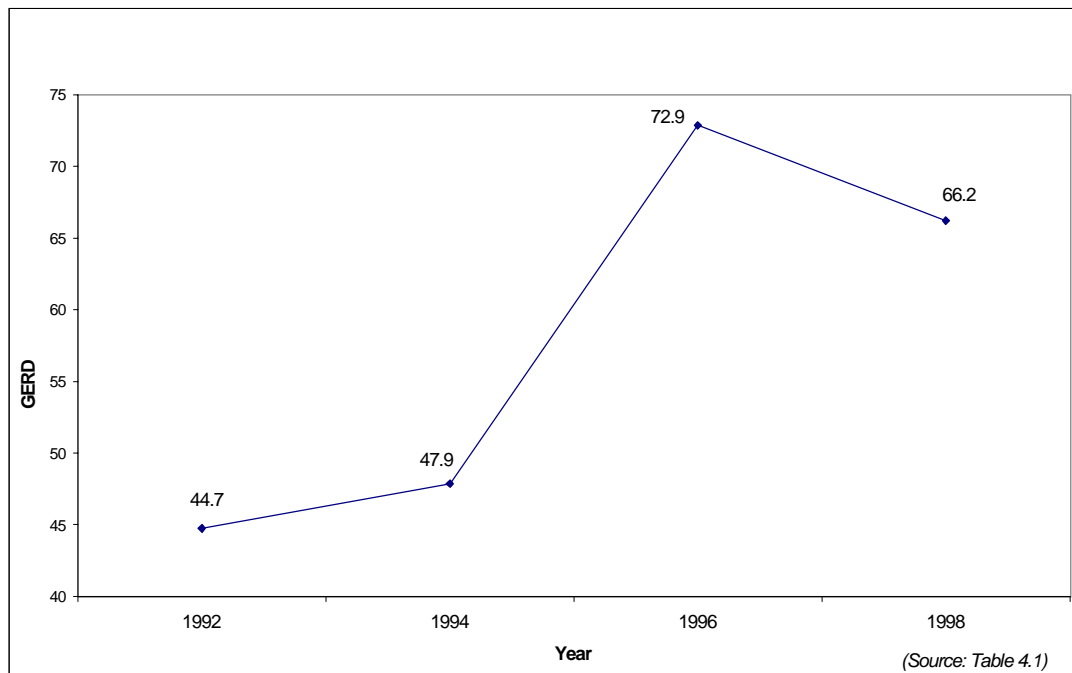


Fig. 4.3 (b) : Percentage of Contribution to GERD by Private Sector

Of the 798 private companies that responded, only a total of 228 (28.5%) companies were found to be carrying out R&D in 1998. In 1996 there were only 158 companies conducting R&D out of the 759 companies that responded. The number of GRI involved in R&D has increased from 28 in 1996 to 33 in 1998. Three new agencies, i.e., MIGHT, INTAN and PELITA have been included in the list of organisations that conducted R&D in 1998. The Operating, Capital, and Labour costs contributed 38.8%, 31.2% and 29.9%, respectively, of the total spending.

The upswing in the GRI total R&D expenditure (from RM 108.7 million in 1996 to RM 247.3 million in 1998) deserves special attention [see Figure 4.4]. Most notable is the dramatic increase (i.e., 23 times) in R&D spending in the area of 'Information, Computer and Communication Technology' from a mere RM 4 million in 1996 to RM 92 million in 1998, indicative of the focus on the development of information technology (IT) for the country.

The IHL showed the highest growth in the GERD, i.e., an increase from only RM 40.4 million in 1996 to RM 133.6 million in 1998 [see Figure 4.5]. This might be due to the increase in the number of IHL carrying out R&D, i.e., from 9 in 1996 to 12 (with the inclusion of three new universities, i.e., UMS, UNITEN and UTP) in 1998. The significant increase of the IHL R&D expenditure over the period 1996 to 1998 was due to notable increases in all types of costs, i.e., Labour (up 77.3%, from RM 22.9 million to RM 40.6 million), Capital (up 5.3 times, from RM 5.9 million to RM 31.3 million), and Operating (up 5.4 times, from RM 11.4 million to RM 61.7 million). In the case of Capital cost, UKM spent RM 21.03 million (67.3% of the IHL Capital cost) for acquiring Land and Building. On the Labour Cost, USM spent the most, i.e., RM 21.7 million (53.4% of the IHL Labour cost) [see Table 8.1].

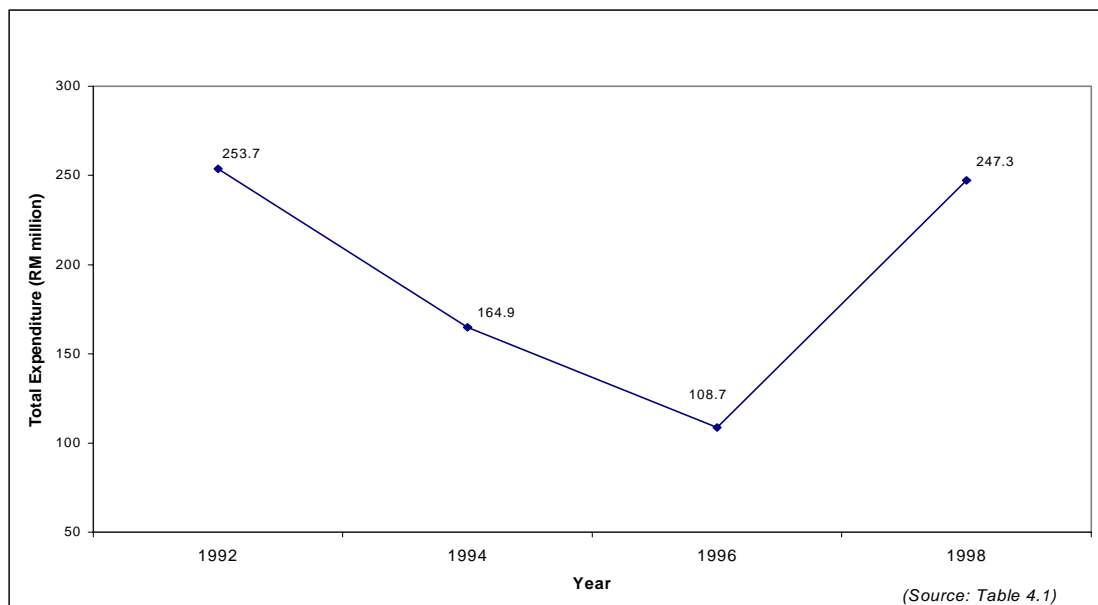


Fig 4.4 : R&D Total Expenditure by GRI (1992-1998)

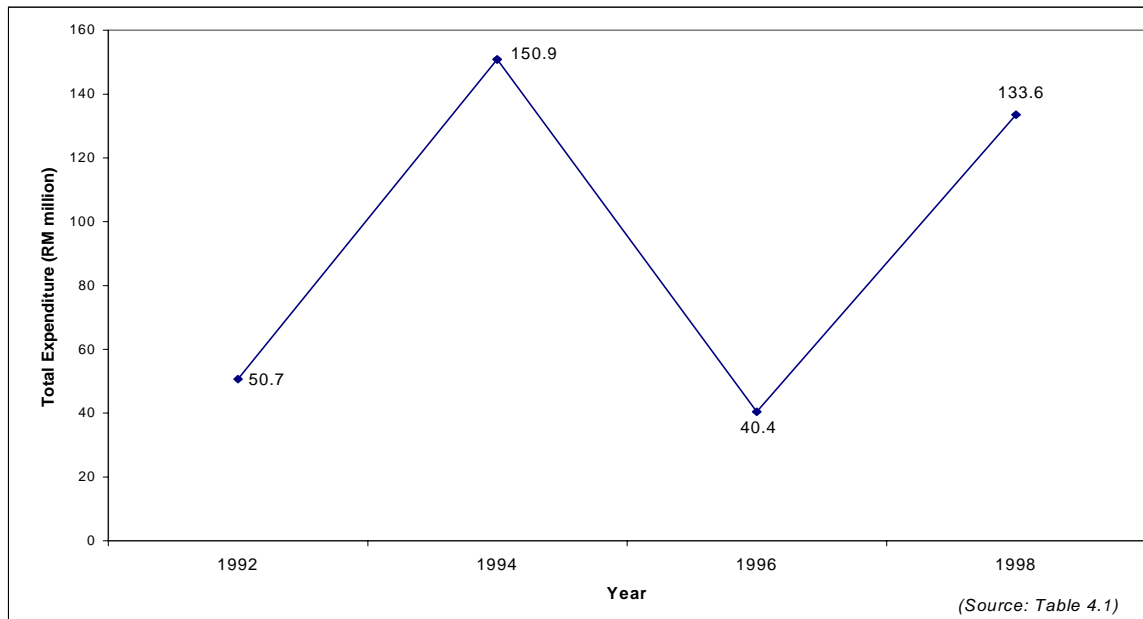


Fig. 4.5 : R&D Total Expenditure by IHL (1992 – 1998)

4.4 R&D Spending by Type of Cost

In 1998, operating cost registered the highest growth (179.7%) in R&D spending, i.e., from only RM 149.4 million in 1996 to RM 417.9 million in 1998 [Figure 4.6]. Both the capital and operating costs contributed 75.3% of the total GERD.

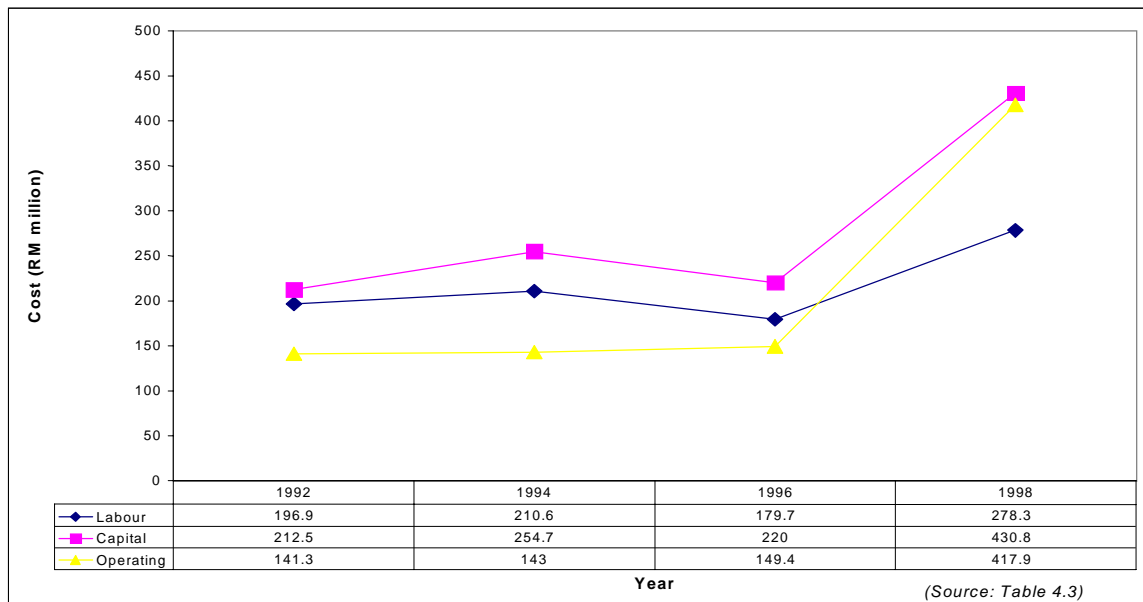


Fig 4.6 : R&D Spending by Type of Cost

4.5 R&D Spending by Type of Research

All types of research, namely, Basic, Applied and Experimental Development have shown significant growth in the R&D spending in 1998 [Figure 4.7]. The amount of spending for Applied Research showed a substantial growth (up 148.8%), i.e., from RM 228.5 million in 1996 to RM 568.47 million in 1998. A similar scenario can be observed on the expenditure for Experimental Development and Basic Research, i.e., RM 419.59 million (up 54.6%) and RM 138.65 million (up 181.8%), respectively.

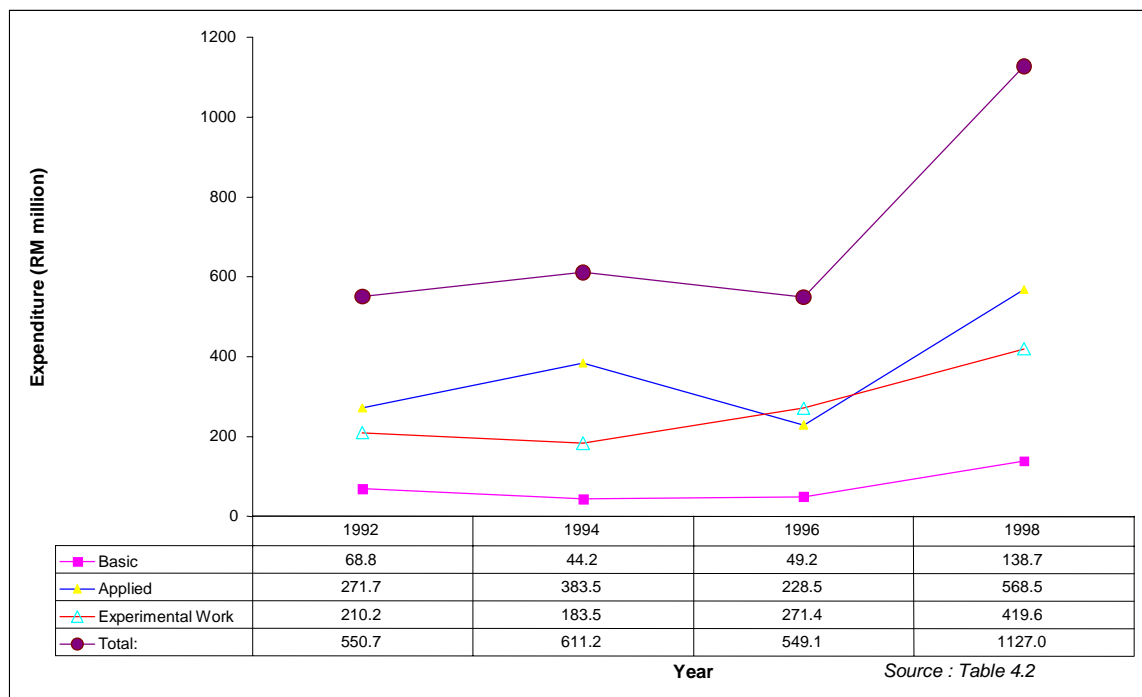


Fig. 4.7 : R&D Spending by Type of Research

4.6 Manpower for R&D

A total of 12,127 research personnel (headcount) were involved in carrying out R&D activities in 1998. This represents an increase of 31.3% compared to the number of research personnel in 1996. Researchers constitute 51.5% of the total research personnel. Private sectors engaged a larger number of researchers (i.e., 2287) compared to GRI (i.e., 1987) and IHL (i.e., 1975), respectively. All the three sectors registered substantial growth in the number of researchers carrying out R&D in 1998 compared to 1996, i.e., Private sector (up 70.4%), GRI (up 30.4%), and IHL (43.4%) [Figure 4.8].

In 1998, the full time equivalent (FTE) utilised by the total number of 12,127 research personnel was reported to be 6656.33. This is an increase of 50% over 1996. The Private sector has the highest FTE (1996.93) compared to the GRI (740.99) and IHL (677.85). All the sectors registered significant increases in the FTEs, i.e., Private (up 94.5%), GRI (up 57%), and IHL (up 71.4%) [Figure 4.9].

Female researchers represent 29.6% of the total manpower (headcount) for R&D and 27.4% of the total researchers (FTE) in 1998 [see Table 4.7 and Table 4.10]. In comparison, male research personnel represent the majority of the R&D manpower with 72% of the total researchers (FTE). The number of male researchers were almost evenly distributed in all the sectors and a bigger number can be found carrying out their research work in private companies. In contrast, the majority of female researchers (with 27% of the total FTE) were attached to universities and GRI for carrying out R&D activities. [see Table 4.10].

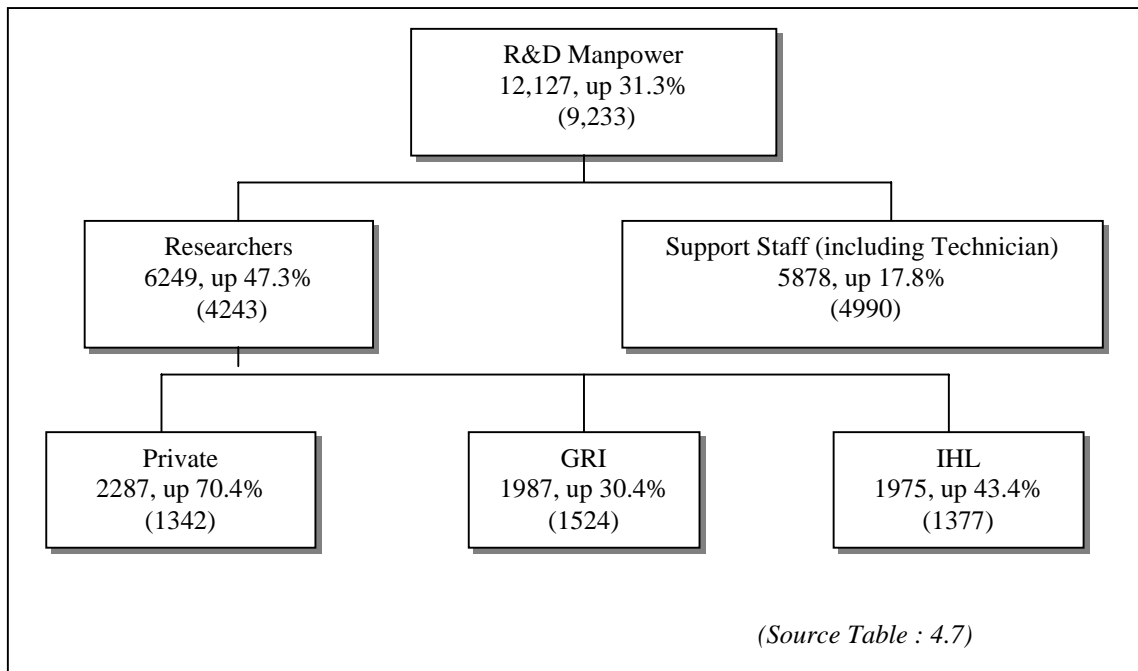


Fig. 4.8 : The Breakdown of R&D Manpower (Headcount) across sectors and comparison with 1996 figures (in brackets).

Among the researchers, the FTE per researcher is 0.55 in 1998 and this is a slight increase over the value of 0.48 in 1996. Malaysia had only 7 researchers engaged in R&D per 10,000 labour force in 1998. This slight improvement (i.e., only 5 per 10,000 labour force in 1996) is still far behind other countries such as Singapore (i.e., 66 researcher per 10,000 labour force in 1998).

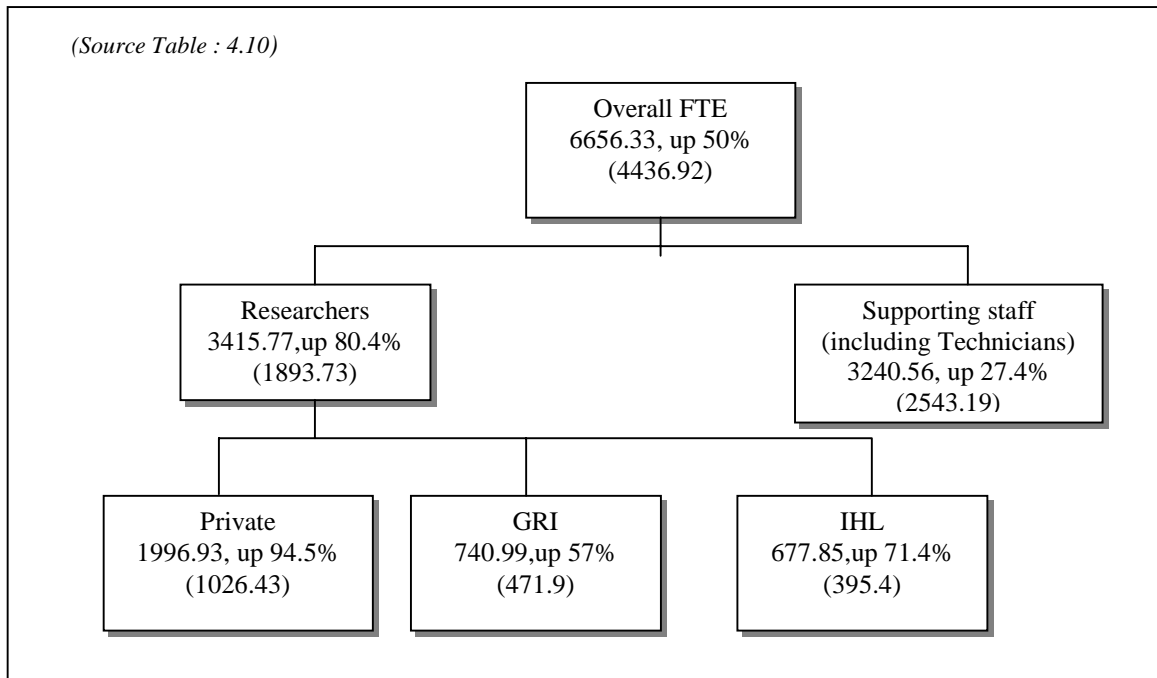


Fig. 4.9 : The Breakdown of research personnel FTE across sectors and comparison with 1996 figures (in brackets).

4.7 The Factors Limiting R&D Activities

Two common internal factors that have been cited as limiting R&D activities in the GRI, IHL and private sectors are 'Limited Financial Resources' and 'Lack of Skilled R&D Personnel'. 'Inadequate Market Research' was considered as an important external factor that greatly curtailed R&D activities in the Private sector. Meanwhile, 'Lack of Emphasis on the Importance of R&D for Long Term Benefit' seemed to impede higher growth of R&D activities in both the GRI and IHL sectors.