4

Human Resources for Competitiveness

4.1 Introduction

This chapter reviews the human capital base in Mauritius in a comparative perspective. It is widely acknowledged in Mauritius that its future comparative advantage does not lie in cheap labour but in an advanced base of skills, which it presently lacks. It is also accepted that worker attitudes and motivation are deficient, and that future competitiveness will require a more hard-working and dedicated work-force. The creation of skills, in educational institutions and specialised worker training facilities, could itself become an exportable resource.

4.2 Labour Costs and Productivity

The value of the educated, reliable and cheap labour force that drove Mauritian export growth is indicated by the existence of full employment and rising wages over time. Table 4.1 shows comparative annual average wages in a number of countries, including some major Asian garment exporters as well as the leading Tiger economies. Unfortunately, the UNIDO data that are used for all the other countries only go up to 1990 for Mauritius; the figure for 1993 is taken from Mauritian government sources, and may not be precisely comparable to the earlier data. Some of the other data may also not be fully accurate. Nevertheless, as they stand, they are useful for broad indicative comparisons.

The table confirms that low wages are no longer a source of competitive advantage for Mauritius: there are several countries in Asia with much lower wages and much larger stocks of employable labour. However, Mauritius is considerably cheaper than the NIEs and new-NIEs, and can serve as a competitive base for export activity if it can provide comparable skills, infrastructure and transport costs.

Table 4.2 shows more detailed comparisons on a range of employee costs. The advantage of this table is that it concentrates on wages in light manufacturing activity rather than averaging over the whole industrial sector – it is thus more relevant to the export activity that Mauritius is engaged in.

The table suggests the following:

- Compared to countries in East Asia in 1994, wages for *unskilled labour* in Mauritius are higher than in China, Vietnam, Indonesia and Philippines, are comparable to Malaysia, and are lower than in Thailand and much more so than in Taiwan (and presumably the other Tigers). They are also higher than South Asia. The lowest wages in the group are in Vietnam, Sri Lanka and Bangladesh.[31]
- Average wages for *skilled and technical workers* in Mauritius are generally much higher than in South Asia but comparable to South East Asia and much lower than in Taiwan.
- *Engineers* are similar to technicians: they are much more expensive in Mauritius than in South Asia but somewhat cheaper than in Taiwan.

Figure 4.1 shows the evolution of the indices (1982=100) of manufacturing production, unit labour costs and labour productivity in the Mauritian EPZs.[32] It shows that rising production has been accompanied by rising unit labour cost (defined as the labour cost index divided by the production index), while productivity has

Table 4.1 **Relative Annual Wages in Manufacturing**

	Wages (US$ p.a.)			Mauritian Wages	Growth Rate (% p.a.)	
	1985	*1990*	*1993*	*as % of others, 1993*	*1985-90*	*1990-93*
Mauritius	*1063*	*1904*	*2998*	-	*12.4%*	*16.3%*
Sri Lanka	529	604	738	406.2	2.7%	6.9%
India	1298	1592	1230	243.7	4.2%	-8.2%
Pakistan	1323	1769	2030	147.7	6.0%	4.7%
Bangladesh	557	854	905	331.3	8.9%	2.0%
Malaysia	3375	3240	4148	72.3	-0.8%	8.6%
Thailand	2422	3523	4661	64.3	7.8%	9.8%
Indonesia	921	925	1128	265.8	0.1%	6.8%
Philippines	1257	1968	2433	123.2	9.4%	7.3%
China	384	500	656	457.0	5.4%	9.5%
Singapore	7290	10800	15393	19.5	8.2%	12.5%
Hong Kong	4808	9161	13220	22.7	13.8%	13.0%
Korea	3476	9353	12269	24.4	21.9%	9.5%
Taiwan	3862	10168	14017	21.4	21.4%	11.3%

Sources: For 1993 Mauritius figure, Mauritius Central Statistical Office, Annual Digest of Statistics 1995. Table 8.3. All other data, UNIDO, Industrial Development Global Report 1994 and 1995.

Table 4.2 **Wage Levels, Mauritius and Selected Asian Countries** (1994)

	Total Labour force (million)	Unemployment Rate (%)	Min Wage Unskilled (US$/day)	Average Unskilled (US$/day)	Average Skilled (US$/day)	Average Technicians (US$/month)	Average Middle Manager/Engineer (US$/month)
Mauritius	0.54	2.0	2.66 (a)	5.5-6.8 (b)	6.8-10.3	210-400	560-1,100
Taiwan	n/a	3.1	22.50	32.50	42.50	1,300	1,500-2,500
Malaysia	7.4	2.8	No min wage	5.20-8.08	12.86	321	780-1,150
Thailand	36.8	4.4	5.22	9.05	15.72	274-630	730-964
China	723	2.3	n/a	2.05-5.18	4.03-9.65	n/a	n/a
Philippines	26.8	9.7	4.00	4.00	7.00	237	625
Indonesia	84.3	8.0	0.60-2.62	2.00-2.87	5.98	215	359
Vietnam	34.4	10	0.70	1.15-1.22	1.75-1.90	55-150	152
Sri Lanka	6.5	13.0	1.15	1.25	2.20	90-279	210-400
Bangladesh	34	3.2	1.58	1.66	2.33	63(min)	n/a
India	344.3	5.7	0.82-1.17	2.40-3.33	4.2-6.2	128-200	285-430
Pakistan	37	6.2	1.44	n/a	n/a	n/a	n/a

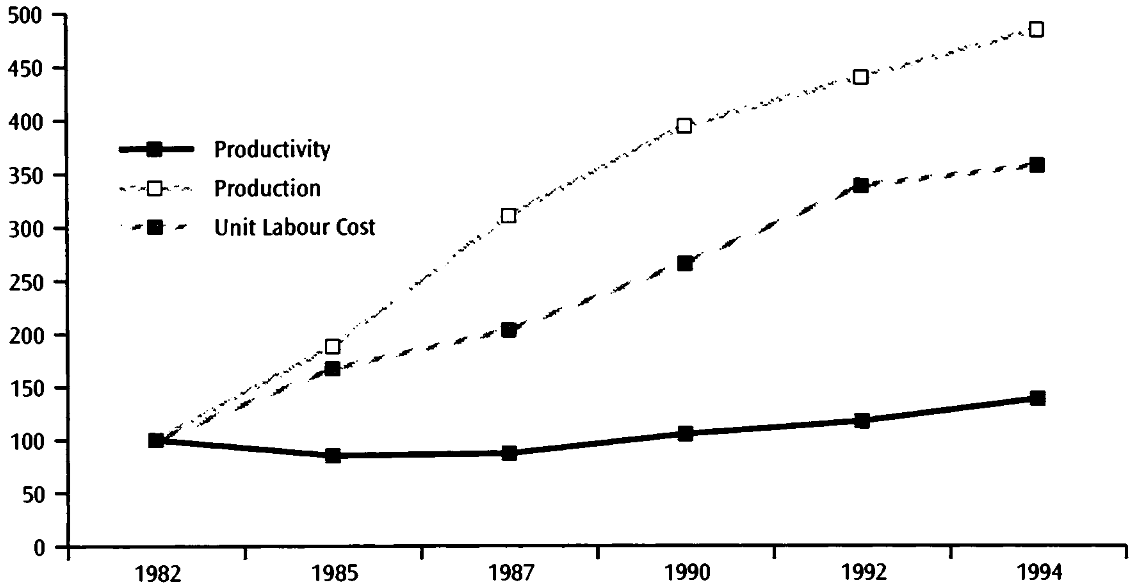
Sources: Interviews, various official and private publications. Wage rates are prevailing averages for workers in light manufacturing; for China, wages are for Special Economic Zones.

Notes: (a) Statutory minimum daily wage in 1995 for export enterprise factory workers in Mauritius. This rate is much lower than minimum wages in other industrial and non-industrial activities. From Central Statistical Office, *Annual Digest of Statistics 1995*, Table 8.9.

(b) Mauritian data on average wage rates in different occupations from Central Statistical Office, *Digest of Labour Statistics 1995*, Table 3.4.

barely risen. While the larger garment firms have raised productivity recently by improving quality, training and management techniques, this has not kept pace with wage costs. Average productivity levels are lower than in the NIEs: for instance, productivity in the Mauritian EPZ was $3,247 per man year in 1991, compared to $12,157 in the Singaporean garment industry.[33]

Fig 4.1 **Index Numbers of Mauritian EPZ Production, Productivity and Unit Labour Costs, 1982-94**



One of the leading textile firms noted that productivity was only about 50% of that in Italy or France, due to worker rather than equipment deficiencies. Smaller firms lag more than large ones, and the closure of several in recent years illustrates their difficulties in upgrading. In general there appears to be considerable scope for productivity improvement.

Table 4.3 shows the evolution of monthly earnings in large establishments and EPZs since 1991 and gives the breakdown of wages by EPZ activity. Non-EPZ firms (the data are for large firms only) pay higher rates than EPZ firms: in 1995 the average difference was 8%. Within the EPZ, the lowest salaries are earned by wood and jewellery employees, the highest by 'other' and textile workers. In nominal terms, wages have risen at 11% per annum in the EPZ firms, with the highest rates of increase in wood and furniture (which has the lowest levels) and the lowest in jewellery. The textile and garment sector has increases of around 10-12% per annum.

The fact that EPZ wages are below other wages suggests that labour markets are segmented and that in a more efficient market EPZ wages would be even higher (a conclusion supported by a recent World Bank report).[34] This is particularly true of various types of skilled labour which are in short supply, but whose wages have not kept up with their scarcity either because workers are not sufficiently mobile or face rigidity in work contracts. A recent survey of training needs by the Ministry of Manpower Resources, and Vocational and Technical Training (1995) points to widespread skill shortages in various export-oriented sectors (more on this below).

Worker productivity is determined by a large number of factors: capital intensity of the process, age and nature of the equipment, process/product/industrial engineering capabilities, organisation and management practices, worker attitudes, worker skills and provision of training. Technological factors are taken up below, here the focus is on *worker attitudes and skills*. Problems with these crop up with surprising regularity and emphasis in Mauritius in the context of manufacturing industry. A number of factors are mentioned by official surveys in respect of worker attitudes:

- **High rates of absenteeism:** Official surveys indicate rates of absenteeism (around 5-10% in the EPZ), in turn reflecting difficult working conditions, long hours and perhaps inadequate wages.

Table 4.3 **Average Monthly Earnings, March 1991-March 1995** (Rupees)

	1991	1992	1993	1994	1995	Rate of annual growth (%)
All sectors in Mauritius	4080	4530	4779	5786	6288	11.4
Large manufacturing establishments	3684	4016	4411	5162	5659	11.3
EPZ manufacturing firms	3440	3875	4287	4955	5257	11.2
Textiles	3500	3900	4323	5072	5452	11.7
Apparel	3500	3850	4302	4956	5156	10.2
Wood and furniture	2500	3655	3607	4405	4677	17.0
Jewellery	3800	4010	4521	4136	4789	6.0
Other manufacturing	3010	4005	4104	4944	5526	16.4

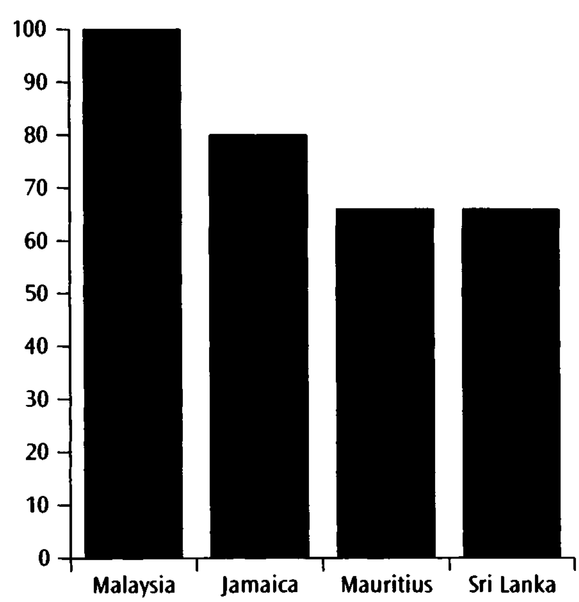
Source: Central Statistical Office, *Annual Digest of Statistics 1995*, Tables 8.3 and 8.5

- **High rates of turnover:** There is a considerable turnover of workers, especially among new and young recruits (7-10% was mentioned by some firms, but one firm claimed that up to 50% of new recruits left in the first year). While high turnover rates are common in the garment and other assembly industries in developing countries, and reflect the tightening of the labour market as well as the low levels of skills required, they are undesirable as far as quality and technological upgrading is concerned. Employers tend to give minimum training in these conditions, and commitment to improvement remains low.
- **Poor work discipline:** Many firms complain of poor worker motivation and discipline, and those with foreign workers draw unfavourable comparisons between them and Mauritian employees. This may be a major factor in holding back productivity, and observers feel that firms need to mount much more advanced human resource management policies. The traditional worker management practices in place in the majority of firms are not suited to the extent of upgrading needed by Mauritian export industry.
- **Insufficient differentiation in wages to reflect skill levels:** The wage and promotion structure does not fully reflect skill levels and productivity, again reducing employee effort and motivation and encouraging turnover.

In an attempt to compliment the findings from official surveys, our enterprise survey collected some information on labour productivity, absenteeism and labour turnover in Mauritius. Our data indicate the following:

Labour productivity. About 61 per cent of the sample firms (largely MNC affiliates) felt

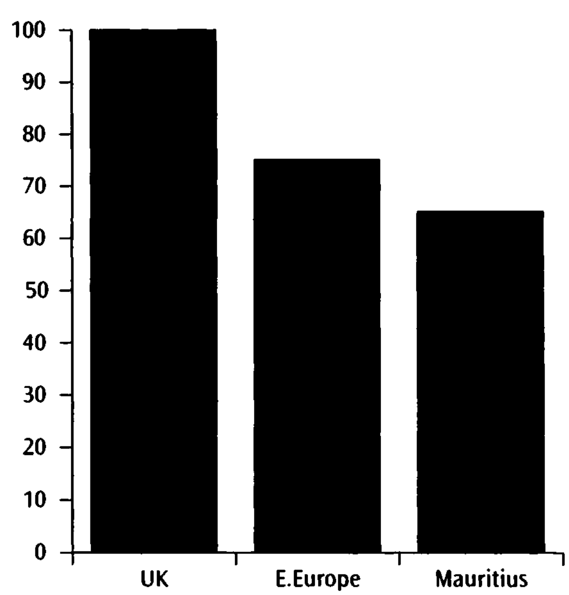
Fig 4.2 **Productivity in a Hong Kong MNC**



that the decline in labour productivity (and high absenteeism) was a negative constraint to export competitiveness. To shed further light on this issue, we asked the Chief Executive Officers (CEO) of a large Hong Kong garment MNC affiliate to rank the productivity of its Mauritius plant with their overseas plants and the CEO of a large local textile firm to compare its productivity with overseas plants that he had visited. These results are shown in Figures 4.2 and 4.3, with the Mauritius plant ranked against the best overseas plant (Malaysia = 100 in Figure 4.2 and the UK = 100 in Figure 4.3).

The labour productivity comparison for the Hong Kong *garment* MNC shows that the Mauritius and Sri Lankan affiliates (both at 66 per cent of Malaysian levels) had the lowest productivity of its operations internationally. Of the four affiliates, the Malaysian one came top and was almost at Hong Kong levels while the Jamaican one reached 80 per cent of Malaysian levels. The Jamaican affiliate was expected to significantly increase its productivity over the next five years, the Mauritian one to record a small improvement and the Sri Lankan one to remain static.

Fig 4.3 **Productivity Impressions of a Mauritius Garment Firm**



A similar picture emerges from labour productivity comparison of the local *textile* firm. The Mauritian plant (65 per cent of the UK level) records a lower level of productivity than the plant in Eastern Europe (75 per cent of UK level). The Eastern European plant was expected to reach UK levels within ten years, but the Mauritian plant was likely to only record small increases in productivity.

One *textile* affiliate said that the productivity of its Mauritian plant was lower than those of plants in India and China. One of the *electronics* affiliates said that the productivity of its Mauritian plant was 75 per cent of that of plants in China.

Although these enterprise-level productivity rankings are impressionistic, they are worrying for the development of future competitiveness in Mauritius. MNC affiliates were attracted to the country in the 1970s and 1980s largely because of cheap labour and preferential market access to the European market, which were sufficient to offset low levels of productivity. However, rising wages and the possibility of a phasing out of preferences in the late 1980s and 1990s dictate that productivity levels need to similarly increase in manufacturing enterprises. Unfortunately, this does not seem to have happened to date and the country seems to have lagged behind its major competitors. There is a danger that Mauritius may lose its competitive edge in labour-intensive industries as lower cost countries enter the export scene with comparable levels of infrastructure and skill. The country's long-term export growth clearly lies in dynamising the process of productivity growth.

Absenteeism and turnover rates. Table 4.4 provides information on absenteeism and turnover rates for workers and technicians. Absenteeism is high and often exceeds 10 per cent in some firms. Those in textiles and garments (5-10 per cent) seem to have somewhat higher absenteeism rates than those in electronics (5-8 per cent). Unfortunately no information was available for food products and chemicals. Firms argued that absenteeism was common following a weekend shift or a night shift, indicating

Table 4.4 **Absenteeism and Turnover in Enterprises**

	Absenteeism rates as % of employment	Worker turnover rates as % of employment	Technician turnover rates as % of employment
	1996	*1995*	*1995*
Industry:			
Food Products	n.a	1.0	0.2
Textiles & Garments	5-10	5.0	0.4
Chemicals	n.a	10.4	2.6
Electronics	5-8	8.6	0.0

a general reluctance to work unsociable hours even for higher wages. One textile MNC affiliate argued that it was working at only 80 per cent of its capacity utilisation rate rather than 90 per cent because of a 10 per cent rate of absenteeism. Several firms maintained that high absenteeism contributes to high overheads and a lack of competitiveness.

Worker turnover varies considerably between the industries. It is quite high in chemicals (10.4 per cent) and electronics (8.6 per cent), moderate in textiles and garments (5.0 per cent) and low in food products (1.0 per cent). However, the industry-averages tend to mask firm-level differences. Some textile and garment firms reported very high worker turnover rates in the range of 50 per cent within the first year. These firms argued that after this period, there was a decline in worker turnover rates. The high worker turnover rates particularly within the first year seem due to factors like rigid factory discipline, demanding work, long working hours, high living costs, poor living conditions and limited transport to factories. Interestingly, technician turnover rates are much lower than those for workers in the same industries indicating that poaching of technical manpower is not a serious problem.

The high rates of absenteeism and worker turnover are likely to be a major disincentive to skill accumulation and upgrading in industry.[35] The move to more complex technologies and high value added products needs a stable, hard working labour force in whose skills firms invest. In an attempt to overcome the problems caused by absenteeism and high turnover, some firms were recruiting a small proportion of foreign workers (from China or India) on short contracts. Foreign workers were said to be more productive than local workers, more willing to work longer hours (10-12 hours as opposed to 8 hours) and less likely to be absent. These are issues which merit urgent government reflection and action.

4.3 Skills

4.3.1 Formal Education

Mauritius is justifiably proud of its record on education, and in the regional context it has a good base of schooling. Table 4.5 shows enrolment rates at the three levels in comparison with some Asian countries. Mauritius is in advance of South and South East Asian countries in secondary schooling, with the exception of Sri Lanka. Its adult illiteracy rates are far lower than in India and Bangladesh, and somewhat better than Malaysia's. In all these, it scores far better than most sub-Saharan African countries (not shown in this table, but see Lall, 1992, for detailed data).

However, there remain several major problems with the education and training system, which were noted in a comprehensive study of industrial training by Bheenick and Hanoomanjee (1988). Many of the findings of this study remain valid today. Mauritius lags well behind the Tigers in secondary-level, and behind all the comparators in tertiary-level, enrolments. The secondary education system is biased against

Table 4.5 **Educational Enrolments in Mauritius and Asian Countries**

	Numbers enrolled in school as percentage of age groups						Tertiary level students per 100,000 inhabitants		Adult illiteracy rate (recent)
	Primary		*Secondary*		*Tertiary*		*Numbers*	*Year*	
Country	1970	1993	1970	1993	1980	1993			
Mauritius	94	106	30	59	1	2	208	1990	17%
Singapore	105	107	46	78	8	9	N/A	N/A	11%
Korea	103	101	42	93	16	48	4208	1992	2%
Taiwan	(d) 97	(e) 100	(d) 66	(e) 92	18	(e) 31	2919	1993	6%
Malaysia	87	93	34	59	4	7	679	1990	16.5%
Thailand	83	98	17	37	13	19	1763	1989	6%
Indonesia	80	114	16	43	4	10	1032	1992	16%
India	73	103	26	44	(a) 6	(f) 10	556	1989	59%
Sri Lanka	99	106	47	74	3	6	505	1991	10%
Bangladesh	54	(f) 77	(c) 13	19	(a) 3	12	382	1990	63%

Note: (a) 1970; (b) 1991; (c) 1965; (d) 1976-77; (e) 1989-90; (f) estimate.

Sources: UNESCO, Statistical Yearbook, 1996; World Bank, *World Development Report* (1992-97); Ministry of Education, *Educational Statistics of the Republic of China*, Government of Taiwan, 1991.

technical subjects, reducing its relevance for competitiveness development. The tertiary-level enrolment rate, at the level of most sub-Saharan African countries, appears grossly inadequate to its income level and to the need for modern industrial and management skills. Taking account of students in tertiary education abroad (78% of the domestic rate, from UNDP 1996) raises the figure to 3.6%; however, even this adjusted figure is far below the levels in the other countries (note that Singapore and Malaysia also have substantial proportions of students overseas, 25% and 38% respectively). There appears to be a clear correlation between tertiary-level enrolments and the development of technological capabilities: the countries that have developed the most advanced industrial structures and indigenous capabilities, Korea and Taiwan, have very high enrolment rates, matching those reached by developed countries.

At the tertiary level, it is useful to look further at enrolments in technical education, especially in natural sciences and engineering (Table 4.6). This shows clearly an enormous lag by Mauritius. Enrolments in the three core technological subjects together account for only 0.04% of the population, only 2.8% of the level reached by Korea (1.45% of the population), and only 31% of the proportions reached in poor countries such as India and Indonesia. Even Bangladesh achieves double the proportion reached by Mauritius. If Singapore is the model for Mauritius to emulate, its technical enrolments would have to be 14 times higher as a percentage of the population to provide comparable levels of technological human capital.

Korea stands out by virtue of its enormous investments in high-level technological skills; it is noteworthy that it has enrolled far more engineers in its universities than India, in *absolute* numbers. Taiwan is just a little further behind. A recent paper (Lall, 1996) finds that these two Tigers now have much higher technological enrolments than any developed country (including Japan), generally *twice* the proportion of population. Singapore is particularly interesting because like Mauritius, it inherited a British education system with its emphasis on arts subjects. As part of its industrial strategy, it was able to switch this 'ethos' in its university system to one

Table 4.6 **Tertiary Level Students in Technical Fields (numbers and % of population) in Mauritius and Asian Countries**

Country	Year	Natural Science		Maths & Computers		Engineering		Total		Population (m.)
		Nos.	*% of pop.*	*Nos.*	*% of pop.*	*Nos.*	*% of pop.*	*Nos.*	*% of pop.*	
Mauritius	1991	86	0.01%	130	0.01%	249	0.02%	465	0.04%	1.1
Singapore	1994	1281	0.05%	1420	0.05%	13029	0.47%	15730	0.56%	2.9
Taiwan	1993	16823	0.08%	32757	0.16%	179094	0.86%	303964	1.45%	20.9
Korea	1993	75778	0.17%	145948	0.33%	367846	0.83%	589572	1.34%	44.5
Malaysia	1990	8776	0.05%	4557	0.02%	12693	0.07%	32222	0.17%	19
Thailand	1992	77098	0.13%	1292	0.00%	105149	0.18%	249952	0.43%	58.1
Indonesia	1992	22394	0.01%	13117	0.01%	205086	0.11%	240597	0.13%	187.2
India	1988	800266	0.09%	./.		201289	0.02%	1138812	0.13%	898.2
Bangladesh	1989	75503	0.07%	7523	0.01%	5830	0.01%	96793	0.08%	115.2
Sri Lanka	1991	8228	0.05%	366	0.00%	3901	0.02%	21234	0.12%	17.9

Note: Data from the field of study in which the symbol ./. appears are included with the figure on the left.
Sources: UNESCO, *Statistical Yearbook*, 1994; Taiwan, *Statistical Data Book*, 1994

geared to technology. The courses were focused on technologies targeted for future promotion, with tight control over the content and quality of the training, and generous finance for selected fields of technology.[36] To prepare its workforce, Singapore also invested in an extensive and state of the art system of technical training and encouraged in-house training by firms (those that do not train enough are penalised). Its polytechnic was built up to provide mid-level skills. Box 4.1 highlights some aspects of its training.

Enrolment data by themselves do not indicate the quality, relevance and content of the education system in Mauritius. There are also problems here. It is worth quoting a recent World Bank report on these issues:

> "*Despite this progress, the education system has not kept pace with the human resource requirements of the country's economy. Mauritius currently faces shortages of skills that would enable the economy to move to, and keep up with, international technological best practice in its industries. The causes lie in insufficient general and specialised education and training which, in turn are the results of limited opportunities for secondary and higher education, in particular scientific and technological education, and the relatively low quality of the output of most of the institutions.*
>
> *Limited capacities of secondary and post-secondary institutions have limited the numbers educated. Varying levels of access to education between urban and rural areas and between elite (public or private) and less well-regarded (predominantly private) schools have also played a part in limiting the numbers educated. As a result, the work force has a mean educational attainment of only 6.9 years of schooling, compared with about 9 years in Taiwan, Korea or Hong Kong. Six years of primary education is still the terminal point for about one-third of the children. Secondary enrolment is 56 per cent ... and has remained stagnant because of high repeater and dropout rates and capacity constraints ...*
>
> *Skills produced are below requirements because of low quality of input and instruction. Three-fourths of secondary school teachers have inadequate teaching skills; the curriculum pays insufficient attention to the acquisition of basic cognitive skills, science and mathematics, while a rigid*

Box 4.1: **Singapore's Training System**

Singapore is a regional leader in employee training programmes held outside the firm. The Vocational and Industrial Training Board (VITB) established an integrated training infrastructure which has trained and certified over 112,000 individuals, about 9% of the existing workforce, since its inception in 1979. The VITB administers several programmes. The Full-Time Institutional Training Programme provides broad-based pre-employment skills training for school leavers. The Continuing Skills Training Programme comprises part-time skills courses and customised courses. Customised courses are also offered to workers based on requests from companies and are specifically tailored to their needs. Continuing Education provides part-time classes to help working adults.

VITB's Training and Industry Programme offers apprenticeships to school leavers and ex-national servicemen to undergo technical skills training while earning a wage. The programme consists of both on-the-job and off-the-job training. On-the-job training is carried out at the workplace where apprentices, working under the supervision of experienced and qualified personnel, acquire skills needed for the job. Off-the-job training includes theoretical lessons conducted at VITB training institutes or industry/company training centres. Unusually, the government collaborated with MNCs (one Indian, one German and one Dutch) to jointly set up these centres, funding a large part of employee salaries while they are being trained (below) in state of the art complex manufacturing technologies. Later the Singapore government worked jointly with foreign governments (Japan, Germany and France) to provide technical training.

Under the Industry-Based Training Programme, employers conduct skills training courses matched to their specific needs with VITB assistance. VITB also provides testing and certification of its trainees and apprentices as well as trade tests for public candidates. The Board, in collaboration with industry, certifies service skills in retailing, health care, and travel services. Using various grant schemes, the National Productivity Board's Skills Development Fund (SDF) created 405,621 training places in 1990. The initial impact of the programme was found mostly in large firms; however, efforts to make small firms aware of the training courses and provide support for industry associations has increased SDF's impact on smaller organisations. SDF is responsible for various financial assistance schemes to help SMEs finance their training needs and to upgrade their operations (for instance, the Training Grants Scheme pays out between 30 and 90% of training costs borne by SMEs). It has also introduced a Development Consultancy Scheme to provide grants to SMEs for short-term consultancy for management, technical know-how, business development and manpower training.

The Training Voucher Scheme supports employers with training fees. This Scheme enabled the SDF to reach more than 3,000 new companies in 1990, many of which had 50 or fewer employees. The Training Leave Scheme encourages companies to send their employees for training during office hours. It provides 100% funding of the training costs for approved programmes, up to a maximum of $20 per participant hour. In 1990, over 5,000 workers benefited from this Scheme. The success of the Skills Development Fund is due in part to a strategy of incremental implementation. Initially, efforts focused on creating awareness among employers, with ad hoc reimbursement of courses. The policy was then refined to target in-plant training, and reimbursement increased to 90% of costs as an additional incentive. Further modifications were made to encourage the development of corporate training programmes by paying grants in advance of expenses, thus reducing interest costs to firms.

Source: Lall (1996).

examination system encourages memorisation of facts rather than ability to analyse and solve problems; and at the post-secondary level, programmes in mathematics, science, engineering and technology are not sufficiently developed, and students tend to favour liberal education programmes. Most private schools provide lower quality education than state schools, due to poor physical conditions, lower-quality teachers, and lack of specialised facilities such as laboratories and libraries ...

Higher education (offered through four tertiary level institutions – UoM; Mauritius Institute of Education, MIE; Mauritius College of Art, MCA; and Mahatma Gandhi Institute, MGI) has not been planned and made to produce enough scholars in the physical and mathematical sciences ... Among [degree level programmes] very few are in scientific and technological disciplines; in 1992-93, only 44 per cent of the students were enrolled in these areas. Furthermore, the UoM has operated mainly as a teaching institution and its research performance has been very modest. These shortcomings in tertiary education are due to the fact that until recently, there was no co-ordinating body to guide the development of higher learning and research... With the creation in 1992 of a Tertiary Education Commission this situation may be changing.

Technical education has also not produced an adequate number of skilled workers. The Industrial and Vocational Training Board (IVTB) is conceived as a joint venture between the private and public sectors to support, encourage and finance training in the private sector, and to provide a place for training for the smaller segments of the industrial and service sectors ... Two factors hamper the public technical training institutions from operating efficiently – the shortage of trained teachers and the lack of equipment and training materials. With the industrial sector developing, there is an escalating demand for technical training at the very time that there is increasing demand from the factories for technicians."[37]

The government is acutely aware of the skill shortages, and has set up a national Task Force to examine training needs and develop programmes to alleviate shortages. Half the planned investments in education are aimed at expanding access to secondary education, raising enrolments by 20 per cent (from 81 to 96 thousand students). However, building up effective educational institutions necessarily takes time, and the technical skill bottleneck may prove a crucial one for export strategy.

4.3.2 Employee Skills and Training

Formal education is only part of the process of creating skills relevant to industrial competitiveness. A significant part, sometimes the most significant part, comes from training and learning during the course of employment. This can be done at training institutions and by programmes undertaken in-house by industrial firms. In a world of rapidly changing technologies and new organisational methods, such as multi-skilling, and total quality management, it is essential for industrial firms themselves to invest continuously in training their employees, both on-the-job and in formal courses. In industrialised countries like Japan, the investment each year by enterprises on training exceeds the government's entire education budget. In the USA, firms spend around 7% of sales on training. NIEs like *Korea* also invest heavily in employee training, pushed along by policies such as a 5% payroll levy for training imposed on medium and large firms since the 1970s. *Malaysia* offers a double (200%) tax deduction for approved training expenditures by industrial firms, and for large firms has recently substituted this with a 1% payroll levy for training. It has also sponsored the setting up of industry led training centres which charge full cost for their services; the model pioneered by the Penang Skills Development Corporation (see Chapter 8) is now being replicated by all the other states in Malaysia. *Singapore* has in place a Joint Government-Industry Training Scheme, in which firms provide training programmes and facilities (including foreign instructors) and the government ensures that trainees stay with the firm afterwards. As noted in Box 4.1, the Singapore government subsidises training by smaller firms, paying between 30 and 90 per cent of the costs under the Training Grants Scheme.

The findings of a recent World Bank study of the effects and determinants of training in several developing countries in Asia and Latin America is worth considering. This study, based on a large questionnaire survey of enterprises (including over 50,000 firms in Taiwan), used production function analysis, with training as one of the inputs along with technology. The main conclusions are summarised in Box 4.2.

Mauritius also has a training promotion scheme in place, administered by the Industrial and Vocational Training Board, IVTB. The government now emphasises skill upgrading within a broader concept of 'human resource development' (which also includes incentives, remuneration, job satisfaction and so on). Industry is also participating; the Mauritius Employers' Federation (MEF) has issued a guide on the training scheme and conducts periodic surveys of training by its members.[38] The IVTB scheme started in 1989, with a 1% levy on basic salaries used to give incentive grants to firms for training on a *cost-sharing* basis. The amount of the grant bears no specified relationship to the amount contributed to the levy, only to expenses on training. For firms that spend nothing on training, the levy is a net tax. The amount of the grant is *related to the company's corporate income tax bracket*, with lower tax payers receiving higher grants (see Table 4.7). Companies listed on the stock exchange pay rates of 25%; EPZ firms were generally in the 15% bracket, but the budget in 1996 abolished all income taxes on these firms (if the training provisions do not change, they will receive the highest rate of refund). In addition, training costs are given double tax-deduction, as in Malaysia.

Table 4.7 **IVTB Training Grant and the Employer's Tax Rate**

Income tax rate	Grant (% of training expenses)
35	17
25	50
15	64
0	75

The IVTB scheme applies to approved in-house training schemes as well as to training in institutions registered by the IVTB, and includes overseas courses. The trainers have to be registered with the IVTB, and details of all the courses, costs and participants have to be submitted for refund. The scheme is similar to that in use in many countries, though, as noted, some countries have stronger incentives (Korea's 5% levy on its larger firms). The IVTB has five vocational training centres: electronics, jewellery, footwear and leather craft, hotels and tourism and textiles. New courses have been added in

Box 4.2 Enterprise Training in Developing Countries

A World Bank study of enterprise training, the largest and most comprehensive of its kind for developing countries, is based on data from large samples of firms in Taiwan, Malaysia, Indonesia, Colombia and Mexico. It finds that firm-level training has a significant and positive effect of productivity for all types of firms: large and small, domestic or export oriented, foreign and local and high or low tech. This evidence, supported by econometric analysis, provides a powerful case for the promotion of employee training at all levels of development.

The study finds that training and technology development tend to be closely related: the firms that invest in training also tend to invest in R&D, undertake quality control activities and use existing technology services. In contrast, the firms that do little training also tend to face technical problems and undertake little in-house technological activity. This supports the findings of the technological capability literature that training and technical effort are an intrinsic part of the same set of capability building activities.

Despite its benefits, training is relatively neglected in most developing countries: the study finds that *50 to 80 per cent of SMEs*, and *20 to 70 per cent of large firms*, provide no training apart from informal on-the-job instruction that consists of watching and imitating experienced workers. This type of informal training is found to have no significant effects on firm productivity. It is *formal and structured training*, in-house or outside, that is important for efficiency.

Some of the important findings of the analysis with respect to formal training are:

- Training of skilled workers yields more productivity improvement than of unskilled workers
- In-house training has larger effects than training provided externally
- Lower income countries enjoy greater productivity benefits from training than high income countries
- SMEs have higher productivity benefits from training than larger firms, presumably because they start from a lower base
- High technology industries have larger productivity gains from training than low technology industries.
- Training leads to higher wages for all workers, but technological change tends to lead to greater inequality between skilled and unskilled workers.

On the incidence of formal training, the study finds that the following types of firms train more than others:

- Large firms
- Export-oriented firms
- Foreign owned firms
- Technology intensive firms

The types of training *policies* that work well are those that provide for skill development funds, financed by a levy on payroll and refunded for approved training efforts. Tax incentives for training are used mainly by large firms and MNCs, who would invest in training in any case – its effects on raising overall training levels are dubious. Non-trainer firms do not undertake training because of tax incentives.

The study finds that the majority of public training institutes are not very effective; they tend to be unresponsive to industrial needs, with outdated curricula and poor equipment and teachers. Private training institutions tend to be better received by industry. Institutions that are led by industry are the most responsive and effective.

Finally, the study notes that SMEs need special support to train. They face greater market failures than large firms in terms of information, access to credit and technology support services. It is critical to convince SMEs of the importance of training and to provide packages of training, credit, technical support and marketing assistance. The government has an important role to play because of the need to subsidise SME training for extended periods.

Source: Tan and Batra (1995).

construction, printing, IT and automotive fitting.

During 1994-95, Mauritian firms reported training of 1.24% of the wage bill in manufacturing, 1.20% in financial services, 1.01% in the EPZ and 0.38% in hotels and restaurants (sample of firms which responded to 1995 MEF questionnaire). The numbers of employees receiving training (8,064) had increased by 57% over the previous survey in 1994. The surveyed firms spent Rs. 49.4 million on training as compared to Rs. 25.7 million on the IVTB levy; thus, own training expenditure was about twice that spent on the levy. The MEF also notes delays in obtaining refunds from the IVTB as a problem, as in the construction and retail sectors which received only 5% and 12.4% respectively of their claims; at the other end, transport, storage and communications firms received 73.1%. Some firms complained of the time needed to fill out the forms.

In manufacturing, of the 36 firms responding to the survey, training cost per employee came to Rs. 7.8 thousand (around $450); by comparison, construction (Rs. 20 thousand) and transport etc. (Rs. 9.8 thousand) had the highest training expenditures. Around 23% of the refund claims made by the manufacturing firms had been refunded. Some 44% (16) firms in the manufacturing sector had in-house training, and *only 11% (4) had training departments*. These are relatively low figures; since the survey presumably covers mainly the larger firms, there are probably large training gaps among the smaller firms. Small firms everywhere spend relatively little on training, for obvious reasons, but it is important for governments to supplement their efforts by providing both targeted training provision and a stronger base of relevant education.

Nevertheless, the growth in training among the Mauritian sample firms is very welcome: the percentage of firms with training departments overall has risen from 21 to 23% over the two MEF surveys. However, the proportion sending personnel to external institutions has declined, from 60 to 46%. Several firms sent their personnel abroad. In general, the courses offered by the IVTB were rated 'good' or 'very good'.

According to the IVTB itself, the most serious constraint on its training activities is a shortage of qualified trainers, especially in new fields such as plastic processing, precision engineering, hydraulics and pneumatics. Fresh university graduates tend to have little practical technical knowledge, and the institution relies on overseas trainers a great deal (there were about 15 at the time of the mission). The equipment used is being modernised.

The high worker turnover rate at the low levels, especially within the free trade zones, constitutes a major deterrent to mounting more sustained and expensive training programmes. There also needs to be a more comprehensive, regular survey of training in Mauritius, providing information for fast and effective policy responses in this critical area of competitiveness policy. One idea proposed by Bheenick and Hanoomanjee (1988) which merits close examination is that closely monitoring skill provision by competing nations. This report makes a number of detailed recommendations for improving industrial training, most of which appear to be as relevant today as when they were written.

Figure 4.4 **Percentage of Engineers in Electronics Firms**

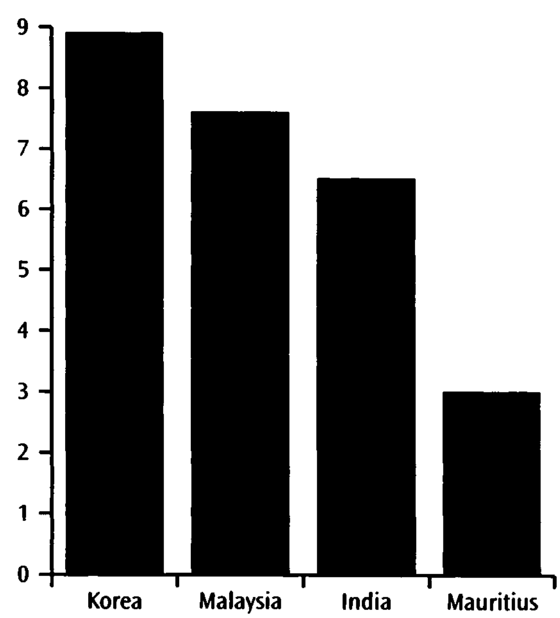


Table 4.8: **Technical Manpower and Linguistic Skills in Enterprises**

	Scientists, Engineers & Technicians as % Employment	Scientists as a % Employment	Engineers as a % Employment	Employees with English %
Industry				
Food Products	5.6	1.4	0.4	50.0
Textiles & Garments	1.3	0.1	0.4	40.8
Chemicals	12.9	5.9	2.7	62.5
Electronics	7.3	0.0	3.0	75.0

The team collected some evidence on technical manpower and training in enterprises in the four industries in Mauritius (textiles and garments, food products, electronics and chemicals) as well as data on technical manpower and training gaps between large firms and SMEs in the textile and garments industry.

Technical manpower. Table 4.8 shows the breakdown of employment of scientists, engineers and technicians; scientists only; and engineers only. It also shows the percentage of workers with a working knowledge of English.

The share of scientists, engineers and technicians is the highest in chemicals (12.9 per cent) and is followed by electronics (7.3 per cent), food products 5.3 per cent) and textiles and garments (1.3 per cent). Most of the technical manpower in the sample firms are technicians rather than scientists or engineers. For instance, the share of engineers in employment is 3.0 per cent in electronics, 2.7 per cent in chemicals, 0.4 per cent in food products and 0.4 per cent in textiles and garments. This may be compared with some figures for the employment of engineers in electronic and engineering firms in Korea, Malaysia and India (see Figure 4.4) where the average percentages are Korea (8.9 percent), Malaysia (7.6 per cent) and India (6.5 per cent).

These figures should not be taken as direct indications of the skill gaps in Mauritian firms, since the technological levels of the other countries is far higher than those of the Mauritius sample. The data do nevertheless illustrate the kind of skill upgrading that may be needed by Mauritian industry if it were to enter more complex activities.

Employee training. Table 4.9 shows information on the number of firms with in-house training programmes and the share of employees sent on training in Mauritius and overseas in 1990 and 1995. The data on training suggest that firms invest relatively little in skill formation and upgrading. Of the 34 firms, only 18 had formal in-house training programmes of any kind and only 9 had independent training budgets and even fewer had a specialist training officer. The average training budget for the 6 textile and garment firms which kept training records was only 0.52 per cent of sales, for the two chemical firms it was only 0.33 per cent, and for the single food products firm it was only 0.11 per cent. A textile and garment firm had the largest training budget in the sample, but even this firm only spent 1.24 per cent of sales while the smallest, also a textile and garment firm, spent only 0.04 per cent. None of the electronics firms had independent training budgets. In contrast, in developed countries like the US and Japan, the training budget is 7 per cent or more of sales.

About 20 sample firms undertook external training of any form in 1996. The data suggest that there has been an improvement in external training incidence since 1990. The share of employees sent on external training courses increased from 0.56 per cent to 1.55 per cent in food products, from 0.40 per cent to 1.61 per cent in textiles and garments, from 2.0 per cent to 7.93 per cent in chemicals and from 0 per

Table 4.9 **Enterprise Training Efforts**

	No. of firms with in-house training programmes	% of Work force sent on external training	
	1996	*1990*	*1995*
Industry			
Food Products	2	0.56	1.55
Textiles & Garments	12	0.40	1.61
Chemicals	3	2.00	7.93
Electronics	1	0.00	0.32

cent to 0.32 per cent in electronics. The figure for chemicals should be interpreted with caution because it reflects a very large increase in one firm.

In spite of the increase, the extent of external training in the Mauritian electronics industry is very low by Korean standards. A recent study by Yun (1996) reports that the average percentage of employees sent on external training in five Korean-owned electronics and engineering firms was 29.2 per cent in 1993. There was a tendency for most of the training provided by Mauritian firms to be in management rather than technical training, and this was infrequent rather than sustained. With the exceptions of the IVTB and the University of Mauritius, there are few institutions in Mauritius that can provide industry-specific training.

Intra-firm differences in skill and training in textiles and garments. Very little is known about skill and training differences between large firms and SMEs in Mauritius. In order to shed some light on the issue, some skill and training indicators of large firms (above 251 employees) and SMEs (less than 250 employees) in textiles and garments were compared. The results suggest that large firms devote more resources to training and hiring technical manpower than SMEs. The detailed findings are as follows:

- Large firms had a considerably higher share of engineers (including textile engineers) in their workforces than SMEs (the means are 0.59 per cent and 0.07 per cent, respectively).
- Large firms placed more emphasis on formal employee training than SMEs. Of the 22 garment firms, only 7 firms had independent training budgets; 6 of these were large firms (which spent an average of 0.23 per cent of sales on training). The top two large firms each spent 1.24 per cent and 0.80 per cent of their sales on training.
- Large firms gave more emphasis to overseas training than SMEs. The large firms typically sent their employees for in-plant training in factories belonging to their foreign buyers (or parent companies) and for specialised courses in overseas technical institutes in areas like quality control product and design. The SMEs, with less resources and information than large firms, typically sent workers to courses at local institutions such as IVTB or EPZDA.

4.4 Training Needs by Main Exporting Activities

The 1995 survey of training needs by the Ministry of Manpower Resources and Vocational and Technical Training provides valuable insights into some of the specific skill needs of industries of main interest to this study: textiles and garments, electronics, and information technology. These are reviewed briefly and selectively below, with the addition of insights from other reports.

4.4.1 Textiles and Clothing

The Ministry survey describes the industry as follows: "15% of local enterprises are vertically integrated in the textile and fabric sub-sector where automation has led to higher productivity. In the garment sub-sector installation, training and technical support from equipment manufacturers and local representatives have helped to modernise. Computerised precision cutting has

Table 4.10 **Emerging Skill Needs in Textile and Garment Manufacture**

Occupation	New Skills Needed
Knitting, dyeing and spinning operators	Technical skills for operating and maintaining automatic and semi-automatic machines.
Garment assembly operators	Multi-skilling to be able to operate different kinds of machines
Maintenance technicians	Knowledge of new machines and materials. Ability to train operators.
Designers and product developers	Computer aided design, more imaginative designs
Pattern makers, graders and cutters	Computerisation of systems
Supervisors	Engineering skills for line balancing and work loading; cost and quality consciousness; team leadership; train operators.
Time and motion study technicians	Upgrading skills to meet market changes.
Engineers	Greater productivity consciousness; adapt machines to gain flexibility; develop preventive maintenance; training
Quality controllers	Higher levels of quality consciousness; familiarity with ISO 9000 standards and system needs.
Sales executives and merchandisers	Customer driven, computerised information systems. Ability to do market research and follow competitive trends

been introduced in one or two large firms only. The use of such technologies can bring up to 15% gains on material usage and reduce waste." (p. 114). Each activity is undergoing technological innovation and demands improved skills on the part of operators, technicians, supervisors, cutters, designers, engineers and quality controllers. The following table sets out the new skills needed.

The survey finds that existing training facilities cannot meet the changing demands on all these new skills: IVTB and university courses do not cater for the whole range. Many operators have low educational attainments, and need special courses to upgrade not just their working skills but also their team spirit and quality awareness. Since working in the EPZ sector is not considered prestigious, few places are created at the education and training institutions. Moreover, the provision of training by itself is unlikely to be enough to raise skill levels sufficiently; changes in remuneration and promotion practices, worker attitudes and the status of EPZ work will also be very important.

The World Bank (1994a) report on 'Technology Strategy for Competitiveness' notes the emerging *skill requirements* in EPZ firms, grouped by the following categories:

- **Linkage capabilities:** Clever marketing will be needed to respond to fast-changing markets, and developing a marketing capability would be needed to increase, even maintain, value added. Good sourcing skills and information will be essential for obtaining the best fabrics needed to respond to changing market conditions.
- **Pre-production:** Mastery of CAD/Cambridge to minimise the time needed to generate new styles, save waste and produce samples quickly. Testing capabilities to ensure that fabrics meet customer requirements and to produce counter-samples of products where specifications are not provided by buyers.
- **Production:** More sophisticated sewing machine operators to make more complex

patterns and motifs. Flexible, 'polyvalent' operators able to switch quickly between different lines and patterns. Optimisation of production organisation, in particular conveyor systems. Advanced maintenance skills to keep capital-intensive facilities running smoothly. Improved quality management skills, backed by efficient cost accounting, inventory management and production control systems.

❖ **Innovation and adaptation:** Fashion design capabilities and R&D are needed to raise value added. Technology intelligence is needed to keep up with changing technologies and equipment. Imported equipment has to be adapted to local conditions to optimise performance.

In terms of the *supply of skills* for the industry, the Textile Unit at the University of Mauritius offers a Certificate in Design (1 year) and a Diploma in Textile Technology (2 years) since 1986. There are around 20 places for each course, but demand for new places is not large as candidates tend to prefer management rather than technical courses: this is an undesirable perception that needs to be changed if the industry is to undergo sustained upgrading.

The IVTB Textile Training Centre has offered training since 1989 in garment making, including (1) pattern making, cutting and design; (2) grading and sewing; and (3) construction of apparel, together with supervisory training and training for trainers. There are around 30 applicants for each of these three courses.

Most employers prefer to give in-house training rather than send workers to other institutions. The larger firms have their own training centres, and in 1991 around 93% of trainees received in-house training. However, SMEs cannot provide such training and need easily accessible centres rather than one central one in Coromandel. Releasing staff for external training is an important problem, and is one reason why in-house training is preferred.

Apart from the two main training institutions above, there are several other centres that offer related training not specifically oriented to textiles: MEPZA, MEF, EPZDA, MSB and SMIDO. Of these, the ones worth noting are MEPZA, which offers courses in quality control and productivity measurement, EPZDA, which trains designers and product developers, production control and planning, engineering skills and testing and TQM. The MSB gives training on ISO 9000 and statistical process control.

Taking all these provisions together, however, there remains a wide gap between the need for skilled operators (estimated at 12,000) and the number of places (30 candidates twice a year). The use of foreign labour does not provide a long-term solution, though it does meet the immediate need for skilled personnel such as engineers, dyeing masters, technicians and production managers. The Ministry report gives various proposals for different types of diplomas and certificates that will be needed. It also notes the proposal for setting up a Textile Institute and the need for a general adult literacy programme to prepare people better for future skill needs.

Given the central significance of the textile and garment sector to future export growth, it is crucial to take these proposals seriously. The setting of a Textile Institute would seem to be a particularly good one, especially in order to provide *design training*. As the World Bank (1994a) argues:

> *"The experience of the Asian NIEs suggests that developing local design capabilities can play a key role in helping firms to increase value-added and sustain their competitiveness despite high labour costs. Over the span of a decade or so, Hong Kong and Singapore have succeeded in developing local brand names and are now recognised as distinctive and innovative design centres... The experience of both Hong Kong and Singapore shows that building an internationally recognised design*

capability may require substantial financial and promotional assistance from the government. Such assistance would involve sending local designers abroad for training, and attracting a few foreign designers to teach and operate in the island for a period of time... It is clear that building capability and reputation in fashion design is likely to be a long, difficult and costly process during which many of the trainees may initially seek jobs overseas rather than contribute to local upgrading." (paras. 6.33, 6.35)

The Indian government has also sponsored a National Institute of Fashion Technology (NIFT) which is regarded within the country as a great success in upgrading the quality of garment design. Box 4.3 describes the NIFT and a recent World Bank project that is helping it to reach out to small garment firms.

The assessments made of training needs by the Ministry are naturally based on the existing structure of the textile and garment industry. However, one of the arguments of this study is that a long-term upgrading of the industry to

Box 4.3 **National Institute of Fashion Technology, India**

The National Institute of Fashion Technology (NIFT) was started in 1986 by the Indian government, under the Ministry of Textiles, in New Delhi to train fashion technologists, provide industry with up-to-date information and help craftsmen and manufacturers, with the main focus on the textile and garment industries. It received collaboration from the Fashion Institute of Technology, New York, the Nottingham Trent University (UK) and IFM, Paris. Within a few years its services were in such demand that various regional centres have been set up, including Bombay, Ahmedabad and Bangalore.

NIFT offers diploma and certificate courses to full and part-time students as well as training to industry personnel. The main campus has 40 faculty, around 70 specialised guest teachers and 486 students. The main programme is a three year diploma on fashion design, whose trainees find instant employment in industry as designers, pattern makers, stylists, co-ordinators and fashion illustrators. There is also a 3 year diploma in accessory design. It is not just the garment industry which seeks these skills but also makers of costume jewellery, leather goods, precious jewellery and other accessories. NIFT also offers a number of 2 year courses: apparel marketing and merchandising; garment manufacturing technology; leather garment design; knitwear design and technology; textile design and development. Admission is purely on merit, and a number of the top designers in India today are graduates of the NIFT.

NIFT has a well stocked library on Indian and foreign designs and materials. Its Resource Centre conducts fashion forecast seminars in major garment manufacturing centres in the country, and has compiled a directory of resources used by the garment industry. It gets constant feedback from industry on its designs and training programmes, and is constantly redesigning its courses to meet industrial needs.

NIFT is implementing the World Bank project to improve its CAD training facilities for industry and to provide design consultancy services for smaller garment firms. There has been growing demand for such consultancy as SMEs have sought to upgrade their export activities, and NIFT plans to develop a network of linked computer design facilities with manufacturers (initially in the region near to Delhi). This would greatly speed up the process of disseminating new design concepts to firms, improving their flexibility and response times.

levels of quality and design found in Europe would require a shift in the structure to more flexibility and specialisation, with clusters of SMEs working around design houses and larger firms. Without such a development it is difficult to see how Mauritian firms will maintain a competitive edge after the MFA goes. To foster Italian-style industrial districts (it should be noted that such clusters are now found in several activities industries in many developing countries, see Schmitz, 1995) would require a broader base of technical, design and entrepreneurial training, as well as other measures to promote subcontracting, financing and infrastructure. These will be taken up later.

4.4.2 Information Technology (IT)

One of the important avenues of future development in Mauritius has to be based on the extensive use of IT (World Bank, 1994a), defined as "the use of computer technology to process and distribute information" (p. 63). The pervasive use of IT means that it will cut across all economic sectors, from manufacturing and tourism to transport, design, banking, education and health, all potential areas in which Mauritius could develop a comparative advantage in the region. The Mauritian government needs to formulate a bold and comprehensive strategy to develop the human resources for the IT sector. Concepts such as Singapore's 'intelligent island' and Malaysia's 'multimedia super-corridor' are examples of how other forward-looking governments are gearing up to provide both the physical infrastructure as well as the skill needs of this emerging technology.

The Mauritian government has been encouraging computerisation and has set up several institutions to promote IT: National Computer Board; Central Informatics Bureau; State Informatics Limited; and Sitrac Limited. The NCB is responsible for developing a computerisation strategy for the nation. CIB co-ordinates the Civil Service computerisation programme. SIL is responsible for systems design, development, implementation and maintenance of computerised information in various bodies. Sitrac is charged with the training of the Civil Service and the public at large. The private sector also has a number of training centres and several firms dealing with hardware and software. However, these are mainly sales and service agents: domestic development of software is very limited. This is important because the government hopes to promote software exports as an important form of diversification.

The government has removed all duties from imports of computer hardware and software and offers financial and fiscal facilities for the development of the IT industry in Mauritius. However, there is a general lack of awareness of the benefits of IT and so a lack of commitment to its development. Total expenditures on IT development come to less than 1% of GDP; less than 10% of the total turnover of the IT industry come from software development. Companies lack the expertise to develop large-scale and complex computerised information systems. The cost of telecommunications services for the dissemination of computer data are high.

Currently there are about 1200 people working in the IT industry, of whom about 300 are graduates and 230 are diploma holders in computing. In more recent years, the setting up of the Informatics Park in 1994 has attracted foreign investors into the software industry. The Informatics Park, which cost US$ 2.7 million, provides good infrastructural facilities for data transmission including integrated services digital network (ISDN), high speed international digital leased lines, and a video-conferencing studio. Enterprises located within the Informatics Park are also eligible for fiscal incentives under the Export Enterprise Scheme and the Pioneer Status Enterprise Schemes (see Chapter 7) as well as subsidised dedicated telephone lines. By late 1996, there were 15 firms located in the park employing 225 people (including 45 software engineers). Of these, 4 are from the UK, 2 from France, 3 are French-Mauritius joint ventures, 1 is from Singapore, 1 is a US/UK joint venture and 1 is a US/Mauritius joint venture. This is a promising start that needs to be strengthened to generate a new export based industry. However, it is difficult to see it becoming a major employer source of export revenue in the short-term, given the intensity of competition in this industry throughout the developing world and the relatively high wages in Mauritius. The small size of the economy and the paucity of training facilities means that the range of skills and specialisations that can be developed are limited, in comparison, say, to the industry in India (which is now claimed to employ some 700,000 software personnel). Smaller competitors are emerging in Latin America, the Caribbean and South East Asia, and East Europe offers strong prospects for high skill IT work in the future. Mauritius would not have a comparative advantage in low-end data entry work, for which there would be many cheaper locations available. For more advanced work, its competitive edge can only lie in some very special niche markets; publishing is an area that has been identified and seems to hold promise.

However, the real potential for IT in Mauritius lies in developing a competence in using it across the whole range of economic activities; this would enhance the competitive edge of Mauritian industry and services in international markets in many different ways. Financial services, transport and shipping, education and training, design and marketing, technology transfer, and other forms of trade facilitation could become important export activities to the African mainland if Mauritius could establish and maintain a lead in IT skills and infrastructure. At this time, this is certainly a real possibility.

On training needs specifically, the Ministry report notes that the University of Mauritius offers a four-year course on Computer Science and Computer Engineering, which started in 1990 and offers 25 places per year. In addition, about 20-30 graduates in this field return from overseas universities. This comprises a very small amount of high level IT training. The Centre for Business Studies of the Mauritius Chamber of Commerce and Industry offers a 2 year full time course (called BTS), as well as a 1 year diploma. There are 28 training institutions registered with the IVTB, but only a few offer award courses in computer studies. The rest offer short term courses in word processing, database programming and elementary programming. These courses need to be thoroughly and regularly monitored and evaluated. World Bank (1994a) noted that IVTB programmes themselves were at a low level and did not include courses in computer hardware, software or networking; it is not known how much better the situation is today. The Lycée Polytechnique is to be upgraded to diploma level in this field under the education master plan. The Mauritian Chamber of Commerce and Industry Business Training Centre offers a 2 year programmer analyst programme and a 1 year diploma.

In general, there is a lack of co-ordination in strategy formulation for IT human resource development in Mauritius, and insufficient commitment of resources for this purpose. This can be contrasted to Singapore where a strategy was formulated in the early 1980s to increase the number of IT specialists produced annually from 800 to 8000 within a decade. *The goal was achieved ahead of schedule:* by 1990 there were 1200 IT graduates being produced each year from the university and two polytechnics.

In the private sector, industrial firms are reluctant to invest heavily in employee training because of the cost and high turnover rates (World Bank, 1994a). Some official intervention is needed to subsidise and encourage such training, along the lines adopted in Singapore. In addition, special provisions may be needed to improve IT skill formation in SMEs.

On the demand side of training are the government, banking, manufacturing, agriculture and tourism. The training has to start at the secondary school level, and this has been tackled in the Education Master Plan subject to the availability of trained teachers. Many young graduates in IT lack the experience to be employed in this field by enterprises. There is no standard job classification in this field, making it difficult to assess the competence of IT professionals. It is important to develop such a classification and set up minimum criteria that must be met. These criteria have to be constantly adapted to changing technological needs. The Ministry recommends comprehensive training programmes at all levels.

4.4.3 Electronics

The electronics industry is under-developed in Mauritius. It consists of 17 enterprises employing around 1 thousand persons. The domestic market oriented sector consists of firms assembling TV sets, domestic appliances, alarm systems and PABX systems. There is only one printed circuit board manufacturer. The export-oriented sector consists of electronic watch assemblers, PH meter assemblers, a quality crystal preparation plant and a high precision coil winding operation. There is also a service segment that consists of supply, installation and maintenance activities.

Mauritius has not got into the export-oriented electronics activities that have driven export growth in South East and East Asia, such as semiconductors, components or consumer electronics. The boom in relocation of these activities to take advantage of lower production costs is far from over. It still continues in Asia, with Philippines the last entrant into the field (its cheap and well educated workforce is now attracting Japanese and other firms into not just assembly, but also design and other high level activities). Mauritius' unfavourable location (and the limited incomes and growth prospects in neighbouring Africa) and its relatively expensive labour are important explanatory factors, but the *lack of technical skills and supporting industries and services* also contribute to explaining why electronics has not followed the garment industry into the country. The fiscal incentives and infrastructure are not deficient, and workers seem to prefer the electronics to the garment industry.

The Ministry report notes that existing electronics firms seek to minimise labour turnover, so emphasise training, both formal and informal. Enterprises note four types of technical deficiencies:

- Insufficient practical knowledge among newly recruited technicians;
- Absence of reliable approach to diagnosing technical defects and ensuring repairs;
- Difficulties in adapting to changing technologies and products;
- Poor marketing skills.

Training is provided at the certificate level by 7 private training centres registered with the IVTB. At the certificate and diploma levels, the main training centres are: IVTB Electronics Training Centre; Lycée Politechnique Flacq; and the Sir Kher Jagatsing and Professor Uppadaya Training Centres. The University of Mauritius offers electrical and electronic engineering degrees, with around 15-20 degree holders qualifying each year. The total number of electrical and electronics engineers registered with the Council of Professional Engineers is around 100.

The Ministry report proposes automation of industrial processes as a major priority for skill development, as well as the training of trainers and of marketing personnel. Again, the assessment of skill needs is based on the existing industrial structure and the perceptions of firms in the country, rather than a strategic one of what Mauritius may need in order to attract electronics firms to the country.

A report prepared by two Irish consultants is more revealing in terms of strategy (Kelly and Kelly, 1992). Drawing upon the experience of their home country in attracting leading electronics MNCs, and on the strategies of some East Asian countries, this report lists products that are likely candidates for export-oriented production in Mauritius (the list is considered in the previous chapter). This list may be out of date now, and in this fast changing industry it is imperative to take stock again of what may be feasible for Mauritius, and the policy actions needed to build up the skill base. This report comments favourably on the skills produced for the industry by the Siemens Training Centre at the IVTB, with its blend of practical and theoretical instruction.

It is suggested here that the electronics industry should not be underestimated for future export growth, though there seems to be a general impression that Mauritius has 'missed the boat'. The continuing relocation of facilities in Asia (and parts of Latin America) suggest that there is plenty of scope still for export-oriented FDI. If Mauritius could build up the human capital base in IT and improve its SME structure so that a domestic supplier and service base develops, it is possible that it could become a staging post for the African continent. As with most of Mauritian strategies, much depends on the future growth in Africa, but even modest, if sustained, rates of growth can offer enormous opportunities for a small economy.