

Development of Human Resources in the Era of the Taiwan Knowledge-based Economy¹

Tsong-Ming Lu (盧聰明)
Dah-June Lin (林大鈞)²

I. Preface

Since the 1990s, information and communications technology (ICT) has made huge innovative progress. The effective inter-linkage of the World Wide Web has speeded up the accumulation and extended the depth of human knowledge. Gradually, knowledge has come to surpass the traditional factors of production such as land and capital, to become the main driving force for continuous economic development.

In the era of the knowledge-based economy, human resources development has taken on a heightened importance. It has an enormous bearing not only on the fortunes of industrial development, but also on a country's competitiveness in the global market. In August 2000, the Taiwan government launched the Plan to Develop a Knowledge-based Economy in Taiwan. Three months later, in November, the Council for Economic Planning and Development (CEPD) convened a national

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 - 2 Lin, Dah-Jun is Associate Professor of Kainan University, Taiwan. He was also a Director of Manpower Planning Department and Councilor, appointed by the Council for Economic Planning and Development.

conference on knowledge-based economic development, at which representatives from government, industry and academia gathered to discuss ways and means of effectively bringing the plan to fruition.

Also, in May, 2001, Taiwan government launched the New Century Human Resources Development Program. Based on the analysis of economic development trends and the future course of manpower development, the program sets out a broad range of strategies on population, education, human capacity building, adjustment of labor supply and demand, labor law reform, and so on, aimed at raising manpower quality, improving working conditions, and enhancing the efficiency of manpower utilization.

II. The Knowledge-based Economy and Taiwan' s Industrial Development

1. The Changing Industrial Structure

In the initial stage of Taiwan' s economic development, agriculture accounted for the lion' s share of national output. Since then, its share of Gross Domestic Product (GDP) has fallen steadily, from 27.5% in 1961 to just 1.8% in 2005. Meanwhile, industry' s share of GDP climbed in the 1970s and 1980s to a peak of 44.8% in 1986, after which it began to gradually decline. In the industrial sector, the biggest sector was occupied by manufacturing, which exemplifies the trend of development for the whole of industry. Its share of GDP rose from 18.9% in 1961 to 37.6% in 1986, and thereafter slipped back down to 21.1% in 2005. The service sector, which has long accounted for the largest share of GDP, has seen its share rise especially sharply over the last couple of decades, reaching

73.6% in 2005. In this sector, professional services have shown the fastest development. In more than doubling their share of GDP from 14.1% in 1961 to 30.5% in 2005, professional services have clearly emerged as the mainstream of the service sector. (See Table 1.)

Table 1 Structure of Domestic Production

Year	Agriculture	Industry	Services		
			Manufacturing	Professional Services	
1961	27.5	26.6	18.9	45.9	14.1
1981	7.3	45.5	35.6	47.2	19.7
1991	3.8	41.1	33.3	55.1	24.0
2001	1.9	27.6	22.7	70.5	30.4
2002	1.8	27.6	23.1	70.7	30.1
2003	1.7	26.6	22.5	71.7	31.0
2004	1.7	25.6	21.9	72.7	30.6
2005	1.8	24.6	21.1	73.6	30.5

Source: *Quarterly National Economic Trends*, DGBAS, Executive Yuan.

Note: "Professional Services" include transportation, storage, communication, finance, insurance, real estate, and business services.

2. From Labor-Intensive to Technology & Capital-Intensive Industries

According to the index of manufacturing production, of the four main manufacturing industries, the technology-intensive information & electronics industry has been developing most rapidly. It is gradually displacing the labor-intensive food, textile and other industries. Its points total in the index soared from 43.50 in 1991 to 149.48 in 2005, while that of food, textile and other industries declined from 198.08 to 79.71 over the same fifteen-year period.

In terms of skill intensity, the index of manufacturing production showed the points total of skilled-worker high intensity rising from 52.64 in

1991 to 148.92 in 2005, while that of skilled-worker low intensity fell from 121.86 to 96.84. This demonstrates that Taiwan's economy is moving on a course of knowledge-based industrial development. (See Table 2.)

Table 2 Index of Manufacturing Production

Year	Metal and Machinery Industry	Information & Electronics Industry	Chemistry Industry	Food, Textile & Other Industries	Human Capital by Skill Intensity	
					High Intensity	Low Intensity
1991	90.15	43.50	57.97	198.08	52.64	121.86
2001	100.00	100.00	100.00	100.00	100.00	100.00
2002	106.72	116.10	104.38	93.64	113.73	97.46
2003	110.85	126.83	109.93	89.81	124.64	97.67
2004	125.47	140.33	116.78	84.45	140.89	99.43
2005	126.30	149.48	113.43	79.71	148.92	96.84

Source: *Industrial Production Statistics Monthly*, Ministry of Economic Affairs.

3. Why Does Taiwan Need to Develop a Knowledge-Based Economy?

The rise in globalization means that cost-saving in production can no longer support continuous economic development. Therefore, Taiwan must encourage innovation and foster new ventures as the way to maintain its global competitiveness.

Taiwan needs an effective information and communication infrastructure to ensure the speedy distribution and application of knowledge, and to maximize the creation of added value. As a matter of fact, at least seven high-tech science-based industrial parks were set up during the 1990s.

Taiwan needs to accelerate the integration of knowledge and industry, depending on the application of knowledge and information to drive the development of emerging industries, maintain the growth of existing high-

tech industries, and help the transformation of traditional industries.

III. The Trend of Human Resources Development in Taiwan

1. The Transformation of the Labor Force

Taiwan's civilian population aged 15 years and over increased from 14.496 million in 1991 to 17.949 million in 2005. While the labor force increased by 1.802 million, it fell as a percentage of the working-age population from 59.11% in 1991 to 57.78% in 2005. The non-labor force increased more substantially by 1.651 million, up from 40.9% of the working-age population in 1991 to 42.2% in 2005.

The labor participation rate peaked at 60.93% in 1987, and thereafter followed a downward trend to 57.78% in 2005. The decrease was due mainly to the falling fertility rate, the slow growth of the working-age population, and the rising rate of enrollment in higher education. The fall in labor participation was concentrated mainly in male workers at the very young or mid-to-older ends of the age spectrum, and those with low educational attainment. (See Table 3.)

Table 3 General Conditions of Human Resources

Year	Civilian Population Aged 15 Years & Over (1000 persons)	Labor Force (1000 persons)	Labor Participation Rate (%)	Structure of Employed Persons				
				Male	Female	Agriculture Industry (%)	Goods-producing Industry (%)	Service-producing Industry (%)
1991	14,496	8,569	59.11	73.80	44.39	10.55	38.74	50.71
2001	17,179	9,383	57.23	68.47	46.10	7.52	36.00	56.48
2002	17,387	9,545	57.34	68.22	46.59	7.50	35.24	57.25
2003	17,572	9,573	57.34	67.69	47.14	7.27	34.83	57.90
2004	17,760	9,786	57.66	67.78	47.71	6.56	35.21	58.32
2005	17,949	9,942	57.78	67.62	48.12	5.95	35.79	58.27

Source: *Monthly Bulletin of Manpower Statistics*, DGBAS, Executive Yuan.

Looking at the statistics for employed persons by occupation over the last ten years, we see that among white collar workers (legislators, government administrators, business executives and managers, professionals, technicians and associate professionals, and clerical staff), legislators, government administrators, and business executives and managers have retained a steady share at about 4.5%, while the others have all increased their shares. On the other hand, the percentage of blue-collar workers has been gradually decreasing. In line with the development of capital & technology-intensive industries and service industries, white-collar occupations have become the mainstream of employment in the past decade. This trend looks set to continue in the future. As more and more employers make the easy choice of introducing automation to replace production workers, the blue-collar workforce will continue to decrease. (See Table 4.)

Table 4 Structure of Employed Persons by Occupation

Year	Total	Legislators, government administrators, business executives & managers	Professionals	Technicians & associate professionals	Clerical staff	Service workers & shop & market sales workers	Agricultural, animal husbandry, forestry and fishing workers	Prod. machine operators and related workers
1991	100.00	4.83	5.14	12.07	8.27	16.71	12.82	40.14
2001	100.00	4.33	6.56	17.21	10.39	18.59	7.41	34.97
2002	100.00	4.49	6.87	17.58	11.01	18.94	7.39	33.73
2003	100.00	4.46	7.09	17.92	11.09	18.98	7.14	33.33
2004	100.00	4.56	7.42	18.13	11.30	18.89	6.42	33.27
2005	100.00	4.51	8.00	18.45	11.39	18.77	5.81	33.80

Source: *Monthly Bulletin of Manpower Statistics*, DGBAS, Executive Yuan.

In recent years, Taiwan's unemployment rate has followed a generally rising trend. Under the impact of the Asian financial crisis, the unemployment rate reached 2.7% in 1997. And following the devastating

earthquake in September 1999, which took more than 2,400 lives, unemployment rose to almost exactly 3.0% in 2000. The unemployment rate reached a peak of 5.2% in 2002, then gradually went down to 4.1% in 2005.

New jobs have been mainly concentrated in the hi-tech and service sectors, and most of the enterprises in these sectors are situated in industrial parks, science-based industrial parks or metropolitan areas. Outside these areas, job-creation has been largely dependent on construction and traditional labor-intensive industries, which have on the whole been in a state of decline. Therefore, significant disparities have emerged in regional unemployment rates, with central and southern Taiwan showing higher levels of unemployment than the north of the island. (See Table 5.)

Table 5 Unemployment Rate by Area

Year	Total	Northern Taiwan	Central Taiwan	Southern Taiwan	Eastern Taiwan	Taipei City	Kaohsiung City
1991	1.5	1.5	1.2	1.4	1.7	2	2.2
2001	4.6	4.5	4.5	4.8	4.8	3.9	5.0
2002	5.2	5.1	5.2	5.2	5.2	4.6	5.5
2003	4.9	4.9	5.1	5.1	5.1	4.6	5.2
2004	4.4	4.3	4.5	4.5	4.6	4.2	4.6
2005	4.1	4.1	4.2	4.2	4.3	3.9	4.2

Source: *Monthly Bulletin of Manpower Statistics*, DGBAS, Executive Yuan.

In terms of the age of unemployed workers, the ongoing transformation of the industrial structure has had a very marked effect. As traditional labor-intensive industries have been shrinking and shedding jobs, a large proportion of those made redundant have been older workers who cannot easily find new employment opportunities.

2. Changing Manpower Quality

High-quality human resources are one of Taiwan's primary assets for developing a knowledge-based economy. In the past fifteen years, the percentage of the higher education per thousand population has risen from 26.8 in 1991 to 54.9 in 2005. In the same period, the ratio of educational expenditure to GNP has remained fairly steady at between 6.5% and 5.9%, while the ratio of R&D expenditure to GNP has continuously risen. These figures underline the high importance attached to higher education and R&D in Taiwan. (See Table 6.)

Table 6 Education and R&D Situation

Year	Higher Education Students per Thousand Population	Education Expenditure to GNP (%)	R&D Expenditure to GDP (%)	R&D manpower (persons)				
				Researchers	Working in Manufacturing Industry (%)	Working in Information Service Industry (%)	Technicians	Supporting Personnel
1991	26.8	6.49	1.70	46,173	50.35	3.05	22,844	13,419
2001	48.9	5.98	2.08	59,656	51.52	3.83	48,886	16,283
2002	51.5	6.00	2.20	64,171	51.40	3.56	51,820	17,381
2003	53.3	6.01	2.33	67,599	53.41	3.40	55,001	17,058
2004	54.3	5.86	2.42	72,720	56.04	3.26	59,583	17,451
2005	54.9	5.91	-	-	-	-	-	-

Sources: 1. *Educational Statistics*, Ministry of Education.

2. *Indicators of Science and Technology*, National Science Council, Executive Yuan.

3. The Adjustment of Future Labor Supply and Demand

According to projections on future labor demand made by the Manpower Planning Department of the Council for Economic Planning and Development, the labor market is likely to see a surplus of mid-level manpower but a shortage of high-level professional and managerial manpower. It is estimated that, in the next ten years, Taiwan will face

an annual shortage of 330,000 low-skilled workers as well as 45,000 professional and managerial personnel, while mid-level manpower will be in surplus by four thousand. (See Table 7.)

Table 7 Projected Manpower Demand and Supply

Unit: Thousand Persons

Skill Level	2005-2008 average			2009-2015 average			2005-2015 average		
	Supply	Demand	comparison	Supply	Demand	comparison	Supply	Demand	comparison
Total	332	689	-357	324	700	-376	327	698	-371
High level professionals and managers	15	65	-50	23	64	-41	20	65	-45
Middle level	273	62	11	261	261	0	266	262	4
Low level unskilled labor	44	62	-318	40	375	-335	41	371	-330

Source: *New Century Manpower Development Program*, CEPD, Executive Yuan.

IV. The Challenges for Human Resources Development in the Future

1. Rapid Population Aging

Taiwan's mortality rate remains essentially stable at about 0.57-0.61%. Therefore, changes in population growth will be determined by the fertility rate. In recent years, the fertility rate has followed a continuously downward trend. With the divorce rate rising, the marriage rate falling, and late marriage and late child birth becoming more common, the problem of an aging population will grow more and more severe within 20 or 30 years. In the knowledge-based era, older workers and less educated workers are more vulnerable to retrenchment. This will exacerbate the problems of an aging society in the future. (See Table 8.)

Table 8 Major Population Indicators

Year	Mid-year population (millions)	Population growth rate (%)	Birth rate (‰)	Death rate (‰)	Total fertility rate (person)	Proportion to total mid-year population (%)			Proportion of 65-74 years to 65+ years (%)	Proportion of 75+ years to 65+ years (%)
						0-14 years	15-64 years	65+ years		
1991	20.5	1.1	1.57	0.51	1.72	26.7	66.9	6.4	70.5	29.5
2001	22.4	0.6	1.17	0.57	1.40	20.8	70.4	8.8	63.9	36.1
2002	22.5	0.5	1.10	0.57	1.34	20.4	70.6	9.0	62.6	37.4
2003	22.6	0.4	1.00	0.58	1.24	19.8	70.9	9.2	61.3	38.7
2004	22.7	0.4	0.96	0.60	1.18	19.3	71.2	9.5	60.2	39.8
2005	22.7	0.3	0.91	0.61	1.15	18.7	71.6	9.7	-	-

Source: *Taiwan-Fukien Demographic Fact Book*, Ministry of the Interior.

2. The Growing Gap between School Learning and Enterprise Needs

Most school courses focus on theory rather than practice. Their curricula generally fail to meet the needs of employers, and thus put their students at a disadvantage in seeking jobs in the labor market. Moreover, most teaching facilities lag behind the times, and cannot possibly stay abreast of the rapid advances in industry.

3. The Shortage of Unskilled Labor and High-tech, Professional and Managerial Personnel

In the era of the knowledge-based economy, demand in the labor market is mainly polarized in low-skilled labor at one end and high-tech, professional and managerial personnel at the other. Taiwan has been facing a shortage of low-skilled labor for more than a decade already. In response, the government has been importing foreign guest workers to cover the deficit since 1992. By the end of 2005, 327,000 foreign guest workers are already at work in construction, manufacturing, home care, and nursing. In recent years, a sharp rise in the number of foreign guest workers has coincided with a rise in the unemployment rate. This has

caused some unemployed workers, especially in aboriginal communities, to protest that they are being squeezed out of jobs by the foreign workers. (See Table 9.)

Table 9 Foreign Guest Workers and Labor Shortage

Year	Unemployment		Labor Shortage				Foreign Guest Workers (number in thousands)
	Number (in thousands)	Rate (%)	Manufacturing		Construction		
			Number (in thousands)	Rate (%)	Number (in thousands)	Rate (%)	
2001	450	4.57	89	3.60	15	3.46	305
2002	515	5.17	82	3.43	13	3.18	304
2003	503	4.99	78	3.21	11	2.80	300
2004	454	4.44	79	3.15	11	2.73	314
2005	428	4.13	80	3.19	10	2.60	327

Sources: 1. *Monthly Bulletin of Manpower Statistics*, DGBAS, Executive Yuan.

2. *Monthly Bulletin of Earnings and Productivity Statistics*, DBGAS, Executive Yuan.

3. *Monthly Bulletin of Labor Statistics*, Council of Labor Affairs, Executive Yuan.

At the other end of the employment spectrum, Taiwan is also facing a shortage of high-tech, professional and managerial personnel. According to estimates of labor supply and demand for the next ten years, the average annual shortage of personnel in this category will be as high as 45,000. In Taiwan, given that high-tech industry will be the driving force of future economic development, it is essential that Taiwan strengthen the training and recruitment of high-tech, professional and managerial personnel to meet the needs of this key industrial sector and make sure that it is able to retain and enhance its competitive edge.

4. Unequal Distribution of Income in the Era of the Knowledge-based Economy

One of the unfortunate byproducts of a knowledge-based economy will be a lack of balance in social development. As knowledge becomes

the foremost factor of production, highly educated workers will see their employment and earning abilities rise far beyond those of workers with lower educational attainment. The result will be a large and increasing disparity in income and wealth. (See Table 10.)

Table 10 Monthly Average Wages by Occupation

Year	Total	Executives & Managers	Clerks	Professionals	Associate Professionals	Service Workers & Shop & Market Sales Workers	Technicians	Production Machine Operators and Related Workers
Wages (NT dollars)								
1991	25,589	43,616	24,591	32,751	22,390	16,449	25,617	18,301
2003	39,050	63,551	33,769	51,129	41,501	25,333	35,256	26,705
2004	40,110	65,702	32,558	53,216	43,771	25,689	36,444	28,169
2005	40,060	63,589	33,153	53,654	42,316	25,417	36,069	28,986
Percentage compared to average wages of all occupations (%)								
1991	100.00	170.45	96.10	127.99	87.50	64.28	100.11	71.52
2003	100.00	162.74	86.48	130.93	106.28	64.87	90.28	68.39
2004	100.00	163.80	81.17	132.67	109.13	64.05	90.86	70.23
2005	100.00	158.73	82.76	133.93	105.63	63.45	90.04	72.36

Source: *Wage Survey by Occupation*, DGBAS, Executive Yuan.

5. The Development of Information and Communications Technology Affecting Work Style and Labor-Management Relations

Information and communications technology has spurred the development of related industries and created the whole new realm of electronic commerce. In so doing, it has generated strong new manpower demand, especially for workers with relevant technical skills. On the other hand, it has enabled businesses to streamline or reduce their workforces. The resulting reduction of jobs is expected to surpass the demand for new manpower, making it hard for Taiwan to maintain its low unemployment rate in the future.

Faced by a shortage of technical manpower, countries around the world are stepping up their recruitment of needed personnel from abroad.

This is speeding up the internationalization of human resources and expanding the international employment market.

The speed and economic efficacy of e-commerce are prompting changes in the conventional modes of employment. A growing percentage of the workforce is working from home or becoming self-employed, while temporary, part-time, dispatch and other such forms of employment are also on the increase (Lin & Lu, 2006). In work-times and workplace, as well as work content, employment is becoming increasingly flexible. Unstable environment and the need for professionals and special facilities are the major reasons for using atypical employment. As a consequence, the role of unionization is diminishing, and labor-management relations are becoming increasingly harmonious. (See Table 11.)

Table 11 The Reasons Why Enterprisers Use Atypical Employment

Reasons	Part-timer	Regular contract worker	Temporary staff	Sub-contractor
Unstable Economic and Business Environment	75.06	73.98	48.26	47.33
Cost Down for Wages	46.87	41.59	40.00	43.01
Cost Down for Fringe Benefits	25.19	24.85	33.04	35.48
Cost Down for Training	14.41	14.55	30.43	38.48
Cost Down for Severance Pay	28.95	34.94	44.78	40.16
The Need for Professionals and Special Facilities	18.92	15.79	30.43	57.79
Avoidance of Labor Disputes	13.41	16.15	23.48	17.78
Substitution for Vacationers	29.95	16.30	11.74	4.61
Probation for Former Employees	13.91	15.94	8.70	2.19
Formal Employees Concentrate on Nucleus Business	8.52	8.55	20.00	14.48
Downsizing Employee Number	21.55	23.90	27.39	12.58
Reduction in Trivial Business	18.05	13.74	39.57	30.43
Others	2.01	2.34	-	1.76

Source: *Research of the Job Style in Atypical Employment*, Council of Labor Affairs, Executive Yuan. December, 2002.

6. Globalization and the WTO

Taiwan entered into the World Trade Organization (WTO) early

in 2002. In joining the WTO, Taiwan is able to share the benefits of expanding trade with all the other member economies. This will create more job opportunities, but it will also prompt readjustment of the industrial structure, which is likely to push unemployment higher during the transition period.

According to macroeconomic model projections, membership of the WTO will result in the loss of 20,000 jobs during the first year, increasing the unemployment rate by 0.22 of a percentage point. However, in the long run, being a member of the global trade body will yield a net gain in jobs and thus, eventually, bring the unemployment rate down.

Agriculture will be the sector most severely affected by entry to the WTO. The demand for agricultural labor will shrink, and many of the older farmers with lower educational attainment will find it very hard to switch to other occupations. The best policy for taking care of such displaced workers will be to help them find employment in the new agricultural service industry, such as recreational farms, rural care institutions, health and outdoor activity centers, and so on.

V. Government Policies for Human Resources Development

To meet the challenges of the new era of the knowledge-based economy, the Council for Economic Planning and Development (CEPD) launched the New Century Human Resources Development Programs in 2000. Covering the five areas of population, education, vocational training, employment enhancement and labor law reform, the program provides a comprehensive range of measures for promoting human resources development. The main measures in each of these spheres are as follows:

1.1. Population Policy

- (1) Setting up a full system of supports to lighten the cost and burden of raising children, such as through the provision of tax relief and social services, in order to raise the fertility rate and maintain the long-term stability of population growth.
- (2) Planning a national old-age pension scheme and enhancing the provision of social services to help senior citizens enjoy a better quality of life.

2.2. Education Policy

- (1) Enhancing the creativity of education and promoting innovation and creativity in teaching and learning in order to cultivate students' capacity for innovation and self-learning.
- (2) Developing a flexible education system, and enhancing mechanisms for cooperation between schools and industry, to improve the interflow between industry and academia and thus help reduce the gap between educational provision and enterprise needs.
- (3) Establishing lifelong and continuous learning systems, and promoting Internet-based long-distance learning and self-learning certification programs, to meet the learning and training needs of individuals and enterprises.
- (4) Strengthening basic courses for foreign languages and IT education, to substantially raise the foreign language and IT abilities of Taiwan' s workforce, and better prepare Taiwan' s citizens to be full and active participants in tomorrow' s global society.
- (5) Integrating universities' educational resources, to enable their more

effective utilization and to facilitate communication and collaboration with well-known foreign universities, in order to raise the international vision and teaching and research capacities of our academic institutions and cultivate manpower needed by knowledge-based industries.

3.3. Vocational Training Policies

- (1) Integrating public and private sector training resources to enhance the training of high-tech, professional and managerial personnel.
- (2) Strengthening the vocational training system and improving public vocational training institutions to bolster manpower development.
- (3) Strengthening training within enterprises and making full use of private sector training resources to assist enterprises' development.
- (4) Promoting various training programs to meet the needs of service industries.
- (5) Promoting various training programs to meet the needs of agricultural and fishing industries and help them adjust to changes in the demand for manpower, especially after Taiwan enters the WTO.
- (6) Establishing a vocational skills certification system, to encourage young people to set their sights on acquiring and being tested for practical, marketable work skills.
- (7) Strengthening vocational training and IT education for laid-off workers and job seekers who lack qualifications for obtaining employment.

4.4. Employment Enhancement Policies

- (1) Implementing the Public Sector Job Opportunities Creation Program

to create short-term employment opportunities for unemployed and disadvantaged workers.

- (2) Coordinating public and private resources to create local employment opportunities in tourism, recreation, social services, and other such industries.
- (3) Making effective use of the Employment Security Fund to provide job-seeking allowances for disadvantaged workers, as well as assisting them to participate in vocational training or obtain employment services.
- (4) Encouraging women and older people to find employment, in order to raise the labor participation rate and make optimal use of the whole potential labor force.
- (5) Recruiting high-tech, professional and senior managerial personnel from the international labor market to help meet the needs of globalized development.
- (6) Reducing the importation of foreign blue-collar workers to alleviate the unemployment problem.

5.5. Labor Laws Reform Policies

- (1) Amending related laws and regulations to allow for the establishment of portable individual retirement accounts.
- (2) Shortening working hours and regulating overtime, night work, and flexible working times for a more flexible labor market.
- (3) Overhauling labor laws and easing their restrictions with a view to ensuring that industries have a reasonable operating environment while atypical employee's interests are properly protected.

VI. Conclusion

The success of socioeconomic development relies mainly on the effective utilization of a nation's human and physical resources. To a nation with little natural wealth but abundant manpower, the formulation of human resources policies in accordance with market forces is an important strategy in promoting economic development. By developing its human resources and making effective use of its well-educated manpower, Taiwan has not only overcome many obstacles to economic development but also achieved rapid economic growth.

Facing the challenge of fierce global competition in the new century, Taiwan must focus on raising the quality of its population and bringing out the highest potential of its human resources. These will be an essential part of the efforts to develop a knowledge-based economy, maintain economic growth, enhance people's quality of life, and achieve the objective of turning Taiwan into a "Green Silicon Island" .

Manpower development requires a long-term effort. The development of scientific and technological manpower has been at the core of Taiwan government's human resources policies for the past several decades. At present, Taiwan is advancing another step forward with the formulation of this new set of policies and measures to meet the requirements of development as a knowledge-based economy in the new century.

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