Title	The industrialization and industrial education in Australia
Sub Title	
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Publisher	
Publication year	1969
Jtitle	Keio business review Vol.8, (1969.) ,p.47- 56
JaLC DOI	
Abstract	
Notes	
Genre	Journal Article
URL	https://koara.lib.keio.ac.jp/xoonips/modules/xoonips/detail.php?koara_id=AA00260481-19690000-03919669

THE INDUSTRIALIZATION AND INDUSTRIAL EDUCATION IN AUSTRALIA

by

Zuiichirō Ōtagaki

1. Foreword

It will be fully discussed by other reporters in this special number of the "Review" that in Australia, a continent with an area 25 times as large as that of Japan and a vast wealth of natural resources, the small number of inhabitants of 11 million are engaged in industrial activities centered on agriculture and in keeping the balance of international payments by foreign trade. In order to maintain their target of 5% growth of economy, it is imperative for the Commonwealth to promote industrialization and to make efforts towards the rise in productivity.

The road toward industrialization has been substantially impeded by the shortage of labor force. Vernon, in his Report,* has mentioned that it is necessary to accept 100,000 immigrants per annum if the labor shortage is to be solved and if the 5% growth is to be attained. The annual increase of the immigrants into this country is shown in Table I, and a probable increase of population in ten years is shown in Table 2. The nationals of immigrants comprise those from—beside from Britain—Italy, Germany, Greece, Holland and Yugoslavia. (*See R. Suzuki's report.)

In the occupational grouping of the settlers from abroad, most of them come under the categories of technicians, tradesmen and semi-skilled tradesmen. This fact reflects the acutest shortage in technical work force and the emphasis is being placed on industrialization as a national policy.

According to the Immigration Department, however, Australia is not alone with the problem of labor shortage; it is a world-wide problem. Therefore, the primary objective of Australia should not be the immediate fulfilment of work force by immigration, but an overall increase in population from the viewpoint of steady advancement of her economic growth; this, they insist, is a sound policy. In other words, it is held, the primary aim in immigration is

Table 1. Occupation and Sex of Settler Arrivals (Jun. 1964)

Occupational Group(a)	1964-65		
	Number	Per Cent	Per Cent of Total Workers
Male Workers			
1. Professional, Technical and Related Workers	4,021	8.1	5.9
2. Administrative, Executive and Managerial Workers	1,988	4.0	2.9
3. Clerical Workers	2,390	4.9	3.5
4. Sales Workers	1,699	3.4	2.5
5. Farmers, Fishermen, Hunters, Timbergetters and Related Workers	3,813	7.7	5.6
6. Miners, Quarrymen and Related Workers	441	0.9	0.7
7. Workers in Transport and Communication Occupations	3,355	6.8	4.9
8. Craftsmen and Production-Process Workers	18,297	37.0	27.0
9. Labourers	8,174	16.5	12.1
10. Service (Protective and Other), Sport and Recreation Workers	1,680	3.4	2.5
11. Occupation Inadequately Described or Not Stated	3,604	7.3	5.3
Total	49,462	100.0	72.9
Female Workers			
1. Professional, Technical and Related Workers	2,318	12.6	3.4
2. Administrative, Executive and Managerial Workers	237	1.3	0.3
3. Clerical Workers	4,508	24.6	6.6
4. Sales Workers	990	5.4	1.5
5. Farmers, Fishermen, Hunters, Timbergetters and Related Workers	66	0.3	0.1
6. Miners, Quarrymen and Related Workers	2		
7. Workers in Transport and Communication Occupations	376	2.1	0.6
8. Craftsmen and Production-Process Workers	2,611	14.2	3.9
9. Labourers			
10. Service (Protective and Other), Sport and Recreation Workers	6,441	35.1	9.5
11. Occupation Inadequately Described or Not Stated	806	4.4	1.2
Total	18,355	100.0	27.1
Persons—			
Workers	67,817	48.4	
Dependants	72,335	51.6	
Total Arrivals	140,152	100.0	

Table 2. Work Force and Population 1966-1976 (a)

	Work Force (000's)			Population (000's)		
Year	Males	Females	Persons	Males	Females	Persons
1966	3,465.5	1,269.8	4,735.3	5,898.2	5,792.5	11,690.5
1971	3,848.3	1,484.2	5,332.5	6,638.2	6,514.4	13,153.2
1976	4,249.8	1,703.7	5,953.5	7,493.4	7,347.2	14,840.6

(a) Source: Treasury Information Bulletin, Projections of the Work Force 1963-1976, April, 1965 (Appendices A. 1 and 4, C. 1 and 3)

a constantly developing community which is generally integrated, substantially harmonious, and usefully industrious.[1)]

Even if the purpose of accepting immigration should be such, doubtlessly the growth of industry must depend on efficient labor force. Thus, settlers should be expected to do their best as industrial-men, while at the same time it is urgent for them to bring up their children as prospective labour force. Here lies the importance of industrial education in Australia.

At the Pan-Indian-Ocean Conference on Education and Training for Engineers, held in 1966 with attendants from seventeen countries, it was unanimously approved that employers should be charged with responsibility of providing basic cultural background to employees to promote their ability to understand technology and to give training in special skills necessary for jobs.

2. *Manpower of Australia*

Mr. J.S.Harrison of the Planning and Research Section, Department of Labour and National Service, regards it as an essential trend that, from a shift of labor population between 1947 and 1976 as predicted in the manpower project, the rate of female work force to the total female population will show gradual increases, while male work force will not.[2)] The trend in the ten years after 1966 will go quite contrary to that observed up to 1966, and consequently in ten years' time the rate between male and female (of work force to total population) will become equal. Another significant trend may be an indication that earlier retirement of female workers will increase, while labor participation by elderly females and married women will also increase (Table 3). It is obvious that younger workers will show a magnificient growth because firstly in the coming ten years their labor participation will rise and secondly the largest increase of labor force is expected to be seen in the age strata of 20–29 (Table 4).

1) *Australia's Immigration Policy*, by the Hon. Hubert Oper MAN. O.B.E. M.P. Minister for Immigration.
2) J.S. Harrison, *Trends in the Australian Work Force;* Personnel Practice Bulletin, Vol. XXII No. 4, 1966.

Table 3. Married Females in the Work Force 1954-1976 (a)

Year	Numbers (000's)	Per Cent of Total Work Force
1954	256.6	6.9
1961	405.5	9.6
1969	514.5	10.9
1971	652.3	12.2
1976	799.0	13.4

(a) Sources: Bureau of Census and Statistics 1954 and 1961 Censuses, and Treasury Information Bulletin, "Projections of the Work Force 1963-1973" April 1965. (Appendix C. 3)

Table 4. Age Distribution of the Work Force 1966-1976 (a)

Sex by Age	1966		1971		1976		Change in Share of Work Force 1966-76
	(000's)	(%)	(000's)	(%)	(000's)	(%)	
Males							%
Under 20	340.6	9.8	330.6	8.6	332.0	7.8	−2.0
20-29 years	806.8	23.3	1,036.7	26.9	1,200.4	28.2	4.9
30-39 ,,	744.7	21.5	776.1	20.2	934.2	22.0	0.5
40-49 ,,	726.3	21.0	785.3	20.4	768.0	18.1	−2.9
50-59 ,,	570.3	16.4	608.4	15.8	669.6	15.8	−0.6
60 + ,,	276.8	8.6	311.2	8.1	345.6	8.1	0.1
Total Males	3,465.5	100.0	3,848.3	100.0	4,249.8	100.0	0.0
Females							
Under 20	309.3	24.4	310.0	20.9	322.7	19.0	−5.4
20-29 years	327.7	25.8	430.0	29.0	502.2	29.5	3.7
30-39 ,,	196.5	15.5	223.8	15.1	283.0	16.6	1.1
40-49 ,,	221.8	17.4	260.3	17.5	279.7	16.4	−1.0
50-59 ,,	158.5	12.5	194.0	13.1	236.6	13.9	1.4
60 + ,,	56.0	4.4	66.1	4.4	79.1	4.6	0.2
Total Females	1,269.8	100.0	1,484.2	100.0	1,703.7	100.0	0.0
Persons							
Under 20	649.9	13.7	640.6	12.0	654.7	11.0	−2.7
20-29 years	1,134.5	24.0	1,466.7	27.5	1,703.0	28.6	4.6
30-39 ,,	941.2	19.9	999.9	18.8	1,217,2	20.4	0.5
40-49 ,,	948.1	20.0	1,045.6	19.6	1,047.7	17.6	−2.4
50-59 ,,	728.8	15.4	802.4	15.0	906.2	15.3	−0.1
60 + ,,	332.8	7.0	377.3	7.1	424.7	7.1	0.1
Total Persons	4,735.3	100.0	5,332.5	100.0	5,953.5	100.0	0.0

(a) Source: Summarised from Work Force Projection worksheets (assuming 100,000 net migrants per annum) as supplied by Department of the Treasury.

3. Labor Mobility

A survey has been conducted by Mr. G.R.Phillips, A.D.P. Section of Department of Labour and National Service[3] as to the number of people leaving their jobs or staying away from them in the fields of the manufacturing and the commerce between the period of August-September, 1966. Information has been supplied by 160 companies related to the heavy industry, radio and electrical appliances, commerce, etc. selected out of four states of New South Wales, Victoria, Queensland and South Australia. Nearly 90% of the companies surveyed have a scale of 50–1000 employees, with the biggest one having 7,000 workers. The data have been studied according by the different fields of industries, by technicians or non-technicians and by sexes.

Although the information gained out of study of data may not exactly represent the true picture in all enterprises, the highest rate of quit is seen with the metal industry of N.S.W., 13.2% and commerce of QLD, 13.8%, both seeming appreciably lower than that in Japan. And the quit rate is lower for females than for males, a feature contrary to that of Japan. A similar survey had been conducted in 1965. Comparison between the two surveys reveals a decline of the rate throughout all industries, and with both technicians and non-technicians. A rising rate is seen with technicians in the metal industry, heavy industry, electrical industry, commerce and cattle breeding.

As to the rate of absenteeism, difference between the two surveys is very small; a rise is observed with technicians in the metal industry, electrical industry and commerce, alike with the quit rate. The reasons for this are not clear, but instability of work force in technicians is exhibited herein.

4. Technical Training

It was only recently that the division of engineers into three stratums—skilled tradesman, technician, technologist—was made. The distinction was first made in 1955 when the public arbitrator placed technicians in the field of the tele-communication above the electrical tradesman and approved a wide wage difference between those two. Professor C.E.Moorhouse of the University of Melbourne says "the fact that the Australian community has only recently recognized the existence of technicians and made provision for their training is the main reason for the present shortage in this category. As night be expected in a developing country, there have also been shortages of skilled tradesmen in various trades from time to time—a situation which still occurs." According to him, each state makes its own recognition of the problems involved in the education and training of people in these

3) G.R. Phillips, Spot-checks of Labour Turnover and Absence: August-September, 1966.

three categories respectively, yet the degree of recognition varies from state to state depending on the current social system, general educational system and the development phase of local industries.[4)]

The following five problems are pointed out by the Professor as the problems in technical training program in Australia today.

(1) It is impossible to predict with any accuracy the relative numbers which will be required in the different groups at any given time.

(2) It is also extremely difficult to ensure that a student is correctly classified so that he enters the group, and receives the kind of training, most suited to his abilities and needs.

(3) It is equally difficult to ensure the allotment of the various kinds of training in the most efficient manner to teaching institutions—some courses carry more prestige than others and some are more expensive than others.

(4) It is inevitable with the present rate of development in science and technology that much of today's 'professional activity' for technologists will become tomorrow's 'standard routine', assigned to technicians.

(5) It is also difficult to reconcile the requirements of a system of technical education involving separate streams for three groups with a general system of education.

In view of these problems it seems desirable to organize technical or engineering training programs in such a way that a shift between the courses may be made as easy as possible. However, this is a case of "Easier said than done." These difficulties in technical training program may be basic problems in every country—perhaps with varying degrees from one country to another. However, the Professor's investigation on the educational system in U.S. and European countries and the Soviet Union reveals that, in those countries with a higher rate of technical population than in Australia more people are attending college or university; and in technically-advanced nations full-time courses provide basis for technical or engineering training, notably in America and Europe. In some countries, particulary in America, the education is being carried without employing the apprentice system which is now prevalent in Australia.

The conclusions as reached by Mr. Moorehouse on technical training program are:—

The development of technical and technological education in Australia in the last thirty years has been considerably influenced by a constant shortage of funds, by state control of most of it, by the acceptance of an early school leaving age, and by the existence of a particular system of training tradesmen.

The most pressing problem of all technical and technological education establishments is undoubtedly that of obtaining adequate finance for the kind of activity which they should be undertaking. It seems unlikely that they will

4) R.W.T.Cowan, Education for Australians, A Symposium; F.W.Cheshire, Melbourne, 1964.

be able to obtain this finance without Commonwealth grants to the states for the purpose, and without taxation concessions to industrial organizations to encourage them to contribute.

Before this is done, however, the general functions of the technical colleges in Australia require careful investigation. A particular decision which urgently needs to be made is whether any, some, or all of them should continue to try and provide courses for technologists as well as courses for tradesmen and technicians and courses of an adult education nature. There is little doubt that in some fields the courses originally provided and still conducted for technologists have now become more suitable for technicians-and that this process is likely to continue.

Whatever may be the historical reasons for the present situation, in which the majority of technical colleges endeavour to cover a wide range of activities, it is likely that many of these reasons no longer hold good, while it is quits certain that the training of small groups of technologists in a large number of scattered establishments is neither an economical nor an efficient process."

These conclusions of Mr. Moorehouse are derived from a viewpoint of educational establishment or system. But there seems to lie another cause impeding the improvement of technological levels, that is, the poor motivation for studying, the little aspiration for becoming a technician, due to the overall mechanism of society which admits small degree of wage difference and almost uniform standard of living. This may be a problem more fundamental than the said financial subsidies to establishments or the setting-up of courses.

5. Training within Enterprise

In view of the shortage of technicians as has been already observed and the fact that a large part of such shortage has been covered by settlers, the promotion of technical training within enterprise itself is the foremost problem. Enterprises must contribute to improving technological levels, by radical use of the existing educational systems and establishments.

Mr. Helen Taylor of the Industrial Service Branch of Department of Labour and National Service has conducted a survey on the method of training with 500 manufacturing enterprises, and presented a general outlook of the kinds and the scopes of training in Australian firms.[5] The companies surveyed cover 101 small ones (with 51 to 100 employees), 335 medium ones (101 to 1000) and 64 large ones (over 1000). A comparison by scales has been intended, using mail questionnaire on the basis of random sampling. The numbers of inquired companies in the three scales are 5%, 15% and 60% of small, medium, and large respectively of all the Australian firms. The educa-

5) Helen Taylor; Training in Five Hundred Manufacturing Undertakings, ibid. Symposium.

tion as found in this survey mainly concerns such administrative tasks as supervision, management, human relations, counseling and public relations. Since the education for technical instructor has been confined to its method, the contents of trained technology itself is not clear, yet a part of it is observable. By comparing the results of this survey with the previous similar survey, Mr. Taylor has concluded as follows. In a certain area an obvious progress has been made. For example, the rate of big and small companies carrying within-enterprise training for operators has risen from 17% in 1961 to 27% in 1965, while that for supervisor has shown a big increase from 11% to 24%. The rate of companies specifying some persons for the responsibility of training has increased generally. In most of big companies the overall responsibility of training is charged on some specified persons, usually those of personnel-affairs or training section. In a half of big firms the leadership of training is concentrated on one department, mostly personnel-affairs division; else it is divided among several divisions. Six percent of medium companies and one-fourth of big companies have a central committee taking charge of development in and cooperation for training.

It seems, however, that there is still much room left for improvement, in particular with medium and small size firms. In the survey a systematized form of training has been reported only by a small number among these companies. About 36% of them report on "on-the-job training". Among medium size companies, about 47% of them have their own system of training and more than half of them use off-the-job training; about one-fifth of them place the responsibility of training on some specific individuals.

Companies that have a written provision of training policy count one-eighth. Those that prepare the training program for every specific term constitute one-eighth. Again one-eighth employ professional persons for training.

Training activities in big firms are fairly remarkable; 92% of them have organized within-company training program; one-third have a written provision; one-half prepare plan for every specific term.

Even among big companies, 8% have no organized method of training. Organized on-the-job training depends much on supervisors including foreman or group-head. In most of big companies teaching supervisor's training method is being conducted, which seems few in medium companies.

6. Education of Safety and Hygiene

According to the labor compensation statistics for 1965, injured persons are as follows:—

Deaths or injuries of 3-day loss or over, which are eligible to compensation, amounted to 97,501, and injuries of less than 3-day loss which are also eligible (effectuated recently) to the labour population counted 140,856, making the total number of workers 277,915. In 1966 the total number of labour force

was 4,735,300. This is the rate about ten times as high as that in Japan in 1965 when the total number of workers was 47,870,000. The number of injuries in Australia, although it may be the number calculated through the development of the system of compensation and powerful organizations of labour union, is very large in view of the labor density in Japan.

In big enterprises efforts for industrial safety are being made to produce good results, throughout all areas of operation control in order to maintain a high standard of safety, but the details in statistics or in other forms are not available.

The Port Kembla Steel Work reports it has succeeded in obtaining a perfect result of safety education notwithstanding the fact that 55% of its workers comprise settlers from 33 countries.[6] Indeed this education is extremely difficult in a work place involving difference of languages. In this company the communication is considered a main means of spreading fully the idea of safety education, and guidance to new entrants and educational courses to all supervisors are fully provided. The full information of the extent and the result of such education were not available; but insofar as big and small plants we visited are concerned, we were not under an impression that the safety education was completely carried out as we gathered from the behaviors of operators or from the speeches of supervisors and administrators. It seemed that the recognition on the management's responsibility for industrial safety was not complete. It may be assumed that even in big enterprises top-level management does not take full responsibility for safety and the care for safety does not constitute a company-wide concept.

In medium and small companies much depends on the leadership of safety consultants, who mainly view the situation from technical standpoints; physiological or psychological factors will be studied in the future.

Training of industrial doctors does not seem to have made much progress, while studies in industrial hygene in close connection with working conditions are not as sufficiently made as in Japan.

However, by the Occupational Health Unit of the School of Public Health and Tropical Medicine at Sydney University a one-year course is being planned with a view to distributing the knowledge on industrial health injuries and their prevention to engineers, physicians, safety personnel, personnel-placement people of factory or to those with technical qualification or experience. Lectures and experiments are given. This course is supported by the Welfare Departments of both Victoria and Commonwealth, by the request of the Safety Engineering Association and the National Safety Association; hence national-political considerations are increasingly emphasized, which will further develop into education of industrial doctors, an organization of doctors, or an academic society of industrial medical science.

6) J.F.Rich, Communication and the Broken Hill Proprietary Company, Ltd.

The main subjects of lecture offered in this course are as follows:—

- General view of industrial and occupational hygiene situations
- Dust and bad air in plant; anti-insects chemicals, gas and steem
- Lightness of plant
- Plant noises
- Ventilation
- Skin injuries
- Harmful radiation
- Human problems in plant
- Rehabilitation
- Normal industrial processes and social nuisance
- Introduction to elgonomics
- Prevention of and adjustment for occupational diseases.

A symposium on "Automation and Advancing Impacts on Life" was being held in the Cairmmillar Institute in South Yarra. Its subtitle was "How can human being survive in this system?" Themes concerning labor and mental hygiene and social adaptation from the viewpoint of economy and business were subjects of discussion.