AN ASSESSMENT OF INDUSTRY DEMAND FOR TECHNICIANS AND SKILLED WORKERS

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INTRODUCTION

One finding of the Presidential Commission to Survey Philippine Education (PCSPE) is that vocational-technical education ranks low in the choice of students in search of an occupation or career. This finding is significant in the light of several factors. First, vocational courses are, by governmental policy, an integral part of the curriculum from the elementary grades through high school. Second, high-school graduates proceed to college into nontechnical courses which are overpopulated and offer very little opportunity for employment. Third, employers, especially in the manufacturing sector, have called attention to the shortage of personnel with vocational or technical training and foresee a larger requirement in the future.

The purpose of this paper is to determine some of the reasons why students continue to neglect vocational or technical training in spite of the advantages that such a training can offer. To be particularly examined are some developments in the economy leading toward new policies for industrial growth; the types and number of manpower needed to sustain that growth; and the inability of the present school system to supply the technical manpower needs of industry. Much of the data used are taken from the sector report on vocational-technical education of the PCSPE.

THE EMPLOYMENT PICTURE, 1960-1969

In 1960, a total of 5.524 million persons were employed in agriculture, forestry, hunting and fishing; the number corresponds to 61.2% of the total employment in the economy. Manufacturing employed an estimated 1.036 million, or 11.3% of the total employment for the same year. Commerce registered 753,000 employed, or 9.6% of the total employment. Government, community, business and recreational services had 424,000 persons in their employ, or approximately 5% of the total employment. The rest of the labor force were distributed among the following sectors: mining and quarrying, construction, electricity, gas, heat, water and sanitary services, transport, storage and communication, domestic and personnel services. Total employment in all major industry sectors of the economy for 1960 was 8.539 million. Employed persons by major industry group from 1960 to 1967 are shown in table 1.

In May 1969, the Bureau of the Census and Statistics Survey of Households (*BCSSH*) reported that total employment in all major industry groups was 11.229 million; this means a total expansion in employment equal to 31.50% from its 1960 level, or 11.17% from the 1965 total. Agriculture, as usual, was the most important employer in the economy, accounting for 56.4% of total employment. This means a reduction in the share of agriculture in total employment equivalent to 4.8% from the 1960 figure. Employment in agriculture expanded by 14.57% between 1960 and 1969; and by 10.55% between 1965 and 1969. Total employment in agriculture for 1969 was 6.329 million.

In 1960, manufacturing had an employment share of 12.1% but this declined to 11.5% in 1969, implying that the manufacturing sector had not really been developing fast enough to effect a significant change in the pattern of sectoral distribution of employment. From all indications, our economy in 1969 was still primarily agricultural with more than 50% of the population dependent upon the agricultural sector for their means of livelihood. However, the pattern of industrialization that has been pursued since the initial imposition of export and exchange controls in 1949, and which consequently led to the "import substitution" type of industrialization up to 1960, is a sign that – given proper direction and enough encouragement – manufacturing can once again lead the other sectors in that it can grow most rapidly.

In spite of the decline in the sectoral employment share of manufacturing in 1969, in absolute figures, employment was up at 1.292 million, indicating a total expansion by 24.71% in the period 1960-69 and by 17.35% in the period 1965-69.

Commerce registered an expansion equal to 46.75% in absolute employment figures in 1960-69 and a decline of 81% in 1965-69. The sectoral employment share of commerce increased from 8.8% in 1960 to 9.8% in 1969, or an expansion equal to 1%.

Although agriculture still remained the most important employer in the economy in 1969, a great degree of industrial diversification occurred in the sectoral distribution of employment as shown by the larger shares in national employment of formerly insignificant sectors (e.g. construction; domestic and personal services; government, community, business and recreational services; transport, storage and communications; and electricity, gas, water and sanitary services). This is shown in table 2.

EMPLOYED PERSONS BY MAJOR OCCUPATIONAL GROUPS

Out of the total employment of 8.539 million in 1960, 5.211 million were employed as farmers, farm laborers, fishermen, hunters and other related workers or approximately 61% of the total employment figure for that year. Employment under this category increased to 5.677 million in 1965 and to 6.297 million

1969, representing an expansion equivalent to 20.84% in 1960-69, 8.94% in 1960-65, and 10.92% in 1965-69.

The decline in the total employment share of agricultural and other related occupations from 61% in 1960 to 57.4% in 1969 is a sign that more persons are being employed as better and higher skilled workers in other occupations. The number, for example, of those employed as craftsmen, factory operatives and workers in related occupations increased from 1.132 million in 1960 to 1.270 million in 1965, and finally to 1.407 million in 1969, representing a total expansion of 24.29% for 1960, 12.19% for 1960-65 and 10.79% for 1965-69. However, although absolute employment figures under this category have expanded since 1960, the failure of the manufacturing sector to keep pace with development after the 1960's may explain the decline from 13.3 to only 12.5% of the number of persons employed in the craftsmen, factor operatives and related workers category.

In other occupational groups substantial gains in terms of both absolute employment expansion and higher employment shares were registered between 1960 and 1969. Professional, technical and related workers, for example, increased from 239,000 in 1960 to 414,000 in 1969, showing an aggregate increase equal to 87.03% from 1960 to 1969. Correspondingly, in terms of employment share, there was an expansion from 2.8 to 4% over the same period.

Workers in service and other related occupations also increased by 62.86% from 1960 to 1969, or in absolute figures from 560,000 in 1960 to 912,000 in 1969. Similarly, the employment share of service workers registered a gain from 6.6 to 8.1% in 1969. The gains in absolute employment expansion and higher employment shares for occupational groups, such as workers in operating transport occupations, manual workers and laborers, clerical office and related workers, workers in mines, quarry and related occupations and others are shown in table 3.

EMPLOYMENT TRENDS AND LIKELY EMPLOYMENT BEHAVIOR

Employment actually suffered a decline from 12.481 million in 1968 to 11.229 million in 1969. The decrease is approximately 10% of the 1968 level and is equivalent to 1.252 million workers. The decline has been attributed by the Bureau of the Census and Statistics to the dropping out of women and younger workers from the labor force by reason of the long drought which lasted during most of the second half of 1968 and the first half of 1969 – thereby curtailing farm and related activities – and to general and economic factors that tended to reduce employment opportunities.

The decrease in employment occurred both in the agricultural and in the non-agricultural sectors. Employment in agriculture fell by 873,000 from 7.202 million in May 1968 to 6.329 million in May 1969, or a decrement equal to 12.1%.

Manufacturing also registered a decrease in employment by 95,000 between 1968 to 1969, or a decrement equal to 6.85%. Overall decline in the nonagricultural sector was 7.2%, or 380,000 workers.

Economic activities in the Philippines respond very strongly to changes in policies. Thus, uncertainty in economic policies early in the 1960's resulted in the uneven behavior of employment. But changes in fluctuations (domestic or international), crop failures due to natural calamities or balance of payments difficulties provide added tremors to the overall employment situation. These factors will probably explain the fall in total employment in 1963-65, 1966-67, and 1968-69. Until 1963, the country had suffered no decrease in absolute employment, but after that particular year employment figures began to become uneven.

The unfavorable employment picture that started early in the 1960's has been attributed by economists, especially those from the University of the Philippines, to the slowdown of manufacturing growth from 1957 to 1966 when the rate of growth in manufacturing went down drastically from 13.3 to only 6.5%. Once the limits of the domestic market for further "import substitution" or manufacturing for the domestic market at the finishing stages have been reach, from all indications overall growth performance of the economy will begin to slacken. Failure to restructure economic policies, such as our highly protective tariff structure, high wages in the manufacturing sector – and for a time – the policy of overvaluing the peso in our foreign exchange system resulted from our failure to explore other avenues for growth.

How will the employment situation behave within the next few years? Will there be a further decrease in absolute employment figures or an expansion, especially in the manufacturing sector? To answer these questions requires a profound understanding of Philippine economic policies, for as stated earlier, economic activities in this country respond very strongly to changes in policies. The manner in which Filipino entrepreneurs responded to industrial incentives during the initial phase of the nation's manufacturing growth at the finishing stages (import substitution) in the 1950's is enough proof that – given enough encouragement in terms of restructured economic policies the economy can again pick up a steady pace of growth.

The need for new directions for industrial growth has been clearly summarized by two economists, as follows:[1]

> The balance of payments crisis of late 1969 has forced to the fore basic issues of development policy that have long been neglected in the Philippines. We noted that the import controls of the 1959's had produced a brief "exuberant"

[1] John H. Power and Gerardo P. Sicat, Industrialization in the Philippines, Institute of Economic Development and Research Discussion Paper, No. 70-11 (April 1970), School of Economics, University of the Philippines, p. 131.

period of finishing stages import-substituting industrialization. What was needed to sustain industrialization beyond the easy phase was reversal of policy incentives so as to favor backward integration and industrial exports. Instead the protective tariff system of the 1960's seemed designed to preserve the existing pattern of industry with the result that manufacturing became a lagging sector in economic growth. Only a remarkable growth performance in agriculture, abetted by forestry and mining, prevented a serious decline in the overall rate of growth. In short, after two decades of heavy protection of manufacturing industry, the economy found itself still mainly dependent on the primary producing sectors for its economic growth.

It is their view that vigorous industrial growth must remain as the most essential component of our nation's development strategy for the 1970's. By vigorous industrial growth is meant not further import substitution, but backward integration (i.e., the development of more basic industries which will supply the input requirements of finishing stages industries) and export expansion in the manufacturing sector. This strategy would call for a full-scale reform of existing economic policies in order to remove the biases against these new avenues, if the 1970's are indeed to be a development decade for the Philippines. Equally important is the need to structure policies that will encourage the substitution of more labor per unit of capital to maximize the rate of labor absorption, for the rapid rate of population growth will certainly make the problem of labor absorption even more critical in the future.

It is perhaps in recognition of the need for these redirections that major policy reforms have been instituted starting with the drastic and sweeping reform of the exchange rate in February 1970. The adoption of the floating rate for the peso has brought about substantial correction in the overvaluation of the currency. Devaluation will certainly have the effect of encouraging investment in all internationally traded goods industries vis-a-vis non-traded goods industries. Backward linkage import substitutes and industrial exports will thereby be favorably affected. Much will depend, however, on the other policies that may be adopted in the light of these effects.

Complementing the favorable effects of the floating rate system is the presence of the Board of Investments (BOI). Under the Investments Incentives Act, this body is charged with the responsibility of preparing the list of priority investment areas (most basic-resource-oriented industries and export industries). It has the power to provide a variety of incentives to firms registered with the BOI in these preferred areas, as well as to investors in these registered enterprises.

Dr. Antonio V. Ayala, Governor of the BOI, is of the view that the power of the Board to implement the *Investment Priorities Plan* not only makes the formal

plan more meaningful – but also gives the board the opportunity to include two matters in its process of planning: evaluation of applications that are submitted for registration and consideration in preferred areas of investment and assistance to and supervision over registered enterprises through the different phases of the life of their projects.[2]

An examination of priority and preferred areas of investment included in the Investment Priorities Plan prepared by the BOI reveals that those listed for consideration are monthly in the export-oriented and resource-oriented industries. The BOI is seeking to promote areas of investment which will lead to forward and backward integration of industries, utilization of indigenous raw materials, development of export-oriented industries and the emergence of a capital goods industry.[3]

The year 1970 also saw the passage of what could be another significant piece of economic legislation. The *Exports Incentives Bill of 1970* was enacted to provide more positive incentives for the growth of exports, especially for export diversification in the manufacturing sector. The fiscal and monetary incentives that have been lined up under the act are calculated to raise the level of internal efficiency and competitiveness of many of the country's viable manufacturing industries. Penetration and ability to sell in the international market is a difficult and demanding phase of economic development. It requires foresight, entrepreneurial skill and a host of related factors. It is an area that calls for both technical competence and advancement, because of the requirements of higher production efficiency and better quality standards. Again, the law gives the BOI the authority to prepare the *Exports Priorities Plan*: a listing of preferred and desirable investment and export areas that are to be given encouragement and incentives under this new policy of the national government.

Seizing the new profit opportunities made possible by these new incentives – and in the absence of any other opportunities in the traditional manufacturing sector – many firms have begun to seek for other avenues of growth, especially the prospects offered by backward integration and export promotion. Substantial numbers of old and new firms have already availed of the incentives being offered by the BOI, as evidenced by the many applications and registrations processed and considered along a broad spectrum of activities. The assembly and automative industry is already seriously considering integrating backwards and the copper industry has plans for forward integration. The broad foundation of the country's steel industry is already being laid with the establishment of the Iligan Integrated Steel Mill (and with the formalized plan to establish the Elizalde Integrated Steel Mill). The cement industry is now focusing more of its attention on the foreign

[2]Antonio V. Ayala, "Some Comments on Planning at the Board of Investment", The Philippine Economic Journal (First Semester 1970, Vol. IX, No. 1), p. 51.

[3]Ibid.

cement market. Many new Philippine products, such as shoes, handicraft, canned foods, furniture, ceramics, beer and others are now breaking into the international market. The economy is being geared and restructured to encourage integration in industries, promote exports, utilize local raw materials and manufacture certain kinds of machinery and equipment.

NEED FOR TECHNICIANS

These new developments in terms of broad and specific manpower requirements within the next few years signify that *many new skilled occupations will be introduced* which will necessitate greater theoretical knowledge and less manual dexterity than has been required of the traditional craft-worker. The greater requirements for higher production efficiency and better quality standards are very likely to lead to a more intensive utilization of precision equipment and processes in certain industries, most especially in heavy industries like steel. However, the extent of factor substitutability between labor and capital will depend on the policies affecting the wage of labor and the price of capital and also on some technological constraints. Interpreted in terms of skill and training requirments, this would mean a greater degree of specialization in the skilled work force.

In an industrial structure where the impact of rapid technological change is being felt, as evidenced by the greater utilization of numerically controlled machines and automatic processes (one has only to view the electrical, petroleum, electronics and instrumentation fields to realize the extent of modernization in our industrial structure), greater demand arise for more highly and technically trained manpower like technicians and technologists, as differentiated from ordinary skilled workers.

SURVEY OF VOCATIONAL/TECHNICAL SKILLS

From the study conducted by the PCSPE, it is clear that, in general, industry appears to be dissatisfied with the graduates currently being produced by vocational and technical schools. A number of companies were interviewed by the commission to get their views on the capabilities of local engineering graduates to inspect, trouble-shoot, cost and maintain factory equipment. Questions were asked to assess the capability of Filipino engineers in performing their functions as engineers and to determine if the technician grade can be effectively covered by failed technologists. An overwhelming majority of the respondent firms rated as "fair" the capabilities of Filipino engineers in this regard, especially in metallurgical, electronics, chemical, mechanical and civil engineering. They add, however, that after some training with the companies, the rating changes from fair to very good. The "fair" rating was attributed by companies to poor academic background, lack of experience and technical difficulties. Majority of the firms rated as also "fair" the performance of engineers in the following fields: agricultural, industrial, marine, textile and ceramic engineering.

Even the capacity of engineers to oversee production with respect to product quality, systems control, data processing and processes was rated as only fair. Improvements were effected by intensive on-the-job training, on-the-job performance ratings and through the selection of applicants by means of a rigid screening process. Reasons cited for this rating were inadequate academic background and lack of experience.

To overcome the inadequacy and the lack of training of newly recruited Filipino engineers, formal training programs have been devised. Out of the 116 industrial firms that responded to the survey, 52.68% indicated that they have formal training programs. The usual per man training expenditure (average) was placed at P1,200, except for one firm which placed the amount at P6,000. Training programs were considered short, with 64.7% of the firms indicating that their formal programs do not exceed six months in duration.

Companies indicated willingness to hire technicians instead of those engineering graduates whose capacity to handle equipment and oversee production are found to be unsatisfactory. In percentage terms, 72.41% of the respondent firms indicated willingness to employ technicians, while those that answered in the negative enumerated the following reasons for their response:

1. Likelihood of violating engineering laws if technicians are employed instead

2. Inferior potentials of technicians compared to engineers with respect to other fields including administration; and

3. Presence of an adequate supply of engineers as compared to that of technicians.

Company ratings of skilled work force in metal, mechanical, building and electrical trades were also found fair. The companies attributed this to poor methods of instruction in the trade schools, insufficiency of practical training in the operation of machines and major weaknesses in some tool subjects – such as science and mathematics. After the workers had trained with the companies, the distribution of company response tended to cluster between good and very good. However, most firms considered intensive company training as very expensive and many of them were hesitant to provide more than the minimum and necessary training required for their employees.

Sometimes, firms are forced to drastically alter their techniques of production for lack of experienced and qualified technical personnel. What appears therefore to be a critical area that must receive the utmost concern of the educational system in the field of vocational and technical education is *technician education*. The current meager program being conducted in this area must be augmented by an intensified technician training program.

In a case study conducted by Hal Mason on technology transfer[4], comparing United States subsidiaries and local counterparts in the Philippines, it was found out that skill availability is one of the factors that can induce firms to alter the technology they use in manufacturing products. It was pointed out that technological transfer and adaptation in the Philippines is hindered due to lack of qualified technical manpower. The study made special mention of the need for technical personnel who have familiarity with local conditions. However, such personnel were found to be exceedingly scarce; and given the educational programs of local higher schools, there is little likelihood that the scarcity will soon be eased at the local level.

With regard to the ways in which firms attempted to overcome this particular problem, Mason states:[5]

> The firms themselves (both U.S. and Philippine owned) have attempted to deal with this problem through training programs – especially for supervisory and technical personnel. Yet most would probably admit that their efforts cannot be expected to meet the country's needs. The difficulty for the firms is that training on a major scale may be wasted, since there is a high rate of turnover among technical personnel. Because of this, firms are reluctant to provide more than the minimum amount of training required to quality relatively unskilled workers for production line work.

Turning to the school system, he says:[6]

> There is an almost universal complaint that trade schools are not adequately preparing people to work with modern equipment. One firm was forced to fly a highly skilled welder from the U.S. to fabricate a particular structure. Firms also indicated that trade schools are woefully underequipped if they have equipment at all. Many classes are conducted with the use of diagrams of the equipment to be used so that trade school trainees come to industry supposedly prepared to use a particular machine, but without having seen or operated one. The problem may be so complex, however, that an entire system of trade schools might have to be created if adequate training is to be obtained. Trade schools are operated as private profit-making enterprises. Under present circumstances, there is little incentive for these schools to improve the training offered. Perhaps the better solution to the problem is to involve industrial concerns through a program of subsidized training projects.

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[4] Hal Mason, "Some Aspects of Technology Transfer," The Philippine Economic Journal (First Semester 1970, Vol. IX, No. 1), pp. 96-7.

[5] Mason, p. 102.

[6] Ibid., p. 103.

The business firms were also requested to evaluate the capabilities in theory and in practice of graduates of different vocational and technical programs ranging from short-unit courses, regular secondary, vocational post-secondary technical and technician programs – to associate degree and apprenticeship programs. Graduates of the two-year post secondary vocational, three-year technician and associate degree program – in addition to graduates of company apprenticeship programs – were rated to be good in theory. However, when it came to practical training they were found to be weak, with the exception of graduates of apprenticeship training programs. Graduate of short-unit courses (less than one year) and regular secondary vocational programs were found weak in both theory and practice by the 116 respondent firms representing different fields and areas of economic activity.

In the agriculture sector, skilled workers were found to be generally good in such areas as poultry, swine, dairy cattle, beef cattle and sugar cane. Reinforced by company training and on-the-job exposure, improvements in their performance were achieved.

In the areas of fish capture (marine fisheries), fish culture (inland fisheries) and fish preservation (fishery technology), the evaluation of skilled workers was not very satisfactory. An overwhelming majority of fishery firms rated their skilled workers' performance to be fair and again this was said to be remedied only by intensive training and job-exposure of the workers.

SPECIFIC DEMANDS FOR TECHNICAL AND VOCATIONAL SKILLS

DEMAND FOR TECHNICIANS

A type of worker that is relatively new in the Philippines and considered scarce in the labor market is the technician. The *technician* has been defined as a person who occupies a position between that of the qualified scientist, engineer or technologist, on the one hand, and the skilled worker or craftsman on the other. His education and training are likely to have taken him at least up to the end of secondary education, in a general or technical stream; he may have had post-secondary level training, and holds a corresponding degree or diploma.

The functions of a technician are likely to include one or more of the following: detailed design and development or the manufacture, erection or commissioning of equipment; use of complex measuring equipment; trouble-shooting and process control; customer service; work study; costing and estimating; assistance to qualified scientists (measurements, collection and evaluation of experimental observations); preparation of biological cultures or similar preparations in other fields; testing of product samples; chemical analysis, etc.[7]

[7]International Labor Organization (ILO) definition of a technician.

On the basis of the statements made by highly placed persons in industry, visits and interviews with different firms all over the country, opinions of experts on manpower and ongoing studies on the manpower requirements of the economy and the purposive sample survey of agricultural, industrial and fishery firms all over the country, there is indeed a critical shortage of highly trained technicians. If the current trend in modernization and utilization of modern productive technicians – especially in the mechanical, electrical and electronics fields – is sustained then the demand of the economy for these types of manpower would substantially increase.

The technician, with his good theoretical background and practical experience, is expected to provide the missing link between the scientist, technologist or engineer on the one hand and the craft or operative workers on the other. He is expected to complete the team.

To overcome the critical shortage for technicians, the practice usually is to employ trained engineers. But even this makeshift arrangement has been unsuccessful because while the country has a quantitative oversupply of engineers, most of them are of weak quality and are lacking in theoretical knowledge, laboratory training and practical experience. The question has been raised as to whether these engineers would even qualify as technicians.

Based on the commission study of industry demands for technicians and skilled workers, a total of 2,333 industrial technicians in various areas of expertise will be required for 1971, 1972 and 1973 by the respondent firm. Only around 75% of the 116 respondent firms were able to provide their estimates because of lack of clear-cut company expansion plans, uncertainty of economic policies and some other difficulties. The 2,333 figure is, therefore, the indicated total needs of firms that were able to provide estimates.

The reasons cited for the demand for technicians are: for full capacity utilization, operation of modern equipment, expansion and others. The need for technicians was foreseen in the following areas: production and maintenance, auto-electric field, sheet metal, instrument mechanics, textile quality control, foundry, hydraulic operations, industrial management, glass manufacture, electronic metallurgy, blast furnace, soaking pit operations, platemaking for offset press and engine rebuilding. The breakdown of the required number and type of technicians for the next three years is shown in table 4.

Since the less than 116 firms that responded to the industrial survey indicated that they will require 2,333 technicians within the next three years, it is logical that more than this number will be required by the economy. The survey result may be taken as minimum because one still has to take into account the needs of manufacturing and industrial establishments not included in the survey and of establishments that will come into existence within the next three years. In 1962, it may be

mentioned, the Bureau of the Census and Statistics (*Annual Survey of Manufacturer*: 1962) reported that there were 8,469 selected manufacturing establishments employing five or more workers in metropolitan Manila and suburbs. In 1970, the number of manufacturing establishments could well have increased to the 10,000 level and beyond.

To emphasize the extent and size of the sample and survey coverage, the 116 participating industrial firms in 1970 indicated that they had a total of 95,498 employees, distributed as follows:

	Number	Percentage Distribution
a. Management and Staff	9,258	9.69
b. Sales	9,532	9.98
c. Production	76,708	80.33
TOTAL	95,498	100.00

The 76,708 production workers were further distributed as follows:

	Number	Percentage Distribution
a. Scientists	166	.22
b. Engineers	2,831	3.69
c. Technicians	5,404	7.04
d. Skilled Workers	33,040	43.07
e. Nonskilled Workers	35,267	45.98
TOTAL	76,708	100.00

The 116 firms represent twenty-five broad industry classification, utilizing Philippine Standard Industry Classification (PSIC). These range from metal to non-metal mining, food and beverages, tobacco products, textiles, footwear, wood products and furniture, paper, rubber, chemicals and petroleum, basic to fabricated metals, machinery to transport equipment, utilities and transportation, wholesale and retail marketing and personal and professional services.

For the next three years, an estimated 20,937 employees will be required by the 116 firms which responded to the survey. The total is the aggregate of the

figures given for their estimated requirements. The required number of employees for the next three years is distributed as follows:

	1971	1972	1973	TOTAL	Total % Distribution
a. Management/Staff	285	344	264	893	4.27
b. Sales	190	156	171	517	2.47
c. Production	7,120	5,769	6,638	19,527	93.26
TOTAL	7,595	6,269	7,073	20,937	100.00

Asked if they are currently employing foreign technicians and in what areas of expertise, the participating companies indicated that they have a total of 107 foreign technicians. Many companies have resorted to employing imported technicians due to lack of qualified local technical manpower in many areas, and also due to some technical factors, such as the unfamiliarity of local technicians with many pieces of modern equipment and processes. The areas of expertise of these technicians are: paper mill installation, welding works, machinery erection, flour milling, computer application, glass manufacturing, quality control, selling machinery, demonstration of new products, medical technology and high-powered compressor works.

The lack of technicians is further confirmed by the *Human Resources and Manpower Development Special Group* of the commission. In a case-to-case survey of major companies, five of such firms confessed to experiencing difficulties in finding technicians.[8] These companies also foresee manpower shortages for technicians in the next five years. One company (the *Philippine Long Distance Telephone Company*), emphasizing the need for technicians, observed that several big companies are trying to outbid each other in the recruitment of graduates from the Philippine College of Arts and Trades (PCAT). These graduates are even offered jobs six months before they finish training. The PLDT foresees critical skill shortages for micro-wave engineers, electricians, radio technicians and automotive mechanics. The *Atlantic Gulf and Pacific Company of Manila, Inc.* has skill short-

[8]The five companies are: Atlantic Gulf and Pacific Company of Manila, Inc. (a pioneer contractor in the heavy construction industry, specializing in the fabrication of structural steel, foundry and machine shop products, air-conditioners, treated lumber, marine services and heavy machinery); Ysmael Steel Manufacturing Co. (produces large quantities of electric motors and sets, air-conditioners and sewing machines, component parts needed in other industries); Rustan Manufacturing and Rustan Pulp and Paper Mills, Inc., (engaged in the manufacture and sale of pulp and paper products, i.e., multiwall paper boards, corrugated cartons, labels and other packaging materials); Philippine Air Lines, Inc. (largest airline company in the country operating both domestic and international flights); and Philippine Long Distance Telephone Company (PLDT).

ages for core makers, moulders and patternmakers. *Philippine Air Lines* anticipates the need for more radio technicians, radio operators, radio mechanics and sheet metal workers.

Again utilizing the findings of the commission's *Manpower Group*, in terms of institutional preferences for vocational and technical graduates, three schools have been prominently mentioned as follows: the PCAT, Don Bosco Technical Institute (DBTI) and Mapua Institute of Technology for engineers and technologists. It is interesting to note that these three institutions are by far the best equipped and staffed to provide vocational and technical training programs.

Questioned about their job qualifications and requirements for different levels and positions in their organization, and for vocational and technical skills, the firms mentioned the following as desirable: experience, general educational background, vocational training and age (maturity). Experience and good vocational training were considered as crucial factors in considering an applicant for a technical position. Age qualification was placed at more than twenty years but below thirty-five.

Going back to the purposive sampling survey of companies, aside from the 116 industrial firms mentioned earlier, twenty-five agricultural and twenty fishery firms also responded and made known their manpower requirements.

Data on demands for agricultural skilled workers were obtained from the agricultural sector, but no figures were obtained for technician requirements. For the fishery firms, the probable technician requirements for the next three years appear in table 5.

Approximately 78.57% of the respondent firm from the fishery sector indicated that unfilled vacancies exist in the skill areas enumerated in table 5. Many of the firms were unable to produce at full capacity because of these vacancies.

NEED FOR SKILLED WORKERS

The 116 industrial firms covered by sample survey revealed that they would require 17,474 skilled workers within the next three years (1971, 1972, 1973). Not all of the firms were able to provide their estimates for reasons stated previously. The total cited corresponds only to the estimates of some of the firms that responded to this question. For the breakdown of the estimated requirements for skilled workers, see table 6.

The respondent firms listed the following areas of skills in which they are currently in need of craftsmen: mechanical, electrical, welding, layout (steel plates), pattern-making (foundry), automotive metal finishing and painting, loom weaving, spinning and other textile works, glass mould-forming, tool and dye making, sheet-

metal works, patterns and varnishing, refrigeration, airconditioning, metal fabrication, auto-building, artists, shipfitting, pipefitting, platemaking, furnace operation and construction.

It is to be assumed, once more, that the total requirement of 17,474 skilled workers is minimum, considering that the survey covered only a very small portion of the total industrial sector. Not accounted for are probably requirements of firms which may be established within the next three years. Available data are insufficient for such statistical estimation of total requirements and nothing really useful can be inferred from such aggregative estimates, considering the dynamic nature of the economy. The most that could be done, therefore, was to pinpoint critical skill shortages in certain skill areas and manpower requirements in certain occupations.

Utilizing again the data of the *Manpower Group*, several types of skilled workers were shown to be in critical supply. The *Manila Times Publishing Co.* noted skill shortages for rotogravure men and printing mechanics. In the heavy construction industry, Atlantic Gulf and Pacific indicated manpower and skill shortages for core makers, moulders and pattern-makers. The company also foresees the following skills to become critical within the next five years:

1. cable splicers
2. carpenters
3. chippers
4. cupola tenders
5. divers
6. electricians
7. erectors
8. fitters
9. gas-cutters
10. layoutmen
11. machinists
12. masons
13. mechanics
14. bench mechanics
15. painters
16. pipefitters
17. punchers
18. riggers
19. sandblasters
20. refrigeration servicemen
21. steelmen
22. template makers
23. tinsmiths
24. welders
25. various machine operators, such as:
    a. compressor operators
    b. crane operators
    c. forklift operators
    d. punch and shear operators

Ysmael Steel Manufacturing Co. is currently experiencing difficulty in finding skilled workers to fill positions along the line of production, such as foundrymen, pattern-makers, tool and dye setters, casting operators, machinists, plumber-masons, tinsmith-welders and spray painters. *Engineering Equipment, Inc.* has difficulty finding moulders, pattern-makers and mechanics. Within the next five years, it foresees that steel workers will be in short supply. The PAL reported shortages of radio operators, radio mechanics and sheet metal workers. Other companies did not indicate the specific skill areas where they are currently finding difficulties.

Majority of the respondents to the *Manpower Group* study listed high-school education as the minimum educational qualification required for most vocational and technical positions at the skilled workers category. For the lower and simpler skill classifications, elementary schooling was listed as enough educational qualification. Firms were requested to rank in the order of preference job qualifications deemed important in considering applicants for skilled positions. Experience appeared as the most crucial factor taken into account. Vocational training and age qualification were also considered important. Age limit imposed was from twenty-one to thirty years old.

Again, in terms of institutional preferences for skilled workers, graduates of the PCAT and also of the DBTI were prominently mentioned.

Mr. Bernardo M. Reyes,[9] in a study of the types of skilled and other workers usually needed by the mining industry, noted that the first five types of workers usually in demand are: mechanics, electricians, welders, miners and machinists.

An expanded listing appears on table 7.

The adequacy or inadequacy of labor supply was found to be relative among the mining companies. Readiness of labor supply is influenced by such factors as location of the company, wage rates and fringe benefits granted to employees and the status of working conditions. Generally, however, the mining companies had no adequate labor supply of certain types of workers due to the demands of other industries in Manila and neighboring areas. The degree of scarcity can be seen in table 8.

The Reyes study shows the following occupation as having a favorable employment trend:

1. mechanics
2. welders
3. machinists
4. painters
5. mechanic painters
6. carpenters
7. construction capataz
8. truck drivers
9. miners
10. mill men
11. crushing plant operators
12. diamond drill operators and laborers

On the other hand, employment in the following occupations showed an unfavorable trend:

1. Bulldozer and payloader operators
2. Forklift operators
3. Trackmen

[9]Bernardo M. Reyes, "Manpower and Skilled Occupation of the Mining Industry and Their Implication to Trade-Technical Education," (unpublished Master's thesis, Philippine College of Arts and Trades, 1969).

4. Mill capatazes
5. Button weighers or scale men
6. Geological mappers
7. Diamond drill foremen
8. Loader heads
9. Log turners
10. Winch men
11. Power plant oil men

The shortage of skilled manpower finds an even more interesting dimension in a study conducted by Medardo P. Santos of the personnel requirements of industries in two municipalities in Rizal province – Pasig and Marikina.[10] The highlights follow:

1. The study covered 692 establishments whose products include food and beverages, paper and plastic products, footwear, metal and machinery, rubber and leather products, paints and chemicals, wood and coal products, transport and equipment, building and electrical construction, ceramics and marble products, glass and electronic products and cigars and cigarettes.

2. The services rendered by the respondent industries are as follows: repair of electrical motors and precision instruments, welding, painting, upholstery work, electrical installation and repair, battery repair and servicing, repair of radio-television and other electrical appliances, repair of motor vehicles, rewinding of motors and transformers, printing and bookbinding, construction and repair of roads, bridges and other public works projects, beauty and barber shop services, furniture and household repair, restaurant and food catering, operation and maintenance of communication sets and apparatuses, interior decoration and advertising, engine reconditioning, power line maintenance and repair, waterworks and sewerage maintenance and repair, refrigeration and air-conditioning maintenance and repair.

3. Seven industrial establishments were found not working at full capacity for lack of skilled manpower. These firms represent shoe manufacturing, textile and other fiber manufacturing, tiles, metals, automotive services, garment manufacturing, and government public work. The skilled manpower shown to be in critical supply by the industrial establishments as of 1 July 1969 were:

[10] Medardo P. Santos, "Skilled Manpower of the Industries In Two Selected Municipalities of the Province of Rizal and Their Implications To Trade – Technical Education," (Graduate School, Philippine College of Arts and Trades, Manila: November 1969).

1. *In shoe manufacturing*

   a. shoe upper makers
   b. shoe finishers
   c. last repairers
   d. shoe designers
   e. clickers
   f. machine-operator-maintenance

2. *In textiles and other fiber manufacturing*

   a. machine operators
   b. drawing frame fixers
   c. knitters (full fashion)
   d. weavers
   e. weave room mechanics
   f. master dyers

3. *In tile manufacturing*

   a. machine operators
   b. tile designers
   c. ceramics technicians

4. *In metal manufacturing*

   a. pattern-makers
   b. metallurgists
   c. machine operators
   d. machinists

5. *In automotive service*

   a. car painters
   b. automotive diesel mechanics
   c. gas station auto service mechanics
   d. automotive electricians

6. *In wearing apparel manufacturing*

   a. dressmakers
   b. tailors
   c. seamstresses
   d. master cutters

7. *In public works activities*

   a. carpenters
   b. machinists
   c. masons
   d. blacksmiths
   e. heavy equipment operators
   f. welders

4. A total of 87 occupations with 11,717 employed manpower were identified and assessed in the light of their employment trends, covering the period from 1965 to 1969, inclusive. In almost all occupations, the number of employed skilled manpower continued to increase during the period of assessment. The list of these trades and occupations is attached as exhibit A to this part of the report.

5. A total of 169 establishments, or 24% of those covered expressed their desire to expand operations, provided favorable government incentives and business climate would be available. In case these companies expand operations, the following occupational opportunities are expected to be generated: shoemaker, shoe machine operator, ceramics technician, quality control technician for metal, tool and die, metallurgist, car painter, plastic technician, heavy equipment operator, electrotyper, typesetting machine operator, linotype machine operator, compositor, lithographic pressman, air condition technician, carpenter, mason, welder, dressmaker, tailor, glass worker, electrician, interior decorator, advertising artist, textile weaver, knitter, weaving loom mechanic and heavy equipment maintenance mechanic.

6. Job qualifications required are secondary trade education for most occupations, but where expensive equipment and processes are involved, college technical education is required. Age and height qualifications are also emphasized.

There is yet another area where the PCSPE found evidence of an increasing demand for skilled workers. The area is in agricultural production and covers such facets as poultry, swine, dairy cattle, beef cattle and sugar cane. The manpower requirements indicated were actually projections for the years 1971, 1972 and 1973. Between the 24 respondent agricultural firms, some 3,347 skilled workers would be needed within the 3-year period. The breakdown is shown in table 9. At the time of the survey, 26.1% of the firms indicated that unfilled vacancies existed in the following skill areas: stock farm foreman, pregnant nursing cow management, fattening, hatchery, immunization and disease control, insemination, milking and processing.

MEETING THE NEED FOR FILIPINO TECHNICIANS AND SKILLED WORKERS

Much of what has been said so far serves to carve in relief the current shortage in, and future requirements for, skilled workers and technicians. The question now is, can the requirements be met and, if so, how?

The companies covered by the commission survey offer the following suggestions to resolve the problem:

1. Industry-government cooperative training programs; and
2. Upgrading of technical schools, to be undertaken by the government.

The majority of the firms appear willing to aid the government in making skilled workers available. Asked in what way, the companies suggest:

1. Offering on-the-job training;

2. Offering apprenticeship programs;

3. Allowing field trips to company plants;

4. Offering in-service training to teachers;

5. Participating in program assessment and formulation

6. Encouraging company exchange of technicians and technical informations.

While the cooperative attitude of industries is well worth exploring, and chances are that it could result in greatly improved skills training, the more vital avenue for reform is the school system. Industry, judging from survey interviews, is quite aware that the country's vocational and technical schools can not produce graduates who are at once directly suited to specific job requirements, but it does believe the schools can provide them with "trainable" manpower. By "trainable" is meant the graduate who can adjust to a job with a minimum of reorientation or retraining. As of today, many company executives believe the schools have not quite fulfilled their role of producing trainables, and, this fact is costing the business establishments a bit of money in retraining programs.

It seems appropriate, in view of all this, that the Department of Education has of late been supporting a move to establish model technical institutes, the upgrading of schools of arts and trades and the organization of more and better regional manpower training centers in cooperation with the National Manpower and Youth Council.

The specific purpose of the proposed technical institute is to provide additional facilities for the training of qualified technicians and vocational/technical teachers needed to meet the critical requirements of existing and developing industries for technical manpower and also of the school system for better-trained and industrially experienced vocational and technical teachers.

The manpower training centers, on the other hand, would provide facilities for: a) accelerated training of unemployed adults and out-of-school youth to prepare them through courses of short duration for employment in industrial establishments; and b) upgrading of existing workers, in the form of modular training, i.e., with self-contained training units of short duration – each leading to a definite and employable specialized qualification. These centers should also be open to technicians for further training.

If the Department of Education can succeed in these projects, it would be the initial step toward the employment of more Filipinos in technical jobs, and will, moreover, mean that our industries can utilize their full capacity – and help the economy to break the chain of sluggish, uncertain growth.

TABLE I
EMPLOYMENT BY MAJOR INDUSTRY GROUP
(IN THOUSANDS)

Industry Group	1960	1961	1962	1963	1965	1966	1967
Total	8,539	9,095	9,603	9,764	10,101	10,936	10,867
a. Agriculture, forestry, hunting and fishing	5,524	5,514	5,898	5,779	5,725	6,290	6,330
b. Mining and quarrying	29	31	40	29	24	26	45
c. Construction	231	230	236	271	295	283	276
d. Manufacturing	1,036	1,026	1,052	1,139	1,101	1,229	1,223
e. Electricity, gas, heat, water and sanitary services	20	19	30	22	22	37	30
f. Commerce	753	873	911	1,026	1,114	1,126	1,078
g. Transport, storage and communications	271	278	286	318	339	384	375
h. Government communication, business and recreational services	424	538	568	582	708	788	769
i. Domestic services	321	368	377	354	500	502	502
j. Personal services other than domestic	184	179	178	228	227	242	229
k. Industry not reported	46	39	28	16	47	30	10

Source: *Bureau of the Census and Statistics Survey of Households Bulletin*, S. Nos. 8, 10, 13, 16, 19, 21 and 24.

TABLE 2
SECTORAL DISTRIBUTION OF EMPLOYMENT
BY MAJOR INDUSTRY GROUP: 1960 AND 1969*
(IN THOUSANDS, EXCEPT PERCENTAGE)

Industry Group	Employment Distribution		Per Cent Distribution	
	1960	1969	1960	1969
Philippines	8,539	11,229	100	100
Agriculture, forestry, fishing and hunting	5,524	6,329	61.2	56.4
Mining and quarrying	29	50	0.3	0.4
Manufacturing	1,036	1,292	12.1	11.5
Electricity, gas, water and sanitary services	20	29	0.2	0.3
Construction	29	351	2.7	3.1
Commerce	753	1,105	8.8	9.8
Transport, storage and communication	271	381	3.2	3.4
Government, community, business and recreational services	424	886	5	7.9
Domestic services	321	519	3.8	4.6
Personal services other than domestic	184	144	2.2	2.2
Industry not reported	46	50	0.5	0.4

*Figures for 1960 are final; those for 1969 are preliminary and subject to change.

Source: *Bureau of the Census and Statistics Survey of Households Bulletin*, S. No. 8 and *Bureau of the Census and Statistics Special Release No. 104*, February 1970, p. 1.

TABLE 3
DISTRIBUTION OF EMPLOYMENT
BY MAJOR OCCUPATIONAL GROUP: 1960-69
(IN THOUSANDS)

Occupation Group	Employment Distribution		Per Cent Distribution	
	1960	1969	1960	1969
Philippines	8,539	11,229	100	100
Professional, technical and related workers	239	447	2.8	4
Administrative, executive and managerial workers	324	121	3.8	1.1
Clerical workers	211	334	2.5	3
Sales workers	446	1,003	5.2	9.2
Farmers, farm laborers, fishermen, hunters, loggers and related workers	5,211	6,297	61	56.1
Miners, quarrymen and related workers	22	40	0.3	0.4
Workers in transport and communication occupations	189	366	2.2	3.3
Craftsmen, production-process workers and related workers	1,132	1,407	13.3	12.5
Manual workers and laborers	163	247	1.9	2.2
Service, sports and related workers	560	912	6.6	8.1
Occupation not reported	43	26	0.5	0.2

Source: *Bureau of the Census and Statistics Survey of Households Bulletin*, S. No. 8 and *Bureau of the Census and Statistics Special Release No. 104*, February 1970, p. 3.

TABLE 4
TECHNICIANS REQUIRED FOR 1971-73

Area	1971	1972	1973	Total	Per Cent Distribution
1. Metallurgy	30	38	33	101	4.33
2. Electronics	41	30	48	119	5.10
3. Chemical	76	94	113	288	12.13
4. Mechanical engineering	166	180	208	554	23.74
5. Production engineering	44	43	52	139	5.96
6. Civil engineering	34	38	57	129	5.53
7. Electrical engineering	70	54	64	188	8.06
8. Mining engineering	191	18	19	228	9.77
9. Others	60	245	287	592	25.38
TOTAL	712	740	881	2,333	100.00

Note: Other areas of expertise include quality control, footwear, instrumentation, i.e., latheman, machinist, flour milling technicians, agricultural technicians, offset printing.

TABLE 5
FISHERY TECHNICIAN REQUIREMENTS
(FOR 1971-73)

	1971	1972	1973	Total	Per Cent Distribution
A. Fish capture marine fisheries					
1. Fishery technologist	7	7	10	24	0.83
2. Fishing gear technologist	6	6	6	18	0.63
3. Master fisherman	44	39	44	127	4.41
4. Fishing overseer	14	9	10	33	1.15
5. Fisherman	714	832	861	2,407	83.58
6. Net maker	73	73	88	234	8.13
7. Fishery aide	3	5	6	14	0.49
8. Minor sea products collector	10	7	6	23	0.80
TOTAL	871	978	1,031	2,880	100.00%

	1971	1972	1973	Total	Per Cent Distribution
Fish culture inland fisheries					
1. Fishery technologist	7	2	2	11	3.43
2. Oyster farm manager	-	-	-	-	-
3. Pearl oyster farm manager	-	-	-	-	-
4. Shrimp farm manager	7	3	3	13	4.05
5. Salt bed manager	3	4	5	12	3.74
6. Fishpond consultant-contractor	15	3	3	21	6.54
7. Fish hatchery technician	18	1	1	20	6.23
8. Fishpond caretaker	54	28	31	113	35.20
9. Oyster farm caretaker	-	-	-	-	-
0. Pearl oyster farm caretaker	-	-	-	-	-
1. Shrimp farm caretaker	26	4	4	34	10.59
2. Salt bed caretaker	4	2	2	8	2.49
3. Fish hatchery caretaker	20	4	5	29	9.03
4. Fish fry collector	39	10	11	60	18.69
TOTAL	193	61	67	321	100.00%
Fish preservation/fishery technology					
1. Fishery technologist	4	1	3	8	6.02
2. Fishery by-products utilization manager	2	-	2	4	3.01
3. Processing plant operation supervisor	2	2	3	7	5.26
4. Fish-processing machines operator	4	8	4	16	12.03
5. Fish packers	20	-	8	28	21.05.
6. Fish-processing plant workers	12	10	29	50	37.59
7. Fishery by-products utilization worker	4	5	11	20	15.04
TOTAL	48	26	59	133	100.00%

TABLE 6
REQUIREMENT FOR SKILLED WORKERS BY AREA OF EXPERTISE
(1971-73)

Trades	1971	1972	1973	Total	Per Cent Distribution
1. Metal	866	1,557	2,145	4,568	26.14
2. Mechanical	795	1,272	2,081	4,148	23.74
3. Electrical	828	1,319	700	2,847	16.29
4. Building	574	1,210	1,737	3,521	20.15
5. Others	702	872	816	2,390	13.68
TOTAL	3,765	6,230	7,479	17,474	100.00

Note: Other areas of trade listed are: textiles, chemical, shipfitters, furnace operation, shoemaking and riggers.

TABLE 7
TYPES OF WORKERS USUALLY IN DEMAND BY MINING COMPANIES

Type of Worker	Number of Companies Indicating Demand. N = 8	Per Cent	Rank
Auto/diesel mechanics	6	75	1
Electricians	5	65	3
Welders	5	65	3
Miners	5	65	3
Machinists	3	37.5	5
Carpenters	2	25	6.5
Drivers (truck)	2	25	6.5
Foundrymen	1	12.5	10.5
Batterymen	1	12.5	10.5
Draftsmen	1	12.5	10.5
Diamond drill operators	1	12.5	10.5
Steno-typist	1	12.5	10.5

Source: Reyes, op. cit., Table XIII.

TABLE 8
OCCUPATIONS/JOBS WITH SCARCE LABOR SUPPLY
(AS INDICATED BY COMPANIES)

Occupation/Job	Number of Companies Indicating Scarcity of Labor Supply	
	Number, N = 8	Per Cent
Chief mechanic	7	87.50
Welders	7	87.50
Drivers (truck) (7 tons plus)	6	75
Draftsmen (geological, mechanical)	5	62.50
Surveyors, transitmen	5	62.50
Machinists/lathemen	5	62.50
Master carpenter	5	62.50
Drivers, truck (7 tons)	5	62.50
Power plant operator	5	62.50
Mechanics (heavy equipment, auto)	5	62.50
Plumber, pipe fitters	5	62.50
Electricians	5	62.50
Mine foremen	5	62.50
Motor rewinders	4	50
Mason	4	50
Diamond drill *capataz*	4	50
Diamond drill mechanic	4	50
Bulldozer/payloader operator	3[a]	60
Foundrymen	2[b]	100

[a] Three of the five companies employing bulldozer operators indicated scarcity of such occupational worker.

[b] The two companies with foundry shops indicated scarcity of foundry men.

Source: Reyes, ibid., Table XVII-A.

TABLE 9
PROBABLE REQUIREMENTS OF TWENTY-FOUR AGRICULTURAL FIRMS FOR SKILLED WORKERS

	1971	1972	1973	Total	Per Cent Distribution
A. Poultry					
1. Hatchery management	16	17	22	55	16.32
2. Broiler production	19	25	16	60	17.80
3. Egg production	47	39	43	129	38.28
4. Others*	31	30	32	93	27.60
TOTAL	113	111	113	337	100.00
B. Swine					
1. Artificial insemination	10	11	14	35	6.76
2. Pregnant-nursing sow mgt.	43	55	62	160	30.89
3. Weaning management	21	30	42	93	17.95
4. Fattening	32	45	58	135	26.06
5. Others	24	31	40	95	18.34
TOTAL	130	172	216	518	100.00
C. Dairy Cattle					
1. Artificial insemination	2	4	4	10	6.41
2. Calf management	13	13	13	39	25.00
3. Dairy cow management	11	17	22	50	32.05
4. Milk and milk-processing	12	17	22	51	32.69
5. Others	2	2	2	6	3.85
TOTAL	40	53	63	156	100.00
D. Beef Cattle					
1. Artificial insemination	2	10	4	16	9.14
2. Steer management	27	29	21	77	44.00
3. Calf management	24	15	26	65	37.14
4. Others	7	8	2	17	9.71
TOTAL	60	62	53	175	100.00
E. Sugar Cane					
1. Soil testing	84	69	78	231	10.69
2. Weed control	37	45	60	142	6.57
3. Irrigation	18	54	64	136	6.29
4. Processing	483	500	515	1,498	69.32
5. Others**	46	37	71	154	7.13
TOTAL	668	705	788	2,161	100.00

*The category includes: poultry processing, dressing plant, feedmill and heavy breed breeders.

**The category represented shipping of by-products.