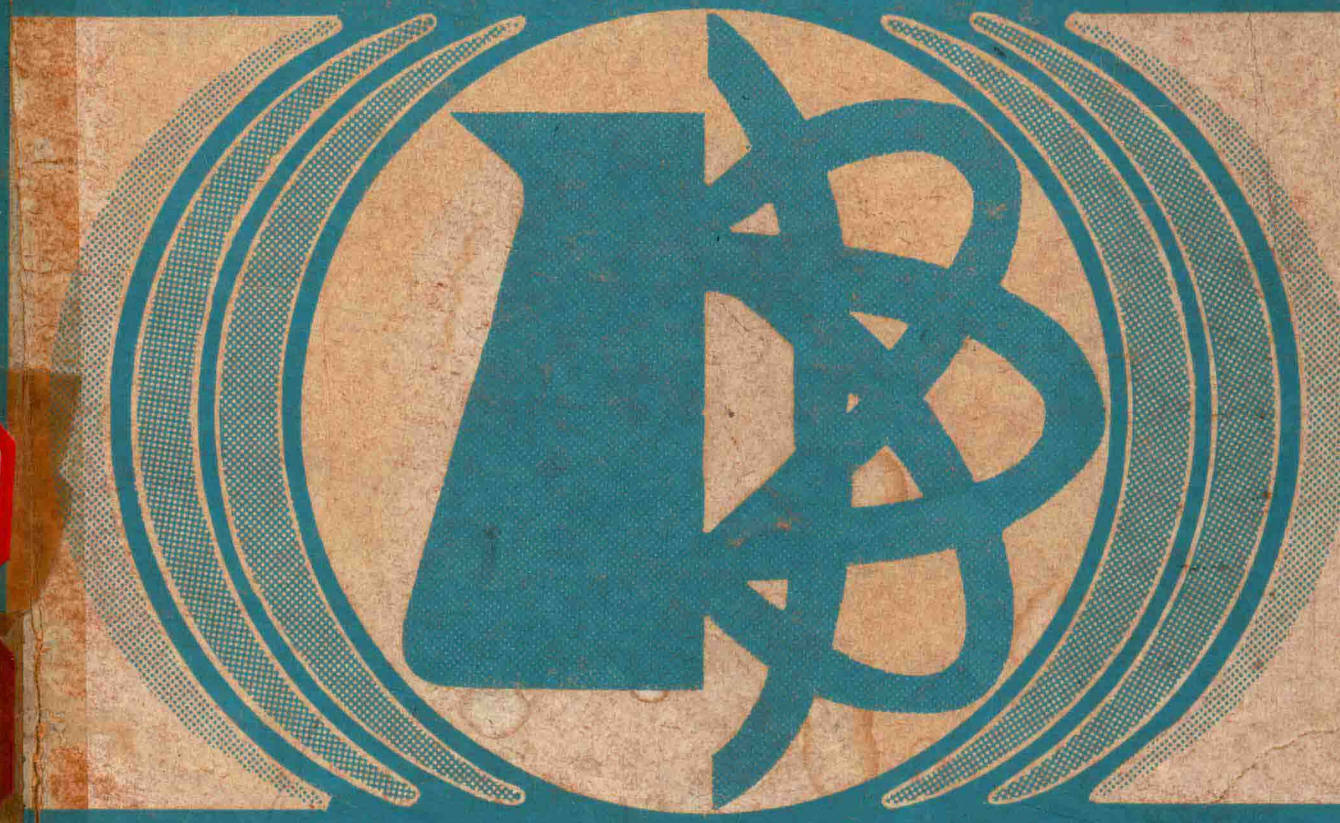
THE SURVIVAL OF HUMANKIN
THE PHILIPPINE EXPERIMENT

Technology and Science Transfer



TECHNOLOGY RESOURCE CENTER

The "Conference on the Survival of Humankind: The Philippine Experiment" was a call for scientists from all over the world to work together in harnessing modern technology for development purposes. The ultimate objective of the scientific gathering was the preservation and protection of the balance and quality of life.

Mrs. Imelda Romualdez Marcos, who was the moving spirit behind this Conference, aptly described the rationale of the Conference, when she remarked:

> *"Man deserves a fate better than mere life on this planet. Man has a right to honor, beauty, and happiness. Too long has the true meaning of life gone with paradise lost. Today, we can hope for paradise regained."*

Thus from September 6-10, 1976, scientists and decision-makers searched for solutions to the pressing problems of the Philippines in the areas of energy, education, environmental protection, food, health and nutrition, housing, natural disaster, planning management, population control and distribution, and technology and science transfer. New ideas, new techniques, and new approaches to man's relationship with nature were evolved, discussed, analyzed and recommended to improve the quality of human life.

The Technology Resource Center, which was set up as a result of the Conference, has undertaken the publication of this volume and ten others on the various themes of the conference. This volume on TECHNOLOGY AND SCIENCE TRANSFER AND UTILIZATION contains the papers read by Filipino and foreign scientists, a reaction paper, and the final report and recommendations prepared by the Theme Committee. The topics include an analysis of the state of technology transfer in developing countries, the choice of appropriate technology

for development, the relationships between the transfer of technology and restrictive business practices, and the role of industry in the transfer of technology. This volume also includes general and specific recommendations.

For this volume the Technology Resource Center gratefully acknowledges the following: the papers read by Dr. Pedro G. Afable, Victor A. Lim, George McRobie and Armand V. Fabella; the reaction paper read by Minister Arturo Tanco, Jr.; and the recommendations prepared by the Theme Committee.

The publication of this volume would not have been possible without the encouragement and active support of Dr. Jose Conrado Benitez, Director General of the Technology Resource Center, and Ms. Carmen Guerrero Nakpil, Secretary General of the Permanent Committee.

TABLE OF CONTENTS

TECHNOLOGY AND SCIENCE TRANSFER/UTILIZATION

BY PEDRO G. AFABLE

SITUATION ANALYSIS

The rate and direction of technological progress is strongly dependent upon the amount and allocation of resources devoted to Research and Development (R & D). Unfortunately, the third world countries, among them the Philippines, own only one percent of world patents and this corresponds closely to their share of world R & D expenditures. Therefore, they have to resort to technology and science transfer mostly through importation from developed countries.

There are many elements affecting the effective assimilation and utilization of imported technology in the Philippine setting. Some of these are: (1) the extent of scientific and technological R & D, (2) regulatory policies and machinery on imported technology,and (3) the coordinative framework and industrial development in both the public and private sectors including information exchange.

The transfer of science and technology under the local situation from laboratory to the end user (consumer and industrial entrepreneur) poses quite different problems from those related to the transfer of technology through importation. While problems of the first type do exist in the Philippines, they are probably not as important as those of the second type. With the present thrust of the Administration of President Ferdinand E. Marcos towards development of small and medium-scale industries through the cooperation of various agencies, local transfer of technology will be accelerated and concommitant problems may be readily resolved. Also, if by "science" we mean humankind's organized attempt

此为试读,需要完整PDF请访问: www.ertongbook.com

to comprehend how things work as causal systems, and by "technology" we mean a set of scientifically based systematic processes used to achieve a given result, then the problem of science transfer appears to be a minor one.

For purposes of this discussion, science and technology transfer will be limited to foreign technology transfer. The type or nature of foreign technology needed by a developing country depends upon its program of development and its economic goals. To be more specific, the choice depends upon the priority industries, incentives policy and the financial requirements. As generally recognized, imported technology has adverse effects on a country's foreign exchange resources and balance of payments position, specially if such transfers contained restrictive clauses on exports and on dissemination of the technology involved.

The various ways of transferring technology are now common knowledge. For information purposes, however, the mechanisms identified by UNIDO and OECD will be briefly discussed.. There are at least nine (9) ways of transferring technology categorized into *market-oriented* and *non-market oriented* mechanisms. Market-oriented mechanisms include joint ventureships, international subcontractings, licensing agreements on patents and trademarks, management agreement and equipment supply. The non-market oriented mechanisms are technical assistance and training, research and development, technical information services, professional catalyzers for inter-enterprises cooperation. The market-oriented mechanisms, arising from the presence of a lucrative market, are usually availed of by the private sector. The second group of mechanisms is usually geared towards the manpower development requirements or support for the market-oriented mechanisms.

Imported technology in this discussion will be limited to that acquired under the market-oriented mechanisms, for this technology embraces the knowledge, experience and skills

needed to manufacture a product or products and to establish an industry. On the other hand, technology acquired from technical assistance and training, research and development, technical information services, etc., does not produce substantial impact on the industrialization process. At best, such technology widens the base of technological manpower and the scope of technological information that are supportive of the industrial development program.

The more common means of acquiring imported technology in the Philippines is by joint venture, licensing agreement on patents and trademarks, and supply of equipment. As in other countries that are basically in a free enterprise economy, technology transfer in the Philippines is largely a part of private investment decisions. Technology transfer under foreign investment of multi-national corporations is confined to priority (pioneering) industries to which local capitalists and entrepreneurs would not venture; hence, the technology under this means could be exclusive and would not be of particular concern to local manufacturers.

In general, the acquisition of technology in the Philippines under the market-oriented mechanisms is subject to scrutiny and approval by the Central Bank (CB) and the Board of Investments (BOI). Under the Invest Incentives Act and the Export Incentive Act, the BOI is directly concerned with technology licensing agreements for projects under the investment priorities plan. It also exercises persuasive powers in the revision of the terms of agreement before approval on such projects is given. However, if these agreements involve remittance of foreign exchange, the CB invariably has the final approval. Under present practice, therefore, the CB has more comprehensive powers on projects under the said incentives acts.

Technology acquisition in the Philippines by whatever mechanism, as in other developing countries, is duly covered

by a licensing agreement, approved by BOI/CB, between the licensor from a developed country and the licensee in the Philippines, usually from the private sector. "Licensing agreement" in this context includes the licensing agreements on patents and trademarks mentioned earlier. Technology acquisition or transfer is usually a part of foreign investment proposal with a provision for foreign exchange remittance. Technology transfer, therefore, is treated largely as an investment proposal with all its technical aspects and imported inputs and hardly examined for local adaptation.

It must be noted, however, that present institutional arrangements for processing such licensing agreements do not provide for appropriate linkages with the science agency and other entities concerned with technological development. As a consequence, most of the established industries in the country, whether public or private, are utilizing imported technology. Only a very minimal number of enterprises have developed their own technology or adapted imported technology to suit local resources.

PROBLEM AND FUTURE IMPLICATIONS

As earlier indicated, transfer of technology does not only involve the know-how but also the trademark and trade name. The Investment Incentives Act extends protection to investors in registered enterprises insofar as patents and other proprietary rights are concerned. Under this agreement, the entrepreneurs become too dependent on the licensor.

The utilization of imported technology may be determined from the lists of licensing agreements approved by the BOI and CB. Most of this information is confidential in nature. The subjects of these licensing agreements and the products and services covered include consumer and industrial goods, luxury and non-luxury items, pharmaceutical and food products.

An examination of these licensing agreements shows some restrictive clauses imposed by the licensor. In general, such clauses curtail the initiative of the licensee to be innovative, particularly in such cases which provide that discoveries and improvements made by the licensee shall belong to the licensor. Other restrictive clauses are non-disclosure of information for an indefinite period of time, free grant to and use by licensor of licensee's improvements; exportation upon prior approval by licensor; non-use of technology and technical information upon termination of agreement; export prohibition, and many others.

It is surprising to note that some of the licensing agreements cover subjects and processes that could be supplied by research agencies in the country, such as the preservation of fish and the manufacture of shoes, plastic toys,and inks. A number of licenses examined also reveal that certain aspects of the process could be supplied by the scientific community, thereby not only reducing the royalty paid to the licensor but also promoting self-reliance through the development of indigenous technology.

PROPOSED SOLUTIONS

From the data of the Board of Investments and the Central Bank, the utilization of imported technology is quite extensive and wide spread. However, the assimilation of imported technology has not been encouraged. This is made more so by the employment and retention of foreign technical men and professionals. Thus the licensee depends a great deal on the licensor in his operation. The local technical men working with the company are not given a chance to understand fully the technology applied, nor given the challenge to think and introduce improvements that would adapt the technology to the local situation. Furthermore, they are only made as skilled operators of the imported machinery and equipment.

Local technical men and the scientific community should be given a chance to understand the imported technology and make adaptations that would eventually lead to the assimilation of the technology in the country. During the initial stages of the scrutiny and review of licensing agreement, science and technology institutions should be involved in evaluating the intended technology to be transferred and/or imported in order to insure a desirable mix of local and foreign technology. This arrangement will give a better bargaining power to the licensee, and at the same time hasten development of local technical capability will be developed. This practice is being done in India and South Korea, where there scientists and technologists are made to review, digest, and evaluate the technology to be licensed.

Unless science institutions are involved in the importation of technology by the Central Bank and the BOI, the assimilation of imported technology would be a very slow process. Technological development of the country would be greatly retarded, thereby perpetuating the present situation where the country's industrialization depends largely on foreign technology, foreign experts, and foreign-processed materials. To partly remedy this situation, the provisions of the Investment Incentives Act on the employment of foreign nationals and on the training of "Filipinos in administrative, supervisory and technical skills" should be implemented to the fullest extent. In this way, imported technology could be assimilated into the local development processes, the technological manpower base to support industrialization could be broadened, and technological development to provide the capability and techniques for an expanding industrial program could be promoted and enhanced.

CONCLUSIONS AND RECOMMENDATIONS

From the foregoing discussion, the following conclusions may be drawn:

1. The utilization and/or assimilation of imported tech-

nology in the country's development process has not been effective so far. This is primarily due to the lack of a policy and regulatory framework or mechanism for the transfer and development of technology. In this scheme, the science agencies, principally the NSDB, could play an important part.

2. Restrictive clauses of the licensing agreements as to export and to local dissemination of the technology should be eliminated so as not to hamper industrial and technological growth and to avoid payment for the same technology over and over again.
3. There is at present no established mechanism for actual adaptation of imported technology. This matter should be studied as part of the industrialization program side by side with policies on foreign investments, patents and trademarks, technology transfer and development, and R & D program.

In summary, there seems to be a need to review and amend the Investment Incentives and Export Incentives Acts and other pertinent laws and policies to update their provisions in order that technology licensing or importation can be made a more effective tool of industrialization. A specific proposal along this line is the establishment of institutional arrangements on mechanisms for the transfer and development of technology with effective linkages between industrial production and regulatory systems (CB, BOI, Department of Industry, etc.) on one hand, and the scientific and technological systems (the NSDB and its agencies, private R & D organizations, engineering consultancy services and technical training institutes, etc.) on the other.

Technology, whether imported or indigenous, will play a major role in the survival of mankind in the years to come. It is essential that such technology, to be meaningful and pervasive, be directed towards the optimum utilization of the country's available resources, both manpower and natural, of

此为试读,需要完整PDF请访问: www.ertongbook.com

which the Philippines is richly endowed.

Mr. Pedro Afable is the Vice-Chairman and Executive Director of the National Science and Development Board, Philippines.

THE ROLE OF INDUSTRY IN TECHNOLOGY TRANSFER

BY VICTOR A. LIM

INTRODUCTION: THE DILEMMA

The theme of our seminar "Survival of Mankind - the Philippine Experiment", particularly the discussion on the "Role of Industry in Technology Transfer", pushes a dilemma facing industry into public discussion. This forum is an appropriate vehicle into which we can transfer this debate from the restricted board rooms of our industrial producers and the closed circuit of our mangement conferences.

Briefly stated, the horns of this dilemma are the urgent need to employ our escalating human flow entering the labor force every year, on the one hand, and the peripathetic and irresistible march of the machine age and its technological explosion, on the other.

This is the dilemma continuing to face Philippine industry today, a dilemma which seems to be constricted by equally unsatisfactory alternatives, and predicating dire consequences into extensive linkages with related economic and social issues.

THE CASE FOR EMPLOYMENT

In the past three or four years, the United Nations and the Philippine leaderships have focused on the fertility rate of the Filipino nation, the highest among nations more than 5 million in population. Initial success appears to have controlled growth from 3.3% per year to a reported 2.7% and has given substance to an ambitious 2.0% by the end of the decade..

But the teenagers who will assume the burdens of breadwinners within the decade and into the next have been born.

They are even now learning a trade, and in the process also learning about the evolving world around them, with rising expectations. They will soon be thrown into the competitive mill, not only to bid against the current unemployed and underemployed, but sometimes tragically to replace some of the aging but still productive workers.

Consider the statistics: - out of a population of 44 million, approximately 15 million are in the labor force. Of this workers reserve, approximately one million are unemployed and perhaps another half million underemployed. In the meantime, 300 to 350 thousand newcomers swell these ranks every year as they graduate from schools or reach working age.

This is the community problem that industrial traders have worried over for the past ten years and which continues to influence the decisions of all responsible managers. These discussions and consultations, attenuated by the New Society, produced a consensus, tentatively reached early, strengthened over the years and more recently closely re-examined and reviewed.

The consensus is to choose employment over machine efficiency. A premium has been placed on labor-intensive processes over capital-intensive systems. Make-or-buy decisions are biased towards local manufacture.

Let us pause for a moment, if we may, and retrace this interesting, and for industrialists, frustrating proposition.

The manufacturer is faced with the variable nature of labor costs. The rise in the cost of living is compounded by the improving standards of modern living. Hefty wage demands have manifested these developments specially when worldwide inflation infiltrated local prices through the fuel crisis and escalating bills for importations.

Industry must also contend with social and labor-union variables: it must contribute to the community of its workers

through social projects; it must maintain industrial peace within its internal organization through the tedious negotiation and involved implementation of collective bargaining agreements.

And as more workers are added to the production process, more supervisors become necessary, a virtual invitation to wasteful multiplication of management channels and levels.

Industry is continuously under pressure: individual companies must keep costs of operations down to stay competitive in the market. Squeezed between sluggish prices and accelerated costs, he is slowly being pushed towards more efficiency: in practical terms, towards more machine efficiency through imported technology.

In contrast, machines once purchased and installed can be depended upon to produce goods in the specified quality and in the programmed volume with very little variance in unit cost. Under a proper maintenance system, they will last indefinitely and can continue to improve in output as accumulated experience and engineering ingenuity enhance the basic capability of the machine. With the few exceptions of merchandise for fashion and for precision, attainable only through manual dexterity, machines can produce more than manual labor, with more predictable costs.

On the other hand, the large capital outlays for machines call for the fixed costs of giant companies, and the concomitant inflexibility of elevated break-even points and inflexible carrying charges. Mechanical devices have further proven to be major targets of inflation, such as the energy crisis and the multiplying cost of spare parts.

After careful evaluation, the industrialist is confronted with growing advantages of capital-intensive operations over labor-oriented manufacture. He is faced with the imperative demands of competitive efficiency and economy

while responding to his social and national responsibilities towards employment.

THE EXPORT FACTOR

In the field of international trade, however, the discussion becomes academic. It is practically impossible to compete without a minimum amount of mechanization. Philippine producers meet their more industrialized competitors in the international market place where efficiency is the name of the game.

We must meet acceptable international quality standards and deliver the ordered quantities within relatively short time spans. These conditions are dictated not only by our more developed competitors but by the capabilities of the importing country itself. Trade statistics clearly show that our manufactures are exported principally to the United States, Japan and Australia, all of which have sophisticated domestic capacities.

The Philippine producer for the domestic market finds a major dilemma when he looks at his export potential. Given the commitment to export, he now has to maintain the delicate balance of keeping up with the latest advances in technology crucial to exports while keeping faith with his own obligations towards a rapidly growing population. The export drive makes this dichotomy sharper and more unpleasant.

THE LOCAL SCENE

As industry looks within its own house for some solutions, it finds that the Philippines has lagged behind in developing its own tools for industrial survival. It must participate in the technological explosion but finds that this participation can be achieved only by importing technology. It must move to higher levels of efficiency, and unceasingly pursue a program of cost reduction apparently possible only through

additional mechanization and imported software in the form of experts and consultants.

Executive Director Pedro G. Afable in his opening paper recommends a more systematic approach to the problem through industrial research and application, monitored by an information system that can mobilize existing capabilities. By utilizing the National Science Development Board as a coordination center, the gap between researchers and operators can be bridged and perhaps give impetus and support to projects within the priority imperatives. By pooling resources, we could reduce the dependence on off-shore technology.

As industrialists, we are not sufficiently familiar with the research potentials available or accessible to the NSDB, to comment on this proposal. Rather we are concerned with developing viable solutions to immediate problems and taking action through our decision trees of feasible alternatives within the parameters of the present dilemma. We could rather contribute to this effort our experience in grappling with the problem origins and describe some simple piece-meal solutions, leaving the whole complex problem to the policy makers.

A two-fold strategy has sustained our progress.

The first strategy is the adaptation of foreign developments to local use.

There seems to be a popular impression originating from the start of our industrial history that spectacular progress can be achieved only through technology transfer of complete systems. This is of course for such systems as the satellite communications system, petro-chemical refineries and some ecology equipment. But in the run-of-the-mill factories which form the backbone of the industrial community, such massive transfers of technology are not really necessary.

此为试读,需要完整PDF请访问: www.ertongbook.com