TECHNOLOGY AND SMALL INDUSTRY DEVELOPMENT
- SOME PREMISES

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Paper presented at the ILO Tripartite Symposium on Choice of Technology and Employment Generation in Asia (with particular reference to manufacturing industries), Bangkok, 18-27 June 1979

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SYNOPSIS

The problem of unemployment is one of the major problems in most of the developing world today. Industry has not been able to provide sufficient employment primarily because developing countries have often adopted too uncritically the models and the technology of the developed.

The level of needs and wants of developing countries are vast and varied and their problems and needs should necessarily be suited to individual country environments and conditions. Third World countries have to develop the capacity for *self-reliance* in making their *own* decisions on matters related to their *own* development, particularly in the choice of technology. More assistance, however, is advocated from the developed world - in the form which should be more attuned to the real *needs* and *wants* of developing countries.

The development of labour-intensive small industries can provide a partial solution to the problem of employment generation. The vital role that can be played by the small industry sector in developing economies is emphasized by the enumeration of some of the important benefits they provide.

The criteria for the choice of technology do not necessarily complement one another and may even run counter to the objectives of the individual enterprise. Adapting the *proper mix* of abundant labour and scarce capital is not an easy task, but not an impossible one. This is necessary if small industries are to survive in foreign markets.

All sectors of the economy have a major role to play in promoting the type of technology that is consistent with national development goals. This can partly be achieved also through Incentive Schemes provided by governments and the provision of industrial extension services.

The experience of TECHNONET ASIA in *cooperation* and in the sharing of technology is related as an example of what can be achieved by developing countries in concerted action. It also gives an insight to the type of assistance that the industrialized world could provide with optimum effectivity.

The implications of the TECHNONET ASIA experience, together with some other conclusions and recommendations, are offered for consideration by the different sectors (represented in the Symposium). But the time for action must be *now*.

INTRODUCTION

"Tell the world that the unemployed are in real want. I have nothing to eat, no house, and no clothes. This life is punishment to me." [1]

- An unemployed worker

In the present decade, ending next year, it is estimated that nearly 300 million additional people will have joined the world's labour force, an increase almost equal to the entire present population of Latin America. Approximately 60 per cent of the increase will have occurred in Asia.[2] The problem of unemployment is almost everywhere in the Third World. Even developed economies such as those of the United States, Canada and Japan have been recently experiencing the unemployment problem. But it is more acute and critical in the developing countries. The great majority of the people in these countries live in the countrysides where life for vast numbers is a question of bare survival. Many migrate to cities and towns in search of jobs, a better life, but there is not enough work for all of them. Many, in fact, would have been better off staying in their small farms where their daily needs could somehow be met.

Industrialization has been thought of as a vehicle to employment and eventual prosperity. Unfortunately, many industries exist purely for economic reasons without regard to their social being. Developing

countries have often adopted too uncritically the models and the technology of the developed. The result: modern, labour-saving techniques when in many cases the same work could have been done just as well, and most probably cheaper, with less machinery and more labour. The Third World now recognizes that complete dependence on foreign technology is not a suitable approach. This does not mean that all capital-intensive technologies are inappropriate in the developing countries. In many instances, there may be no feasible alternative to sophisticated technologies developed in the industrialized countries. But these generally apply to larger enterprises.

The Third World is not a homogeneous block of countries in much the same way that the First or Second World are not either. The political and social systems differ to a considerable degree. The level of needs and wants of developing countries are vast and varied even if there are some similar elements. Their problems and the solutions should necessarily be country specific suited to individual country environments and conditions. However, one message comes out loud and clear - their aspiration for "self-reliance". This means developing the capability to make their *own* decisions on matters related to their *own* development. For one, the choice of technology must be made by the developing countries themselves and some of its elements must be generated from within.

To develop a self-reliant approach, the developing countries must have the political will, the necessary policies, strategies, and systems.

The *knowledge* must be acquired and developed, new institutions are necessary or existing ones re-oriented. This is not to say that the assistance of the developed countries is not welcome. Far from it. In fact, much more is required from the developed world in response to the real *needs* and *wants* of developing countries. But the types and forms of assistance should not be dictated by donor countries.

EMPLOYMENT MAXIMIZATION THROUGH SMALL INDUSTRY DEVELOPMENT

The creation of more employment opportunities is a major aim of development policy in almost all countries, but specially in Third World countries where there is a surplus of labour and scarcity of capital. Men and women looking for work in all parts of the world is an urgent problem that must find solution *today*. With scarce capital, employment must be maximized.

Many developing countries, with rapidly growing population and inadequate capital resources, have to rely heavily on small industries which use capital-saving technologies to increase gainful employment and thereby improve standards of living and working conditions for the masses. Without proper programming and selectivity in the use of technology, the development of small industries *per se* will not provide a solution to the problem of employment generation. These small industries must be capable of producing comparable substitutes for imports and goods that could compete in export markets. In the latter case, they must meet the quality standards of international trade.

Even in the most industrialized countries, small industries have played a key role in their development. In the United States, for example, more than 90 per cent of the manufacturing establishments employed fewer than 100 workers in 1958. These establishments employed 27 per cent of the entire industrial labour force and their output represented 22 per cent of the total in terms of value added. In Japan, 98 per cent of the manufacturing establishments had fewer than 100 workers

in 1959, and they employed 56 per cent of the labour force of the entire manufacturing industry with an output representing 34 per cent of the total industrial output.[3]

A much more vital role can be played by the small industry sector in developing economies. Among the many important benefits of small industries are:[4]

1. *Utilization of Resources*

Small industries permit the tapping of resources which otherwise would remain idle, including entrepreneurship, capital, labour and raw materials. It may be emphasized further that small factories are more capable than large plants of taking advantage of unskilled or semi-skilled labour, including traditional skills.

2. *Lower Capital/Labour Ratio*

Many small industries are adaptable to employing more labour-intensive methods of production, thereby absorbing a significant number of the labour surplus. Empirical evidence has shown that labour-intensive techniques can be used side by side with highly-mechanized processes without sacrificing efficiency. Small industries, therefore, encourage *self-reliance* which is an important pre-requisite to economic independence.

3. *Foreign Exchange Generation or Savings*

A long range of consumer and simple producer goods now being imported can be economically produced locally by small industries. Eventually, many of the goods produced by these industries can find foreign markets because of their comparative advantages.

4. *Diversification of the Industrial Structure*

Small industries contribute significantly to the strengthening of the industrial structure. They can be linked with large enterprises in complementary relationships, e.g. sub-contractors. Many parts and components of products manufactured by large enterprises can be done more economically by small industries.

5. *Entrepreneurship Development*

Small industries serve developing countries not only by their output of goods but also by functioning as a nursery of entrepreneurial and managerial talent. As a general rule, neither government nor foreign investors are interested in owning and operating small establishments. Therefore, to promote small industries is to promote domestic private enterprise. In effect, a new class of indigeneous industrialists are created which are necessary to counter the strong influence of interlocking giant corporations.

6. *Foiling Monopolies*

As mentioned, the proliferation of efficient small industries will counteract undue concentration of power in the hands of monopolies and will result in lower prices and better services to customers.

7. *Regional Development and Industrial Dispersal*

Because of their ability to survive on smaller community markets, small industries lead to the creation of employment opportunities on a dispersed basis, including smaller towns and far-flung regions. They, therefore, make it possible to reverse the trend of migration of people from rural to urban areas which is a disturbing phenomenon in most developing countries.

8. *Counter-cyclical Factor Against Inflation and Recession*

The economic crises that are recently being experienced by many developed and developing countries has convinced economic planners that small industries are in a better position to weather such crises of inflation and recession rather than large industries. They are more flexible in their operations and can survive on smaller production runs and can more easily shift from one product to another. Further, small industries generally do not consume as much energy, per unit of output, as large industries and are therefore less affected by energy costs and shortages.

In spite of the important benefits cited of small industries, it is important to recognize that their promotion and development is not an alternative to the promotion of large enterprises. Rather, a strong and productive industrial structure should be set up in which small (including medium) and large enterprises not only co-exist, but function together in close complementary relationship.

THE PROBLEM OF TECHNOLOGY AND TECHNOLOGICAL CHOICE IN SMALL INDUSTRIES

The first concern of developing countries in promoting the establishment of small industries is the provision of funds from financing sources. But as these industries flourish, many problems surface that are traceable to technical and technological aspects. Small industries are often ineffective because of excessive costs, particularly through wastage or improper use of raw materials, or because their products are of low quality brought about by poor methods of production.

Generally, small industries do not have the technical manpower capable of solving their technological problems. They have no ready access to sources of technological information, both local or foreign. Even if such information are available to them, it may not be in a comprehensible or appropriate form.

For small industries with more sophistication and the necessary "expertise", the problem becomes one of choosing the *appropriate* technology or the adaptation of technology to their specific situations. Further, national development policies should be considered alongside the goals of the individual enterprise. It is not uncommon to find that such goals do not always complement one another. Hence, the problem of choice arises.

Basic Assumptions. Three relevant basic assumptions can be made for developing countries:

1. That there exists a vast pool of unskilled and unemployed cheap labour;
2. That such relatively poorer countries have limited foreign exchange resources;
3. That there are basic indigeneous cottage industries in existence which can serve as an initial industrial base for future development.

Criteria for Choice.[5] At the national level, the criteria for selecting the "appropriate" technology can be summarized as follows:

1. Maximization of net national output and income;
2. Maximization of availability of consumption goods;
3. Maximization of rate of economic growth;
4. Reduction of unemployment;
5. Regional development;
6. Reduction of balance of payments deficit;
7. Greater equity in income distribution;
8. Promotion of political development and national political goals;
9. Improvement in "quality of life".

These criteria may not necessarily complement or reinforce one another. Worst still, some of these may even run counter to the objectives of the individual enterprise, aggravating the problem of choice of the "appropriate" technology.

To alleviate their balance-of-payment deficits, developing countries should eventually promote export-oriented small industries. The need for efficiency and quality to survive in foreign markets tends to point towards capital-intensive rather than labour-intensive technologies. But the comparative advantage of developing countries is mainly its "cheap" labour. Herein lies the dilemma - of adapting the technology which employs the proper mix of abundant labour and scarce capital. This is not an easy task, but not an impossible one.

Governments can play an important role in promoting the type of technology that is consistent with their development goals. This can partly be achieved through Incentive Schemes. For example, the Philippine Government allows registered enterprises a reduced income tax for the first five years by allowing the deduction from their taxable income an amount equivalent to the sum of the *direct labour cost* and local raw materials utilized in the manufacture of completely finished export products. (The deduction is up to 25 per cent of its total export revenue). Further, an additional deduction from taxable income of one half of the value of *labour training expenses* incurred for upgrading the productivity and efficiency of unskilled labour is allowed. (The deduction is up to 10 per cent of direct labour wage).[6]

Small industries do not often recognize their technological problems. They have to turn to specialized institutions in their countries, particularly those providing industrial extension services. These institutions, in turn, are often limited in their capabilities - in terms of quality and quantity - to serve the many small industries

in their country, specially those in the countryside. This means they have to depend heavily on foreign technical assistance. Hopefully, the type of assistance must be appropriate.

Small industries are also faced with both extremes in their choice of technologies. On one end, it can be very limited because of their limited exposure on access. On the other end, it can be a very wide range of choices since there are a host of technological processes that can be freely available from other countries. The process calls for some degree of adaptation and innovation on the part of the recipient small industries. This process is sometimes much more difficult than developing a "brand new" technology of their own.

To overcome their problems and meet national and enterprise objectives, small industries need technological advice. Quite often, the advice needed is at a very basic level - it is not a question of providing advanced technology, but of having an experienced engineer or technician look at a plant and make suggestions that will improve the processes or the products. Unfortunately, many of these small industries cannot afford to pay for these services in their infancy stage. Hence, these industrial extension services must be made freely available or at least heavily subsidized by government.

Industrial extension services in Asia vary according to the level of development of each country and the types of organizations set up to provide these services. There is, however, a clearly expressed recognition of the need for providing technological advice on equipment, methods and processes, production techniques and quality control, and a determination

to work towards a situation in which the industrial extension services will have the personnel and resources to provide this advice to production managers on the factory floor.

Because of the wide differences between countries in language, cultural background, types of industry and levels of industrial development, it is clear that the industrial extension services must be staffed by indigeneous engineers or technicians, and be complementary to the fields of management, marketing and financing which are equally important. Extension services should be organized nationally or perhaps even by province and city.

No service organized for a region as a whole could be expected to provide satisfactory service to individual factories. But a regional service could provide resources on which various national extension services could draw; a regional service could also provide a focus that would facilitate cooperation and exchanges between national extension services and help link them into a functional network. This was the basic premise upon which TECHNONET ASIA was conceived.

TECHNONET ASIA: AN EXPERIMENT IN COOPERATION AND IN THE SHARING OF TECHNOLOGY

In 1973, the International Development Research Centre (IDRC) of Canada agreed to support a major project named TECHNONET ASIA.[7] It brought together eight organizations in six Asian countries - later expanded to eleven organizations in nine Asian countries - into a *network* for industrial technology information and extension services. IDRC itself is a unique institution in the developed world which has become a model for other similar institutions that have been set up in donor countries. It stimulates and supports projects *in, by and for* the benefit of developing countries. IDRC support is directed at improving the well-being of people in less-developed countries by adapting and applying science and technology to their needs.

The organizations participating in the TECHNONET ASIA network had two common aspects:

(a) they were all involved in rendering assistance to small- and medium-sized industries in their respective countries; and

(b) they were all involved in technical aspects of industrialization.

The countries and organizations involved are the following:

BANGLADESH	Bangladesh Small and Cottage Industries Corporation (BSCIC)
HONG KONG	The Hong Kong Productivity Centre (HKPC)
INDONESIA	Department of Industry (DP)
KOREA	Korea Scientific and Technological Information Center (KORSTIC)
MALAYSIA	Standards and Industrial Research Institute of Malaysia (SIRIM)
	Council of Trust for Indigeneous People (MARA)
PHILIPPINES	Institute for Small-Scale Industries, University of the Philippines (UP ISSI)
	Economic Development Foundation, Inc (EDF)
SINGAPORE	Singapore Institute of Standards and Industrial Research (SISIR)
SRI LANKA	Industrial Development Board of Sri Lanka (IDB)
THAILAND	Department of Industrial Promotion, Ministry of Industry (DIP)

Applications for membership to TECHNONET ASIA have since been received from organizations in other Asian countries and are now under consideration.

In brief, TECHNONET ASIA is a cooperative grouping of eleven Participating Organizations in nine Asian countries, which aims at improving the quality and efficiency of production in those countries' small- and medium-sized industries through the transfer of technological information and the provision of industrial extension services. The Project has been looked upon as an experiment in cooperation.

The Centre, located in Singapore, has been set up to act as the focal point for the network. It is headed by an Administrator selected from one of the Participating Organizations. The heads of the Participating Organizations, together with the Administrator, comprise a Council which meets at least once a year and concerns itself with policy aspects. Two technical committees created by the Council - one on Information and one on Training - also meet regularly to plan in more detail some major activities of TECHNONET.

The Centre is fully supported by IDRC, with a funding allocation for a total of seven years - phase one for 3½ years (1973 - 1976) and phase two for another 3½ years (1977 - 1980). The total amount of funds spent on TECHNONET operational activities by IDRC and the Participating Organizations is approximately US$1 million annually. This is considered a relatively modest amount in comparison with what would be necessary to undertake similar activities without the benefit of a network. (The above figure does not include the amount now allocated by Participating Organizations to national industrial information and extension services and entrepreneurship development activities which is approximately US$10 million annually).

While the Project is a voluntary 'cooperative' one in the sense that - while IDRC provides financial support - the national Participating Organizations will, on a mutually acceptable basis arrange to:

- make available to one another industrial technical information on products and processes in their country that is readily obtainable;

- receive personnel from other Participating Organizations for observation, training and discussion - as appropriate;
- make available its technical personnel for short-term assignments to other Participating Organizations;
- arrange visits of industrialists from TECHNONET ASIA countries to local industries, organizations and institutions;

and individually:

- develop effective coordination and liaison with local institutions concerned with the development of small (and medium scale) industry, as well as with local sources of technical information and expertise - to facilitate such development and to assist other Participating Organizations in their development efforts.

The technology gap. There can be no doubt that all types of assistance programs are important and should be provided for the development and growth of small industries. And there are evident signs that most of these programs are successful and have contributed to the industrial progress of developing countries in Asia. However, much has yet to be done in providing the appropriate technology for small industries to enable them to survive the competition from large and modern enterprises and those from overseas. Understandably, the field of technology is often neglected because of inherent difficulties in providing this type of assistance and the lack of technically trained manpower in the public sector.

There exists a 'technological gap' not only between urban and rural industries, but also between large and small industries. Similarly, there is a greater technological gap between industries in developed nations and those in the developing countries. To overcome these problems, small industries need technological information and a 'delivery system' that will effectively bridge this gap. This delivery system will, to a large extent, have to rely on *people* who can provide technological advice right there on the factory floor.

There is nothing new to the TECHNONET concept. It has been discussed before. Proposals have been made for technology data banks, new systems for the international referral of technological enquiries, reforms to the international patent system and, inevitably, new institutes where well-endowed researchers can develop theories about how it can all be made to happen.

Yet, while no one denies that the industrialized countries and the international agencies could be more effective in stimulating the diffusion of technology, at the same time there is a growing realization that the greater part of man's technological know-how is already freely available - and the biggest problem is that the developing countries are ill-equipped to find, evaluate and apply it. By strengthening the capabilities of its Participating Organizations, TECHNONET aims to facilitate the transfer of technology and its assimilation to small-scale industries.

What is really new - and can be of enormous benefit to other developing regions in the world - is that such a network can be workable. Developing

countries have much to share with each other; and the developed countries, through their technical assistance programs, can strengthen this capability. In fact, TECHNONET draws upon the technological resources of various cooperating organizations in developed countries for some of its activities.

For one, the National Research Council of Canada's Technical Information Service (NRC/TIS), with its thirty years of experience in serving the Canadian industry, and its international reputation, backs up TECHNONET's technical information needs when the information it has access to is pertinent to Asia. Similar arrangements have also been made with about 50 other centres of technical information.

Highlights of Phase One. In phase one, 1973 to 1976, the TECHNONET project produced results that have attracted considerable attention. The most important results are:

1. that it now has a strong network of organizations which share the common goal of developing industrial extension and information services for small- and medium-sized industries and that are helping each other in doing so. They make available to one another, industrial technical information on readily obtainable, products and processes in their own countries.

   Empirical evidence - as reported in cases that are being compiled - indicates that technical information obtained from countries with similar stages of development is far more useful and relevant than that imported from highly developed countries. Participating

Organizations also make technical personnel available to each other for short-term assignments. Visits of personnel from participating countries to local industries and institutions are also arranged. A quarterly TECHNONET *Digest* keeps Participating Organizations informed on the latest technological developments in countries within the network.

2. that it now has the nucleus of a group - some 1,200 practitioners - who see industrial extension as a valid professional activity. Over 15,000 extension cases involving factory visits are currently being handled each year. In addition, approximately 10,000 technical enquiries are being handled each year - either by correspondence, telephone or personal contact. Formal training programs, seminars and workshops have been undertaken for industrial extension and information officers to upgrade the capabilities of Participating Organizations.

   Observation, training and discussion visits - as appropriate - have been arranged within the network. In 1975, the Asian Industrial Extension Officers (ASINDEX) Forum, under the aegis of TECHNONET was born to give added impetus to this emerging profession. The quarterly TECHNONET Newsletter facilitates communication between extension and information officers. It also publishes industrial extension cases handled by Participating Organizations which could be of value to others.

3. that governments now increasingly accept the need for this type of service and allocate resources for its further development. As a result, since 1973, industrial extension and information services for small and medium industries have been given high priority in government development programs.

The developments, along these fields of activity, and the various programs that have been launched with satisfactory results are interesting cases in themselves. The activities now range from computerized technical information services - available in two Participating Organizations with the possibility of two others eventually being computerized - to industrial extension services on a provincial level in many of the Participating Organizations. In the process, networks on a national level have also been encouraged and developed.

While all the Participating Organizations have terms of reference that permit them to be active across the entire industrial sector, experience has shown that needs are greater in some types of industry than in others. To identify priority industries, a list of industries in order of their degree of need for technical information has been agreed upon:

1. Metals
2. Food Processing
3. Wood-based Industries
4. Plastics

5. Packaging
6. Electrical Applicances and Products
7. Agricultural Waste Utilization
8. Ceramics
9. Rubber Products
10. Footwear
11. Leather
12. Construction/Building Materials

State-of-the-Art Reviews (STARs) have been undertaken to pinpoint problem areas and the assistance needs of specific industry groups. These broad industry classifications are now being further refined in order to arrive at more specific areas of activity. A matrix of expertise and sources of information in Participating Organizations, centres of excellence in specific fields have been encouraged to minimize the wasteful duplication of efforts.

For example, the establishment of a Plastics Technology Information Unit (PTIU) within The Hong Kong Productivity Centre and the upgrading of the Foundry Workshop at the Industrial Development Board of Sri Lanka have been supported with the understanding that their expertise and facilities will be available to all the other Participating Organizations. IDRC has also supported in part the establishment of the Asian Packaging Information Centre (APIC) in Hong Kong, the International Ferrocement Information Center (IFIC) in Bangkok (at the Asian Institute of Technology), the Coconut Information Centre in Sri Lanka, and other specialized centres in various parts of the world.

All the other Participating Organizations of TECHNONET have likewise shared their facilities with the rest. The Institute for Small-Scale Industries of the University of the Philippines has made available to participating countries its modern low-cost automation and adaptive technology laboratories as well as its excellent training facilities. The Singapore Institute of Standards and Industrial Research has made available to all Participating Organizations its excellent Current Awareness Service (CAS) on technical information. Other Participating Organizations are now in the process of setting up centres for specific industry areas - not necessarily with the financial support of TECHNONET - but whose programs will be tied up with TECHNONET's long-range activities. The newly-created Furniture Industry Development Center of the Industrial Service Institute in Thailand is one such example.

Other international organizations have also cooperated with TECHNONET on some of its programs. A Special Technical Extension Workshop (STEW) on vegetable and fruit processing was held in Sri Lanka with the cooperation, among others, of the Tropical Products Institute (UK). A second STEW on the wood furniture industry received the support of the United Nations Industrial Development Organization (UNIDO). The Japan International Cooperation Agency (JICA) has provided funds for a major research on the metalworking industries initially involving four countries (Bangladesh, the Philippines, Sri Lanka, and Thailand).

The following are some examples of industrial problems successfully handled by extension officers trained by TECHNONET-sponsored courses which illustrate the type of work TECHNONET Participating Organizations are involved in:[8]

1. Mechanical Knives for Cutting Bamboo

The Malaysian Handicraft Board had a problem increasing the rate of splitting bamboo trunks, an essential raw material for local handicraft. A Malaysian, who was trained by TECHNONET, designed a mechanical knife with eight cutting blades. With this, the rate of production increased to at least four times what it had been before.

The same extension officer also designed a knife for use with the same machine to reduce the split pieces of bamboo to thin strips, as used in many hand-crafted items. The traditional method was to whittle each piece of bamboo to strips by hand with an ordinary knife. This was time-consuming and uneconomical because of a high rate of wasted material whittled away. With this knife, production rate leapt and was further matched with a dramatic increase in yield from raw material.

2. Glue Mixer

A glue manufacturer in Thailand wished to increase his production. Previously he had the appropriate mixture stirred in a drum with manual labour, which was seen as a very cumbersome and ineffective method. A TECHNONET-trained extension officer was able to contribute to designing and fabricating a simple mechanical mixer, at very low cost, which has now been put to use satisfactorily.

3. Nuts and Bolts

During an industrial visit made by an extension officer, he came upon a small company which could not market its production - nuts and bolts - because of sub-standard quality. He and his colleagues found a way to provide the firm with the necessary information concerning the required quality standard and helped to determine the correct raw materials and treatment to achieve the desired results. The manufacturer is now able to market his products and is looking to the extension officers of the Standards and Industrial Research Institute of Malaysia (SIRIM) for further assistance regarding selection and purchase of machine tools to further expand his business.

4. Woodcraft

A Filipino manufacturer of wood products such as trays and mugs faced two main problems. Firstly, a high percentage of finished products became warped and cracked. Secondly, a high percentage of raw materials had to be rejected because the firm could not effectively get rid of wood colour defects through staining.

With the help of extension officers trained by TECHNONET, the problems of warping and cracking were determined to have been caused by improper seasoning and drying. Subsequently, the firm was given detailed drawings of a new kiln combustion chamber and also sketches with which to modify and improve the drying chamber. Finally, the correct type of staining medium for acacia sapwood - which was causing a high rejection rate - was identified. All these have helped to alleviate the manufacturer's problems.

5. Gold Wire

A Singapore manufacturer of gold wire, for use in integrated circuits, had a problem of low yield caused by breakage. The wires were made of 99.9% pure gold, drawn to a diameter of 0.001 inch through a series of diamond dies using a soap-based lubricant.

Through TECHNONET Centre's Technical Enquiries Service, with backing from the National Research Council of Canada's Technical Information Service (NRC/TIS), the problems were determined to have been caused by work-hardening, impurities in the gold, and the soap-based lubricants used in the process. Information regarding proper stress-relieving methods and necessary filtration of the lubricant was furnished the manufacturer. This has helped in significantly reducing the losses caused by breakage.

6. Electroplating

Thai extension officers were requested to help solve an electroplating firm's problem - cracking and pitting of nickle-plated products. The extension officers visited the plant and subsequently discovered that the electroplating solution used was both off specification for pH and also contaminated. Starting with fresh solution and setting rigorous "standard procedures" to control strength and purity, and also establishing maintenance and cleanliness standards throughout the process area, not only solved the problem but also improved sales. Several other similar enterprises have since been assisted following this first successful extension activity.

7. Cast Iron Pipe Foundry

A Malaysian foundry made cast iron moulds for spun pipes by drilling a four-inch bore in solid cast iron rods one foot in diameter and ten feet long, using a heavy duty lathe and boring head. This resulted in heavy toolwear and eccentric bores.

With TECHNONET Centre's help, SIRIM's extension officers made investigations and later concluded that a "sand-core" - rather than a "solid-core" - casting technique would be more appropriate and would solve the problem. Since this had already been tried unsuccessfully by the foundry, the extension officers examined the results in detail and were able to determine that the sand-core composition, tried and failed, was wrong. By adding necessary ingredients such as pelleted pitch, wood flour, and applying compressed gas, the "sand-core" casting technique was successfully demonstrated and subsequently adopted by the foundry.

8. Lingerie

Owners of a Filipino lingerie factory wished to increase production efficiency which persistently remained at only half the rated capacity of the plant.

When extension officers first visited the factory, the disorderly work flow was particularly noticeable. Tracing the flow by section and by machine to determine the appropriate flow rate from one processing stage to the other, a more functional layout for the plant was drawn up. At the extension officers' recommendation, two supplementary machines to relieve the most serious bottlenecks were installed, and all within a week production efficiency increased to a satisfactory level.

Based on this success, the firm has since relied upon the extension officers to help them further with management problems, including cost and quality control, book-keeping, production planning and even personnel administration.

9. Car Parts

Two extension officers, while training in the Philippines, were assigned to investigate the possibility of increasing the productivity of a small firm's muffler manufacturing section. Through careful and methodical in-plant observations and interviews, the priority need was determined to be machine and method improvement, which could be expected to result in immediate and significant productivity increase.

Production bottlenecks in several operations were then identified and appropriate corrective measures were recommended. These were accompanied by several practical engineering design sketches for

modification of the most essential machines, and also descriptive details necessary for production method improvement. The recommendations - with expected improvements in cost, productivity and even product quality - were so convincing to the owner/manager that he implemented all measures promptly and has never looked back.

10. Foundry Works

An extension officer from Sri Lanka revisited a foundry after having attended a TECHNONET training course. His previous extension visits, before his training, had resulted in his determining that the factory needed a centre lathe and a bench drill. However, his latest visit, after the training, enabled him to better help the same non-ferrous foundry in many more ways. He particularly noticed that the furnace and burner, the most critical equipment to this type of industry, were both primitive and inefficient. Fuel combustion was incomplete and there was no temperature control. Production method and quality control were also problems which contributed to high production costs.

The Officer prepared sketches for a new furnace with a high efficiency burner. Strict procedures were also laid down to minimize deposits of impurities on castings. The factory manager was extremely pleased with the results, and especially with the great improvement to the extension service which has become available to him because of TECHNONET's training.

The above illustrative 'cases' and scores of others being handled daily by extension and information officers of TECHNONET ASIA's Participating Organizations could very well explain what TECHNONET is all about.

As mentioned before, much of the experiences gained from the experiment have been previously theorized. What is revealing, however, is the fact that TECHNONET ASIA is in the process of demonstrating that such concepts as *self-reliance* and *cooperation* are not mere slogans. They can be made to work. The investment of IDRC in the project is worth imitating throughout the developing world.

But much more has to be done in making technology accessible to small industries. The technological problems of small industries in the developing countries of Asia are vast and varied. In countries represented in TECHNONET ASIA alone, we are catering to an estimated 450,000 small industries. And we are possibly reaching only a small portion of these establishments. It is clear that everyone has a role to perform if we are to achieve the objectives we envision - industry and professional associations, technological R and D institutes, the educational system, and other public and private institutions devoted to technology. More important, the cooperation and active involvement of government policy makers and legislators is necessary to make all these happen. This should be underscored.

One of the major objectives of TECHNONET - always implicit in phase one (1973-1976), and now particularly stressed in phase two (1976-1980) - is the development of a self-reliant activity that will be able to continue into the future when IDRC funding tapers off or ceases. This objective has the strong endorsement of the Participating Organizations who have taken the necessary steps in this direction. During the last Council Meeting held in September 1978, it unanimously resolved that TECHNONET ASIA should continue and that it be transformed into a legal and official organization. The details are now being finalized by an Executive Steering Committee formed by Council.

In addition to the present sources of funds, the Canadian International Development Agency (CIDA) and other donors are expected to support the organization - with counterpart contribution from Participating

Organizations. These support to TECHNONET ASIA will be based on programs and activities which it considers relevant to its own needs as determined by its Council.

CHOICE OF TECHNOLOGY AND EMPLOYMENT MAXIMIZATION - SOME CONCLUSIONS AND RECOMMENDATIONS

The Implication of the TECHNONET ASIA Experiment

The experiment is by no means completed. The approaches and specific activities undertaken continue to be critically evaluated and improved upon. But even this early, some lessons may be gained from the results of the project which could be of immense value to international agencies involved in development assistance and funding and to policy makers:

1. that by effectively deploying a proportion of its *own* technological manpower for advisory work, a developing country can be technologically much more self-reliant than has hitherto been imagined;
2. that what is most needed is not fancy new systems, but an indigeneous capacity to apply well-known and readily available technology to overcome actual problems as they are encountered on the floors of the factories that are there today;
3. that the transfer of technological information can be effectively achieved if properly processed - in this case, by the industrial extension officer who acts as the link between the entrepreneur, who often is not capable of recognizing his problems and identifying his needs, and the sources of information, which can provide more relevant information when the request is more specific;
4. that developing countries have much to share with each other in terms of technological information, processes and expertise. What is needed is the stimulus to spur this cooperation and the interchange and even

bring to the surface this capability - the role of which can be properly undertaken by international assistance agencies;

5. that the so-called transfer of technology is *not* a one-way affair - from developed to developing countries. In some cases, as supported by actual experiences, developing countries have the capability to make this transfer a two-way affair.

Some Further Conclusions and Recommendations

1. Third World countries should develop a *self-reliant* approach in the solution of their problems. They should think out answers to their own problems and not rely totally on the help of the industrialized nations.
2. The use of the most plentiful endowments of developing countries - labour and raw materials - should be maximized. And this can partially be achieved through the promotion and development of labour-intensive small industries.
3. Incentives must be given for the application of technologies with the greatest labour intensity. Industries with maximum employment potentials should be identified and promoted.
4. "New" technologies should be developed in the Third World that are as efficient on a small-scale and labour-intensive as on a large-scale and capital-intensive - and shared among developing countries. Such technologies are unlikely to be developed by industrial countries, which do not need them.

Speaking as President of the International Labour Conference held in Geneva in 1975, the Philippines Minister of Labour Blas Ople said:

> *"In the face of forces rapidly homogenizing the world, it is crucial for developing states to keep intact their power of innovation. We lost this power when we abdicated our initiative to others in the belief that our problems and their solutions have been thought out for us by superior minds in other times and places."*

That statement is perhaps as relevant today as it was then.

REFERENCES

1. ILO, Fact Sheet No 1 (n.p., n.d.)

2. Ibid

3. UNIDO, Small Scale Industry in Latin America, (New York, 1969), Annex 2, p. 262

4. L V Chico, Employment Maximization Through Small-Scale Industry Development in the Philippines, (Manila, 1976), pp 36-45

5. R S Eckaus, Appropriate Technologies for Developing Countries, A Report submitted to the National Research Council, USA

6. Republic of the Philippines, Presidential Decree No 92, "Business Incentives and Reforms", 6 January 1976

7. L V Chico, "Sharing in Technological Development", International Development Review, Focus: Technical Cooperation, No 4, 1977, pp 7-10

8. P Chakkaphak, "Advice on the Factory Floor", Give Us the Tools - Science and Technology for Development (Ottawa, 1979), pp 154-157