

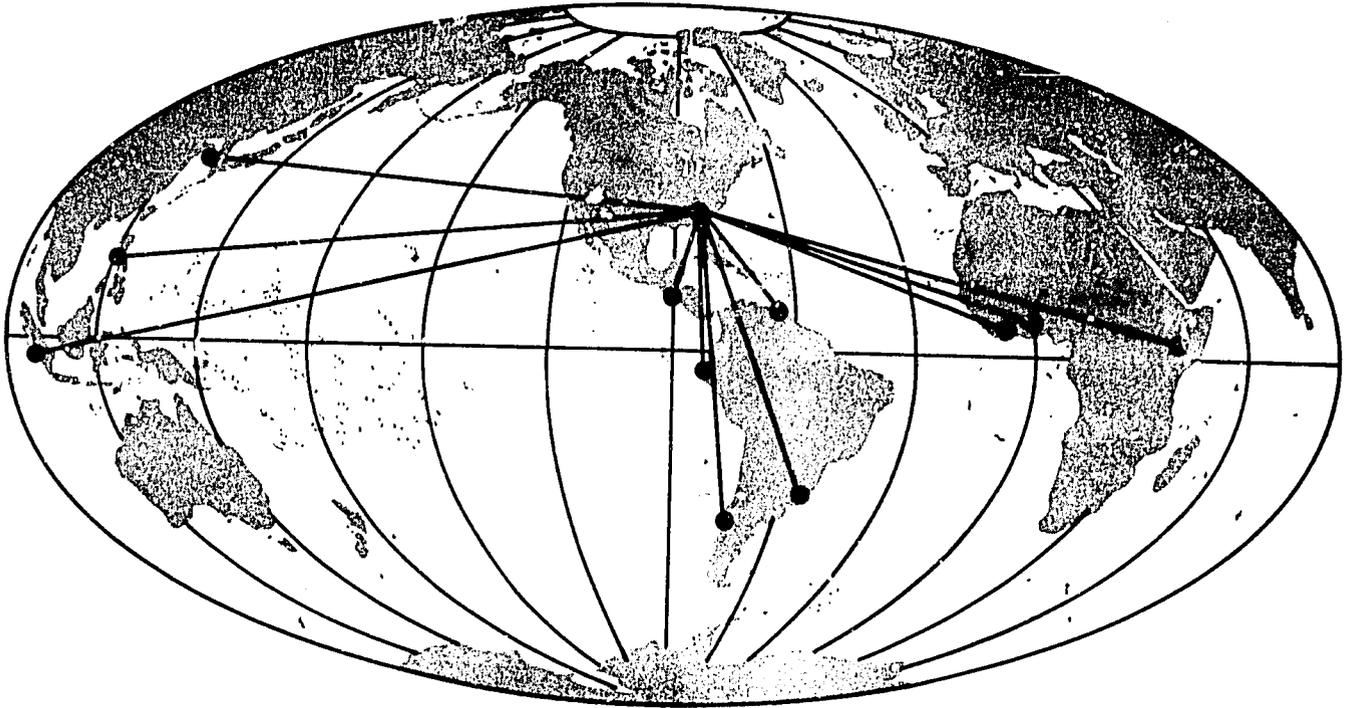
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EMPLOYMENT GENERATION THROUGH STIMULATION OF SMALL INDUSTRIES

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ANALYSIS OF SMALL INDUSTRY DEVELOPMENT METHODS AND TECHNIQUES

GEORGIA INSTITUTE OF TECHNOLOGY
ATLANTA, GEORGIA 30332
U.S.A.

ANALYSIS OF SMALL INDUSTRY DEVELOPMENT
METHODS AND TECHNIQUES

A Review of Selected Techniques
For Industrial Development

Prepared for
Agency for International Development

by

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February 1978

1

Table of Contents

	<u>Page</u>
Foreword	i
SMALL INDUSTRY DEVELOPMENT METHODS AND TECHNIQUES: INSTITUTIONAL APPROACHES	
Industrial Development Centers	1-1
General	1-2
Kenya Industrial Estates	1-2
Industrial Development Center of Ecuador	1-3
Institute for Small-Scale Industries, University of the Philippines	1-6
Industrial Development Centers in Nigeria	1-8 1-12
Productivity Centers	1-14
General	1-14
Europe	1-15
Asia	1-15
Latin America	1-17
Conclusions	1-18
Industrial Development Centers	1-18
Productivity Centers	1-20
* * *	
TECHNOLOGY TRANSFER SYSTEMS	2-1
The Nature of Technology Transfer Systems	2-1
Comparison of Environments for Technology Transfer	2-2
Existing Techniques of Technology Transfer	2-4
Indirect Transfer Techniques	2-4
Direct Transfer Techniques	2-6
Technology Transfer Techniques for the Future	2-8
Stumbling Blocks in Technology Transfer	2-9
Conclusion	2-10
<u>Figure</u>	
1. The Technology Transfer System	2-1
* * *	
INDUSTRIAL EXTENSION FIELD OFFICES	3-1
Introduction	3-1
Assistance Needs of Small Companies	3-1
Information	3-2
Analysis and Recommendations to Correct Problem Situations	3-3

	<u>Page</u>
INDUSTRIAL EXTENSION FIELD OFFICES (continued)	
Assistance Needs of Small Companies (continued)	
Special Skills and Know-how	3-5
Techno-economic Analysis	3-5
Education	3-5
Industrial Assistance -- Objectives and Concepts	3-6
The Agricultural Sector Model -- Cooperative Extension Service	3-9
1862 Morrill Act	3-9
1890 Morrill Act	3-9
1887 Hatch Act	3-9
1914 Smith-Lever Act	3-10
Industrial Extension Field Offices in the United States	3-13
Georgia Tech's Industrial Extension Service	3-15
Assistance to Local, Area, and State Economic Development Groups	3-15
Technical Assistance to Small Companies	3-18
Industrial Extension Field Offices in Developing Countries	3-24
The Philippines: Institute for Small-Scale Industries	3-24
The Philippines: Small Business Advisory Centers	3-30
Nigeria: Industrial Research and Development Unit, University of Ife	3-33
Indonesia: Development Technology Center, Institute of Technology Bandung	3-35
Summary and Conclusions	3-36
<u>Figures</u>	
1. The Role of an Adaptive Agent in Industrial Assistance	3-8
2. The Agricultural Extension Assistance Triad	3-11
3. Organization for Industrial Extension at Georgia Tech	3-16
4. Confidential Manufacturers Data Sheet Used by Georgia Tech Industrial Extension Service	3-21
5. Interview Card Used by Pilot Extension Office, UP/ISSI	3-27
6. Technical Assistance Activity Record Used by Pilot Extension Office, UP/ISSI	3-28
* * *	
FINANCIAL INCENTIVES FOR INDUSTRIAL DEVELOPMENT	4-1
The Economics of Financial Incentives	4-1
Specific Tax Incentives	4-3
Tax Holiday	4-3
Tariff Policy	4-5
Accelerated Depreciation	4-6
The Effectiveness of Tax Incentives	4-6

	<u>Page</u>
FINANCIAL INCENTIVES FOR INDUSTRIAL DEVELOPMENT (continued)	
Financial Incentive Programs in Less-Developed Countries	4-7
Brazil	4-8
Korea	4-10
Nigeria	4-11
The Philippines	4-11
References	4-17

Figure

1. Employment Effects of Changes in Capital Intensity and Output Level	4-2
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Foreword

This report deals with selected methods and techniques utilized by various organizations to stimulate industrial development in a number of developing countries and the United States.

During the five-year period of the U.S. Agency for International Development's 211(d) grant to the Georgia Institute of Technology, the Georgia Tech staff has been able to observe the different approaches used in a number of countries by government, educational institutes, and other organizations. Obviously, a variety of techniques and approaches are being used worldwide. This report does not attempt to cover them all, but rather to focus on a selected few, which, in some cases, involves counterpart linkage institutions.

The first section of this report is a description of organizational approaches to stimulation of small industries, mainly various country systems of industrial development centers and an earlier version of these, productivity centers.

Since technology transfer, either through training or direct assistance, is the primary concern of many such centers, a discussion of technology transfer systems follows.

A third section deals with industrial extension field offices, a technique which has shown fruitful results in many places.

Finally, a fourth section deals, from the economist's point of view, with financial incentives for industrial development. Four countries are used as examples.

Obviously, when one considers the spectrum of factors which impact on industrial development potentials, the four subject areas are only part of the picture. However, they relate to organizing for industrial development, methods for transferring technology, and financing plans for industry, three very important considerations. There are lessons to be learned from the descriptions of methods and techniques included herein. More important, these techniques may have applicability in areas where they are presently not being utilized.

During the five-year period of the 211(d) grant, it has been of interest to observe the pronounced trend of developing country governments toward

increased emphasis on industrial development (and to a large extent, small-scale industry). Many factors are at work in this trend -- burgeoning populations and the need for employment generation, the smallness of enterprises associated with rural areas, the need for labor-intensive activities, the recognition that manufacturing is one of the better employment and income producers, the appropriate technology thrust, among others. Whatever the reasons, more and more national development plans seem to be stressing the need for small-scale industrial development. Some, but not all, of the international funding agencies are responsive to these initiatives.

Ross W. Hammond, Director
Office of International Programs

SMALL INDUSTRY DEVELOPMENT METHODS
AND TECHNIQUES: INSTITUTIONAL APPROACHES

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One of the critical challenges facing developing nations in the decades ahead is industrialization. Increases in the areas of population, food production, and mobility combine to create an overwhelming demand for new jobs, improved income distribution, and better urban-rural balance. This demand can only be met through better utilization of existing resources, and effective industrialization certainly offers an essential part of the total solution.

In the field of industrial development, the practitioners have for many years lived with what still must be regarded as tentative conclusions:

1. The contribution of industrialization to the fulfilling of the national goals of LDCs is at best complex, requiring a deep understanding of individual factor endowments (natural resources, capital, labor, and many others).
2. The existing knowledge of the industrial development process is very limited, unsystematic, and too localized to provide an adequate technical basis for effective transfer as an "industrialization policy."
3. There continues to be a need for an international institution to examine, evaluate, research, and illuminate those forces and values used in the development of small-scale industries as a technique of "industrialization" in a less-developed country (LDC).

At present, some 60 countries in Asia, Latin America, and Africa, representing well over 60% of the world's population, are entering the industrialization process as defined by the World Bank. The vast majority of these nations are newly independent and wish to define modes and strategies leading to the industrialization goals they have established. These LDCs have in general recognized the fact that the so-called "green revolution" has raised rural incomes, but it cannot by itself overcome the lack of productive jobs or increase wages to acceptable levels. The most promising solution available to them is that of industrialization.

In seeking to develop the industrial sector--and particularly the establishment and growth of small and medium-scale industry--LDCs have used a

number of types of institutional approaches. Typical of these approaches are two general categories of institutions: (1) industrial development centers and (2) productivity centers.

Industrial Development Centers

General. Industrial development centers (IDCs) often play an important role in the industrial development of a country, and they may have a particularly significant influence on the establishment and development of small and medium industry.

This section describes four industrial development centers in terms of their objectives, organization, and activities, together with other pertinent comments which might provide an insight into their reasons for success or failure. The centers described are located in the countries of Kenya, Nigeria, Ecuador, and the Philippines.

These four IDCs all have one paramount objective--the promotion of small and medium-scale industry. Other objectives include indigenous industrialization, import substitution, and employment generation.

Although their organizational structures vary, they share the common activities of training, conducting feasibility studies, securing finances for industry, and providing extension services, including management and technical assistance.

Other activities performed by some but not all of these centers include entrepreneur selection, shop services, technical information services, industrial park programs, research, publication, and regional cooperation responsibilities.

Kenya Industrial Estates (KIE) works to establish industries in industrial estates. The Industrial Development Center of Ecuador (CENDES) works as a formal autonomous organization to provide direct assistance to industry. The Institute for Small-Scale Industries of the University of the Philippines (UP/ISSI) is a university-spawned institution primarily providing academic course work to train competent people to be able to assist small-scale industries, but also providing direct industrial extension assistance. The Industrial Development Centers (IDCs) in Nigeria were created primarily to enable more Nigerians to enter private business and industry by providing entrepreneurs with technical and financial assistance.

A detailed examination of the four organizations, as they describe themselves, reveals interesting contrasts and similarities in modes of operation.

Kenya Industrial Estates. Founded by the government of Kenya in 1967, Kenya Industrial Estates (KIE) was commissioned to promote small and medium-scale industries in that country. It thus helps to put into practice a vital part of the government's development policy whose main aims are:

1. To facilitate the entry of indigenous people into the sphere of industrial production;
2. To raise the level of industrial output so as to provide suitable substitutes for manufactures that have hitherto been imported as well as increase the country's exports;
3. To impart managerial and technical know-how to the local industrialists by providing suitable training; and
4. To increase industrial employment opportunities.

KIE is currently working in two major industrial development areas, formally identified as the Industrial Estates Programme and the Rural Industrial Development Programme. The former deals with setting up industrial estates in the large towns and initiating and implementing industrial projects on the estates. The latter, on the other hand, involves the establishment of Rural Industrial Development Centres (RIDCs) in the smaller towns, with a view to raising the level of existing "grass roots" industry and starting off new industrial projects in the rural areas. By means of the rural program, KIE is helping to reduce the gap that exists between the towns and the countryside in employment and income.

Under the Industrial Estates Programme, KIE:

1. Makes available to local industrialists suitable factory premises for reasonable rents;
2. Conducts market surveys and feasibility studies for selected industrial projects free of charge to the industrialists;
3. Selects suitable entrepreneurs for the projects;
4. Assists selected entrepreneurs to obtain up to 100% loans for the purchase of machinery at reasonable interest rates so that the entrepreneurs raise only working capital; and

5. Provides technical extension services, such as the manufacture of dies and tools and repair services, on a no-loss basis.

Under the Rural Industrial Development Programme, KIE:

1. Provides a variety of extension services, including managerial and technical assistance and repair facilities, to the entrepreneurs;
2. Provides on-the-job training for entrepreneurs in the use of machines, and undertakes temporary production for demonstration purposes;
3. Identifies new rural industry, prepares feasibility studies, and selects suitable entrepreneurs who are provided with the necessary training; and
4. Recommends the extent of government participation in the projects, and follows up the projects according to plan.

The activities of KIE have continued to grow over the life of the project. Several industrial estates and Rural Industrial Development Centres have been established, and many projects have been formulated and implemented.

The following summary indicates the expenditure on different industrial estates and Rural Industrial Development Centres on building and civil works as of June 30, 1975, and the number of industrial units or approved projects under each estate's jurisdiction.

<u>Estate</u>	<u>Expenditure</u>	<u>Units or Projects</u>
1. Nairobi Industrial Estate Phase I	4,498,874.95	52
2. Nairobi Industrial Estate Phase II	5,104,481.25	-
3. Nakuru Industrial Estate	6,699,654.95	21
4. Kisumu Industrial Estate	2,610,000.00	8
5. Mombasa Industrial Estate	2,935,420.00	17
6. Rural Industrial Development Centres	<u>8,366,949.00</u>	<u>65</u>
Total	Kshs 30,215,380.15	163

Through June 1975 KIE had invested 30.2 million Kenyan shillings (Kshs)^{1/} on infrastructure and buildings and advanced loans amounting to Kshs 15.3

^{1/}9.7 Kenyan shillings equalled US\$1.00 in 1977.

million to entrepreneurs at Nairobi, Nakuru, and Kisumu industrial estates and Ksh 1.1 million to entrepreneurs at the four RIDCs in Nyeri, Kakamega, Embu, and Machakos.

In addition to investing funds in the construction of factory premises to house various types of industries, KIE also helped entrepreneurs to obtain loans for machinery and equipment for the manufacture of various items. With more industrial units being established in the several industrial estates, the investment in machinery and equipment increased steadily. Entrepreneurs were also very active in obtaining working capital necessary for running their businesses, and the local banks showed a readiness to come to the aid of the small manufacturers by providing financial support.

Despite the difficulties created by the unstable economic conditions in the world economy, the units in the estates recorded a steady growth and continued to offer more employment opportunities to the local people. At the close of the year, the 38 units that were reported to be in full production at the Nairobi Industrial Estate employed some 582 persons. The seven units whose implementation was completed by the end of the year, including such big units as canvas manufacturers, expect to create employment for well over one hundred persons.

Employment at the Nakuru Industrial Estates showed a remarkable improvement. The seven units in production created jobs for 162 people. More job opportunities were opened in the few units which were started at Kisumu Industrial Estate.

The products manufactured in the industrial estates vary widely from steel windows to wooden cloth pegs to zipper fasteners.

KIE achieves its assignment to promote small and medium-scale industry by being an economic catalytic agency that provides the essential services of market surveys, feasibility studies, selection of entrepreneurs, provision of capital loans, acquisition of factory premises, on-the-job training, technical extension, advice on machinery selection, and repair services. The level of KIE activity is shown by the establishment and successful operation of 163 different units or projects. The Kenyan program of industrial development assistance provides an excellent example of the use of industrial estates in the promotion, development, and growth of small and medium industry in a developing country.

Industrial Development Center of Ecuador. Since its creation in July 1962, Centro de Desarrollo Industrial del Ecuador (CENDES) has been the official institution in charge of providing technical assistance to new or existing enterprises, developing a wide range of industrial promotion activities, and preparing feasibility and prefeasibility studies in accordance with the priority requirements of Ecuador. CENDES, an autonomous legal entity, has its own patrimony and resources and operates as an organism ascribed to the Ministry of Industries, Commerce and Economic Integration.

The specific functions of CENDES include the following:

1. Carry out studies of industrial projects which are considered of high priority for the development of the country in order to obtain a better use of natural resources, local raw materials, and labor.
2. Identify investment opportunities and prepare studies for the installation of industrial projects directed so as to take advantage of both the regional and subregional integration as well as the world market possibilities.
3. Promote the establishment of new manufacturing plants, channeling national savings and foreign investment towards industrial activities.
4. Provide technical and administrative assistance to enterprises to stimulate their development and increase their productivity.
5. Act as a consulting firm in the study and implementation of investment plans for industrial entrepreneurs and promoters.
6. Compile, select, and disseminate technical information related to industry through a specialized service.
7. Implement the Conglomerates and Industrial Parks Programs as a means to achieve a balanced development of the country.
8. Cooperate with other public and private institutions in the performance of policies which favor industrial growth.

CENDES maintains permanent and close contact with all of the national institutions involved in the economic development of the country. This interaction is seen in the constitution of its Board of Directors--the main body--which is presided over by the Minister of Industries, Commerce and Economic Integration and includes the President of the National Planning Board, the General Manager of the Securities Commission-National Financial Corporation, the General Manager of the National Bank for Development, a representative of

the Chambers of Industry of the Coastal region, a representative of the Chambers of Industry of the "Sierra" or Inter-Andean region, and the Executive Director of CENDES.

The Executive Director is the legal representative of the Center. He is responsible for the main technical and administrative activities. There is also an Assistant Director-Technical Coordinator and a Regional Assistant Director who has his office in Guayaquil (Coastal region).

CENDES has Technical Divisions for Promotion, Project Studies, Agro-Industries, and Technical Assistance to Industry. It also has Working Units in charge of Conglomerates and Industrial Parks Programs, Industrial Demonstration Workshops, and a Technical Information Service (SIT).

The Promotion Division fosters the implementation of new industrial projects in the country, particularly those assigned to Ecuador within the Andean Subregional Integration Process, as well as those included in the Five-Year Plan for Transportation and Development, and encourages the active participation of local and foreign investors.

The Project Studies Division carries out prefeasibility and feasibility studies of projects that are considered of high priority to the development of the country, in accordance with national plans and programs.

The Agro-Industries Division performs prefeasibility and feasibility studies on integrated agro-industrial projects, involving raw material production of vegetable or animal origin, as well as the respective industrial processes, in accordance with national priority requirements.

The Technical Assistance to Industry Division, with the cooperation of the United Nations Industrial Development Organization (UNIDO) and through its Project ECU-533, provides an integrated consulting service to Ecuadorean industry in the following fields: business administration, managerial and cost accounting, production engineering, industrial engineering, quality control and standardization, technical information, and marketing. This service is provided by United Nations international experts and the CENDES technical staff.

The Conglomerates and Industrial Parks Unit prepares and carries out Conglomerates and Industrial Parks Programs. Under these programs, entrepreneurs are provided with basic infrastructure, buildings, public services,

technical assistance, and other services, under favorable financial conditions, to install their industries within these industrial parks. CENDES is also a shareholder in the Industrial Park Corporations.

Industrial Demonstration Workshops Unit, through a technical assistance service, promotes the installation of pilot industrial workshops in various zones of the country in order to improve the level of business organization of the artisan sector. The Industrial Demonstration Workshops operate as training and production centers which furnish new techniques concerning business organization, production and marketing systems, use of credit mechanisms, and other additional technical services.

The Technical Information Service (SIT) provides a permanent scientific and technical information service to industry to facilitate the accomplishment of projects and an adequate operation of the industrial plants. SIT offers a "Question-Answer Service" on industrial matters for interested entrepreneurs, publishes a monthly "Technical News Bulletin" with selected articles on a number of industrial subjects, and gives information on available patents and the transfer of foreign technologies.

CENDES has been highly successful in its program, which differs from the Kenyan program in that CENDES works directly with industry rather than exclusively through industrial estate activities. Through its various programs, activities, and services CENDES fulfills its obligations to small and medium-scale industry in all areas of Ecuador.

Institute for Small-Scale Industries, University of the Philippines. In cognizance of the need to accelerate the first stage of development and the promotion of local small-scale industries, the Republic of the Philippines and the Royal Kingdom of the Netherlands concluded on March 2, 1966, a bilateral agreement creating the Institute for Small-Scale Industries within the University of the Philippines (UP, ISSI). The collaboration of the two governments in the establishment and operation of the Institute was defined by a "Plan of Operation" pursuant to Article 2 of the bilateral agreement.

On March 10, 1966, the National Economic Council and the University of the Philippines concluded a Memorandum of Understanding delegating to the University the task of implementing the terms of the bilateral agreement. On March 25, the Memorandum of Understanding with the National Economic Council was confirmed by the Board of Regents of the University of the Philippines.

The major purposes of the University of the Philippines in the establishment of the Institute for Small-Scale Industries are to train competent people up to a level where they will be able to assist existing small-scale industries to increase productivity and to develop and promote new ones, to provide consultancy and extension services to existing small-scale and medium-scale industries, to conduct research on plant operations and make the results of such research available to interested parties, and to assume leadership in overcoming the various problems of small-scale and medium-scale industries needing the advice, stimulation, and assistance of consultancy.

Republic Act 6041, approved by the President of the Philippines on August 4, 1969, redefined the objectives of the Institute in the following vein:

1. To undertake continuous conduct of consultancy training courses, periodic seminars, and technical studies in the field of medium and small-scale industries with emphasis on Philippine industries;
2. To undertake technical studies and researches on request of various government agencies concerned with industrial development, interested private industries, and those concerned with industry;
3. To undertake study programs and research studies for the promotion of small-scale industries;
4. To undertake the publication of studies, monographs, research papers, articles, and other written works on small and medium-scale industry, with emphasis on those related to the Institute's objectives, for distribution to government agencies, private industry, and other interested parties; and
5. To perform all other acts as may be necessary for the achievement of its objectives and functions in accordance with the rules and regulations of the University, including the granting of research awards, prizes, scholarships, and fellowships.

To fulfill the Institute's objectives effectively, the operational units are divided into five functional groups:

1. Training Program
2. Research and Consultancy Program
3. Entrepreneurship Development Program
4. Industrial Technology Program
5. Regional Program

Directed towards small industries, these five programs offer the following services:

1. Training
 - a. Management and technical services (short- and long-term)
 - b. Seminars for selected industries
 - c. Seminars on entrepreneurship
2. Research
 - a. National surveys
 - b. Provincial surveys
 - c. Industry profiles
 - d. Industry studies
3. Extension Services
 - a. General information
 - 1) Regular publication of a journal on small industries
 - 2) Handouts and reports
 - 3) Library facilities
 - b. General management consultancy
 - c. Direct plant assistance
 - d. Project feasibility studies
 - e. Industrial and entrepreneurship promotion on the regional level

The stimulus provided by the regional dispersal and the rural industrialization schemes of the government inspired the Institute to establish a pilot extension project in Region VIII with offices on the UP College of Tacloban campus. Financial assistance to this pilot extension project is being provided by the Georgia Institute of Technology under a USAID small industry grant. Region VIII is in the central southeastern part of the Philippines, and Tacloban City is the location of a branch unit of the University of the Philippines.

The pilot project is a three-year program aimed at stepping up rural industrialization efforts in Region VIII and enabling small industrialists and entrepreneurs in that area to avail themselves of UP/ISSI services and assistance. This helps lessen the industrial imbalance that exists between the different regions of the Philippines and the Greater Manila Area, where most of the industries are concentrated.

The most significant aspect of the pilot project is the experience that will be gained from it. It provides guidance for the planners in assisting similar programs or projects in the future. More of these extension institutes are to be set up in each region over the next 10 years. UP/ISSI will either draw upon the assistance of the different branch units of UP or, in areas where there are no existing units of UP, the support of established and recognized schools in the areas will be sought.

The Institute conducts a series of courses based upon the operational activities of each of the five functional groups:

- o The Management Consultancy Course is a seven-month course to develop suitable management consultants for small and medium industries.
- o The Regional Industrial Development Course teaches technical assistance in the field of regional development through advanced professional education, dissemination of knowledge, and practical training through supervised field work.
- o The Low Cost Factory Automation and Advanced Production Management Course is designed to meet the need to maximize productivity in small and medium industries. The concept is introduced to train managers and engineers with the aid of demonstration projects in the low-cost automation laboratory and actual in-plant assignments in various industries.
- o The Entrepreneurship Development Program promotes the development of small enterprises in the rural areas, generates self-employment schemes for potential entrepreneurs, encourages and develops the processing of local materials into salable goods, promotes the use of modern technology in small-scale manufacturing to enhance higher productivity, and develops entrepreneurial qualities and attitudes among potential entrepreneurs.
- o The Manager's Course for Small and Medium Industries accommodates the request of industrialists for a part-time management course which provides the manager with a broad view of the functions of the industrial enterprise as well as the problems of industrial administration and affords the participants a chance to interact with fellow managers.

There are also special programs which supplement the more formal course work of UP/ISSI. These seminars deal with marketing, management, finance, and production.

The industrial development center concept embodied in the approach used by the Institute for Small-Scale Industries at the University of the Philippines is a comprehensive one that capitalizes on the teaching and extension capabilities of a large, multi-campus university. In addition to research, information dissemination, and direct service to industry, the UP/ISSI program is particularly concerned with education and training, with emphasis on industrial development through the upgrading of skills of entrepreneurs, managers, and foremen of small-scale industrial enterprises.

Industrial Development Centers in Nigeria. The Industrial Development Centers (IDCs) in Nigeria are a section of the Small-Scale Industry Division of the Federal Ministry of Industries. The most active IDC is the one at Owerri, which was established in 1962 by what was then the Eastern Nigerian Ministry of Trade and Industry (before the Civil War). In its early years, the Owerri IDC only operated in the Eastern Region, assisting small-scale enterprises with technicians provided by USAID/Nigeria, the International Labour Organization, and the Netherlands. The activities of the Owerri IDC were interrupted during the years of the war, and most of the buildings and facilities were severely damaged.

In 1971, the Federal Military Government again opened the IDC at Owerri as part of the National Development Plan. Some of the facilities have been restored since then, and the Owerri IDC is at present working with small-scale industries in the area. They have a staff of about 100, classified as technical officers, management/commercial officers, technicians, and support/administrative staff.

At present, the Owerri IDC is providing services to small-scale industries in Rivers State, East-Central State, and South Eastern State. The Center is headed by a director, and he was assisted until 1977 by a team of foreign consultants provided by the Ford Foundation. The IDC is made up of four divisions, each of which is divided into departments which may perform assistance or training as required. The following outline identifies the divisions and departments by functional title:

- A. Technical Services Division (Non-Engineering)
 - 1. Leathercraft
 - 2. Textiles
 - 3. Ceramics
 - 4. Chemical

- B. Technical Services Division (Engineering)
 - 1. Automotive
 - 2. Electronics and Electrical
 - 3. Metal
 - 4. Woodwork

- C. Management Services Division
 - 1. Industrial Management and Training
 - 2. Economic Survey and Information

- D. Administration Division
 - 1. General Administration
 - 2. Library
 - 3. Stores
 - 4. Accounts

The principal functions of the Industrial Development Center at Owerri are the following:

- 1. Technical appraisal of applications for loans.
- 2. Provision of industrial-technical services.
- 3. Training of entrepreneurs and staff.
- 4. Applied research into industrial products, involving the design of industrial products for small-scale industries, and management training.

Expansion plans for 1977-78 called for the staffing of new IDCs at Zaria and Igshogbo, but to date these are yet not operational. In 1976 the Federal Military Government, through the States Decree, redivided Nigeria into 19 states, and it was anticipated that eventually each state would have an IDC. This great expansion had not taken place at the end of 1977.

Nevertheless, the IDC at Owerri--although limited in its funding--has been by far the most successful small-scale industry development effort implemented in Nigeria.

Productivity Centers

General. The national productivity centers first came into being in Europe as a result of the post-World War II efforts to rebuild the continent. At that time, Europeans became aware of the considerable differences between the efficiency of their own production units and those of the United States. During the 1950s, the Marshall Plan to a great degree assisted in establishing the original productivity centers in Europe, and later this successful concept was duplicated in both Asia and Latin America.

Three principal ideas were prevalent in the original productivity centers established in Europe:

1. Mass production as a prime requisite for productivity growth.
2. Use of productivity techniques whose scope and cost were not proportionate to outlays; in other words, productivity without investment.
3. Establishment of a climate of cooperation and integration of groups in the form of unions and individuals in the economic and social system.

In a very general manner, the productivity centers soon became aware of the need for an individual productivity policy which would take into account the economic situation prevailing in the country as a whole and which could then be adapted as needed at the different levels of the economic structure. Over the years, the productivity centers have evolved to their present position within the national structure, which is between the government authorities (those responsible for national programming and research and others at the macro-economic level) and the private sector (individual firms, trade associations, and trade unions). The productivity centers, therefore, have access to certain sources of micro-economic information and, at the same time, exert influence on those who are responsible for the implementation of national planning objectives.

As a result of this evolution, a majority of the productivity centers have recognized that a better integration of productivity policies into the national development process as a whole can be obtained by extending the basic objectives of the national development centers and by playing a dual role with the national planning groups to include: (1) assistance or cooperation in the elaboration of national plans and (2) serving as a practical implementor of the fundamental objectives of these plans.

Europe. Generally speaking, the European productivity centers have the following characteristics:

1. Small centers, with very decentralized activities.
2. A "pioneer" role in developing new ideas and questioning traditional concepts.
3. Liaison with employer associations and trade unions.
4. A check and balance position between the different political groups.

Two basic type of productivity centers are identified: (1) those that are an integral part of existing public administration (Denmark, France, Spain, and Czechoslovakia) and (2) those considered to be independent organizations with varying degrees of commitment to industry, ministries, or others. In the past few years, nearly all productivity centers in Europe have been subject to a reevaluation of their role as a result of three trends: (1) the proliferation of "intermediary" service bodies, both public and private; (2) the increasing pressure of the future; and (3) the considerable mass of research being conducted on the efficient functioning of these types of organizations.

As a result of this "reevaluation" of the productivity centers in Europe, three developments have been identified to date:

1. Involvement of the negative elements into the centers (i.e., position on the Board or others).
2. Hiring of younger persons as staff members and allowing these to serve as "advisories" to the Board or Council.
3. More interaction with secondary groups, both public and private.

Asia. The position of the Asian productivity centers is not as clear as that of the sister organizations in Europe. The main factor may be the fact that the economies of the nations in Asia are mostly in the "development stage," while in Europe they are "developed." By and large, the productivity centers in Asia are considered to be independent institutions, but nearly all of them are under government authority and depend on government for subsidies and financial support. As a general rule, it can be said that the productivity centers in Asia operate at the micro-economic level, and very few have engaged in broad studies of productivity by economic sectors. The following country briefs are representative of the overall picture.

- o Ceylon. The Management Development and Productivity Center has been supported by the United Nations Development Programme (UNDP) since

it started in 1969 or 1970. The center is under the administration of the Industrial Development Board of the Government of Ceylon. This organization replaced a private group that operated the Productivity Association and was concerned with different productivity improvement projects.

- o China. The China Productivity and Trade Center (CPTC) has been sponsored in the past by the International Executive Service Corps, the Indo-Pacific Council, and others. At one time, the Volunteers for International Technical Assistance, Inc. (VITA) was providing staff support to the CPTC. The Center has been active in training programs and has worked closely with the Chinese Institute for Engineers, Chinese Society for Quality Control, and the Chinese Packaging Institute.
- o Hong Kong. As early as 1967, the Hong Kong Productivity Centre was operational and was involved in several programs with the Asian Productivity Organisation. The Centre has conducted many training programs on specific techniques, such as methods study, quality control, plant layout, personnel management, and operations research, to mention a few.
- o India. The National Productivity Council of India has training as its principal objective, followed by consultancy, productivity research, surveys, and promotion. In training, many programs related to industrial engineering have been offered in the past by this organization.
- o Iran. In this country, the Industrial Management Institute has the responsibility for "productivity." The Institute started an extension service sometime in the late 1960s or early 1970s as part of the Fourth Economic Plan. Most of the assistance offered by this group to local enterprises has been in the area of management and finance.
- o Korea. The Korean Productivity Center (KPC) has always been very much oriented to the government policy of export expansion and price stabilization through quality improvement and cost control. By 1969-1970, the KPC had installed the first electronic data processing system to be used in Korea.

- o Nepal. Several organizations are active in the field of productivity, such as the Ministry of Economics, Nepal Industrial Development Corporation, and others, but there is no productivity center per se.
- o Pakistan. Two organizations are active in this country, the Management Development Centre and the Pakistan Industrial Technical Assistance Centre. Most of their activities are in the area of training and development of skills.
- o Philippines. The Productivity and Development Center, sponsored by the National Economic Council, is responsible for the growth of productivity in this country. The Center provides training and gathers information for the entire region.

Latin America. It is difficult to provide a consistent overall view of productivity centers in Latin America due to the fundamental differences between them. Productivity centers in Latin America are very diverse, ranging from government agencies to independent private companies, from organizations that promote ideas and offer training programs to groups that act as direct consultants to private firms, from centers with staffs of over 300 persons to those with less than 10 employees.

There are 18 productivity centers in Latin America affiliated with the Interamerican Productivity Association; of these nine are of a joint nature (made up by both the official and public sectors), four are independent private agencies, and five are government agencies. They are closely associated with the executive authority and are either under a department of the government or have the status of legal bodies organized under civil law; all are nonprofit and are somewhere between a government organization and a technical institution.

The fundamental activities of these productivity centers in Latin America may be highlighted as follows:

1. All provide vocational training, but this may also include executive training or be limited to crafts and skills.
2. About half of them have programs to provide direct technical assistance to local companies. In some cases, this may include industrial sector studies, sectoral forecasting, and development of action programs. (The most advanced centers are those in Mexico, Peru, Venezuela, and Chile.)

3. About one third of the existing centers are greatly involved in the area of small-scale industries (Chile and Ecuador are at the top of the list) and are active in investment promotion, productivity measurement, and appropriate technology.
4. Nearly all of the productivity centers are very active at the regional level, and some have set up regional offices to conduct specific programs.

In summary, it may be said that the actions generated by productivity centers in Latin America have been of a positive nature, but restricted to certain areas. Most of the centers are, in general, uninformed of the changes in productivity that have been generated by present economic development. There continues to be no clear integration policy within the regions of Latin America.

Conclusions

This section has presented two types of institutional approaches common to LDCs which, in general, try to provide the methods and techniques required in the development of small-scale industries in different parts of the world.

Industrial Development Centers. The IDCs are oriented to serve and assist in carrying out the industrial development objectives and needs of a particular set of people. Unfortunately, these objectives and needs often are not clearly defined by the IDC. These institutions vary greatly in size, location, funding, and purpose, but most appear to have an interest in small to medium-size industries. The majority of IDCs appear to follow the guidelines suggested by Eugene Staley^{1/} a decade and a half ago:

1. Despite "economies of scale," manufacturing is not always more economical in large than in small establishments, and a country will achieve the most productive industrial structure by developing a well chosen combination of large and small manufacturing units. Development leaders in countries striving to accelerate the rate of industrial advancement will do well to give attention to the constructive possibilities in modernization and growth of small and medium industry. It is important, however, to stress selectivity in the choice of product lines and efficiency in production and business operations.

^{1/} Eugene Staley, The Role of Small and Medium Industry in Development, paper presented at the U.N. Conference, Geneva, Switzerland, February 4-20, 1963.

2. As a country moves through the transitional stages from a traditional toward a modern economy, the outlook is for household industry to be replaced (except for special functions) and for artisan industry to be transformed into modern service trades. The small but modern factory will rise in importance. Such factories, if well managed, have distinctly favorable prospects in the newly industrializing countries.
3. Some product lines and some situations offer opportunities for efficient small-scale manufacturing and others do not. Therefore, continuous research to provide up-to-date analysis of changing markets, production methods, costs, and other economic and technical factors is advisable in a program of small and medium industry development. It is also necessary to have some type of communication system, such as an industrial advisory service or industrial extension service, to carry to existing or potential entrepreneurs the information on which they can base sound investment decisions. Such a service should also encourage a progressive outlook among small entrepreneurs and keep feeding them improved ideas on the economic, technological, and management problems of their enterprises. These ideas should be based on the best modern techniques of production and management, suitably adapted to smaller-scale operations. Significant help could be given in the advancement of the newly developing economies by devoting more scientific and technological effort to the search for methods of increasing the efficiency of comparatively small-scale production units.
4. Among the practical measures which should be considered in designing a positive program to improve the efficiency and promote the growth of small and medium industry are: (1) industrial advisory or counseling services, (2) industrial training services, (3) industrial research services, (4) measures to improve small industry financing, (5) industrial estates, (6) marketing aids, (7) aid in procurement of materials and equipment, and (8) fostering interfirm assistance and industrial self-help.
5. A development program for small and medium industry should be reasonably comprehensive. Usually it does little good merely to set up an institution for making capital and credit more readily available without, for example, doing anything to improve techniques of production and management. Which factors are most strategic in the circumstances of a particular country should be determined in a preliminary survey. Valuable ideas can be had by studying the experience of other countries--for example, India, which has the best planned and most comprehensive small industry program among the less industrialized countries. However, it should be stressed that no system worked out in one country can be recommended in its entirety for another. Each country requires a set of measures tailormade in general approach and in detail to its own situation.

The four examples presented all appear to be developing well within their limitations and, in some cases (Nigeria), the IDCs are the only pragmatic, professional group providing a real service to the small-scale industry sector.

Productivity Centers. This institutional approach appears to be more formally structured and defined than IDCs, but less specifically focused on the development of small-scale industry within LDCs. Centers in the three geographical areas discussed (Europe, Asia, and Latin America) have the following common characteristics:

1. Attempts are made to define industries which should be given priority in their national development plan.
2. Critical surveys are made of the use of means of production. They are involved in planning and in the analysis of results.
3. Most concentrate on the training of human resources (including vocational and managerial training and the development of trainers) and on general dissemination of information.
4. Attempts are made to bridge the existing gaps of knowledge of existing techniques and how they are utilized.
5. Most serve as pressure groups that are constantly "preaching productivity."
6. Most participate in a loose network throughout the world of productivity centers, thus having access in some degree to the exchange of information and experience.

TECHNOLOGY TRANSFER SYSTEMS

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The Nature of Technology Transfer Systems

Technology transfer may be thought of as the movement of technical knowledge and information from one location to another with whatever adaptation that is needed to make it relevant to the new location. Such a generalized statement needs some modification, however, when technology transfer is considered in the international development sense. Here, technology transfer is generally viewed as the flow of technological knowledge and information from the developed countries to the developing countries. While there are many examples of such flows from one developing country to another, there is little doubt that the bulk of technology transfer at present stems from the developed countries and flows to the less developed countries.

Reduced to its simplest form, technology transfer can be thought of as having three main elements: centers of technical information, systems for delivering information, and a variety of users of the technology. Graphically, such a system may be diagrammed as shown in Figure 1. This figure is very deceiving, however, in that it does not portray the complexities of the technology transfer process, the multiplicity of centers of technical information, the difficulties of physical transfer and adaptation of technology, the potentially great numbers of end users, and the variety of their problems which the technology must address.

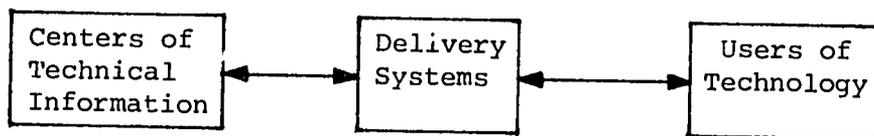


Figure 1. The Technology Transfer System

The centers of technical information are very numerous and are housed in many kinds of organizations and individuals. Industries, research centers, educational institutions, trade associations, libraries, governmental units, financial institutions, and a variety of other organizations may all be centers

of knowledge, as well as individuals with broad and specialized backgrounds and specific know-how competencies.

Technical information may be divided generally into (1) knowledge in the public domain, which in theory, if not in practice, is available to everyone and (2) private sector information, which is usually transferable through patents, licensing, trade secret sales, joint ventures, and like processes and hence is not readily available to every interested party.

Comparison of Environments for Technology Transfer

The great differences that exist in information flow and receptivity internally in the developed countries and in the developing economies add further restraints to an already difficult transfer process. Some of the readily discernable differences between the developed and developing countries that impact on technology transfer follow.

In developed countries 30% of the labor force may be engaged in manufacturing and only 5% to 10% in agriculture. In developing countries, the situation generally is the reverse, with as high as 80% to 90% of the labor force involved in agricultural employment. Hence, in LDCs people are not as knowledgeable about manufacturing. It is not a common thing and they tend to think in agricultural-related terms.

Unemployment and underemployment vary widely in LDCs, but it is generally in the order of three to six times the developed country average. Such massive unemployment introduces elements of political instability, which has contributed to the frequent toppling of governments. Hence, employment generation has become a prime government objective in many less developed countries.

In the developed countries, relatively high per capita income levels exist, as well as a large middle class. LDCs are characterized by low per capita income levels (\$100 to \$200 per year in many countries) and usually the absence of a large middle class. Hence, the middle class as a source of capital is relatively nonexistent. While in developed economies capital sources are varied and relatively plentiful, the LDCs characteristically do not exhibit either a large or accessible capital financing structure.

Compared to many LDCs, developed country education systems are excellent in terms of average years of schooling and other indicators. Literacy is high, while in many LDCs it is low. Development, parenthetically, is often linked to

education and literacy, but one can exist without the other. In the Philippines, for example, literacy is high but development is relatively slow, especially when compared with South Korea where similar high literacy prevails.

In the developed countries, a high proportion of industry, large or small, is indigenously owned. In the developing countries, the large companies are frequently foreign owned or managed. Only the smaller industries tend to be indigenously owned and operated. As recognition of this pervades nationalistically oriented LDC governments, a greater interest develops in stimulating the small industrial sector, for this is the home-owned sector of the economy.

Management problems are quite similar in nature in developed and developing countries, varying in degree with the different orders of scale found in the developing countries. However, management advice and assistance is available from many sources, public and private, in the developed economies. In the developing countries, it is much more difficult to obtain and is often beyond the financial capabilities of those companies that may need it most.

Capital is more available in developed countries, less so in the developing countries. A reservoir of skilled labor exists in many advanced countries; such a labor supply is rarely present in the less advanced countries.

Developed countries, with high per capita incomes, represent good domestic consumer markets. The traditionally low per capita incomes in LDCs provide inadequate domestic markets.

Developed countries generally have advanced multi-modal transportation complexes which facilitate the movement of goods and people. Such complexes are unheard of in the developing countries (with few exceptions).

In most developed countries there is a broad range of industrial sophistication, from low technology to extremely high technology. In developing countries, the range is characteristically low to medium technology, with primitive often representative of the low side.

The average size of industrial enterprises is much larger in developed countries. With smaller industries characteristic of developing economies, there are fewer internal problem-solving staff positions in industry and thus a greater need for technical information and assistance from outside. Technical information and assistance is available in the developed countries from educational institutions, state and federal government units, research institutes,

consultants, etc. This multiplicity of technical assistance sources is not common to or existent in many less developed countries.

Many technology alternatives are available from a variety of sources in the developed countries. It is a mistake to think that all of these technological alternatives are equally available to the entrepreneur in rural Brazil, or Kenya, or Indonesia. Inadequate systems of information transfer in most developing countries make the delivery of technology difficult and/or non-existent. The LDC entrepreneur really has relatively few technology alternatives to consider.

In the developed countries, numerous institutional change elements are at work, both in the public and private sector. In the LDCs, relatively few organizations are working at change and, where they do exist, they are thinly staffed with good people, and even these frequently are inadequate in their experience.

Existing Techniques of Technology Transfer

Indirect Transfer Techniques.

1. Mail response to inquiries and areas of interest. Indirect technology transfers fall into a number of categories, of which the simplest, most used, and perhaps the least effective is the use of mail services to transfer technological information. This technique has a number of drawbacks, including the danger of incorrectly interpreting the request which generates the transfer, the frequent inability of the user to adapt the technology to his specific needs, and the unreliability of the mail service in many of the developing countries. Moreover, since most technological information is written for a knowledgeable scientific or engineering audience, it may be difficult for the layman to understand and utilize. Sometimes, the language in which the technical information is produced poses problems to the user, who may not have fluency in that language.

In this written communication approach, requests for technological information are usually responded to by published materials which relate as specifically as possible to the inquiry. Most international technology transfer centers utilize this technique for transfers. The National Technical Information Service (NTIS) provides U.S. government documents to potential users, utilizing mail services as the delivery vehicle (it also uses representatives

in various countries to deliver and explain the materials). The Intermediate Technology Development Group in London utilizes the same delivery system for its documents, reports, and communications. The Office of International Programs at the Georgia Institute of Technology does the same both domestically and internationally. Citing these few examples is misleading, however, since almost every data center relies on postal services to respond to inquiries for technological information.

Another approach to this mail-response technique is to ascertain the general nature of technology interests of the user and to provide materials to the user on a continuing basis as they appear in the literature. Since such a procedure attempts to cover generally the users' areas of interest, it may or may not be useful to the potential user who has a very specific problem. It is a relatively time-consuming and expensive procedure as well. As an example of this kind of activity which can be cited was the effort made by the Georgia Institute of Technology to disseminate information on new processes, techniques, and products to the metalworking companies in Georgia. This involved a continuing search of all relevant literature, excerpting appropriate materials and incorporating these in a periodic bulletin to all of the metalworking companies in the state. This was well received by the companies, but examples of usage of the materials incorporated in the bulletins were never obtained, and it is doubtful if this type of approach is economically justifiable except under unusual circumstances or as a service of a professional or trade organization.

2. Newsletters and similar publications. Newsletters may be particularly useful as an intermediate step in the technology transfer process. Their greatest value is in providing answers to technology users as to where certain types of information may be obtained. In this way, the forwarding of inquiries or requests for information may be expedited. Newsletters, of course, are subject to the same disadvantages as other mail-response techniques, as mentioned above.

3. Use of intermediate transmitters. Frequently the source of an inquiry or request for technology is not the end user but an intermediate individual or organization that is aware of the need of the user and of the potential source of information. The intermediary forwards the inquiry or request to the information source, receives the reply, and relays it to the potential user of the technology. While this transfer may be done in person, most often it is done by mail, especially in the case of international technology transfers.

This technique has the disadvantages previously mentioned in connection with technology transfer by mail. In addition, it introduces a third party in the transfer. This may be good or bad, depending on the role the intermediary plays in (a) clarification of the request, (b) selection of the right information center, and (c) manner of delivery of the technology to the ultimate user. If, for example, the intermediary is capable of explaining the technology or how it might be utilized or adapted by the user to overcome the problem, the probability of a successful transfer is greatly enhanced. Successful examples can be cited involving research institutes, government organizations, universities, and a variety of other organizations as the intermediary in technology transfer.

Direct Transfer Techniques.

Direct transfer occurs when the holder of the technology has direct personal contact with the potential user. This permits a back-and-forth interchange of ideas, questions and answers, and a better understanding of the technology and its usage.

In this area, a number of different techniques are used. Some of these and their relative advantages and disadvantages are given below.

1. Technology demonstrations. An extremely useful way to illustrate the way a technology can be utilized is through demonstrations to the appropriate audiences. For example, in Pakistan and Thailand, offices of the International Rice Research Institute (IRRI) were established to further the utilization of research findings. One of the activities included encouraging the manufacture of IRRI-designed rice machinery. In order to demonstrate the utilization of these machines, audiences of farmers, industrialists, and government officials in Pakistan and Thailand were invited to observe field demonstrations of the equipment. These demonstrations successfully stimulated interest in the manufacture and marketing of various types of rice machinery.

The advantages of this technique are obvious. The potential manufacturer and user can observe operation of the machines, discuss the design, manufacture, and operation with knowledgeable personnel, and evaluate performance on the spot. Hence, this is a relatively effective technology transfer technique.

Two disadvantages are (a) it is time consuming and relatively costly to mount demonstrations in the field, and (b) an organizational framework must exist for promoting utilization of the technology.

2. Industry presentations. Closely allied to the demonstrations method described above are industry presentations. In this approach, a technology which can be useful to an entire industry sector can be demonstrated to representatives of companies in that industry sector.

When the mobile home industry in Georgia was first rapidly expanding, all of the companies were invited by Georgia Tech to an industry presentation on the use of gangnails in the assembly of roof trusses for mobile homes. Gang-nail assembly of roof trusses was a new approach at the time and appeared to promise a better construction technique at an overall cost savings. This method was shown to approximately 20 mobile home companies, many of which subsequently adopted the technique.

3. Conferences, seminars, and group meetings. Meetings which involve both the holders and users of technology take many forms. They can be large conferences, seminars, symposia, workshops, or small group meetings. The major characteristic of these meetings is that they tend to relate to generalized subject areas (e.g., food, energy, transportation, etc.). As a consequence, they may provide valuable knowledge about the subject area and can create a state-of-the-art awareness, but they rarely provide solutions to the specific problems of the technology user. Hence, as an educational medium, such meetings can be useful, and they frequently result in an interchange of information between sources of technology and the potential user, perhaps after the meeting, which is helpful in the technology transfer process and problem solving. However, such meetings require preparation and various arrangements which can be costly and time consuming.

4. Direct technical assistance. Perhaps the most successful technique in achieving technology transfer occurs when face-to-face communication occurs directly between the source of the technology and the potential user. This type of contact permits a dialogue between the two parties and a better understanding of the nature of the problem and the conditions surrounding the problem. Explanation of the technology in question is also facilitated, and any needed adaptation can be discussed and implemented more easily.

Although this type of transfer is carried out in both the public and private sectors, it is perhaps done successfully most often in the private sector. Multinational companies, for example, have the organizational infrastructure and personnel to permit a transfer of either proprietary or public technical

information or know-how from one company location to another. Use of company personnel to perform the face-to-face transfer mentioned above is relatively easy and effective.

Face-to-face technology transfer through public sector organizations is not as well organized nor are there always public sector organizations which are staffed, skilled enough, or motivated to effect viable technology transfers to the user.

Technology Transfer Techniques for the Future

Obviously the existing mechanisms and techniques for technology transfer need further development, and new methods for technology transfer must be developed and implemented.

There are a number of approaches which are technically feasible and which have worked well in certain instances. They need further refinement and utilization where appropriate.

First, the use of computerized data bases has grown rapidly in the developed countries. These systems, which may contain millions of citations and abstracts in a variety of fields of endeavor, have considerable promise in the technical information search field. As the use of these data banks is extended both through advanced communications (satellites, etc.) and through establishment of new information systems in developing countries, we can expect a favorable impact on the technology transfer process.

Second, the concept of satellite "teleconferencing" seems intuitively to hold much promise. This involves the transmission of images and verbal communications via satellite from one part of the world to another. The audience can be large at either end of such a conference "call," or it may be one individual talking to another. Such a technology provides instantaneous communication, retains the face-to-face transfer characteristics, and is technically feasible in many parts of the world today.

Third, the use of industrial extension systems, modeled in part after the agricultural extension systems which have been successful in a number of countries, seems to be a trend which has merit. In the United States, the field office extension system of Georgia Tech has been successfully replicated by a number of universities. A number of Georgia Tech counterpart institutions in

developing countries have successfully established field offices within their own social and cultural context, notably in Nigeria, the Philippines, and Indonesia. In these field office systems, industrial extension activities are carried out at the grass roots level by professionals and other staff members in residence where the field offices are located.

Such extension activity requires two basic components: (1) a strong central unit which can be supportive of the field station personnel and (2) the outreach industrial extension field offices. Assuming that the field offices are staffed by knowledgeable, well motivated individuals who can obtain information, advice, and assistance from the central unit, the ingredients are then present for an aggressive, dynamic industrial extension effort. However, the field office staffs must be active in the promotion of their services, cannot be desk bound in their offices, and must be active in interviewing users of technology to determine how they can be assisted.

Stumbling Blocks in Technology Transfer

In addition to the complexities of technology transfer when long physical distances are involved, there are a number of pitfalls to be avoided.

Transfer without adaptation. All too frequently, technology is transferred unchanged from a developing country to an undeveloped area without regard to social, cultural, economic, political, and infrastructure differences. Sometimes such transfers work well, but frequently they fail because some minor adaptation of the technology to better suit conditions was not made. For example, one cannot transfer wetland rice machine designs to a dryland farming area without some modification of the machine designs.

Transfer without supporting services. An essential feature of successful technology transfer is the availability of maintenance services and spare parts. In some countries, agricultural equipment lies rusting in the fields for lack of such support activities. Numerous examples exist around the world of this type of problem in many fields of endeavor.

Lack of industrial extension infrastructure. Because industrial extension organizations charged with technology transfer are costly and require good staff people, they are sometimes established without all necessary support functions. In one developing country, extension offices were established by the government in major cities to serve industry needs. However, these offices were not

provided with vehicles. The result was that only nearby industrialists were able to visit these offices to obtain assistance. Those further removed from the office locations received little or no assistance. One must categorize such a situation as an incomplete technology transfer function.

Conclusion

There are a number of techniques and methodologies which can be utilized in the technology transfer process. The large variances in budgets, staffing, support, commitment, and other essentials in technology transfer make it impossible to generalize about the techniques and methodologies most appropriate for universal use. The individual situation must be examined, and the technique must be selected which is best suited to the circumstances and conditions surrounding the potential technology transfer.

Experience has indicated, however, that certain basic features are characteristic of most successful technology transfer systems. The system itself must be based on a comprehensive center of pertinent technical information, the delivery of technology must be as personalized as conditions will permit, and the individuals involved in transferring technology must be capable of discerning the particular needs and capabilities of the users of technology. In general, the most effective technique for achieving technology transfer involves face-to-face communication between the source of the technology and the potential user, institutionalized in a fully equipped industrial extension system with a strong central unit and strategically located field offices. Regardless of the system or techniques employed, however, successful transfers of technology are not likely to be made on a continuing basis -- particularly in a less developed country -- unless those responsible are sensitive to the level of infrastructure development, to the availability of essential supporting services, and to the social, cultural, economic, and political environment in which the technology is to be used.

INDUSTRIAL EXTENSION FIELD OFFICES

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Introduction

Small companies are a vital segment of the industrial base of every country. In the United States, for example, 97% of existing businesses (9.7 million) qualify as "small." They provide some 58% of private sector employment. Similarly, well over half of Japanese industrial workers are employed in small enterprises. Statistics for developing countries are not readily available, but small companies are certainly no less important and quite likely represent an even greater proportion of their industrial bases. The well-being of these small enterprises is essential to the industrial health of the country not only because of their direct contribution to the economy, but also because they are a necessary part of the infrastructure which supports larger enterprises.

In this section, the role of the industrial extension field office in small industry development is examined. Industrial extension activities in the U.S. are discussed and compared with similar activities in developing countries with which the staff of Georgia Tech's Office of International Programs has had direct contact. It is beyond the scope of this study to present a comprehensive analysis of industrial extension services throughout the world.

Assistance Needs of Small Companies

There appears to be widespread agreement that small companies need managerial and technical assistance not generally required by large firms. Although the technological level of the assistance may be different, the need exists in both industrialized and developing countries since, in both environments, it is generally true that small companies

1. do not possess the managerial and technical skills found in large companies,
2. do not have research capability to obtain answers to managerial and technical problems,
3. are unfamiliar with or have no access to reservoirs of managerial and technological expertise and information, and

4. are less capable of adapting off-the-shelf technology to their specific needs.

Managers of small companies are likely to view most of their problems as financial (i.e., inability to obtain adequate financing) since problems of every kind eventually affect cash flows. The real causes of the difficulties, however, may lie in managerial practices and/or inappropriate technology which company management cannot or will not recognize. What the company really needs is help in seeking out improvement alternatives and in coordinating a program of change. Obviously, the assistance needs in small companies are varied, but they generally fall into one of the following categories:

- o information needs
- o analysis and recommendations to correct problem situations
- o special skills and know-how
- o techno-economic analysis
- o education

Information. As pointed out by Bass,^{1/} most companies first seek outside help when they are faced with a technical problem and suspect that information is available someplace to help them. The problem may pertain to product design, manufacturing methods, suppliers of equipment, standardization and standards, processes, or raw materials. They want an immediate solution to an immediate problem. In an industrialized country the problem may require advanced technology. For the most part, however, the needed assistance is not based on state-of-the-art technology, but rather on practical expertise and adaptation of relatively well-known technology. The following specific examples illustrate the types of information which are commonly requested:

1. Technical information
 - o Information on systems to remove fumes and heat from a plant
 - o Uses of wood waste

^{1/} Bass, Lawrence W., "Technical and Managerial Help for Small Enterprises," World Development, 1976, Vol. 4, No. 4, pp. 339-347.

- o Alternative methods for generating CO₂
 - o Modern technology in furniture manufacturing
2. Market information
 - o Users of commercial sand and quantity of sand used by each
 - o Markets for small forgings
 3. Wage and salary information
 - o Survey of wages and salaries paid for comparable jobs in the labor area
 - o Information on the "overlay concept" for evaluating management

Analysis and Recommendations to Correct Problem Situations. Requests for information are often really introductions to the need for further assistance in problem analysis, evaluation, and adaptation of available methods or technology to suit the specific situation. The types of problems are varied and any classification scheme is likely to be inadequate. However, for convenience of discussion, the following is acceptable:

1. Profit improvement

The company is basically sound but with inefficiencies in operations and/or management controls which prevent the achievement of profit objectives. Typically, assistance efforts proceed by first examining expense items and then designing or improving systems to reduce costs and/or increase productivity. Profit improvement programs may also focus on quality, service, product development, or sales if these are roadblocks to better profit performance.

2. Organizational and personnel problems

Organization is a dynamic process and organizational problems may involve interpersonal conflict, organization structure, and more. Small businesses also may need assistance with wage policies, incentive programs, and personnel training.

3. Product development, marketing, and distribution problems

This category includes problems related to marketing and selling. Many medium-sized and even large companies do not have internal skills needed to conduct market studies in order to identify customer needs and sales opportunities. Small companies certainly do not have such capability.

4. Planning problems

Planning involves establishing business objectives and the policies and programs of actions that will achieve these objectives. Along with planning there must be an information system and controls to measure and guide the fulfillment of the plans. Planning without a control system will accomplish nothing. As Fuchs^{1/} states, "Most companies grow like Topsy, carried along by a hard-driving entrepreneur, an inventive genius, a unique product, good timing, or sheer luck. But few of these make the big time without some planning." Planning is required for virtually every major business activity and includes market planning, production planning, manufacturing planning, financial planning, and personnel planning.

5. Production-related problems

Many problems for which management seeks assistance are production related. For example, "Orders are being shipped late, back orders are increasing, customers are shouting for goods, inventories are high, what can we do?" Clearly what is needed in this instance is improvement in production planning, scheduling, and inventory management. Other problems include plant layout, material handling, quality, work methods, and technical processes. Each of these requires special expertise which is not usually found in a small company.

6. Management control systems

In order to remain effective, management control systems must change as the company grows and as goals are modified. Every company is dedicated to delivery of a quality product, on time, at a competitive price, and with costs which permit an acceptable profit. In order to achieve these goals, many facets of production, inventories, and costs must be continuously monitored and controlled. Obvious control needs are costs (material, labor, waste, capital, etc.), quality, production activities, and inventory levels. The relative importance of control needs and the design of specific control systems are determined only after thoroughly studying and understanding the operations and objectives of the company.

^{1/} Fuchs, Jerome H., Management Consultants in Action, Hawthorn Books, Inc., New York, 1975, p. 90.

Special Skills and Know-how. Inevitably, occasions arise in any company when highly specialized knowledge or skill is needed and must be obtained from outside the company. Such needs may be either technical or managerial and may include process design, plant design, methods improvements, equipment design, job evaluation and rating, incentive systems design, accounting systems, and market analysis. There is invariably a need for training to accompany the installation of techniques and systems. In fact, there are two reasons why training is absolutely essential. First, teaching and training during the adaptation of new techniques and systems remove some of the fear of change and help to obtain acceptance and endorsement of the change. Second, training is necessary to ensure that the improved system will be effectively continued after the installation is completed. There is virtually no chance of this if the company personnel do not understand the technique or system and remain unconvinced of its benefits.

Techno-economic Analysis. Techno-economic analyses are concerned with evaluating the technological feasibility and the economic consequences of technological alternatives. Every investment decision should be preceded by such an analysis. Even equipment replacement decisions should involve an economic comparison of alternatives. As the amount of the investment increases, the depth of the analysis should be increased. Large projects such as new ventures, plant expansions, and new product introductions should not be undertaken without a feasibility study to evaluate the cost of plant and operations and the projected returns from sales. Such studies not only provide a profitability estimate, but, if they are well done, also result in a project plan.

Education. Each of the preceding types of assistance is concerned with the needs of an individual company. In every case there is an implied need for education and/or training of company personnel along with the needed information, problem analysis, systems design, or techno-economic analysis. In addition to this education and training which should (and inevitably will) accompany other forms of assistance, there is a need for continuing education to upgrade the business knowledge of managers of small companies.

At the beginning of this section it was stated that managers of small companies do not generally possess the managerial and technical skills found in large companies. This is particularly true in developing countries. In

Nigeria, for example, surveys conducted by Aluko^{1/} revealed that ". . . out of 27,350 industries investigated only three university graduates were proprietors while up to 98 percent of the proprietors were either drop-outs from primary, secondary schools or teacher training institutions, and very few were literates in the modern sense. Consequently, the level of performance, technological and managerial, was low and static. Very few even know how to keep accounts, deal with banks, insurance or other financial institutions or keep abreast with modern relevant technology and industrial techniques." Clearly there is a need to provide managers of small businesses with knowledge of good managerial practices. This need cannot be met economically by the individualized assistance discussed earlier. There is, therefore, a need for group educational programs and courses.

Industrial Assistance -- Objectives and Concepts

The problem of providing managerial and technical assistance to small firms is well recognized. It is reasonable to think that the industrialized nations would have solved this problem and that the need would exist principally in developing countries, but this is not true. It is true that in most industrialized countries there are a complex of sources, both public and private, for technical and managerial assistance to small firms. It appears, however, that these efforts are inadequate or, at least, not completely effective. Pearson^{2/} contends that the United States is weak in technology commercialization programs, and he compares U.S. technology utilization with that of European nations to support his contention.

In developing countries there is even a greater need for effective technical assistance to small companies, since most of their enterprises are in this category and, as pointed out previously, do not have the capability to locate and utilize managerial and technical information. The report of an ad hoc

^{1/} Aluko, Samuel A., "IRDU Update of Programs, Problems and Prospects," Proceedings of the Conference on "Adaptive Technology and Small Industry Development," Institute for Small-Scale Industries, University of the Philippines, Quezon City, Philippines, May 26-29, 1976.

^{2/} Pearson, Jack W., "New Ways to Bring Technology to the Marketplace," Technology Review, March/April 1977, pp. 27-35.

advisory panel of the Board of Science and Technology for International Development^{1/} states that:

Village level industry is important in many developing countries because it is labor intensive and capital saving. However, little of the scientific and technical information from developed countries is directly applicable to village industries; and, in any event, local customs often hinder the acceptance of improved technologies. Therefore, the information-assistance approach will differ from that for more advanced industries. Primarily, it must emphasize the development and adoption of technologies appropriate to the skills, resources, and attitudes of villagers.

Industrial extension field offices are the most frequently suggested approach for responding to industrial assistance needs. Pearson^{2/} advocates an industrial technology extension service to serve as a local advisor to general industry in the U.S. and lists the following five interactive operating elements as important to success:

1. University affiliation
2. Experiment station
3. Resident experts
4. Local advisors
5. A coordinated education and training program

In their report on scientific and technical information for developing countries, the Ad Hoc Advisory Panel of the Board of Science and Technology for International Development recommends establishment of "Village Technology Centers" staffed entirely, or largely, by indigenous personnel. The principal function of the center would be to "identify technological needs, adapt available technologies as required, and introduce and disseminate appropriate technologies." Likewise, the report of an inter-agency team financed by the United

^{1/} "Scientific and Technical Information for Developing Countries," A Report of an Ad Hoc Advisory Panel of the Board on Science and Technology for International Development, National Academy of Science, Washington, D.C., April 1972, p. 32.

^{2/} Pearson, op. cit.

Nations Development Program and organized by the International Labour Office^{1/} maintains that "if infrastructure, technical assistance, and credit were made available simultaneously and jointly, they would be many times more effective in the promotion of small and medium-sized enterprises than would be the sum of these services provided separately," and proposes the establishment of industrial technical assistance centers in the Philippines. The function of these centers would include the following:

- o assistance in preparing project proposals and loan applications
- o assistance in dealing with government agencies
- o accounting and legal advice
- o skill development
- o adaptive technology development
- o assistance in marketing
- o assistance in product design
- o collection and transmission of data

The general concept seems to be that a delivery system for industrial assistance should function as an "adaptive agent" as indicated in Figure 1.

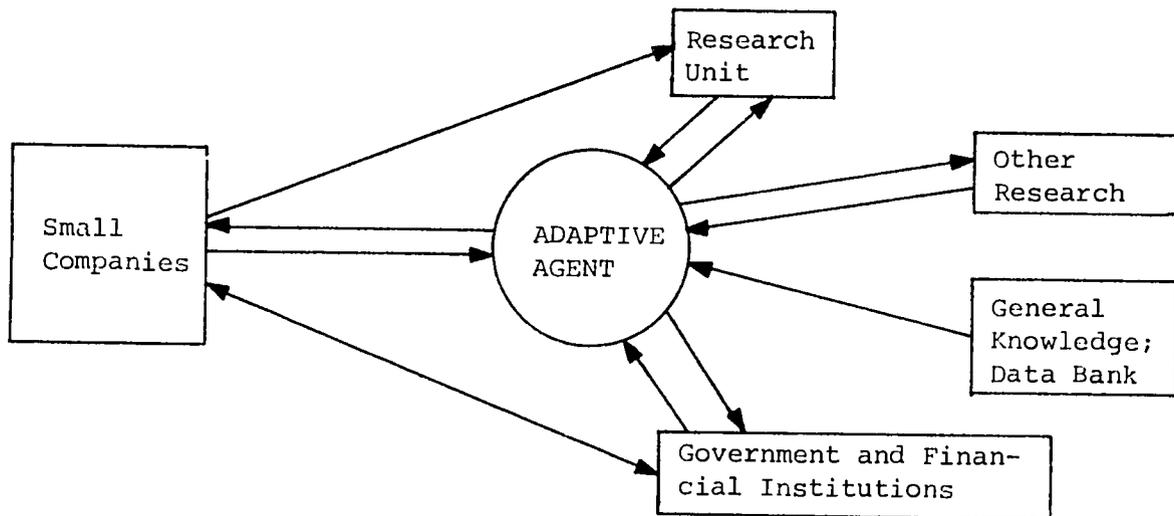


Figure 1. The Role of an Adaptive Agent in Industrial Assistance

^{1/} "Sharing in Development - A Program of Employment, Equity and Growth for the Philippines," International Labour Office, Geneva, 1974, p. 551.

The role of the adaptive agent is to locate, interpret, adapt, and demonstrate general knowledge and research results for use in a specific situation. The adaptive agent also serves as a link between the small company and the generators of new knowledge by observing and correctly perceiving the needs of small businesses and transmitting them as research needs. It is interesting to note that these concepts for industrial assistance delivery systems emphasize technology and tend to overlook the equally important need for management assistance.

The Agricultural Sector Model -- Cooperative Extension Service

Virtually all proponents for industrial extension centers cite the United States Cooperative Extension Service (often called Agricultural Extension Service) as a model for industrial extension. This national system has foundations more than a century old and has existed in its present form for over 60 years. Its history can be traced through a sequence of legislative acts which surely include some of the most profound legislation enacted in the nation's history.

1862 Morrill Act. The first Morrill Act (introduced by Vermont Congressman Justin Smith Morrill) provided a number of 30,000-acre land grants to each state equivalent to the number in each state's congressional delegation at the time. These grants were to be used for at least one college in each state " . . . where the leading object shall be, without excluding other scientific or classical studies, to teach such branches of learning as are related to agriculture and the mechanic arts." The educational institutions established under this act are known as "land-grant colleges" and include some of the largest and most renowned educational institutions in the United States. The act was signed by President Lincoln only a few weeks after he signed the Organic Act creating the United States Department of Agriculture.

1890 Morrill Act. The second Morrill Act provided additional endowment funds for the land-grant colleges.

1887 Hatch Act. The Hatch Act provided for Agricultural Experiment Stations at one land-grant college in each state. A fundamental and widespread capability in agricultural research was thereby established throughout the country.

1914 Smith-Lever Act. Agricultural extension activities were a natural result of the agricultural education and research at land-grant colleges. Individual states and farmers' organizations disseminated research findings of the experiment stations to rural areas. As these extension efforts increased, it became clear that coordinated federal support was needed. The Smith-Lever Act authorized cooperative extension work between land-grant colleges and the U.S. Department of Agriculture. It specifies that:

Cooperative agricultural extension work shall consist of the giving of instruction and practical demonstrations in agriculture and home economics to persons not attending or resident in said colleges in the several communities, and imparting information on said subjects through demonstrations, publications, and otherwise . . .

It also provided for the funding and administration of agricultural extension activities as a cooperative arrangement involving three levels of government -- federal, state, and county.

The Cooperative Extension Service has functioned basically unchanged since it was established by the Smith-Lever Act. However, several later acts have intensified and expanded extension services. The system now operates in every state, with a land-grant college serving as headquarters for a network of local advisors (county agents) who are skilled agricultural experts in residence in virtually every county in the state. These local advisors are graduates of agricultural education programs. They live in the community, know its people, and are directly concerned with local agricultural and agribusiness problems.

In this system, the functions of identifying problems, planning, research and development, evaluating new knowledge, and applying it in the field are well integrated. In each state, the relationships between the county agents and the state agricultural experiment station at the university are very close. Agricultural education and research is motivated by feedback from county agents, and there is a constant stream of research results and technical information flowing from the institution to the county agents in the field. Experts in every agriculture-related field (e.g. soils, crops, structures, veterinary science, animal breeding and nutrition, forestry, and farm machinery) are available to respond to problems identified by the county agents. Typically, the county agent maintains an active role in the rural community. He calls on farmers, attends local meetings of farm organizations (e.g., Farm Bureau and

48

4-H Clubs), and assists agribusiness in every possible way. He perceives his major role as educational.

At the federal level, the U.S. Department of Agriculture also provides agricultural research and sponsors legislation and programs to support agricultural development. Thus the coupling between local/state/federal agricultural assistance is very strong. Also, the Cooperative Extension Service "fits" the model shown in Figure 1. The local county agent and his staff serve as an adaptive agent, and the system operates as shown in Figure 2.

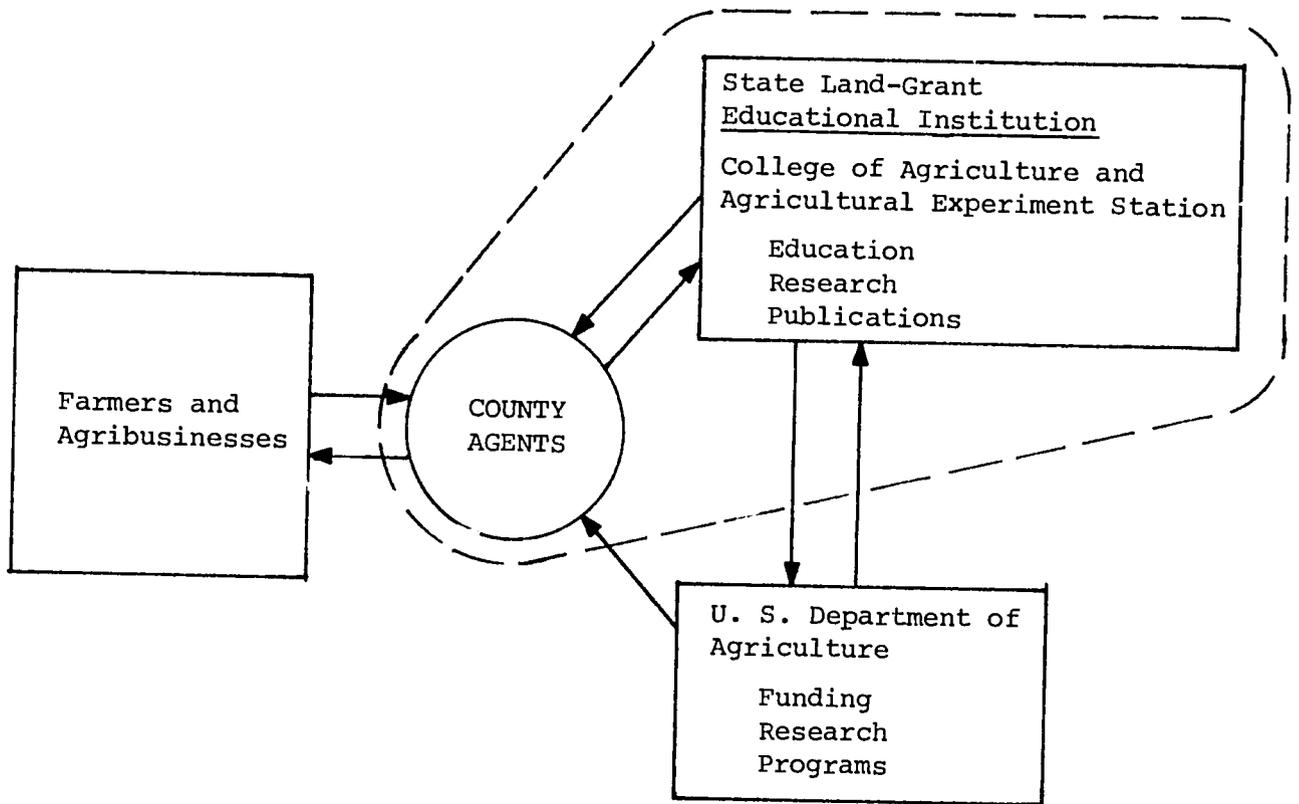


Figure 2. The Agricultural Extension Assistance Triad

As Pearson^{1/} points out, in the agricultural cooperative triad "the government identifies goals and supplies the funds needed to produce the public goods. The university extension controls research and development, and supplies the trained manpower needed to service industry and maintain its own research and development and training functions. Industry implements new technology within its productive process by incorporating technology directly from the extension service and by using the contribution of university trained manpower."

There is no denying that the U.S. Cooperative Extension Service has been successful. Agricultural production has increased steadily over the years, and the agricultural sector leads all economic sectors in productivity growth.

The U.S. is not the only nation with a cooperative extension service for agriculture. Many nations have agricultural extension agencies with similar objectives. According to an international directory of extension organizations, however, very few involve the triad of university/government/industry.^{2/}

It seems unlikely that the agricultural extension field office system should or can be duplicated for industrial extension service. The two needs, although superficially similar, are distinctly different. Perhaps the major difference lies in the diversity of technological assistance which could conceivably be required of any industrial extension field office system. The technology of agriculture as a whole is diverse, but it is generally more homogeneous on a county or regional level. Farms in a given region tend to have the same set of crops and livestock, similar soils and weather conditions, and similar farming practices. In the industrial case, the major industries in a region may be resource based; however, there are no other natural forces which limit the types of industry. Any county or region may contain a large number of small firms producing both goods and services of many types. There may be literally hundreds of different product-related enterprises, each with different technological needs. No industrial extension staff of reasonable

^{1/} Pearson, op. cit., p. 33.

^{2/} International Directory of Extension Organizations and Extension Training Institutions, 1975. Compiled by Marie S. McCabe and Burton E. Swanson. Published February 1975 at the University of Wisconsin-Madison by Midwest Universities Consortium for International Activities Rural Development Research Project.

size could possibly have the breadth of technological knowledge that would be required. It is essential that any industrial extension service include a back-up agency to which field office personnel may turn for a wide variety of technical information and research.

It is extremely doubtful that public sentiment in the United States, now or in the future, will permit the commitment of public resources to industrial productivity which have been and are being provided for agriculture. (It is estimated that in fiscal year 1977 more than \$876 million of public funds will be spent by Agricultural Experiment Stations and the Cooperative Extension Service.) The major legislation which brought about the present system of agricultural extension services was passed when the United States was largely an agrarian nation and most voters were farmers. Foresighted government leaders of the time recognized that the strength of the growing nation lay in agriculture. Their wisdom is undisputed. Currently, the U.S. is the world's leader in agricultural production, but its economy is also highly dependent on industrial production. In spite of this, there is not the same attitude toward business as there is toward agriculture and certainly not the same propensity to assist business as there was to assist agriculture almost a century ago. For whatever reason, public attitude appears to be that industries in general have earned a reputation as exploiters of resources and people and that they should be regulated and heavily taxed rather than assisted.

Industrial Extension Field Offices in the United States

Although there is no counterpart to the Agricultural Extension Service, the United States Small Business Administration (SBA) serves small businesses throughout the nation. The SBA is an independent federal government agency created by Congress in 1953 to encourage, assist, and protect the interests of small businesses.^{1/} The agency attempts to carry out its mission through programs in the following areas:

- o Financial Assistance to Small Businesses
 - Direct and immediate participation loans
 - Loan guarantees

^{1/} SBA, what it is --- what it does, U.S. Small Business Administration, Washington, D.C., 1973.

Economic opportunity loans
Disaster loans

o Development Company Loans

Loans to state and local development agencies

o Surety Bond Program

o Minority Enterprise Program

o Small Business Investment Companies (SBICs)

SBICs are SBA-licensed companies which supply venture capital and long-term financing to small firms for expansion, modernization, and sound financing of their operations. SBA may make loans or guarantee 100 percent of the loans made by private lending institutions to SBICs to add to their own funds for financing small firms.

o Procurement Assistance

SBA helps small firms to participate in bidding on U.S. government purchases.

o Management Assistance

Courses

Conferences, workshops, and clinics

Counseling and individual assistance

Technology utilization

These programs are made available to small businesses through a network of 85 field offices in major cities throughout the 50 states of the United States. Obviously, SBA assistance to small businesses--with an average of less than two field offices per state--is not comparable to agricultural extension with resident agents in virtually every county in every state.

In addition to the Small Business Administration, organizations of various types in many states in the U.S. offer assistance to small businesses, and several states have industrial extension centers connected with one or more of their universities. Only a very few, however, provide a network of field offices with resident specialists to assist local industry. Perhaps the oldest such service is operated by the Engineering Experiment Station at the Georgia Institute of Technology in Atlanta, Georgia.

Georgia Tech's Industrial Extension Service

The Industrial Extension Division, a component of the Engineering Experiment Station at the Georgia Institute of Technology, has a network of seven extension offices throughout Georgia. Georgia Tech's present program of industrial development assistance had its beginning in the mid-1950's with the establishment of the Industrial Development Division. The first extension office was established in Rome, Georgia, in 1961 with the objective of improving the economic level of the Coosa Valley area through the attraction of new industry. This objective has been only slightly modified over the years, and the present system of industrial extension offices strives to promote the economic level of the state of Georgia through economic development. Each office carries out activities aimed at attracting new industry and promoting growth in existing companies.

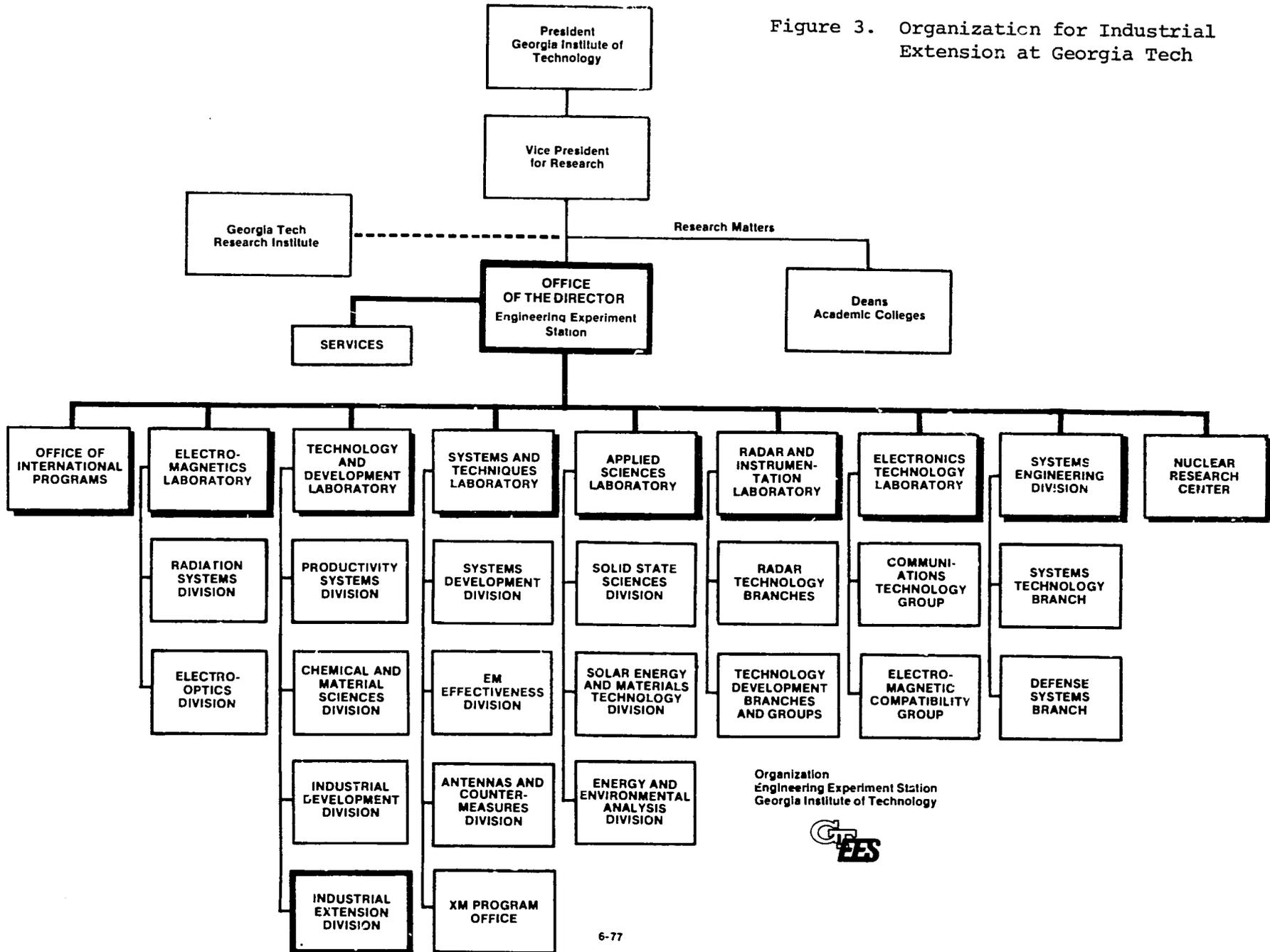
The Industrial Extension Division is now a unit of the Technology and Development Laboratory in the Engineering Experiment Station, as shown in Figure 3. Each of the field offices has a staff of from one to three professionals trained in engineering or business. The central office at Georgia Tech has an administrative staff of four. Industrial extension activities in the field offices may be divided into two broad categories: (1) assistance to local, area, and state economic development groups, and (2) technical assistance to small companies.

Assistance to Local, Area, and State Economic Development Groups. This portion of the extension office activities has the objective of bringing new industries into the area. It includes the following:

- o Encouragement of local organizations devoted to economic development. The service provided to local development groups usually begins with organizational guidance and support. Where possible, use is made of existing organizations such as chambers of commerce and development authorities. Local groups are guided in the creation of committees within their organizations which can exercise responsibility for certain functions and policies such as financing, industrial site development, publications, transportation, utilities, manpower resources, governmental relations, and relations with existing industries.

It should be emphasized that the purpose in assisting local development groups is to create strong local organizations and that the field office

Figure 3. Organization for Industrial Extension at Georgia Tech



3-16

Organization
Engineering Experiment Station
Georgia Institute of Technology



52

does not assume local development responsibilities. The office staff provides continuing guidance and assistance when their services are requested, but the local leadership must assume the responsibility for formulating local policies and decisions.

o Assesment of economic, natural, and human resources in the area and identification of industrial infrastructure needs. Another service provided to local and area development groups is that of economic research. Such work involves the collection and analysis of resource data in order to determine the potential of individual communities for economic development. The most common forms of publication of these data are "Economic Profiles," "Industrial Data Digests," and "Condensed Facts Sheets." Other types of economic research include information on existing industry, raw materials, wage rates, labor availability, utility services, transportation, and natural resources. Analysis of these data provide indications of the communities' assets and liabilities as related to economic development.

The extension office professional staff also assists commissions in making traffic and thoroughfare studies by supplying information concerning worker commuting patterns, potentials for industrial growth, industrial transportation needs, etc. Similar information is also supplied for the purpose of preparing proposals for federal grants and loans, legislative requests, and other needs related to infrastructure development.

o Identification of potential industrial investment opportunities. Resource assessment also provides a basis for realistic local and area action programs for attracting new businesses. Also, it serves to disclose manufacturing and service opportunities to supply the needs of established industries and helps to identify opportunities for expansion or diversification of existing firms. In many cases, the extension office staff prepares project feasibility studies for use in promoting industrial development.

o Industrial site selection. The extension office staff often assists local development planners in conducting land-use studies, recommending those areas of individual communities which should be set aside for and restricted to industrial use. Such recommendations are made after a thorough survey of the locations of existing industries, the potential for industrial growth, and available and planned transportation services, as well as available and planned utility services such as water, sewage disposal, natural gas, and electricity.

Extension office personnel also provide assistance in planning, developing, and promoting private and public industrial parks and districts.

Industrial site selection is another service provided to local and area development groups. These studies have produced data on numerous parcels of land (including maps, site sketches, aerial photographs, and data summary sheets on each parcel) and have emphasized the importance of controlling good land to ensure its availability at a reasonable cost. Site data are used in promotional work by the communities and are provided to area and state development agencies for their promotional use. Also, the data are readily available for consideration by industrial prospects.

o Industrial recruitment and community promotion. The industrial extension field office assists local and state development agencies in providing information to recruit industrial prospects. For the most part, this takes the form of a documented presentation prepared specifically for the prospect's requirements and may also include personal visits to the company headquarters as well as participation in meetings between the prospect and local representatives.

o Liaison between local development organizations and other agencies. Another important function of the extension office is that of providing liaison between the statewide development organizations and the local and area development groups. By maintaining active and participating membership in professional development organizations, area office personnel are able to maintain good contact with industrial development groups from utility companies, transportation companies, construction companies, and financial institutions. Through these contacts, area office personnel are able to assist in getting suitable communities in their areas considered for prospective industries.

Technical Assistance to Small Companies. In addition to area development assistance, another function that is equally important in creating jobs and upgrading a community's economy is management and technical assistance to existing firms. Such assistance is particularly needed in small companies that do not have large technical staffs or up-to-date technical and management libraries.

o Background. Direct assistance to industry by Georgia Tech's industrial extension field offices was initially carried out on a very modest scale because of limited funding. However, in 1965 the State Technical Services

Program was created by an act of Congress. Its purpose was to speed industrial and economic growth of the nation through dissemination of technical and scientific knowledge. The program was administered under the U.S. Department of Commerce and provided matching funds to states wishing to participate. In Georgia, the State Technical Services Program was administered by the Office of the Board of Regents of the University System of Georgia and implemented by three institutions of the University System -- Georgia Tech, The University of Georgia, and Georgia State University. Georgia Tech's principal mission under this program was to provide technical information and assistance to facilitate technology transfer to industries within the state. This act and its related funding provided the impetus for expansion of Georgia Tech's industrial extension field offices to the present level of operations.

In 1969 the federal program of assistance under the State Technical Services Act came under the influence of sweeping economy drives in the federal government. In spite of favorable accomplishments of the program, federal funding was discontinued and, on the national level, the program was dropped. The State of Georgia, realizing the value of the program to the state's industry, made a decision to continue the funding. The Industrial Extension Division is now financially supported by state funds (allocated through the Board of Regents of the University System), contracts from local and area development groups, and contracts and grants from federal agencies.

o Approach. Initially the State Technical Services Program stressed transferring technology by providing pertinent technical publications in response to industry needs. It quickly became apparent, however, that when these technical publications were put in the hands of a plant manager, plant engineer, or entrepreneur, the information was often never used. It was found that, much of the time, technical publications required a great deal of interpretive work before the technology could be implemented. Also, even when interpretive work was done, direct technical assistance by field engineers was required.

The Industrial Extension Division is responsible for providing a major portion of the state's technical assistance to industry. Extension office professional personnel respond to requests from companies desiring assistance and also contact industries in their areas and, by plant visits and interviews with key company personnel, determine how they can best assist company growth.

During the initial visit to a company, the extension officer explains the various programs carried out by the Industrial Extension Division and obtains as much information about the company as possible. This information is noted on a confidential manufacturer's data sheet (see Figure 4) prepared during the interview. It covers production equipment and capabilities, raw materials and waste (which also includes air pollutants and water pollutants), sales and marketing, plant facilities and possible expansion plans, and an appraisal of the company's assistance needs.

Usually during this initial plant visit, the extension officer will have an opportunity to tour all of the manufacturing facilities. In many instances during this tour, he is able to make on-the-spot recommendations for improvements. It is sometimes very difficult, however, to get the company officials to disclose the company's problems and information needs. Often, if the official is reluctant to divulge such information, the extension officer is able to deduce from observations and conversations what the company's present and potential problems are.

As a result of this initial visit, problems requiring laboratory work or which are otherwise beyond the capability of the extension office are sent to the Industrial Extension Division headquarters at Georgia Tech in Atlanta. The assistance requests are screened and then assigned to either a researcher in the Technology and Development Laboratory or directed to specialists in other laboratories in the Engineering Experiment Station and the academic faculty.

In many instances, the extension officer finds that the information gathered by these specialists, while very pertinent to the company's needs, is too technical for the company personnel who will use it. In these cases, the extension officer must rely on his own technical background and knowledge of the company and its personnel to interpret and present the information sent to him. He may even provide direct assistance in implementing the recommended changes in management and/or technology.

There are no official limitations on assistance provided by the industrial extension field office. General practice, however, is to give priority to small companies and to limit the time commitment to approximately five man-days.

CONFIDENTIAL MANUFACTURERS DATA SHEET

Date: _____

1. Firm Name _____ S.I.C.# _____
 2. Street Address _____ P. O. Box _____
 3. City and County _____ Phone _____

4. Key Personnel (Include President, Manager, Purchasing Agent, etc.):

<u>NAMES</u>	<u>TITLES</u>	<u>NAMES</u>	<u>TITLES</u>
_____	_____	_____	_____
_____	_____	_____	_____

5. Normal number of production employees: Total _____ Male _____
 Key Skills _____

6. Products and/or Services: _____

7. Brief description of production process: _____

8. Average daily production output (with present facilities): _____

9. Maximum daily production output (with present facilities): _____

10. Normal production schedule: Days per year _____ Shifts _____ % Overtime _____

11. Major items of equipment: _____

12. Percentage of time that equipment is in use: _____ %

13. Specialized equipment and/or capabilities, if any: _____

14. Are you interested in handling subcontracts? _____ Government contracts? _____

15. Major materials, components, supplies used and sources:

<u>ITEM</u>	<u>SOURCE</u>	<u>ITEM</u>	<u>SOURCE</u>
_____	_____	_____	_____
_____	_____	_____	_____

16. Needs, if any, for additional and/or closer sources of materials and supplies: _____

17. Types, quantities, and disposition of by-products and waste: _____

18. Current sales volume: _____ () Increasing
 () Steady
 () Decreasing
 19. Seasonal fluctuations: _____
 20. Description of distribution system used: _____
 21. Marketing area (county, state, region, nation, overseas): _____

22. Plant site _____ sq. ft.; Site size _____ acres; Office area _____ sq. ft.
 Production area _____ sq. ft.; Warehouse area _____ sq. ft.
 23. Plant expansion in last five years: _____
 24. Expansion or diversification planned: _____

25. Transportation services used (check): Rail _____ Highway _____ Air _____
 26. Presently, what are the major problems confronting your business? _____

27. In the area of new developments, in what particular fields of management, science, engineering, or technology, would you like to be kept informed? _____

28. Sources of information presently used: _____

29. What specific information needs do you have in either management or technical areas? _____

NAME _____ TITLE _____

Comments: _____

Interviewer: _____ Interview completed for:
 () EDA () STS

PRODUCTION

EQUIPMENT AND CAPABILITIES

RAW MATERIALS AND WASTE

SALES/MARKETING

PLANT INFO & EXPANSION

TECHNICAL INFORMATION & ASSISTANCE NEEDS

3-21

571

Figure 4. Confidential Manufacturers Data Sheet Used by Georgia Tech's Industrial Extension Service

o Problems. During the almost 17 years that Georgia Tech has provided industrial extension services, certain problems related to this work have emerged which seem to be quite general.

- Gaining the confidence of industry. One of the major problems is gaining the confidence of the client company management. Characteristically, small company entrepreneurs and managers do not trust any organization that is in any way sponsored by the state or federal government. They all, to some degree, fear governmental intervention or governmental meddling. As a result, one of the first things that the extension office professional must do to gain the confidence of company management is to give convincing assurance that any information obtained will be held in strictest confidence and, specifically, will not be passed on to government agencies or competitors. The fact that extension office personnel live in the communities that they serve is certainly a major factor in gaining the confidence of local industry. This accomplishes two things: (1) it enables extension office personnel to better know the community and general problems and needs of local industry, and (2) it gives local industry the comfortable feeling that extension office personnel are part of the community and not merely agents of a big city governmental organization.

- Problem identification. Another common problem is the reluctance of a plant manager or entrepreneur to admit that problems exist. When extension officers first visit a company, they explain their desire and capability to assist in solving problems which the company may be having. The usual response is, "Oh, everything is fine -- no problems." After company management is better acquainted with the extension officer and has developed a more trusting relationship, he usually begins to disclose a number of technical and managerial problems. These, quite often, are only symptoms of the real problem, however, and it sometimes requires many hours of painstaking work to analyze all of the symptoms and arrive at the basic problem. Then the manager or entrepreneur must be convinced that this, and not his stated symptom, must be corrected. The old engineering cliché that a problem defined is 90% solved is very often the case when working with small industry.

- Company acceptance of recommendations. Another basic problem is that company management wants to be told what it wants to hear. When extension officers report something that may be unpleasant, such as processes being

obsolete, or worn out equipment that is no longer capable of producing good parts, or anything that will cause inconvenience or cost money, the manager may become irritated and discontinue his relationship with the extension office. In spite of patient efforts to convince company management of the wisdom of the recommendations, they may not be accepted. The best defense against rejection of recommended improvements is a well-documented economic analysis.

- Difficulties in obtaining "back-up" services. Still another problem encountered by extension officers is in trying to get expert assistance from specialists at the Engineering Experiment Station and academic faculty when it is needed. The problem lies in the fact that most such individuals have priority commitments to their own organizational components. Even though the need may be urgent, they are often prevented from giving time and attention to problems referred by extension personnel because such work is not a regularly scheduled part of their responsibilities and not included in evaluations of their performance. Also, the administrative system does not provide payment either to the specialist or his organization for time expended on industrial extension problems.

- Cost of extension service. Finally, the most critical problem is that of limited funds. Invariably, there is never enough money for everything that should be done. As a result, a priority system must be used to achieve the greatest benefit to the state from the funds that are available. In many cases this means not being able to supply the technical needs of a small manufacturer because the available resources can be better used in helping a larger manufacturer. The rationale behind this is that the major objective is to create jobs with scarce dollars. If the benefit, in terms of jobs created, would be greater by helping a larger company, then resources must be spent with the large company.

The two primary measurements of the effectiveness of industrial extension activities are (1) changes in company employment levels and (2) changes in company profitability. The latter is important because of its implications for industrial growth and long-term economic benefits to the community and state. Unfortunately, however, exact profitability data are difficult to obtain.

Employment change is much more obvious and its measurement has indicated that Georgia Tech's industrial extension field offices have been very effective.

In a cost/benefit analysis conducted by the nationally known consulting firm of Arthur D. Little, Inc., six companies selected for evaluation out of more than 600 visited by industrial extension field office personnel indicated that the assistance provided was instrumental in creating or saving over 300 jobs and yielded a benefit/cost ratio of 22:1.

Industrial Extension Field Offices in Developing Countries

In spite of the generally acknowledged importance of small industry in the development process, it appears that organizations to provide technical, managerial, and financial assistance to small companies are just beginning to be established in the Third World. The literature of industrial development contains many publications on "technology transfer" (usually referring to the transfer of advanced technology from the industrialized nations to less developed countries) but virtually nothing concerning managerial and technical assistance to small companies. Apparently there has been no effort to assess the availability of industrial assistance in countries throughout the world as has been done with agricultural extension.^{1/} The discussions of industrial extension field office activities which follow are therefore restricted to those countries and activities with which the staff of the Office of International Programs at Georgia Tech has had first-hand experience. With the exception of the Small Business Advisory Centers in the Philippines, each of the organizations has worked in cooperation with the Office of International Programs under the US/AID Institutional Grant Program, "Employment Generation through Stimulation of Small Industries."

The Philippines: Institute for Small-Scale Industries. Since its establishment in 1966, the University of the Philippines' Institute for Small-Scale Industries (UP/ISSI) has always committed itself to the support of small-scale industry and entrepreneurial development. It is one of twelve government agencies involved in the promotion and development of small and medium industries and is a member of the Department of Industry's Commission on Small and Medium Industries.

^{1/} International Directory of Extension Organizations and Extension Training Institutions - 1975,

UP/ISSI was established with the following objectives: (1) to train competent people to a level where they are able to assist existing small-scale industries to increase productivity and to develop and promote new ones, (2) to provide consultancy and extension services to existing small and medium industries, (3) to conduct research on plant operations and make the results of such research available to interested parties, and (4) to assume the leadership in overcoming the various problems of small and medium industries. In their efforts to achieve these objectives, UP/ISSI staff are organized into the following operating departments:

- o Planning and Management
- o Consultancy
- o Information
- o Training
- o Low-Cost Automation
- o Technology
- o Research
- o Entrepreneurship

Each of these departments is responsible for several specific areas related to the Institute's basic objectives. The Technology Department, for example, is concerned with response to technical inquiries, fostering local innovation (inventions), technological assessment, and technical extension activities. The Training Department is responsible for the many training courses on entrepreneurship development, small business consultancy, project study preparation, regional industrialization, low-cost automation, and other areas of interest to the small business community. One or more of these courses is under way at all times. In the period July 1, 1973, to June 30, 1974, UP/ISSI trained a total of 9,778 participants in various management functional areas.

Consultancy services are available for the preparation of project feasibility studies, work simplification, managerial control systems design, planning, and business problem analysis. During the same one-year period cited above, the Institute staff evaluated 70 project studies, conducted surveys of 43 provinces for identification of potential industrial projects, and assisted 946 small and medium-sized firms in management, financial, and technological aspects of production.

In August 1976, the Institute opened a Pilot Extension Office (PEO) at Tacloban City, Leyte, to serve the Eastern Visayas Region. This began a three-year project with the aim of making available to the region's entrepreneurs the assistance offered by UP/ISSI. It is anticipated that it will be the forerunner of a network of such industrial extension offices. The objectives of the PEO are as follows:

1. to continuously conduct consultancy in the region,
2. to undertake technical studies and research on request of various government agencies concerned with industrial development,
3. to undertake research for the promotion of small industries, and
4. to undertake the publication of studies, monographs, research papers, and other written works on small and medium industry.

The PEO staff consists of six professionals with a broad mix of educational background and experience. Included in the group are a certified public accountant, a mechanical engineer, a professional chemical engineer, an economist, a public administration graduate, and a commerce major.

In the first year of operation the staff has assisted more than two dozen enterprises with technical problems. When the initial contact is made with an entrepreneur, an Interview Card (Figure 5) is created as a permanent record for follow-up. If technical assistance is provided, a "Client Activity File" is set up to record the details of the assistance provided (Figure 6). A monthly accomplishment report in the following format is sent to UP/ISSI headquarters:

MONTHLY ACCOMPLISHMENT REPORT FORMAT

I. PROJECT DEVELOPMENT AND EXTENSION SERVICES

A. Project Inquiries and Guidance

B. Project Supervision/Management

- Follow-up Action and Visit
- Progress Report on Technical Assistance
- Marketing Assistance
- Design of Machineries
- Plant Layout

- Product Costing

II. DATA GATHERING

(Research Activities)

III. MISCELLANEOUS

- A. Involvement with Other Agencies, Institutions, etc.
- B. Communications Drafted
- C. Personal Development (Seminars attended, etc.)

IV. PENDING/EXPECTED

Assignment and the target date for accomplishment.

INTERVIEW CARD	
NAME OF OWNER (S) _____	CONTROL NO. _____
NAME OF FIRM: _____	
ADDRESS: _____	TYPE OF ORG. _____
(STATE OTHER CONTACT ADDRESS(S) _____)	
DATE ORGANIZED: _____	TYPE OF INDUSTRY: _____
TOTAL ASSETS: _____	EMPLOYMENT: _____
PRODUCT(S) / SERVICES: _____	
REASON(S) FOR INITIAL CONTACT: _____	
ACTION INITIATED	
PROBLEM AREAS IDENTIFIED BY INTERVIEWEE: AND AREAS REQUIRING ASSISTANCE:	
STAFF'S OBSERVATIONS / COMMENTS / ACTION:	
PERSON INTERVIEWED: _____	
INTERVIEWED BY: _____	
DATE: _____	
(USE EXTRA CARDS IF NECESSARY)	

Figure 5.. Interview Card Used by Pilot Extension Office, UP/ISSI

63

UPISSI EXTENSION OFFICE NO. 1
TACLOBAN CITY

TECHNICAL ASSISTANCE ACTIVITY RECORD

Visit Locale: _____ Date: _____ By: _____

Problem Area Code: _____

Time (Including Travel) Used: _____

Report Brief: (include follow-up anticipated)
(note significant statistical changes)

Figure 6. Technical Assistance Activity Record Used by Pilot Extension Office, UP/ISSI

64

UP-ISSI EXTENSION OFFICE NO. 1
TACLOBAN CITY

TECHNICAL ASSISTANCE ACTIVITY RECORD

Date	Visit Locale	Staff	Report Brief	Time Used

Working relationships have been established with other development-related organizations in the Tacloban area, and one trade association, the Tacloban Ironwork and Engineering Industries Association, has been established. A proposal for a training program to train automobile mechanics and machinists was submitted by the PEO and funded by the National Manpower and Youth Council. This training program, with instruction provided by local entrepreneurs in their own shops, is now under way. In its efforts to promote small industry, the PEO has shown audiovisual presentations of management films in each of the five urban areas of the region. A total of 225 entrepreneurs attended these meetings.

The initial obstacle to the work of the PEO, distrust and suspicion from the small industry managers, has been overcome. The major obstacle at present is the lack of funds to pursue all the assistance and development activities that are obviously needed. Funding for the trial period was obtained through a Small Industry Grant from the United States Agency for International Development. Efforts are now being made to obtain other financial support for continued operation of the extension office.

The Philippines: Small Business Advisory Centers. The Small Business Advisory Centers (SBACs) of the Philippines are a network of government-financed industrial extension centers administered by the Department of Industry. These centers are an outgrowth of the Medium and Small Industry Coordinated Action Program (MASICAP), which is also in the Department of Industry. MASICAP was initiated to identify new industrial projects and entrepreneurs, prepare project studies and loan applications for submission to venture financing institutions, and assist proponents in the venture initiation process. It soon became clear that management and technical problems arose during the implementation of projects assisted by MASICAP, and the Small Business Advisory Centers were formed in July 1975. There are presently ten centers and two more are planned. Any small or medium-size business (i.e., assets not exceeding ₱4 million) can obtain assistance from a Small Business Advisory Center without charge.

The brochure published by the Department of Industry describes the SBAC as follows:

The Small Business Advisory Center (SBAC) of the Department of Industry is a catalyst for the growth and development of small and medium-sized businesses in a given area. As such, its role is to stimulate and coordinate all possible types of assistance needed

to develop and strengthen this sector of the economy. Its function is to harness resources from both the public and private sectors and channel these toward small and medium-scale industries (SMSI).

It is the local friend of small businesses to which they could go for advice, assistance, support and attention.

The Small Business Advisory Center provides managerial and technical consultancy services to small business establishments to improve their productivity and efficiency. In this regard, SBAC does the following:

- Diagnoses a client's operations
- Identifies areas of improvement
- Makes the necessary recommendations that are expected to bring about an improved system
- Quantifies the costs and benefits of implementing the said improvements
- Assists the client in implementing the proposed improvements
- Checks on the actual costs and benefits the improved system has actually brought about.

Presently, Centers are staffed with five persons. However, this is considered minimal staffing, and the plans are to increase the staff size at Centers which serve the more heavily populated regions. At the present time, field staffs are heavily weighted with business and commerce graduates. However, the need for technical expertise is recognized and there is an intent to add engineers (particularly industrial engineers). There is, however, some question as to the best qualifications for industrial extension personnel. The Secretary of the Department of Industry is said to advocate "industry specialists" (e.g., sugar industry, woodworking, and copra processing) as opposed to a mix of specialists in various disciplines. On the other hand, SBAC officers fear that industry specialists would have difficulty responding to the broad mix of technical and managerial problems which the Centers are asked to solve.

A major problem has been the high turnover among SBAC staff. Two incentive programs have been proposed which, when adopted, should solve this problem:

- (1) each professional will be given an opportunity to earn a Master's Degree in Business Management; and
- (2) after K years of service (K is as yet unspecified), an SBAC professional can start his or her own business and obtain a maximum of ₱4 million equity capital from government sources or with government assistance.

A support group at Manila headquarters responds to problems and information needs which the field staffs cannot handle. However, it is a rare exception when a field staff does not handle a problem. In theory, SBAC personnel can

also refer problems to any member of the Commission on Small and Medium Industries, which includes the Science Center of the Philippines, Natural Science Development Board, the Design Center of the Philippines, and others (12 agencies in all). In practice, however, each of these organizations has its personnel committed to its own activities, and requests by SBAC for assistance generally are not answered in a timely manner. The SBACs do have access to and use UNIDO experts. Further, the Department of Industry plans to recruit "sponsoring groups" with various skills to respond to inquiries from the field. Participation will be strictly voluntary.

In some regions there are more than enough "walk-in" clients, but in other regions the staff must visit the local firms to make themselves and SBAC services known. There seems to be some difficulty in getting started, and a slide presentation is being produced to be used as a way to inform the business community of SBAC services.

Record keeping seems to be extensive. A coding system is used for each client, and all activities with each client are recorded. Similar records are kept at Manila headquarters so that a response to a problem in one region may be used in responding to a client's needs in another region. Each SBAC office submits a quarterly report showing a summary of activities for the quarter. These are used to prepare a report on the total SBAC operations, which includes the following measures of effectiveness:

- o Ratio of clients generated over establishments visited
- o Number of walk-in businessmen
- o Ratio of implemented to concluded cases
- o Commercial viability of SBAC

"Profiles of Center Output," showing establishments visited, clients generated, cases generated, cases concluded, cases in-process, and cases implemented, are also given in the report.

Perhaps SBAC operations can be best illustrated by reference to a specific center. The SBAC for the Eastern Visayas region is located in Tacloban and is now in its second year of existence. The objective of the staff is to assist small and medium-size businesses (manufacturing, trading, and services) so that they will prosper, grow, and provide employment. To this end, the Center is developing a list of small companies, setting up priorities (potential for growth, export oriented, labor intensive, management qualifications, receptiveness to assistance), and actively assisting small and medium-sized firms.

They are also identifying investment opportunities and searching out (and developing) entrepreneurial talent. These potential projects are then referred to the MASICAP group, which shares an office with SBAC, for economic analysis and funding application preparation.

During the first year, the office was staffed with only two persons. The present staff is five people with the following educational backgrounds: industrial engineering, accounting, mechanical engineering, agribusiness. The long-range plan is to have a staff of 25 with backgrounds in business and engineering.

Effectiveness measurements are focused on cost-benefits (e.g., sales increases in response to assistance efforts). However, it is very difficult to obtain information to facilitate effectiveness measurements. The Center attempts to develop a continuing relationship with each client. After the initial assistance, a complete plant survey is conducted and an intensive study is made of the firm's operations. An effort is made to get the client to report his business results to SBAC on a regular basis.

Nigeria: Industrial Research and Development Unit, University of Ife.
In Nigeria, many systems provide assistance in some form to industry. The Ministry of Industry, Trade, and Cooperatives in each of the 19 states, for example, has a Department of Small-Scale Industries and offers industrial consultancy, training, and development services. In addition, the national Ministry of Industry plans to establish development centers in every state. These Industrial Development Centers are fully staffed with as many as 50 professionals with a wide range of trades and skills. There is also a Center for Management Development which presently assists large companies but which has been selected to establish an Institute for Small-Scale Industries. Also, the Administrative Staff College of Nigeria (ASCON) is a large organization which trains high-level administrators. This group works with the top management consultants in the world to provide the best possible instruction.

The Industrial Research and Development Unit (IRDU) and its field extension offices are a part of the Department of Economics at the University of Ife in Ile-Ife. IRDU was started with the objective of providing direct managerial and technical assistance to small-scale industry. The objective was later expanded to include medium-sized industries, and three industrial extension field offices were opened. These are located in Ile-Ife (Oyo State), Ado-Ekiti (Ondo State), and Agbor (Bendel State). Additional extension field offices

are planned for Ilorin (Kwara State), Ijebu-Ode (Ogun State), and Ikorodu (Lagos State). Staffing in each extension field office is as follows:

Extension Officer - Industrial Economist with a Master's Degree
Assistant Extension Officer - Assistant to the Extension Officer. This man should have 2-3 years of college and a Higher National Diploma (HND) or an Ordinary National Diploma (OND) in Business Administration or Technology
Clerk typist
Office cleaner
Driver

The extension field offices provide direct consultancy to manufacturing, process, and service enterprises but must be careful to deal only in those fields which have no interest to private consultants. Assistance to small and medium-sized enterprises by field office staff includes the following:

- o equipment procurement
- o arrangements for equipment maintenance
- o plant layout
- o equipment design
- o site selection and relocation
- o accounting systems design
- o preparation of feasibility studies
- o preparation of loan applications

Requests which cannot be handled by field office staff are referred to the Polytechnic.

One of the major problems for small-scale industries in Nigeria is apprentice training. There are state exams for the various skilled trades, and persons passing these exams are virtually assured of employment. However, small industries usually are not able to hire these people. There is a guild system in Nigeria, and IRDU staff members are looking for ways to involve the guild in apprenticeship training standards and content and perhaps in certification of apprentice training graduates.

Each field office also does work in industrial development. The staff at the Ile-Ife office, for example, took the list of publications furnished by the U.S. National Technical Information Service and identified a number of industries which could be started with a small amount of capital. This list

was circulated to government and businesses. Interest was expressed in some of the industries and feasibility studies were prepared. Studies for a printing company and a pharmaceutical company have now been completed.

Other activities include surveys conducted for the state government. For example, an economic survey of industrial institutions, commercial institutions, and service companies was made for Oyo State. Other states have expressed an interest, and it appears very likely that a survey will be completed for each of the six states.

Another objective of IRDU is to collect reliable data for research, and surveys such as the one for Oyo State are being used to build a data bank for use by graduate students and other researchers.

Each extension office keeps detailed records of clients, plant visits, discussions, and time spent on each project. Assessment of effectiveness is measured by the following:

1. reception by managers,
2. employment increases,
3. improvements in technology and/or operations of the company,
4. client success in obtaining loans, and
5. number of clients who are members of the Association of Small-Scale Industries in their state. About three states give direct assistance (financial and otherwise) to their Association of Small-Scale Industries.

The major deterrent to the effectiveness of the extension field offices to date is the size of field office staffs.

Indonesia: Development Technology Center, Institute of Technology Bandung. Field stations in Indonesia are now being established to transfer technology developed at the Institute of Technology Bandung and to train entrepreneurs in management and technology. The first such field station is near Pelabuhan Ratu, and two others are planned but their locations have not yet been announced.

The objective of the field station is to identify the assistance and training needs in the area and to satisfy those needs. It is expected that the stations will serve small-scale industry and building contractors. A staff of 10 engineers is now being recruited.

The first field station is being established in collaboration with the TOOL Foundation of the Netherlands.

Summary and Conclusions

It is generally recognized that small businesses are essential to the economic well-being of every nation. In fact, current industrial development strategy emphasizes the necessity to develop small-scale industry as a base for employment and an infrastructure to support large industry. Moreover, it is universally conceded that small companies have managerial technical problems that cannot be solved by company personnel and that external assistance is necessary. Current thinking is that the delivery systems for this external assistance should function as an "adaptive agent" to locate, interpret, adapt, and demonstrate the general knowledge and "state-of-the-art" technology which the small business manager needs to improve his operations. The model for such a delivery system is the U.S. Agricultural Extension Service and its army of resident county agents to assist farmers and agribusinesses throughout the nation.

In actuality, however, no nation, industrialized or developing, has been able to develop and install an industrial counterpart to the Agricultural Extension Service. The principal reasons seem to be that the variety of small-scale industrial problems require a breadth of knowledge for their solution which is beyond the capability of a small staff of resident experts. Agricultural extension has a strong coupling to land-grant educational institutions and research which takes care of this problem, but efforts to do the same thing with industrial extension have not been completely successful. For a number of reasons, governments seem to be unwilling to commit the same quantity of resources to industrial assistance that are provided for agricultural assistance.

The problem of providing assistance to small businesses is not well solved in any nation. In the United States there are, in every state, several federal, state, and locally supported organizations that are interested in small business development and which provide assistance of some type to small businesses. Unfortunately, their efforts are fragmented, overlapping, often wasteful, and largely unknown to the small business community. In the developing countries with which the staff of the Office of International Programs

has worked, there are also multiple agencies striving to provide industrial extension services to small businesses. They are presently at an early stage of development.

In the Philippines, the efforts of all groups with an interest in small business development are loosely coordinated through the Commission on Small and Medium Industries. Industrial extension field offices are operated on a pilot basis by the University of the Philippines' Institute for Small-Scale Industries and by the Department of Industry. The Small Business Advisory Centers operated by the Department of Industry are located in each region. They are funded by the Philippine government and, although lightly staffed at present, plans are to provide adequate staffing by competent specialists.

Nigeria, likewise, has several organizations at the state and national levels which provide assistance to small companies. Here, too, extension field offices are being established by both the Industrial Research and Development Unit at the University of Ife and by the National Ministry of Industry. However, only a very few such centers have been established thus far.

Indonesia also is attempting to establish extension offices in connection with the Institute of Technology at Bandung. One such office has been set up and two more are planned.

In each of these countries, an educational institution is involved with at least one of the efforts to provide assistance to small businesses through industrial extension field offices. On the surface, it appears that these offices should be able to fulfill the "adaptive agent" role mentioned earlier. In practice, however, this role is made difficult by the inaccessibility of researchers and specialists from whom information or work is requested.

Undoubtedly, each of the industrial extension field office networks discussed in this paper can provide many examples of the benefits that they have provided to small businesses. There is no doubt that they have helped and are helping to increase employment through small business development. There appear to be, however, a few rather obvious faults with present small business assistance efforts:

1. There are too many organizations involved and their activities are not well coordinated.

2. Organizations are not adequately staffed and funding is always inadequate.
3. The large number of organizations involved tends to spread resources too thinly.
4. Assistance priorities, if there are any, are established at each office or agency without an overall plan.

FINANCIAL INCENTIVES FOR INDUSTRIAL DEVELOPMENT

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The Economics of Financial Incentives

Financial incentives to raise the level of capital spending are now an established element of fiscal policy strategies used by modern western-style economies. In theory, financial incentives (1) increase the flow of internal funds, thus facilitating capital stock adjustments, and (2) lower the implicit rental price of capital services.^{1/} By lowering the implicit rental price of capital services, the desired stock of capital should increase. A growth in the stock of capital permits a more ready absorption of a growing labor force into productive activity.

Most less-developed economies have responded to growing population and labor force by giving capital formation high priority. Below-equilibrium interest rates, achieved by various methods, have been commonly employed to spur capital formation in selected economic sectors. Only slowly did recognition come of the adverse employment effects produced by artificially cheap capital. Theoretical discussions of this problem have moved increasingly in favor of higher interest rates (1).

The national policy objective behind financial incentives is the stimulation of economic activity and output. Raising capital spending (or, more precisely, net investment), given an aggregate consumption function and unchanged governmental receipts and expenditures and assuming a closed economy, can be expected to produce an increased real national output, if unemployed resources were initially present. This, of course, is elementary macroeconomic theory. Again, the employment effects of increased capital spending, however, might not be positive even though output effects are. The matrix shown as Figure 1 defines all possible employment effects from changes in capital intensity and total output levels in an economy. As may be seen, cells 1.1 and 3.3 have employment results that are indeterminate.

^{1/} Capital services are an input flow into the productive process. Under restrictive assumptions, a static equilibrium level is reached when the marginal value of capital services just equals the price of capital services.

Figure 1
 EMPLOYMENT EFFECTS OF CHANGES
 IN CAPITAL INTENSITY AND OUTPUT LEVEL

Average Capital Intensity	Output Level		
	Increased	Unchanged	Decreased
Increased	Employment ?	Employment Decreased	Employment Decreased
Unchanged	Employment Increased	Employment Unchanged	Employment Decreased
Decreased	Employment Increased	Employment Increased	Employment ?

The employment outcomes specified above require the assumption of an aggregate production function with properties permitting a competitive equilibrium. The production process of the competitive model also assumes competitive pressures ultimately force a plant size determined by the low point of a "U" shaped industry long-run average cost curve.^{1/} In equilibrium, a unique plant size emerges. Firms, however, which may be composed of a number of plants, have no determinate size, although some scarcity, commonly managerial talent, is assumed to provide some upper limit.

The real world, of course, differs from that theorized by the competitive model. Labor immobility and institutional constraints make it possible for firms to use a wide range of technologies on a continuing basis. Plant sizes vary greatly, although in defense the economic theorist has argued that this merely means the movement to competitive equilibrium has not been completed. In U.S. manufacturing, for example, not only do we observe continuing wide differences in plant sizes, but also systematic wage differences. Average compensation per worker increased steadily with firm size in virtually all U.S. manufacturing industries. Smaller firms, presumably using older technologies, appear to compete by paying lower wages. When capital is replaced by the largest firms, which generally use the most advanced technology, it filters down and is used by progressively smaller firms until ultimately the ability

^{1/} The empirical evidence casts considerable doubt on the existence of "U" shaped long-run average cost schedules.

76

of the small firm to exploit pockets of immobile labor is exhausted or else restricted by minimum wage legislation.^{1/} At that point, the technology and the capital represented by it disappear from use. The capital equipment itself is either scrapped or exported.^{2/}

Thus, from a real world point of view, the matrix of Figure 1 also requires no shifting of capital intensity between firms in an industry (or between industries) if the employment effects of output and capital intensity changes are to be as indicated. For example, given that the value product per worker is significantly lower in small firms than in large firms, a reduction in employment and capital in small firms could have a complete output offset by larger firms using slightly more capital (but not enough to prevent the average capital intensity from falling). This case would then result in lower, not higher, employment as the matrix predicts.

Taking into account these considerations, it should be clear that the employment effects that can be predicted from tax incentives used to foster capital formation are not completely reliable. This is clearly a drawback to the use of this policy tool where employment generation is of first-order importance. Another aspect of subsidies to business capital spending is their economic stability effects. Typically, the empirical evidence shows that these subsidies are most used by larger firms. Moreover, the U.S. experience has shown that the volume of the subsidies is largest during boom times and smallest during recessions. From a stabilization viewpoint, the opposite should occur. The procyclical behavior of capital spending subsidies is thus a negative factor also to be considered.

Specific Tax Incentives

Tax Holiday. Of the specific financial incentives used to spur industrial development, the "tax holiday" to new industry is the one most frequently offered. The tax holiday is an income tax exemption for usually five but sometimes as many as ten years. Certainly, increasing net returns to a prospective

^{1/} The largest firms are typically unionized, and continuous wage pressures on management tend to force growing capital intensity.

^{2/} The international trade in used machinery is based upon the same considerations as purely national used machinery markets.

firm by this means may be a powerful location or establishment inducement. In the rather special case of Puerto Rico (which "exports" to the U.S. mainland duty-free), the income tax exemption has been called by some observers the single most important factor in the rapid industrial growth experience there.

The proponents of the tax holiday have argued that: (1) it is tangible evidence of a governmental commitment to new investment; (2) given the uncertainties entailed in foreign investment, the tax holiday is particularly advantageous because it either shortens the "pay back" period or else permits a more rapid expansion by the firm; and (3) the tax holiday is relatively inexpensive when the benefits of the new output and employment effects it generates are compared against it.

The arguments against the tax holiday are: (1) it is most valuable to those who need it least, i.e., new high-profit firms probably would not need this incentive; (2) firms receiving the income tax exemption may have invested without it being offered (this is probably the most telling criticism of the tax exemption incentive); (3) administration of income tax exemption programs is frequently poor; and (4) once the income tax exemption program is established, there are political pressures to extend and lengthen it.

There does appear to be some consensus that an income tax exemption is effective if: (1) all the other factors in development are not unfavorable, i.e., the income tax exemption cannot offset seriously negative factors; (2) it is part of an overall development package; (3) it is limited and selective; (4) it is as automatic as possible in its administration; and (5) it is only given in the early stages of industrial development. This last point recognizes that a newly industrializing country is unlikely to have the agglomeration economies present in more advanced economies and is thus less likely to be giving the income tax exemption to foreign firms which would be attracted in any case. (South Korean government policy, however, still offers the income tax exemption to new foreign investment despite its relatively advanced stage of development.)

It seems clear, however, that where new industry is created that would not exist in the absence of a tax holiday, the longer run net benefits are likely to be positive. Exceptions to this might be firms requiring a very high level of governmental services (roads, fire protection, etc.) and which generate below-average wage payments. In such case, the additional outlays at all levels

of government for services to the new industry and its workers may be greater than the additional tax revenues from the increased tax base.

A personal income tax exemption is not uncommon as part of the tax exemption incentive program in developing countries. This permits the recruitment of foreign specialists for periods of one to five years. Without such an exemption, the employment cost of foreign specialists would become prohibitive to the firms they assist.

Tariff Policy. Import duty relief is the second most common tax incentive for industrial development. The logic of this tax incentive is quite straightforward. New capital goods purchased abroad should not have import duties levied against them, particularly when capital expansion is a primary objective of governmental economic policy. This elementary proposition, however, becomes more complex when there is a domestic capital goods industry producing reasonably close substitutes for foreign imports. Replacement parts for foreign capital goods already in place require application of the same considerations. Of course, where the new foreign capital goods (and their spare parts requirements) are not used to produce for the domestic market but only for export, the issues become simpler again.

With the great need for export earnings, most LDCs are particularly anxious to induce a new foreign export industry. To help such industries, free ports or duty-free zones are frequently established. The principle here is to allow the foreign firm to locate and import duty free all necessary inputs (and in combination with domestic inputs of the host country) to produce an output for export. Careful controls against smuggling out of the duty-free area are the only administrative problem of consequence. Alternatively, duties can be collected in the usual manner and then refunded to the export producer. These refunds are commonly called "customs drawbacks." They typically employ time-consuming procedures and thus immobilize the producer's working capital balances for unnecessarily long periods. The free port or duty-free zone is, therefore, preferable from the point of view of the export producer.

Domestic producers of export products are also given special treatment. Usually these include tax incentives, duty-free imports of inputs, and even outright subsidies. Domestic producers for the domestic market are generally protected from foreign competition. This action is justified mainly by the

familiar "infant industry" argument. An evaluation of the arguments for protectionism, however, goes beyond the scope of this paper. Export duties are not commonly levied. They reduce exports, but where the exporting country has a monopoly supply position or an oligopoly position through joint action with other producing nations, the government(s) involved have taken advantage of such situations. The OPEC nations are an obvious example of an oligopolistic supply situation where export taxes have been levied successfully.

Accelerated Depreciation. Depreciation is simply the recovery of investment. As such, it is an allowable deduction from income (revenue) in calculating income tax liability. Given the time value of money, the greater the sheltering of income (revenue) from taxation in the early years of an investment project, via accelerated depreciation allowances, the more attractive the investment project becomes. Accelerated depreciation is then another means of increasing investment by raising the normal returns on such investment.

The depreciation formulas allowed vary over time and from country to country, of course, but their economic effect is the same. (Some specific examples of accelerated depreciation schedules are given in the incentive program used by the less-developed countries selected for this review.) Finally, it should be clear that where complete income tax exemption is given, accelerated depreciation has no value to the firm during the tax exemption period. In fact, a firm would improve its long-run profitability in such case by deferring, if possible, depreciation charges until the tax exemption period ended.

The Effectiveness of Tax Incentives

The effectiveness of tax incentives is not fully clear. Using the U.S. experience after the 1962 tax cut, which included an investment tax credit, researchers have interpreted the empirical evidence differently. Bischoff (10) states that the U.S. investment tax credit probably " . . . stimulated more investment spending than the policy . . . cost the government in taxes." Coen (11), looking at the same question, reports " . . . policies that produced an estimated \$8.6 billion in tax savings from mid-1962 through the third quarter of 1966 increased (capital) expenditures by only \$2.8 billion." These confusing results probably stem, as Fromm (10) suggests, from a lack of agreement among economists about the determinants of investment spending. Despite this, tax incentives remain an important governmental policy tool. On a broader

level of analysis, Acharya (2) finds " . . . some scope for fiscal and financial intervention in inducing economy-wide factor combinations with more employment per unit of capital . . . (but) . . . quantitative estimates how much of a change may be expected from given changes in factor prices . . . and . . . what are the efficient ways of intervening to change factor prices, the available research does not permit firm conclusions."

Clearly, the use of fiscal incentives needs careful consideration and must be compared with the other alternatives available that can produce the desired level of capital spending. Further, these alternative choices will tend to have different distributional effects, which adds another constraint, given the pressing need for greater equity.

Financial Incentive Programs in Less-Developed Countries

The financial incentive programs used by less-developed economies vary in their details, but, generally, they have three major components: (1) tax holiday or exemption from income taxes for a specified number of years; (2) exemptions from customs duties, both import and export; and (3) accelerated or supplemental depreciation allowances. The depreciation-related incentives, of course, are significant only to firms ineligible for or beyond the income tax exemption period. (Usually only new foreign firms are offered the income tax exemption incentive.)

The relative importance of these major components varies considerably from country to country. Generally, where foreign investment is important, the tax holiday component looms large. In the case of Brazil, however, the income tax exemption is structured primarily to benefit existing domestic firms (Public Law 34/18). The longer run effect of this should be an increased concentration of economic power. Korea, on the other hand, with a more orthodox approach, uses the income tax exemption as the major feature of its financial incentive program to induce new foreign investment. There, new foreign investment currently amounts to about 40% of total national annual net investment.

In the following sections, the financial incentives offered by Brazil, Korea, the Philippines, and Nigeria to increase investment are described. The differences in approach taken become readily apparent. Data limitations, however, prevent comparisons of the effectiveness of these tax incentive programs. Consequently, only a brief description of their essential features can be

given. As will be seen, their differences stem mainly from the differing patterns of government funding, i.e., the types of taxes levied by governmental units.

Brazil. The federal constitution of Brazil gives the federal government the power to tax: (1) imports of goods; (2) exports of Brazilian goods; (3) rural property; (4) income and revenue of any kind; (5) the production of industrial goods; (6) operations of credit, exchange, and insurance; (7) transportation and communication services, except those of a strictly municipal nature; (8) production, importation, circulation, distribution, or consumption of liquid or gaseous fuel or lubricants of any origin or nature; (9) production, importation, circulation, or consumption of electric power; and (10) production, circulation, or consumption of minerals produced in the country.

The states are given the power to tax: (1) transfer of real estate, (2) sale and distribution of merchandise, (3) inheritances, and (4) legal documents. Municipalities may tax urban real estate and may tax for services rendered.

The principal business tax levies in Brazil are the federal income tax, with a basic rate of 30%, and two indirect taxes: (1) the Imposto Sobre a Circulacao de Mercadorias (ICM) or Merchandise Circulation Tax, a state tax, and (2) the Imposto Sobre Produtos Industrializados (IPI) or Industrialized Products Tax, a federal tax. The tax rates of the ICM and IPI vary by state and product.

A major investment incentive for business is allowing the corporate taxpayer to invest up to 51% of its income tax liability in approved projects in lieu of paying such amount in income tax. This measure, of course, fosters continued concentration of economic power in Brazil. (In addition, there is no federal inheritance tax forcing the break-up of large estates.)

The basic approach taken by the Brazilian government has been to leave industrial development to private firms. The government will undertake some projects, however, when there is no private firm alternative or when national interest needs are to be served. Investment is guided by an Industrial Development Council (CDI) under the Ministry of Industry and Commerce. Approval of an investment project by the DCI provides a wide range of benefits: (1) exemption from duty (averaging 30%) on imported equipment, provided generally that no similar Brazilian product exists; (2) exemption from the IPI tax on such equipment and credit for IPI charged on local equipment; (3) accelerated

depreciation on locally purchased equipment; (4) priority in applications for loans from official credit sources (provided local capital participants are involved); and (5) priority analysis for alteration of tariffs in order to protect local infant industries. The duty exemption also implies exemption from the state ICM tax on imported equipment.

All incentives are controlled by the CDI. The CDI also sets Brazilian industrial objectives. These objectives are defined by sectors: (1) capital goods industries, (2) basic metallurgical industries, (3) intermediary metallic products industries, (4) intermediary nonmetallic products industries, (5) automotive and spare parts industries, (6) durable consumption goods industries, and (7) nondurable consumption goods industries. The specific incentives by industrial sectors are contained in hundreds of decree laws, making a complete enumeration impractical here. Basically, these decree laws give tax liability reductions for reinvestment, tax exemptions (import duties, etc.), financing priorities, and the like for favored industries. Generally, Brazilian capital participants are also required in favored projects in order to gain incentive benefits.

As an example, Decree Law 221 grants income tax, sales tax, and duty exemptions for projects in the fishing industry. Further, all legal entities registered in Brazil were allowed to deduct 25% of their income tax liability for investment in fishing projects approved by the Superintendency of the Development of the Fishing Industry (SUDEPE).

Another example pertains to industrial and agricultural projects approved by the Superintendency for the Development of the Northeast (SUDENE). It allows any legal entity operating in Brazil to deduct from its income tax: (1) up to 75% of the face value of bonds (but not more than 50% of income tax liability) it buys from SUDENE issued to increase the resources of the fund of Investments for the Economic and Social Development of the Northeast (FIDENE), and (2) up to 50% of the value of income tax and other nonrefundable assessments for reinvestment in SUDENE-approved industrial, agricultural, or telecommunications projects. For the Amazon region, a counterpart to SUDENE has been created, the Superintendency of the Development of the Amazonian Region (SUDAM). Its corresponding investment fund is FIDAM (Fund for Private Investments in Amazonia). It too has incentives similar in character to those offered by SUDENE.

Export incentives were broadened under Decree Law 1219, which created the Commission on Granting Fiscal Incentives for Exports (BEFIEEX). Essentially all industrial exports are granted exemption from direct taxes, and profits from export operations are income tax exempt. Fiscal incentives to trading companies are given to firms registered with the Foreign Trade Department of the Bank of Brazil (CACEX). The primary incentive given is exemption from income taxes on foreign sales of manufactured products. The National Foreign Trade Council (CONCEX) coordinates Brazil's export/import programs. The law creating CONCEX also created, within the Central Bank, the Export Financing Fund (FINEX).

Korea. Investment incentives in Korea have focused on foreign investors. In 1975, foreign investment in Korea represented about 40% of total investment. This ratio, however, has been falling; domestic savings as a percent of GNP have risen dramatically since the early 1960s. Nevertheless, the Korean government still has the inducement of foreign investment as an important policy objective. The fourth Five-Year Development Plan (1977-1981) has foreign investment of US\$10 billion as its target. (Japanese are by far the largest foreign investors, which has had important political repercussions.)

The financial incentives offered foreign investors are:

1. Corporate income tax on foreign enterprises is reduced in proportion to the percentage of stocks on shares which foreign investors own in the enterprise. This total exemption is reduced after five years of operation to a 50% tax reduction, which goes on for another three years.
2. Foreign-owned enterprises are exempt for five years from the Acquisition Tax, Property Tax, and Dividends Tax. After the five-year exemption, these taxes are at half rate for another three years.
3. Capital goods imported by foreign investors are exempt from Import Duties, Commodity Tax^{1/}, and Textile Product Tax.
4. Foreign investment projects approved and operating under the Foreign Capital Inducement Law are exempt from the Defense Tax (a 2½% surcharge on all imports) until the exemption period expires.

^{1/} The Commodity Tax applies to 122 specified commodities and ranges from 10% to 20% of the sales price.

5. Personal income tax exemption for five years.
6. An additional depreciation of 20% to 30% of original depreciation for export and machinery industries.
7. Business Tax, Commodity Tax, Textile Product Tax, Oil Tax, and Liquor Tax exemptions for exports and foreign exchange earnings.

Financial incentives for domestic investors are offered to promote ship-building machinery, iron and steel, nonferrous metal refining, power generation, chemical fertilizer, mining, and refining, as well as the petrochemical industry. For investors in these industries, three mutually exclusive financial incentives exist: (1) they may be eligible for a reduction or exemption from corporate tax for six years; (2) they may be allowed to deduct 8% of the total investment from the tax liability; and (3) they may be eligible for special depreciation up to 100% of the total amount originally depreciable. The Office of National Tax Administration authorizes all investment credits. Where the tax credit due exceeds taxable corporate income, the excess can be carried forward for four years.

Industrial estates are classified into four major groups: (1) free export zones, (2) special industrial estates, (3) export industrial estates, and (4) local industrial estates. They have been actively promoted by the Korean government. While industrial estates are open to local as well as foreign investors, the free export zones require firms with a majority of foreign ownership.

Nigeria. The study of tax incentives in Nigeria was last performed by Aluko (1), who acknowledged the paucity of data at that time. No more recent data are available.

The Philippines. The investment incentives in effect in the Philippines are given by the provisions of the Investment Incentives Act (R.A. 5186) and the Export Incentives Act (R.A. 6135). In addition, Presidential Decrees No. 92, January 6, 1973, and No. 485, June 19, 1974, have provided revisions and amendments to these two incentive laws. The Presidential Decrees gave priority to export-oriented industries using indigeneous raw materials and extended coverage to include public utilities.

The investment incentive laws are implemented by the Board of Investments (BOI), a government agency created in 1967.^{1/} Only firms registered with the BOI are eligible to take advantage of the investment incentives offered. Thus only "deserving" projects receive this aid. Firms receiving financial incentives also must accept some BOI supervision.

Under the Investment Incentives Act, eligible industries are classified by ownerships and type as (1) Filipino-owned pioneer and nonpioneer and (2) foreign-owned pioneer. Combining ownership and type, there are then three classes of eligible industries: Filipino-owned pioneer, Filipino-owned non-pioneer, and foreign-owned pioneer. All three of these classes are given the unqualified benefits of the following provisions of the law (15):

1. Deduction of organizational and pre-operational expenses from taxable income over a period of not more than 10 years from start of operation.
2. Deduction of labor training expenses from taxable income equivalent to ½% of expenses but not more than 10% of direct labor wage.
3. Accelerated depreciation.
4. Carry-over as a deduction from taxable income of net operating losses incurred in any of the first 10 years immediately following the year of such loss.
5. A tax credit equivalent to 100% of the value of compensating tax and customs duties that would have been paid on machinery, equipment, and spare parts (purchased from a domestic manufacturer) had these items been imported.
6. A tax credit for tax withheld on interest payments on foreign loans, provided such credit is not enjoyed by lender-remittee in his country and the registered enterprise has assumed liability for tax payment.
7. The right to employ foreign nationals in supervisory, technical, or advisory positions within five years from registration.

^{1/} A major task of the BOI is to formulate Investment Priority Plans. The criteria used, in order of importance, are: (1) labor intensity, (2) dispersal of industry, (3) local availability of raw materials, (4) export potential, and (5) rate of return on investment.

8. Deduction from taxable income in the year reinvestment was made of a certain percentage of the amount of undistributed profits or surplus transferred to capital stock for procurement of machinery and equipment and other expansion.
9. Anti-dumping protection.
10. Protection from government competition.
11. Tax credits equivalent to sales, compensating and specific taxes and duties on supplies, raw materials, and semi-manufactured products used in the manufacture, processing, or production of export products.
12. An additional deduction from taxable income of direct labor cost and local raw materials utilized in the manufacture of export products, but not exceeding 25% of total export revenues for producers, 10% for traders, and 50% for service exporters. In the case of traditional exports, the local raw material component is not included in the computation of said deduction.
13. Filipino and foreign-owned pioneer projects are exempt from tariff duties and compensating tax on imports of machinery, equipment, and spare parts, if they are new or expanding and have less than a 20% return on equity. Expanding pioneer projects with 20% or greater return on equity and existing pioneer projects desiring to replace or modernize their facilities are entitled to mere deferment of taxes and duties, without any reduction in their amount. Filipino-owned new and expanding nonpioneer projects with total assets not exceeding ₱500,000 are also eligible for the first two years of commercial operation. Nonpioneer projects with assets over ₱500,000 and expanding nonpioneer projects with less than a 20% return on equity are entitled only to reduced tariff and compensative tax on a deferred basis for a period not exceeding 10 years. Expanding nonpioneer projects with 20% or greater return on equity shall be entitled to only deferment of taxes and duties without any reduction in their amount.
14. Filipino and foreign-owned pioneer projects are given post-operative tariff protection.
15. Filipino and foreign-owned pioneer projects are exempt from all taxes under the National Internal Revenue Code, except income tax on a gradually diminishing percentage.

16. Filipino and foreign-owned pioneer projects can employ foreign nationals within five years from operation or even after this period in exceptional cases.

17. Filipino-owned pioneer and nonpioneer projects have preference in the grant of government loans.

The Export Incentives Act creates three eligible categories of beneficiaries: (1) export producers, (2) export traders, and (3) service exporters. The incentives offered parallel those given under the Investment Incentives Act. Specifically, for all three categories, they are:

1. Item 11 above, qualified to be applicable to service exporters producing and exporting television and motion pictures or musical recordings.

2. Item 12 above, with the sentence treating traditional exports deleted and further qualified to be applicable to all registered export producers, except foreign firms exporting 70% of their production.

3. Preference in grant of government loans, qualified to be applicable to (a) all projects for expansion under List A of the Export Priorities Plan and to both pioneer and nonpioneer projects under List B, and (b) enterprises at least 60% Filipino owned.

Export producers and traders are eligible for:

1. Item 4 above, qualified to be applicable whenever a registered export producer or export trader shall use a brand name for an export product that distinguishes it from products produced outside the Philippines.

2. Exemption from export and stabilization taxes.

3. An additional deduction from taxable income of 10% of incremental export sales when a registered export producer or export trader shall use a brand name for an export product that distinguishes it from products produced outside the Philippines and whenever financial assistance is extended by an export trader to an export producer in an amount equivalent to not less than 20% of the export trader's export sales during the year.

Export producers and service exporters are eligible for:

1. Item 6 above, qualified for export producers to be applicable only to all projects for expansion under List A of the Export Priorities Plan and to

both pioneer and nonpioneer projects under List B, and qualified for service exporters to be applicable to expansion projects only involving the production and export of television and motion pictures or musical recordings. Also qualified to apply to service exporters catering primarily to foreign tourists.

2. Exemption from tariff duties and compensating tax on importation of machinery, equipment, and spare parts, qualified for export producers to be applicable (a) only to all projects for expansion under List A of the Export Priorities Plan and to both pioneer and nonpioneer projects under List B; (b) to new or expanding nonpioneer projects with total assets not exceeding ₱500,000 for the first two years of commercial operation; nonpioneer projects with assets exceeding said amount and expanding nonpioneer projects with less than 20% return on equity are entitled only to reduced tariff and compensating tax on a deferred payment basis for a period not exceeding 10 years; expanding nonpioneer projects with 20% or greater return on equity shall be entitled to mere deferment of taxes and duties without any reduction thereof; (c) to new or expanding pioneer projects with less than 20% return on equity; expanding pioneer projects with 20% or greater return on equity and existing pioneer projects desiring to replace and modernize their facilities are entitled to mere deferment of taxes and duties without any reduction thereof. For service exporters, the above is qualified to be applicable to expansion projects only in the producing and exporting of television and motion pictures or musical recordings and to service exporters catering primarily to foreign tourists.

Export producers are eligible for:

1. Item 7 above.
2. Items 2, 5, 8, 9, and 10 above, qualified to apply only to all projects for expansion under List A of the Export Priorities Plan and to both pioneer and nonpioneer projects under List B.
3. Items 14, 15, and 16 above, provided the export producer is in a pioneer area.
4. Export producers get additional incentives whenever their processing or manufacturing plant is located in an area designated by BOI as necessary for proper dispersal of industry or which is deficient in infrastructure, public utilities, and other facilities.

Under both the Investment Incentives Act and Export Incentives Act, certain provisions are favorable to investors in registered enterprises. Here, however, the beneficiary categories are expanded to include foreign export producers, traders, and service exporters and foreign-owned nonpioneer industries. The concessions and guarantees offered are as follows:

1. Both Filipino and foreign investors in registered enterprises are guaranteed (a) the right to repatriate investments and remit earnings (subject to Central Bank regulations), (b) freedom from expropriation of investment, (c) freedom from requisition of investments, (d) protection of patents and other proprietary rights, and (e) exemption from capital gains tax on disposition of capital assets, provided proceeds of sale are invested in new issues of capital stock of a registered enterprise within six months from the date gains were realized. This exemption under Sec. 6(b) of R.A. 5186 is applicable only to Filipino investors in pioneer projects.

2. Filipino export producers engaged in a pioneer area and Filipino-owned pioneer projects receive (a) a tax allowance to the extent of actual investment but not to exceed 10% of taxable income, and (b) tax exemption on sale of stock dividends provided sale occurs within seven years from date of registration.

3. Filipino export producers and Filipino-owned pioneer and nonpioneer projects have preference in GSIS and SSS loans for purchase of shares. Applicable to Filipino export producers only for all expansion projects under List A of the Export Priorities Plan and to both pioneer and nonpioneer projects under List B.

REFERENCES

1. Aluko, S. A. Fiscal Incentives for Industrial Development in Nigeria. U.N., Department of Economic and Social Affairs, 1967.
2. Archarya, Shankar N. "Fiscal/Financial Intervention, Factor Price, and Factor Proportion: A Review of Issues," IBRD Staff Working Paper No. 183, August 1974.
3. Berry, R. Albert. "Price of Capital, Income, and Demand in Labor in Developing Countries," Southern Economic Journal, January 1978, p. 457-467.
4. Brazilian Government Trade Bureau. Guide to Investing in Brazil, 1975.
5. Bryce, Murray D. Policies and Methods for Industrial Development. New York: McGraw-Hill Book Company, 1965.
6. Citibank. Investment Guide: Korea, 1976.
7. Cole, David C., and Lyman, Princeton N. Korean Development. Cambridge: Harvard University Press, 1971.
8. Ferber, R., ed. Determinants of Investment Behavior. New York: National Bureau of Economic Research, 1967.
9. Fisher, R. T. "Tax Incentives for Investment," National Tax Journal, September 1973, p. 397-401.
10. Fromm, G., ed. Tax Incentives and Capital Spending. Washington: The Brookings Institution, 1971.
11. Intriligator, M. D. Mathematical Optimization and Economic Theory. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1971.
12. Kaatz, John R. Finance and Small-Scale Industry Lending in the Philippines, 1967-73. Atlanta: Georgia Institute of Technology, 1975.
13. Musgrave, R. A. The Theory of Public Finance. New York: McGraw-Hill Book Company, 1959.
14. Ott, D. J., Ott, A. F., and Yoo, J. H. Macroeconomic Theory. New York: McGraw Hill Book Company, 1975.
15. The Philippines, Board of Investments. Summary of Incentives, (no date).
16. von Furstenberg, G. M., and Malkiel, B. G. "The Government and Capital Formation: A Survey of Recent Issues," The Journal of Economic Literature, Vol. XV, No. 3, September 1977.
17. Yoinges, A. Q., and Trinidad, R. F. Fiscal Systems and Practices in Asian Countries. New York: Frederick A. Praeger, Publishers, 1968.