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TECHNICAL SERVICES FOR SMALL-SCALE INDUSTRIES

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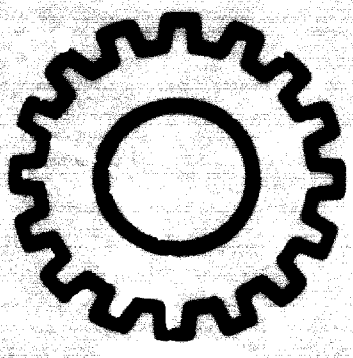

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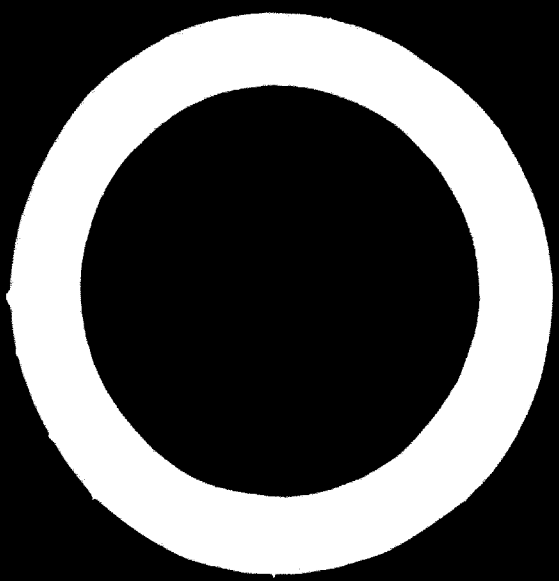

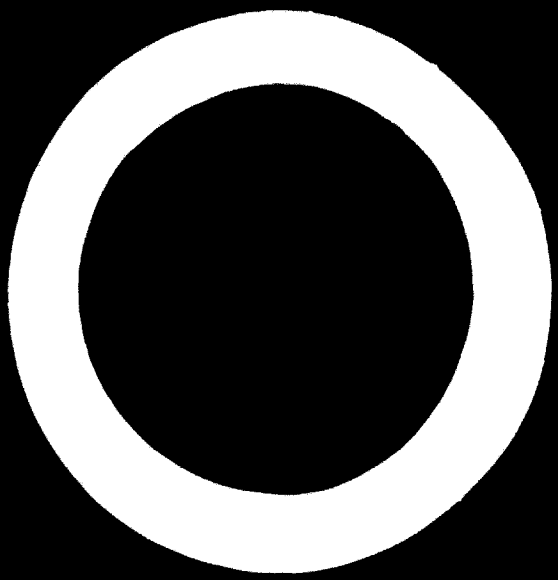

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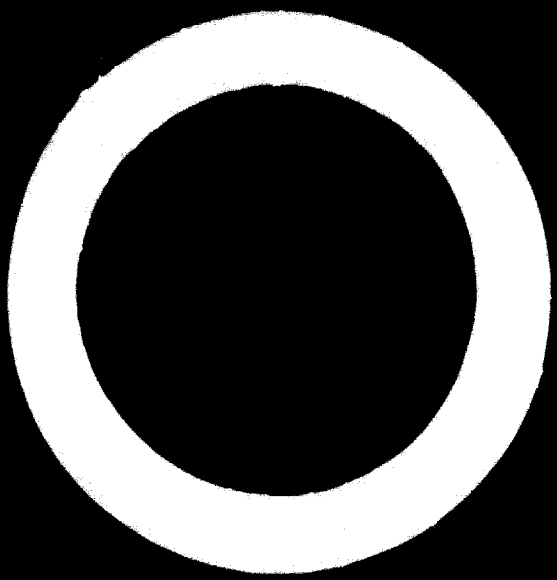


UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

VIENNA

TECHNICAL SERVICES FOR SMALL-SCALE INDUSTRIES

UNITED NATIONS
New York, 1970

ID/20

UNITED NATIONS PUBLICATION

Sales No.: E.70. II. B. 19

Price: $U.S. 3.00 (or equivalent in other currencies)

Preface

At its second session, in 1962, the United Nations Committee for Industrial Development noted the important role that specialized institutional facilities, such as technological research institutes and small industry service institutes, could play in assisting small-scale industries and invited the United Nations Secretariat to collect, develop and disseminate information by appropriate means, such as seminars and working parties, on the experience gained in the establishment and operation of such facilities in developing countries. Accordingly, the United Nations Industrial Development Organization (UNIDO), the Bureau of Technical Assistance Operations (now the Office of Technical Co-operation) of the United Nations, and the Government of Denmark jointly organized an Interregional Symposium on Technical Services and Facilities for Small-Scale Industries, which was held in Vedbaek, Denmark, from 26 June to 8 July 1967. The present publication contains the report of the symposium and selected papers presented to it.

The organization of efficient technical services and facilities for the promotion of new small enterprises and improvement of existing ones is one of the most important and difficult problems in the developing countries. In a broad sense, technical services and facilities include all activities that assist the operation and management of small-scale industries, including those having a bearing on modernization, upgrading and growth, e.g. institutionalized training (vocational or managerial); general technological and marketing research; industrial estates; and pilot plants. In a more narrow sense technical services and facilities cover activities within and for the individual manufacturing enterprise. In this sense they include assistance to existing or prospective entrepreneurs, such as feasibility studies, financing facilities, technical counselling, management assistance, design improvement, the setting of quality standards and quality control in the enterprises or marketing assistance. Part of these services may be research, designed to meet the needs of individual enterprises, and training for its manager and/or workers.

The most important of the institutions furnishing such services are small industry service institutes, industrial extension centres, productivity centres, production-and-training centres, common service facility centres, and testing and quality-control centres.

The symposium dealt with services and facilities for small-scale industries as defined above in the narrow sense. Thus, it considered technological research

undertaken to solve a specific problem of a small industrial enterprise, but not general technological research; it discussed training provided by extension officers to the manager and workers of a given enterprise in the factory itself or in the workshop of the extension centre, but not the general type of instruction given by a technical training or apprenticeship centre; it dealt with industrial extension services provided in connexion with financial operations, but not with the financing of small-scale industry *per se*; it discussed facilities in industrial estates, but not the development of industrial estates.

The purpose of the symposium was to provide guidelines for the planning, establishment and operation of technical services and facilities for small-scale industries in the developing countries. The report of the symposium (Part I) contains a review and evaluation of existing technical services and facilities for small-scale industries in developing countries and findings and recommendations on their organization and operation.

The paper on "The Role of Industrial Extension Services in Small Industry Development Programmes", prepared by UNIDO, considers the relationship of industrial extension with financing, research, industrial estates and special incentive programmes, and underlines the need for co-ordinating the various measures of promotion of and assistance to small-scale industries.

The next four papers in the publication, namely, "Sponsorship, Organization and Financing of Technical Services in the Light of Indian Experience", by P. C. Alexander; "Operational Problems of Small Industry Service Institutes in the Light of Indian Experience", by G. Sain; "Technological Research and Industrial Extension in Canada", by R. E. McBurney; and "Technical Services and Facilities for Small and Medium Industries in Denmark", a summary of three papers prepared by the Copenhagen and Jutland Technological Institutes, the Danish Textile Institute, M. Knudsen and E. J. A. Ohrt, contain a description and a critical analysis of technical services and facilities provided to small-scale industries in India, Canada and Denmark, respectively. These papers also include conclusions and recommendations applicable to various developing countries.

In his paper on "Training of Small Industry Extension Workers", Yap Kie Han provides a conceptual framework for formulating training programmes for industrial extension workers and analyses the career patterns for such workers, their professional qualifications and the methods of training required.

The paper on "Technical Services and Facilities for Rural Industries", prepared by the Food and Agriculture Organization of the United Nations (FAO), analyses the possibilities of setting up small-scale rural industries linked to the development of agriculture, fisheries and forestry, and the technical services and facilities required for promoting such industries.

The paper on "Problems in the Application of Technical Assistance to Small-Scale Industries in Developing Countries", by A. Neilson, discusses some of the problems that arise in providing technical advice to small-scale industries in developing countries, particularly the role and approach of the foreign expert, and the appropriate methods of industrial extension.

The paper on "Conditions for Setting up and Operating Technical Services for Small-Scale Industries on a Regional or Subregional basis in the Light of

the Experience of the Central American Research Institute for Industry (ICAITI)", prepared by M. Noriega Morales and S. Wittkowsky, analyses the prerequisites for establishing regional or subregional centres for extending technical services to small-scale industry; and the sponsorship, organization, financing and management of such centres.

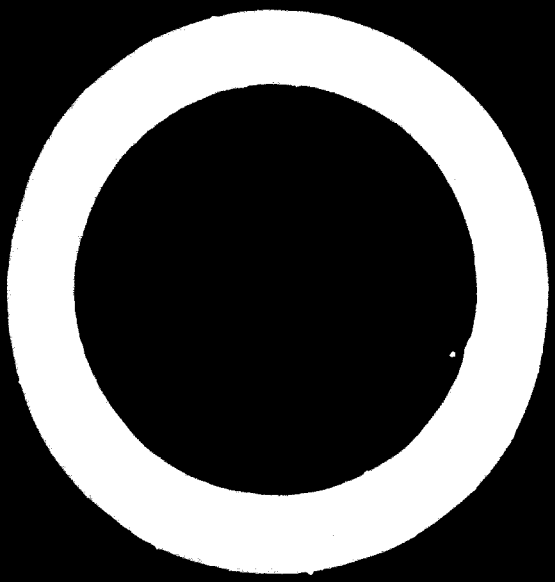
Finally, the paper on "UNIDO's Activities Relating to Technical Services and Facilities for Small-Scale Industries", prepared by UNIDO, presents information on projects carried out in this field by this organization. Information is also given on the work done by certain specialized agencies of the United Nations. This paper is an updated version (January 1970) of the one submitted to the Vedbaek symposium.

The annex to this publication contains "A Summary List of Technical Services and Facilities for Small-Scale Industries and Related Institutions", prepared by UNIDO.

Since the 1967 symposium, UNIDO has continued to disseminate information on the establishment and operation of technical services and facilities for small-scale industries through seminars and meetings, research, and technical co-operation programmes. This subject was one of the main items on the agenda of an Expert Group Meeting on the Development of Small-Scale Industries in Arab Countries of the Middle East held in November 1968 in Beirut. Similar emphasis will be placed on the discussions to be held at regional and subregional meetings for African and Latin American countries planned for 1970 and 1971.

In the field of research, three series of studies are being undertaken. The first series relates to specialized industrial estates, such as the "functional", "ancillary" and "single-trade" estates. The second series deals with common service facilities, which may be set up in or outside industrial estates, such as the toolroom and the testing and quality-control laboratory. The third series deals with different aspects of subcontracting. A number of studies on this subject have been prepared and were submitted to an Expert Group Meeting on the Role and Promotion of Subcontracting in Industrial Development, held in Paris in October 1969 in co-operation with the Development Centre of the Organisation for Economic Co-operation and Development (OECD). Other studies are concerned with small-scale manufacturing of certain important consumer and producer goods that lend themselves to production by small enterprises either as subcontractors to large industries or under joint production programmes among small producers; a study on bicycles has been completed and will be followed by studies on sewing machines, radios, lathes and other products.

In the field of technical co-operation, the number of projects for the provision of technical services and facilities for small-scale industries, financed under UNIDO's Regular Programme of technical assistance, the Technical Assistance and Special Fund components of the United Nations Development Programme (UNDP) and the programme of Special Industrial Services (SIS) has constantly increased. These projects are concerned with the establishment or strengthening of industrial extension centres, the stimulation of entrepreneurship or the modernization of existing enterprises, and the establishment of common service facilities, subcontracting exchanges and other technical facilities.



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Reference to dollars ($) is to United States dollars unless otherwise indicated

One billion equals 1,000 million.

ABBREVIATIONS

United Nations organizations

FAO	Food and Agriculture Organization of the United Nations
ILO	International Labour Organisation
SIS	Special Industrial Services
UNDP/SF	United Nations Development Programme, Special Fund component
UNDP/TA	United Nations Development Programme, Technical Assistance component
UNESCO	United Nations Educational, Social and Cultural Organization
UNIDO	United Nations Industrial Development Organization
WHO	World Health Organization

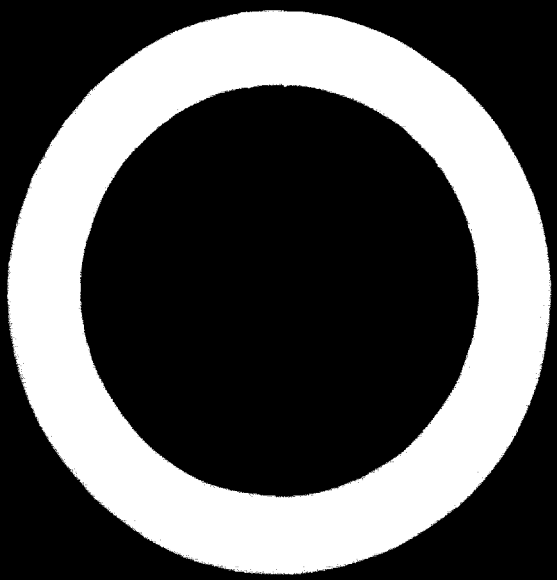
Other

CSIO	Central Small Industries Organization (India)
CSIR	Council of Scientific and Industrial Research (India)
DGS & D	Directorate General of Supplies and Disposals (India)
ICAITI	Central American Research Institute for Industry
ISI	Indian Standards Institution
NPC	National Productivity Council
NRC	National Research Council (Canada)
NSIC	National Small Industries Corporation (India)
OECD	Organisation for Economic Co-operation and Development
SATEC	Société d'aide technique et de coopération (France)
SHIO	Federation of Crafts and Small and Medium Industries (Sweden)
SIET	Small Industry Extension Training Institute (Hyderabad, India)
SISI	Small Industry Service Institute (India)
TIS	Technical Information Service (Canada)

PART I

REPORT OF THE INTERREGIONAL SYMPOSIUM ON TECHNICAL SERVICES AND FACILITIES FOR SMALL-SCALE INDUSTRIES

Vedbaek, Denmark, 26 June - 8 July 1967



REPORT OF THE INTERREGIONAL SYMPOSIUM ON TECHNICAL SERVICES AND FACILITIES FOR SMALL-SCALE INDUSTRIES

Introduction

1. The Interregional Symposium on Technical Services and Facilities for Small-Scale Industries was held at Vedbaek, Denmark, from 26 June to 8 July 1967. The symposium was sponsored jointly by the United Nations Industrial Development Organization (UNIDO), the Bureau of Technical Assistance Operations (now the Office of Technical Co-operation) of the United Nations and the Government of Denmark.

2. The symposium was attended by 36 participants from 32 countries; UNIDO staff members and consultants; representatives of the International Labour Organisation (ILO) and the Food and Agriculture Organization of the United Nations (FAO); staff members and consultants from the Technological Institutes of Copenhagen and of Aarhus; and observers from the Organisation for Economic Co-operation and Development (OECD), the International Federation of Small and Medium-Sized Industrial Enterprises, and the Société d'aide technique et de coopération (SATEC). A list of the participants is given in annex I. Mr. O. Rydeng, Director of the National Association of Danish Enterprises, and Mr. I. Krestovsky, Chief, Small-Scale Industry Section, UNIDO, served as Co-Directors of the symposium.

3. In his opening address, Prof. P. Nyboe Andersen, Chairman of the Danish Board of Technical Co-operation with Developing Countries, welcomed the participants and observed that there were good reasons for holding the symposium in Denmark. First, Denmark had experienced in recent years a rapid growth of manufacturing industry, much of which was taking place in the small-scale and medium-sized sectors. Second, Denmark's contribution to international efforts to promote the growth of developing countries had been steadily increasing. Denmark's aid to developing countries was the second highest *per capita* and the sixth highest in absolute terms of all developed countries. This assistance was being increased by 25 per cent every year, and it was expected that by 1972 Denmark would contribute 1 per cent of its national income for aid to developing countries. Furthermore, about one half of the Danish assistance was channelled through United Nations programmes. The present symposium was one of 43 interregional and regional courses, symposia and conferences organized during 1967, with the funds coming from the Danish contribution to the United Nations.

4. On behalf of Mr. Abdel-Rahman, Executive Director of UNIDO, and of Mr. Victor Hoo, Commissioner for Technical Assistance of the United Nations, Mr. Krestovsky expressed gratitude to the Danish Government for its co-operation in organizing the symposium, and extended a warm welcome to all the participants. Mr. Krestovsky stated that the organization of this interregional symposium was a continuing part of the work of the United Nations Centre for Industrial Development and of its successor, UNIDO. During the previous six years, considerable attention had been devoted to the problems of planning, organization and management of industrial estates for small-scale industries. Four regional seminars and conferences had been organized on this subject,[1] and another regional seminar had taken place on the role and problems of small-scale industries, including industrial estates.[2] The present symposium on technical services and facilities for small-scale industries was concerned with another major problem in this area. UNIDO proposed to cover other aspects of small industry development, such as financing, subcontracting and rural industrialization through research studies and further regional and interregional seminars, conferences and training programmes.

5. Mr. Krestovsky stated that the scope of the symposium included all technical services and facilities for small manufacturing enterprises, whether for establishing new enterprises or for upgrading and modernizing existing ones. The need for integrated programmes for the promotion of small-scale industries was evident, since small-scale industries needed guidance and assistance in all aspects of establishment, operation and management; no single measure could be effective unless it was associated with, and supported by, other measures. The symposium would not, however, be concerned with broader programmes such as technological research, financing, training or industrial estates, but only with the relationships of such programmes with technical services and facilities for small-scale industries. The purpose of the symposium was to provide guidelines to facilitate and improve the planning, establishment and operation of technical services and facilities for small-scale industries in the developing countries. The symposium would provide an opportunity for exchanging information,

[1] The first seminar on industrial estates, for the Region of the Economic Commission for Asia and the Far East, was held in Madras, India, in 1961; the report of the seminar and long excerpts from the discussion and information papers submitted to it have been published in *Industrial Estates in Asia and the Far East* (Sales No.: 62. II. B. 5). The second seminar, for the Region of the Economic Commission for Africa, was held in Addis Ababa, Ethiopia, in 1964; the report of the seminar and two of the discussion papers have been published in *Industrial Estates in Africa* (Sales No.: 66. II. B. 2). The third regional conference, the Consultative Group on Industrial Estates and Industrial Areas in Certain European and Other Countries in the Process of Industrialization, was held in Geneva, in 1966. The fourth regional conference, the Consultative Group on Industrial Estates and Industrial Areas for Arab Countries of the Middle East, was held in Beirut in 1966. The reports of the third and the fourth regional conferences and some papers presented to them have been published in *Industrial Estates in Europe and the Middle East* (Sales No.: E. 68. II. B. 11).

[2] A Seminar on Small-Scale Industry for the Region of the Economic Commission for Latin America was held in Quito, Ecuador, in 1966. The report of the seminar and some of the papers prepared for it have been published in *Small-Scale Industry in Latin America* (Sales No.: E. 69. II. B. 37).

pooling experience, and assessing the usefulness of different services, their organization, methods, financing and management. It would provide guidance not only on programmes of individual countries, but also on regional and inter-regional co-operation in this field, including projects under the United Nations technical co-operation programmes.

6. Mr. Rydeng stressed two aspects of small industry development in Denmark: the increasingly rapid transformation of handicrafts into small and medium-sized industries, and the recent organization of out-going advisory services for the promotion of small-scale industries. The Danish experience might stimulate an exchange of ideas on measures and methods for promoting and improving technical services and facilities for small-scale industries in the developing countries.

7. The provisional agenda was adopted. The agenda is given in annex 2. A list of discussion papers, background papers and country papers presented to the symposium is given in annex 3.

8. During the symposium, the participants visited the Technological Institute at Copenhagen, the industrial estate at Valby and several small-scale industrial enterprises in Denmark. The report was adopted on 8 July 1967. The closing addresses were delivered by the Co-Directors.

REVIEW OF THE TECHNICAL SERVICES AND FACILITIES FOR SMALL-SCALE INDUSTRIES IN THE COUNTRIES OF THE PARTICIPANTS AND GENERAL EVALUATION OF EXPERIENCE

9. The symposium had before it 32 country papers prepared by the participants. Each paper gave the definition of small-scale industry adopted in the country, described the various measures for promoting small-scale industries, such as technical assistance, financial assistance, tax and tariff concessions, industrial estates and training facilities, and assessed the place of technical services and facilities in the over-all programmes for the development of small-scale industries.

10. The country papers and the complementary statements made by the participants indicated that in all countries, irrespective of the levels of development, the problems faced by small-scale industries and those confronting the promotion and servicing agencies are strikingly similar. At the same time, broad differences in the institutional set-up and in the methods and scope of action of the agencies exist. In countries at early stages of industrialization, the main problem is to promote entrepreneurship in new industrial undertakings. This problem is also very important in the relatively more advanced countries, but these countries face in addition the urgent need to modernize plant, equipment and processes, to increase productivity and to improve product quality, and to upgrade management practices. In all countries, the financing of small-scale industries is regarded as an extremely difficult problem having the highest priority, the provision of technical and managerial assistance being very close to it in importance. No clear-cut priorities emerged from the discussion in regard to the other needs — training, marketing, export promotion, research, quality testing, provision of

land, plant and machinery, subcontracting and so on—all of which appear to be pressing.

11. One similarity in national experience is that, in most countries, small-scale industries account for an overwhelming proportion of the total number of manufacturing enterprises and for an appreciable proportion of total employment and total value added in industry. In countries at the earliest stages of industrial development, however, especially in the newly independent countries of Africa, the industrial structure consists essentially of a few large-scale and medium-sized industries owned either by foreign or expatriate interests and/or by the Government on the one hand, and a large number of artisan and handicraft undertakings and cottage industries on the other. Where a few small manufacturing concerns do exist, they are invariably owned and managed by foreigners. Except for some types of industry in the relatively more industrialized developing countries, small-scale industries are generally weak, ill-managed, poorly equipped and produce goods of uneven quality. Everywhere, many small entrepreneurs are unaware of their needs or unable to identify them and are reluctant to request or even to accept assistance for reasons ranging from ignorance and prejudice to fear that information might be channelled to the tax authorities or to competitors.

12. In some countries, the promotion of small-scale industry is an important objective of policy, and government responsibility for the development of this sector is fully recognized. In other countries, however, there is some confusion regarding the respective role of artisans, handicrafts, small-scale and large-scale industry in over-all industrialization plans. Every participating country has adopted some measures of promotion, and several countries have set up one or more agencies to carry out these measures; but it was acknowledged that whatever is being done is not enough. Even in India, which has set up the largest small industry development organization in the world, services can be provided to only a small fraction of a large and constantly growing number of small industrial enterprises. Most of the agencies suffer from inadequate financial resources and from difficulties in recruiting and keeping qualified staff. They are subject to various restrictions, usually because they are government departments bound to civil service budgeting, administration and personnel management, and those restrictions hamper initiative and action.

13. All countries recognized that, since small industries need guidance and assistance in all aspects of establishment, management and operation, measures to assist them should be integrated in a comprehensive development programme. With some exceptions, such as Argentina, Ceylon, China, Cyprus, India, Israel, Pakistan and Thailand, most countries have taken only piecemeal action; most of them, however, intend in due course to develop the necessary services and facilities. Lack of expert knowledge—national and foreign—appears to explain this gap as much as the lack of financial resources.

14. In all countries, responsibility for small industry development is borne by the Ministry of Industry, but special small industry service institutes, industrial extension centres or equivalent agencies providing technical and managerial assistance as a major function are in operation or in the process of establishment

in fewer than half of the participating countries: Argentina, Ceylon, Chile, China, Cyprus, Ecuador, Greece, India, Indonesia, Israel, Pakistan, the Republic of Korea, Thailand, Turkey, Uganda and the United Arab Republic.[3] In other countries, technical and managerial assistance is provided by technological or industrial research institutes (Colombia) and by industrial studies and development centres (Saudi Arabia, the United Republic of Tanzania).

15. While 200 industrial estates are in operation in India, 25 in Pakistan and 4 in China, only a few projects are functioning or being constructed in Ceylon, Cyprus, Iran, Israel, Kenya, Mexico, Nepal, Peru, Turkey, the United Arab Republic and Venezuela. Some industrial estates are at the planning stage in Colombia, Ecuador, Greece, the Republic of Korea, Saudi Arabia, Senegal, Thailand, Uganda and the United Republic of Tanzania. While a number of vocational training and apprenticeship centres have been set up in all countries, facilities for training managers and supervisory personnel exist in only a few. Some common service facilities have been established on industrial estates, but only rarely outside them. Primarily because of ignorance of techniques, but also because of lack of initiative and of co-ordination with other agencies, new entrepreneurship has not been promoted in a systematic and sustained way by service institutions, with the exception of the intensive promotion campaigns recently undertaken in India.

16. Only in a few countries has industrial extension been closely linked to financial assistance. Special credit schemes with liberal conditions for small-scale industries are exceedingly rare and, of the participating countries, only in India is hire-purchase of machinery found. Small industries rarely receive special tax and tariff concessions; in a few cases, such concessions discriminate against them. Special measures of export promotion of the products of small industry are in effect only in China, India and the Republic of Korea. The organization of co-operative associations of small producers appears to face the same obstacles in the participating countries as in other countries. The promotion of sub-contracting is seldom undertaken systematically; subcontractors' exchanges do not exist in the developing countries participating in the symposium.

17. The definitions of small-scale industry adopted in the various countries differ considerably both as regards the criteria used - investment and/or employment - and the quantitative levels adopted for these. In Ecuador, for example, the ceiling on fixed investment has been set at the equivalent of $11,000 and in the Republic of Korea, at the equivalent of $200,000. Elsewhere, the ceilings on investment vary from $40,000 to $100,000. The symposium recognized that definitions can vary from one country to another but felt that, since the objective is to identify a segment of the industrial structure entitled to special benefits, the value assigned to the criteria should be such as to encourage both the raising of employment and the use of modern machinery. The symposium felt that the definitions adopted in some countries should be revised.

[3] Although some countries—Iran, Senegal and the United Arab Republic—were not represented at the symposium, papers on their experience were submitted.

18. Small-scale industry plays a significant role in Poland, and its importance is increasing in Yugoslavia. In Poland, a network of institutions, laboratories, construction units, technological and design units has been set up to assist small-scale industries. In Yugoslavia, interest in small industry promotion is awakening, and some assistance is being given in the form of consultative services in management and marketing. In both countries, large industries provide some help to their small subcontractors, and consideration is being given to the adaptation of the principles of industrial estates to the conditions of socialist economies.

19. There was a consensus that there is an urgent need to establish promotional and servicing institutions for small-scale industries in countries lacking such institutions. In most of the other countries, the existing machinery is either at an early stage of establishment or suffers from inadequate resources in funds, personnel and expert knowledge. The symposium felt that in most cases a greater awareness on the part of the Government of the need to create, expand and strengthen technical services and facilities for small-scale industry is a prerequisite for any progress in the development of this sector. In many countries, assistance from technical co-operation organizations in the establishment and early operation of these services and facilities would be another fundamental condition.

Promotion of entrepreneurship and assistance at the pre-investment stage

20. Promotion of entrepreneurship covers the provision of direct services to individual entrepreneurs, both prospective and established. In the former case, it is aimed at attracting and steering people towards industrial activities and assisting them, through counselling, training and other means, to set up new enterprises. In the latter case, it is aimed at helping existing industrialists to expand or diversify their undertakings.

21. There was a consensus that measures for the promotion of entrepreneurship and assistance at the pre-investment stage are of crucial importance in developing countries, particularly in the newly industrializing ones. A number of interconnected measures should be taken to motivate entrepreneurship and to create the necessary climate to attract people and induce them to assume the risks inherent in the manufacturing industry. The most important measures are: the building up of an industrial extension agency to provide economic, technical and management advisory services; the provision of training facilities; the undertaking of surveys and studies pinpointing techno-economic possibilities for small-scale industries in specific areas; and the provision of financing. It is essential that the promotional agency should have an active rather than a passive attitude. Once individuals have been stimulated to engage in industrial activities, they must be given continuing assistance from the stage of pre-investment to that of operation.

22. Certain types of surveys and studies should be carried out in many developing countries in order not only to provide rational orientation to prospective entrepreneurs but also to provide the basis for programmes of development for small-scale industries and plans for industrial estates and common service

facilities. The following studies and surveys should take into account the availability of capital, labour, raw materials, domestic and foreign markets, import-substitution and export-promotion possibilities etc., as well as the objectives, priorities and requirements of a country's over-all industrial development plan:

(a) Surveys to determine the industrial potential of a given area, which may be the country as a whole, a region, a province, a district or a town. The area survey provides the basis for a planned programme of industrial development pinpointing short-term and long-term industrial possibilities and necessary measures of promotion and assistance.

(b) Industry feasibility studies to determine the techno-economic possibilities of establishing and expanding a particular industry or of manufacturing a specific product or group of products. These studies present recommendations on number and size of enterprises to be encouraged and their location; production, marketing and financing possibilities; investment requirements; anticipated cost of production and profitability, and policies and measures for the establishment or expansion of industries.

(c) Market surveys to provide information on the outlets for given products not only to improve distribution and to expand sales but also to assess the feasibility of candidate industries. The market survey also provides information on the potential size of the market, the long-run effect of substitute products and the elasticity of demand.

(d) Model schemes or industry fact sheets for industries offering good prospects of development. These are short pamphlets containing basic information for establishing and operating an industrial unit and manufacturing a product: size of plant, type of equipment, production processes, prospective markets, requirements of fixed and working capital, estimates of income, expenditure and profitability.

23. The preparation of area surveys, feasibility reports, market studies and model schemes, and the formulation of bankable projects should be a continuing activity carried out either by an extension agency, a development bank or a development centre. When the studies are carried out by agencies other than the industrial extension centre, there should be close co-ordination with the centre in the preparation and use of the data. Broad dissemination of the information is essential.

24. The establishment of financing facilities by the Government for meeting the long-term and short-term capital and credit requirements of small-scale industries, either through allocation of government funds to existing institutions or through the setting up of new institutions, is another prerequisite for the stimulation of entrepreneurship.

25. The methods and techniques of the Indian intensive promotion campaigns jointly undertaken by extension, financing and other public and private agencies were discussed by the participants. In India, intensive campaigns are carried out in medium and small towns, since technical counselling and consultancy services are readily available to entrepreneurs through small industry service institutes and industrial extension centres located in the main urban areas.

26. The most important sources of new entrepreneurship in small-scale industries in India are skilled factory workers and foremen of industrial enterprises, merchants, artisans and graduate engineers. This is also the case in some other countries, for example, Ceylon, China, Pakistan and Turkey. The symposium expressed its conviction that similar sources of new entrepreneurship exist in even the least developed countries and could be activated through extension programmes and the provision of pre-investment assistance.

27. The symposium recognized that the intensive campaign is a new technique of industrial extension that can accelerate and expand entrepreneurship under certain circumstances. Not all countries, however, need or are able to organize such campaigns. In some of the larger and relatively more advanced countries, especially in those where industrial decentralization has a high priority, there is some scope for undertaking them. It is evidently desirable to mobilize, bring together and co-ordinate, within the framework of a campaign, the whole range of measures of promotion of small-scale industry - area surveys, feasibility studies, model schemes, technical and managerial counselling, supervised credit, demonstration equipment, mobile vans and so on. However, the availability of all these measures and facilities is not a prerequisite. The minimum institutional machinery necessary for undertaking and following-up a campaign is an industrial extension centre that has carried out techno-economic surveys of prospects for developing small-scale industries in a given locality and has the technical expertise to set up, expand or diversify industrial enterprises and a financial institution that provides credit on liberal conditions and works closely with the extension centre. In the smaller countries or in countries where small industry development could take place only in a limited number of localities, there is little scope for launching such campaigns. In a few countries, the upgrading and modernization of existing enterprises has a higher priority than the creation of new industries, and the organization of a promotional campaign of the type under consideration would therefore be unnecessary.

28. In countries at the earliest stages of industrialization, the emergence of a new class of entrepreneurs, especially from the indigenous sector of the population, is a major economic, social and political objective. It is doubtful, however, that the organization of occasional intensive campaigns would be effective in achieving it. What is needed is a persistent effort on the part of the authorities in charge of industrial development to seek out prospective entrepreneurs among likely sources - skilled workers and supervisory personnel, wholesalers, importers, artisans and handicraft workers, civil servants, successful agriculturalists and graduate students - with a view to steering them towards industrial occupations. In these countries, the initial creation of even a relatively small number of indigenous entrepreneurs through such efforts could set in motion a cumulative development.

29. Quite often, technical assistance to established industrialists has led to expansion, modernization or diversification of production to such a degree that the changes are tantamount to the creation of new units. The symposium was of the opinion that efforts in this direction should be undertaken by extension agencies on their own initiative to the largest extent possible.

30. There was a brief discussion of the intensive modernization campaigns such as those carried out in a few Latin American countries. In such campaigns, extension, finance and other officials visit small enterprises in certain industrial fields, examine their plant and methods and make recommendations for their modernization. Credit applications for purchase of new machinery are frequently submitted on the spot. It was felt that this type of campaign deserves further study.

31. The symposium stressed that an industrial extension agency should adopt an active attitude and undertake work on its own initiative. Such work should be patterned on agricultural extension work, which has played a successful role in the promotion and modernization of agriculture, and which consists largely of visits to producers, on-the-job training and demonstration and similar field work. Industrial extension work not only requires a progressive outlook on the part of the leaders of the industrial extension agency, but often depends on the availability of sufficient funds and personnel, the absence of statutory limitations, the avoidance of bureaucratic procedures and co-operation and co-ordination with other agencies, especially with financial institutions. Leadership and a central co-ordinating role should be assumed by the extension agency.

Technical counselling

32. Technical counselling includes advice and guidance on the selection and utilization of materials, machinery and auxiliary equipment, on plant layout, production processes, production planning and control, maintenance, inventory control, cost reduction and general housekeeping. Technical counselling provided in connexion with financial assistance was considered separately.

33. The methods of providing technical counselling include visits and consultations, in-plant studies, on-the-job or classroom training and demonstration, question-and-answer service and distribution of brochures and bulletins. The symposium was of the opinion that the measures most likely to be successful in assisting a particular industry, as distinct from an enterprise, are seminars, training courses and the establishment of pilot plants. With respect to an individual undertaking, the most effective tools are consultations, visits, in-plant studies and demonstrations. When more than one organization is involved in technical counselling, for example, an extension service and a research institute, their respective efforts should be co-ordinated.

34. Apart from the shortage of financing, the principal obstacles to the modernization of small-scale industries are the persistence of a low level of technology, the shortage and inadequate skill of operatives and the absence of effective management techniques. While the extent and nature of problems arising from these obstacles are not identical in all countries, the most urgent requirement appears to be the introduction of sound quality control and cost accounting.

35. Many participants referred to the reluctance of small entrepreneurs to avail themselves of existing developmental facilities, either because of complacency or suspicion of the motives of the Government. These obstacles can be overcome only through educational efforts. Several participants thought

that once an entrepreneur is convinced of the soundness and disinterested nature of the proffered advice, he will be likely to welcome further assistance. To surmount the barriers of self-satisfaction and suspicion, initiative should be taken by the development agency; progress cannot be made by waiting for the entrepreneur to bring his problems, the existence of which he may be unaware. In many cases, simple and relatively inexpensive reforms should be recommended first. As confidence is established, more important changes can be introduced. It was agreed that the ultimate objective of any extension agency should be to help the small industrialist to help himself.

36. In many developing countries, a serious problem is under-utilization of plant in small-scale enterprises. When this is not due to a shortage of raw materials, it is due to bad planning of production in relation to the market. However, there are instances of markets so limited that the output of even the smallest production unit currently available could not be absorbed.

37. Another problem is the continuing use of obsolete or unsuitable machinery, a problem that was attributed – leaving aside the lack of financing – to the reluctance of small entrepreneurs to move with the times. Yet obsolescence is a relative concept that should refer to the average level of technology and the relative costs of capital and labour in a particular country. The use of second-hand machinery is a related question. Most of the participants felt that second-hand plant should often be considered, but only after a thorough investigation into the economics of the proposed operation has been made and reliable assurances on the condition of the machinery and the continuing availability of spare parts have been received.

38. It is desirable to secure the co-operation of foreign manufacturers (and local agents) of imported machinery and equipment in providing training and after-sales service. It was believed that reputable manufacturers would, in their own interest, provide such services, and cases were mentioned where training and service facilities have been obtained in commercial transactions. In some developing countries, the manufacturers and even the Governments of machinery-exporting countries have set up technical agencies to provide such services. Whenever possible, provision of after-sales service should be included in contracts for import of machinery.

39. As regards the role of training in technical counselling, the general view was that an extension service should not be concerned with basic vocational education; such education should be provided by special institutions. Specialized short-term training to upgrade the skills of the operatives, particularly when new processes and machinery are introduced should, however, be carried out by the extension service and would be particularly effective if provided in common facility centres. The symposium discussed the effectiveness of centres where training is carried out as an integral part of the production process in conditions approximating actual industrial operation. There was much evidence that such centres are neither efficient production centres nor efficient training centres, that they are expensive to equip and to operate, and that they often compete with private small industrial enterprises. Most participants felt that a realistic introduction to industry could be given more effectively to young workers

graduating from vocational training centres through apprenticeship and in-plant training schemes.

FACILITATION OF FINANCING

40. The symposium discussed the role of industrial extension agencies in facilitating the financing of small-scale industries and stressed the need for closer association between financial and technical assistance. Advice on the use of improved machinery and equipment or on the adoption of new techniques of production is of little avail to small industries in developing countries unless it is backed by financial support to translate the advice into practice. Similarly, the provision of credit to small industrialists is of little help unless it is supported by guidance and advice on the proper use of the funds. The symposium recommended that programmes of technical services and facilities and of credit for small-scale industries be closely integrated in all developing countries.

41. The symposium recognized the obstacles to the financing of small-scale industries, and noted that because of high risks and costs, commercial credit institutions are reluctant to grant loans to weak and often inefficient enterprises having inadequate accounting systems and little collateral or security to offer. As a rule, commercial banks cannot meet the requirements of small-scale industries for long-term capital and equipment financing. However, in several developing countries, the provision of short-term credit has not raised insurmountable difficulties. The symposium recommended that special credit institutions or special departments of industrial development banks be organized, wherever necessary, to meet the needs of small-scale industries, particularly as regards their long-term capital requirements.

42. To encourage commercial banks and industrial development banks to advance credit in liberal terms to small-scale industries, it may be necessary for the Government to provide supporting facilities and services. In view of the large number of applications for small loans, financing institutions, in particular, commercial banks, are often unable to afford the overhead costs of a permanent technical staff to undertake the technical operations relating to the scrutiny of applications or to the supervision of the use of funds. In such circumstances, government technical service agencies should assume the responsibility for technical scrutiny and credit supervision. The increase in productivity and improvement in product quality and management, which could be brought about by the technical service agency, would enhance the eligibility of the small industrialists for further loans from credit institutions and thus generate a healthy chain reaction that would be beneficial to the credit institutions as well as to their clients.

43. The symposium noted that in a few countries the Government has set up an industrial development bank but not a separate technical servicing agency. It was the general view that the proliferation of institutions should be avoided, especially in small countries and countries at early stages of industrialization. An industrial development bank strengthened with technical and extension staff is often an appropriate agency for small industry development. Initially

it can limit its services to borrowers, evaluating their applications for loans and providing them with pre-investment services and post-loan supervision. In the course of time it can extend its services to small industries in general, borrowers or not. As a rule, the cost of the extension services rendered by a development bank should be subsidized by the Government.

44. A tangible form of support to commercial credit institutions would be for the Government to introduce credit guarantees or insurance schemes. It was noted that some developing countries have already introduced such schemes and that these have aided the financing of small industries.

45. The symposium stressed the importance of integrating technical and financial assistance schemes not only in programmes for improving the efficiency of existing small industries, but also in those for stimulating new entrepreneurship. Especially in countries at early stages of industrial development, where the basic problem is to stimulate new entrepreneurship, advice on the prospects of starting new industries should be backed by financial schemes providing the entrepreneur with the means of acquiring machinery and equipment, factory accommodation and working capital. It was noted that in many countries, funds earmarked for loans to small industries remain unused for a variety of reasons, such as lack of sound projects, irksome procedures or exceedingly strict conditions for grant of loans, or because the small industrialist is unaware of his needs. In such cases, promotion of entrepreneurship and technical counselling through industrial extension are the only means of making effective use of the available financial resources. In this connexion, the symposium drew attention to the schemes of supply of machinery on hire purchase implemented in a few developing countries. It felt that such schemes are a good example of integrated technical and financial assistance and might well be adopted in other developing countries. In India, the scheme of supplying machinery on the basis of payment in instalments is operated on commercial lines by a government-owned corporation. Such schemes can also be administered by industrial development banks and similar credit institutions, but close co-operation between government technical service agencies and credit institutions is a prerequisite for their effective operation. Such close co-operation is also essential for carrying out intensive promotion campaigns and intensive modernization campaigns.

Common service facilities

46. The symposium considered the scope for establishing common service facilities such as a toolroom, a testing and quality-control laboratory, heat-treatment, electroplating and finishing workshops, forging and die-casting units, foundry, specialized workshops for certain industries, leasing of machinery and equipment, and maintenance and repair workshops. Such facilities have been set up in areas in which small-scale industries are concentrated, in particular on industrial estates, and within the premises of industrial extension agencies.

47. The main reasons for setting up a common service facility as a promotional device are that certain types of machinery and equipment cannot be economically operated by any individual small enterprise, owing to limitations on capacity

and skill, in spite of a demand, current or prospective, for items to be produced with such machinery; that no private initiative for setting it up on a commercial basis is forthcoming; and that the provision of the services is conducive to increasing productivity and improving product quality and of reducing costs of small-scale units. The symposium felt that the existence of the first two conditions should be ascertained by careful surveys; these would also provide the data necessary to plan the facility and, in particular, to select the proper machinery and equipment. In no case should a publicly sponsored facility be set up if similar services are available on a commercial basis in the locality. Wherever possible, encouragement should be given to its establishment as a private undertaking. Most participants agreed that publicly sponsored facilities should be turned over as soon as possible to private or co-operative ownership.

48. The toolroom and the testing and quality-control laboratory were considered to be particularly useful. They can serve many types of small-scale industries and seldom meet private competition. The toolroom, properly equipped, can also serve as a maintenance and repair workshop for general engineering industries and other industries, such as plastics, rubber goods and leather goods, which require large varieties of dies and press tools. The symposium noted that these and other common service facilities are considered to be key elements in the success of industrial estates in India and that they are particularly effective when set up on an industrial estate. Some participants felt that a promotional testing and quality-control laboratory should not engage in quality certification, the reason being that no institution or service of this type should be judge and party at the same time. Some other participants felt that quality certification is an incentive for the use of testing facilities and thus has a promotional value. These participants felt that a public or semi-public testing laboratory should provide both testing facilities and quality certification. The use of the facilities for training and demonstration was approved, although only as a secondary function.

49. Certain other common facilities, such as a machine-lease shop, where specialized or expensive machines could be used by small enterprises on payment at machine-hour rates, leasing of power tools and inspection equipment and leasing of installation and hauling equipment, were considered useful to a variety of small industries, provided these facilities are set up after an adequate assessment of the demand for them and provided they are operated on a commercial basis or on a no-profit, no-loss basis, without a subsidy.

50. It was felt that mobile vans with machinery and equipment are extremely useful instruments for promotional campaigns, training and demonstration and servicing in scattered locations and that they should be part of the facilities of an extension agency. Noting the high capital and operating costs of mobile vans, the symposium recommended that the type of vehicle and the type of equipment be carefully selected and that sufficient portability and flexibility of the equipment be ensured. For instance, the vehicle should be able to travel on unmetalled roads; the machinery should be adaptable to electric or oil engine drive, or sometimes even to manual drive; it should be possible to install the machinery temporarily in a semi-urban or rural location. The optimum utilization

of mobile vans should be ensured through careful preparation and planning of their travel and operation.

IMPROVEMENT OF DESIGN, QUALITY AND STANDARDS

51. In all countries, the demand of the consumer becomes more and more sophisticated and exacting as the levels of industrial development and the standards of living rise. If the producer, and particularly the small producer, is to secure, retain and increase his share of the market, it is essential that he should cater to the current trend in demand in his particular line and should manufacture at a price the consumer is prepared to pay. Such a policy may pose problems that the small entrepreneur is unable to solve by his own efforts. The consensus was that small-scale industries are in real need of guidance with respect to design and quality of their products.

52. The improvement of design is influenced by such factors as local materials, manufacturing facilities available and the level of the workers' skills. An extension service could provide assistance in these areas, as is being done in some of the countries participating in the symposium. Some doubt was expressed as to the advisability of referring all these problems to a research institution. While some problems, such as use or adaptation of local materials, can be solved by a research institution, most design problems of small-scale industries need quick solutions. With regard to determining consumer preference, it was felt that in many developing countries private counselling services would not be available and this task would have to be undertaken by the extension centre.

53. Many of the participants felt that there is scope for improvement in the quality of the goods produced by small-scale enterprises in their respective countries. They held the view that the low quality of many indigenous manufactures makes it impossible to implement policies of import substitution satisfactorily, that it makes the building up of an export market extremely difficult, and that this low quality is responsible for the reluctance of the larger industrialists to make use of locally made materials or components. It is imperative to introduce quality control in small manufacturing undertakings. Quality is a matter of complying with a predetermined standard or specification. The extension service could advise on the specifications, which should be in accordance with the needs, and could assist the entrepreneurs to meet them. The successful compliance with the accepted specifications might depend, among other things, on the availability of raw and intermediate materials of a known and consistent quality. Since the testing needed to determine that quality is beyond the resources of most small-scale entrepreneurs, such testing should be provided, and this could also be a function of the extension service.

54. It was felt that statistical quality control is too complicated to be accepted by the average small industrialist, although it has been introduced in a few instances. However, simpler procedures based on standardized sampling techniques and control charts are available, and the extension service should promote them.

55. It was agreed that a system of national standards is necessary. In respect of certain items, international specifications might be accepted; in other cases, these could be adapted to suit the needs of the country. Several participants were of the opinion that the standards for certain articles should have legal backing and that assistance should be given to small manufacturers to produce goods conforming to legal standards. There was agreement that wherever possible a system of certification marking should be introduced to show that the marked goods are of the requisite quality. Periodic inspections would be necessary to maintain standards. Most of the participants felt that quality certification should be the task of an independent body and not a function of an extension service.

MANAGEMENT ASSISTANCE

56. Management assistance to small-scale enterprises includes advice on such matters as diagnosis of the state of the finances, budgeting and cost control, organizational structure, personnel policies, industrial relations and management training. The symposium felt that management assistance should be carried out through both advisory services and training courses. A continuing long-term effort by the industrial extension agency is required to bring about a significant modernization of management methods and practices and increased productivity in small-scale industries. Special methods of training combined with extension work in the factories should be devised for that purpose.

57. The small industry entrepreneur/manager should be helped to take an integrated view of the management of his enterprise. Courses of short duration should be organized, for instance, part-time or evening courses, in which attention would be devoted to solving practical problems, especially those confronting the participants. The interest of the small industrialist should be kept alive through periodic visits to the plant by the extension officer to help the entrepreneur solve his problems himself and through periodic evening meetings of groups, spread over a long period. In this connexion the organization of what are known in Western Europe as "self-training groups" or "exchange-of-experience groups" by industry associations, with the assistance of a trained co-ordinator from the extension agency, for discussion of mutual problems and solving actual cases was considered useful. Such groups are usually composed of ten to twelve entrepreneurs each and meet once in a fortnight for three hours in the evening over a period of a year or two.

58. Because of the lack of specialization in management in small-scale industries, it was felt that, at the initial stages, there is a greater need for "generalist" than for "specialist" extension officers. There is also a need to devise simple vocabulary and simple language to communicate complex ideas. The "generalist trainer" requires not only a thorough and comprehensive knowledge of management problems and methods but also abilities in extension and communication and in generating the confidence of small industrialists. These extension trainers should therefore be properly oriented to their work.

59. However, the close relation between technical and management problems in small-scale industries, one participant expressed the view that management courses should be organized separately for different product or process groups, such as woodworking, foundry units and leather footwear units. The symposium agreed that management techniques and tools of cost accounting, production planning and control could be introduced more effectively in homogeneous groups.

60. It was recognized that in some developing countries that have either a large number of small enterprises or have made some progress in the development of small-scale industry, specialists are needed both to solve specific problems of the enterprises and to provide training in specialized management fields. In newly industrializing countries, the need for specialists will be increasingly felt as small industry develops. As regards training in specialized management fields, such as production planning and control, cost accounting and inventory control, courses should be of longer duration and could in many cases be profitably given to prospective entrepreneurs and to intermediate management employees.

61. The need for close ties between management improvement and technological improvement in small-scale enterprises, and hence the dovetailing of management training with technical advisory services, was emphasized. It was recommended that management improvement and training form an integral part of the functions of an industrial extension agency for small-scale industries.

Marketing Assistance

62. The symposium felt that assistance in the field of marketing is extremely important for small-scale industries, especially in newly developing countries where there is a strong preference for imported products and at times even unwarranted prejudice against indigenous products. The small entrepreneur himself has little time to devote to the specialized function of marketing and sales promotion. The diseconomies of small size could be overcome in this field through joint action by groups of manufacturers or industry associations and through the co-operation of wholesalers, for example.

63. Campaigns organized by industry groups or associations were considered necessary to make indigenous products known in national markets. One effective method is to organize national fairs and exhibitions. Marketing consultants in extension agencies can provide advice on advertising methods, marketing channels, mark-ups and other information. They can organize and assist in conducting market surveys and in disseminating marketing information.

64. The symposium noted that some countries have adopted procedures to facilitate procurement by government purchasing agencies from small-scale industries. In India, a list of articles has been established for exclusive purchase from small-scale industries on a competitive tender basis. Another list has been drawn up for the procurement of articles from both small and large enterprises through competition in tendering, but small-scale manufacturers are entitled to price preference. Government and institutional agencies provide such facilities

as awarding certificates of competence, technical assistance, testing of materials and products, information on tenders and tendering procedures and credit on liberal terms. This system has assisted small enterprises to improve the quality of their products and to diversify their production and has opened up new marketing channels and outlets. The symposium felt that there is scope for similar programmes in other developing countries, since government purchases usually absorb a significant proportion of the total output of these countries.

65. The symposium was of the opinion that measures to protect indigenous manufacturers, such as tariffs, restricted markets and differential excise duties, are often justified in the earliest stages of development. However, such restrictive measures should be temporary and should not be an obstacle to the long-run competitiveness of the products of small industry in internal and international markets.

66. In most developed countries and in some developing ones, there is a nucleus of wholesalers and middlemen experienced in marketing methods and in foreign trade. The establishment of direct links between large-scale manufacturers and retail marketing outlets, on the one hand, and the restrictions on import trade and operation of state trading organizations, on the other hand, have reduced the activity of some of these wholesalers and middlemen. In the developing countries where this is the case, the expertise and know-how of these specialists could be utilized with advantage by small industry groups and associations for promoting the sale of their products, both in internal and in export markets.

67. The experience of Denmark and France in organizing groups of small industries for domestic and export marketing of related and complementary products was noted with interest. The symposium felt that there is scope in developing countries for such collective and co-operative action by small industries, actively assisted by the extension agency. Such joint action might include advertising, product improvement, quality labelling and negotiations with wholesalers and department stores.

68. Some participants felt that there are good opportunities for small-scale industries in export markets for certain types of products having both a high element of labour costs and a high added value. Aggressive marketing and sales promotion are required in export markets, through joint efforts of government trade representatives, trade associations and export groups. Without such co-operative efforts it would be impossible to meet the competition from the developed countries and the sophisticated requirements, in respect of constantly changing design and quality and large volume, of the markets of the rich countries. Trade associations and industry groups should be able to engage marketing consultants and market research experts. Export credit facilities should be provided on liberal terms.

INDUSTRIAL RESEARCH

69. The discussion on the utilization of industrial and technological research facilities by small industry extension services covered such matters as: industrial

use of local agricultural, mineral and forest products and of waste materials or by-products; investigation of problems of processing, of machinery and equipment and of developing appropriate technologies; testing of raw materials and products and providing laboratory standards of measurement and calibration services; and collection and dissemination of industrial, technical and scientific information of interest to small-scale industries.

70. It was the view of the symposium that a close relationship should be maintained between industrial research and industrial extension. On the one hand, much of the research carried out by technological research institutes in developing countries—particularly research on local raw materials—is of special interest to small-scale industries, though it is generally undertaken for industry irrespective of size. It should be one of the functions of an industrial extension agency to inform itself of achievements in science and technology, to screen out what is particularly relevant to small-scale industries in the region it serves and to apply it as part of the technical assistance it provides to small enterprises. On the other hand, extension work could reveal areas in which research should be undertaken, and projects could be referred by extension agencies to research institutes. Some research projects could be of exclusive concern to a particular industrial enterprise; others could be of interest to a whole industrial subsector.

71. The symposium noted that small-scale industrialists in general do not avail themselves readily of the services of industrial and technological research institutes. This is due to a variety of causes, such as their unawareness of the existence of such institutes and of the potential value of these institutes to small industry; their awe of the research worker and a reluctance to trouble him with their affairs; their lack of technical capability to determine and describe their problems; their difficulty in visiting institutes separated by great distances in large countries; and, of considerable importance, the small industrialist's lack of time to seek assistance. This lack of communication should be overcome through positive action by both research institutes and the extension agencies. Research institutes and extension agencies might co-operate in organizing lectures, seminars and discussion groups, either for exchange of information and experience or for dissemination of knowledge. It is important, however, that the results of research work be expressed in a technical language intelligible to small industrialists.

72. An advisory field service could conceivably be set up as an integral part of a research institute. Qualified technical personnel would visit small enterprises, diagnose their problems and carry out the necessary research. It was recognized, however, that practical considerations related to organization, staff and finances would often make this difficult and the co-operation of an industrial extension service would be called for. In such a case, positive, firm and clearly defined measures should be taken to co-ordinate closely the activities of the institute and of the extension service. These would include the careful selection and training of advisory personnel to ensure communication between the institute and small industry.

73. It was noted that in some countries technological research institutes have been designed to serve also as counselling agencies for small-scale industry

Examples include the Central American Research Institute for Industry, the National Institute of Industrial Technology of Argentina, the Institute of Technological Research of Colombia and the Danish Technological Institutes. The symposium felt that this combination is desirable when no industrial extension agency exists.

74. It was noted that, in most developing countries where commercial testing facilities are not available, industrial and technological research institutions can play a useful role in testing industrial products and materials, and in making available standards and calibration services to industry. In one developing country, testing facilities were installed in the laboratory of a technological research institute, but small industries did not derive any of the anticipated benefits because the laboratory personnel was engaged primarily in research, and laboratory technicians and assistants were not available in adequate numbers to carry out routine analyses and testing. Co-operation between industrial extension services and research institutions would help solve such problems. While the symposium was not in favour of duplication of facilities, it felt that the establishment of a testing and quality-control laboratory as a common service facility for small-scale industries would often be justified, especially in an industrial estate or in an industrial extension centre.

75. The symposium recognized that developing countries promoting manufacturing industry have a wide range of technologies from which to choose and that quite often the most up-to-date technology is not necessarily appropriate to the scale of operations, the factor endowments, and the skills and raw materials available in a particular country. The choice of the appropriate technology should be based on both economic and technological research, including investigation of means to adapt modern technologies to the conditions of developing countries; and the development of new methods and technologies based on an analysis of the economic and technological problems of manufacturing in an industrializing country. Related problems include the adoption of policies encouraging the optimum utilization of existing machinery and capital equipment and pricing policies that ensure the use of the factors of production in optimum combinations, particularly in economies having a surplus of employable labour and a scarcity of investment capital. Industrial research institutions have a role to play in the selection of those technologies that are best suited to the resources and needs of a developing country, but here, too, the co-operation of industrial extension agencies is necessary. On the one hand, industrial extension officials would be able to pinpoint problems of technology in small-scale industries requiring research by research institutes. On the other hand, the extension officials could themselves provide solutions in the field, for instance, in the design and development of simple jigs, fixtures and tools; it would also be their task to disseminate and assist in the application of technological modifications or new processes evolved by research institutes.

76. The symposium noted the establishment of prototype production and training centres in India. Three such centres have been established with the objective of developing and producing prototypes of machines, implements, accessories and component parts that could be manufactured by small-scale

industries, and of training the operatives of small enterprises in manufacturing such machinery and equipment. The symposium noted that although these centres are still in an experimental stage and lack sufficient experience, their basic work of developing prototypes appears to have suffered on account of diversified demands upon their facilities for specialized training of skilled workers and supervisors of small industries, for commercial production and for common servicing. The symposium approved the establishment of prototype development centres, but suggested that such institutions concentrate on prototype development rather than on other functions. Once a prototype has been developed, it should be handed over to private industry for manufacture. The prototype centre should not have responsibility for auxiliary activities such as training.

77. In most developing countries, small-scale industries make little use of technical, economic and legal information. In this area, too, there is scope for close co-operation between extension agencies and industrial research institutes. The industrial extension agency responsible for small industry development in a country should build up library, information and reference services in co-operation with research institutes, and one of its essential functions should be to disseminate technical information through publication of illustrated brochures written in simple language; through the preparation of films, film scripts and other audio-visual aids; and through the organization of courses, seminars, conferences and discussion groups. These courses should be devised for small groups and for short periods and should be concerned with specific technical or managerial improvements in a particular branch or sector of industry. Dissemination of new information and of improved methods could also be undertaken by encouraging groups of entrepreneurs to engage a consultant from an extension centre or from a research institute to assist in organizing such conferences and meetings.

Promotion of subcontracting between large and small industries

78. The establishment of subcontracting relationships between large and small industries requires all or most of the following conditions: large plants in certain fields of manufacturing, e.g. the metal industry, and of efficient and usually highly specialized small industries; an effective machinery for bringing together supply and demand; technical and managerial assistance facilities; legislation to protect small establishments; and, in certain cases, a favourable tax system – taxation on value added being especially appropriate, since it avoids cumulative tax payments. In all countries, subcontracting is a means of remedying the underutilization of machinery and equipment, which is a serious waste of expensive and sometimes scarce productive resources. In the developing countries, subcontracting is also a means of promoting small-scale industry and of strengthening the industrial structure. Another advantage is that technical assistance from the large to small firms can complement the limited facilities of the industrial extension centres.

79. In countries where the above conditions exist, the symposium recommended that active consideration be given to the establishment, with technical assistance

if necessary, of subcontracting exchanges such as those recently created in certain European countries. The exchanges are clearing-houses of information on demand for parts and components and processing and finishing operations on the part of large-scale industries and on supply facilities (in particular of machines of different types), productive capacity, and skill and trade specialization, in small-scale industries. The information obtained through regional surveys is filed on cards and is continuously updated. An exchange is headed by an engineer, with one or several assistants. The staff is often able to give technical assistance and some training to small industrialists and to counsel them on investments and types of production corresponding to the needs of the large-scale industries.

80. In the absence of subcontracting exchanges, industrial extension agencies should provide information on subcontracting opportunities, facilitate the negotiation of contracts and help in carrying out the orders, mostly as regards the achievement of good product quality, timely delivery and reasonable prices, all of which are prerequisites for the contribution of small-scale industries to the production of large industries. Other facilities include subcontractors' fairs, in which parts and components required by large industries are exhibited and ancillary industrial estates set up for small subcontractors, usually in the vicinity of the large plant.

81. India and Japan have had some experience in the establishment of ancillary industrial estates. In Toyama, Japan, 39 small and medium enterprises work in an industrial estate as subcontractors to a large steel company. In Bangalore, India, a large, public-sector machine-tool factory set up an industrial estate where 50 small-scale enterprises manufacture castings, forgings, parts and components for the large factory. It was the general view of the symposium that the establishment of an ancillary industrial estate requires careful study and should be considered only if it can be demonstrated that an estate would, on balance, be more beneficial than other arrangements. For instance, existing small-scale enterprises in scattered locations may not always benefit from subcontracting orders if an estate is centrally located near a large plant. On the other hand, it may be advantageous to plan simultaneously a new large-industry complex and an estate for small-scale industries. In any event, regulatory measures to prevent abuse and exploitation of small-scale enterprises by the large parent firms and promotional measures by the extension service to upgrade technology and skills, to ensure quality control and to facilitate financing are essential for promoting subcontracting between large and small industries.

Joint action programmes

82. There was agreement that some of the diseconomies of small-scale industries arising from size could be overcome through collective or co-operative action. It was noted that in France, 150 groups of ten enterprises each have been organized in various parts of the country for the provision of common purchasing, sales, export marketing, management, training, financing and other services. The provision of such services on a joint basis has resulted in considerable savings in costs and consequently in increased turnover of the enterprises

to the extent of 25 to 30 per cent per annum. The Government of France has promoted the establishment of such common groups by providing tax incentives and liberal credit facilities. The symposium agreed that such co-operative and collective action under the sponsorship of industry associations and other industry organizations should be encouraged by the promotion authority in each country through direct action as well as through indirect incentives.

83. One form of co-operation and joint action that might be useful in newly industrializing countries is the establishment of "functional" industrial estates, in which the functions of one industry are subdivided among a number of small-scale units located in one place, each functioning according to a co-ordinated manufacturing programme. The functional estate is particularly suitable for co-operatives of small industrialists venturing into new fields of manufacture. When properly organized and managed, a functional estate can ensure that small-scale units derive the economies and efficiencies of specialization and large-scale production. In Japan, a number of functional industrial estates have been set up in such fields as woodworking, ready-made clothing and machine tools; and in India, functional estates for radios, clocks and time pieces, ceramic products, automobile ancillaries, electronic components, scientific instruments and electric meters are at various stages of planning and implementation. While commending the principles and objectives of the functional industrial estate, the symposium suggested that before such an estate is organized, the structure of market relationships, the compatibility of different producers and other factors should be carefully weighed; and the provision of technical and financial assistance, quality control and market-promotion measures should be ensured.

Scope of functions

84. The symposium considered the functions of institutions and facilities providing technical services to small-scale industries under the following headings:

(a) The most rational institutional set-up, taking into account differences in national conditions;

(b) The case for general-purpose or specialized institutions;

(c) The basis of specialization-type of industry and/or functions of the institutions;

(d) Centralization versus decentralization of facilities: extension of services and facilities for the development of small-scale industries in rural and less developed areas.

85. The consensus was that no general principles can be prescribed for the most rational institutional set-up for providing technical services and facilities to small-scale industries. This is a matter for each country to decide, taking into account its size, the number and distribution of small-scale enterprises, the development of institutional facilities, the structure of political organization and government policies. In large countries or in countries with many small-

scale enterprises, the main problem is often to achieve co-ordination among different agencies. In newly industrializing countries with limited resources, overlapping of functions and activities should be avoided when the institutions and facilities are being planned. The symposium felt that in countries in the early stages of industrialization, it would often be advantageous to build technical services and facilities for small-scale industries within one existing institution, such as an industrial research institute, an industrial estate, an industrial development bank, a management development centre or a small industry service institute. Only where no such institution exists or where there are good reasons for not making use of an existing institution should a new one be established.

86. For similar reasons, general-purpose facilities are usually more appropriate at the earliest stages of development than specialized ones. Specialized institutions and facilities should be established, where required, only after a careful assessment of needs and resources.

87. The symposium felt that specialization in the provision of services and facilities should generally be based on function rather than on type of industry. The provision of technical services and facilities for small-scale industry — as distinct from industry in general — is necessitated by the special functional characteristics of this sector of industry. As industrial development progresses and production becomes more diversified some specialized technical consultant services will become necessary.

88. The extent to which facilities should be decentralized depends upon the size of the country, the concentration or dispersal of small-scale industries, the transport and communications network and similar factors. Since it is recognized that services to small-scale industries should be carried to the door of the entrepreneur, the symposium considered the principle of decentralization to be important. In rural and less developed areas decentralized services might be set up or mobile teams and peripatetic facilities employed.

Recruitment and training of small industry extension personnel

89. The symposium was of the view that the effectiveness of the extension work for small-scale industry depends to a large degree upon the personal qualities of the extension personnel. Extension officers should genuinely believe that small industry can make a positive contribution to economic development; they should have above average intellectual abilities, appropriate character and disposition as well as physical fitness. Good powers of expression and aptitude for engaging in training and instruction activities are highly desirable.

90. Proper recruitment and selection procedures are necessary to secure these personal qualities in extension personnel. Recruitment procedures should include not only an evaluation of a written *curriculum vitae* but also personal interviews and, whenever appropriate, a period of probation.

91. Training and career development programmes are essential for recruiting and upgrading. These programmes should take into account the requirements for different levels and categories of staff. Three broad levels of personnel required

at the primary, the intermediate and the senior levels can be distinguished. The personnel of the primary level should be graduates of secondary technical schools, those of the intermediate level should be university graduates with specialized professional qualifications and some industrial experience; and those at the senior level should have had considerable industrial and administrative experience. Training and induction programmes are required at all these levels, but more particularly at the primary and intermediate levels.

92. In view of the shortage in developing countries of qualified personnel and the competing demands for them, the participants felt that special training methods should be devised to make extension personnel available without much time lag. Short orientation courses should be organized for recently recruited personnel. After about two years of working experience in the extension agency, an intensive specialized training of four to six months would be advantageous. Refresher courses should be organized every two or three years and seminars every year to provide knowledge of new methods of extension work and new experience. Advanced courses and seminars of six to eight weeks' duration should be organized for senior-level personnel.

93. In the large developing countries, training programmes for extension personnel should be organized nationally. The symposium felt that many small countries should consider organizing regional or subregional training programmes along the lines of those carried out at the Research Institute for Management Science, Delft, the Netherlands; the Small Industry Extension Training Institute, Hyderabad, India; and the Asian Productivity Organization, Tokyo, Japan.

Sponsorship, organization, financing and management

94. The symposium reviewed the experience of developing countries in the sponsorship, organization, financing and management of technical services and facilities according to the type of sponsorship, namely, public, semi-public and private.

95. In many developing countries, institutional agencies to provide the technical services needed by small industries are non-existent or inadequate. Medium and large industries are often able to secure such services through foreign suppliers and consultants, but for small industries these possibilities are limited. Small industries are therefore obliged to look to the Government for securing assistance. There was general agreement that, in such circumstances, public agencies should assume the main responsibility for providing services and facilities. Public agencies should play a particularly positive and dynamic role in countries in the early stages of industrial development.

96. The symposium considered the extent to which public agencies should shoulder the responsibility for providing technical services. In view of the wide disparities in the development of small-scale industries in the various countries, no guidelines of universal applicability can be laid down. This question must be decided by each country, taking into account the industrial development policies and objectives and the levels of development of semi-public and private agencies. There was, however, general agreement that it is desirable for the

Government to play a "pump-priming" role, with a view to stimulating the participation of private institutional agencies. Although the Government's assumption of full responsibility in sponsoring, organizing and managing such services is justified in the initial stages, its policy should be to encourage private agencies to contribute to, and eventually to take over, some of these functions.

97. Since private institutional agencies grow only slowly, it will be necessary, in most developing countries, for the public agencies to provide technical services and facilities for a very long time. The immediate problem, therefore, is to make these public agencies more effective instruments of service than they have hitherto been. Some of the defects arise from their operation as government departments having to comply with cumbersome procedures and ineffective practices, such as a centralized system of recruitment of staff, rigid rules of promotion, frequent transfers of personnel and inadequate training facilities at senior levels. A more serious danger is the tendency of the extension staff to become more bureaucratic in their approach and less service-minded. The chief merit of industrial extension is its personalized and service approach, and special efforts are therefore required to ensure that extension work, though organized within the framework of the government machinery, retains its service nature.

98. In this connexion, the symposium endorsed the suggestion that a useful way of improving the efficiency of technical services provided by public agencies would be to associate experts from private industry, research institutes and universities with these agencies. The agencies should retain panels of consultants who could be called upon at short notice on a part-time basis; this system should help greatly to improve the quality of the services rendered and to reduce their costs.

99. The symposium considered a further suggestion that in countries where public agencies have been providing technical services and facilities over a long period, they should cease to provide services that could be undertaken in a satisfactory manner by other agencies on a commercial basis or are available, or could be made available, from other sources. While the stage or extent of such withdrawal from existing responsibilities should be decided by each country, attention should be drawn to the need of conserving the resources available in public agencies for service in depth and in especially deserving areas. Particularly in countries with numerous small industries, the aim of public agencies should be to provide service in depth, and not total coverage. In such countries, any attempt by public extension agencies to reach all the enterprises would only dilute the quality of the service. Rather than spread the services too thin, attempts should be made to provide concentrated services to a fewer number that in turn would have a demonstration or "spread" effect on other industries. However, some participants felt that in countries in the earliest stages of development, full coverage might be necessary.

100. The problems of recruitment and training of qualified staff for the public agencies were also considered. As far as possible, technical staff should have sound practical industrial experience, but such a requirement would make recruitment difficult, especially in countries in early stages of industrial development.

It was felt that, in these cases, people with adequate technical qualifications should be recruited who, when no national training facilities exist in the country, should be sent for intensive practical training in more industrialized countries. Although this is a costly form of recruiting and training extension staff, it can be expected that after a number of people have been trained in this manner, they in turn will be able to train other national personnel.

101. As to whether public agencies should charge fees for the technical services provided by them and, if so, on what basis, it was noted that the practice in developing countries varies widely. In some countries, all services are free; in others, charges are levied for services of a commercial type or for all types of services and facilities, with rates varying from one type to another. There was general agreement that purely promotional or developmental services should be provided free. As regards other types of services, two distinct views were expressed. One view was that services should be charged for, even though the rates need not necessarily be on a full-cost basis in all cases. The other view was that services should be free to all small industries, whether located in a backward area or not, during the initial period of their operation; after the initial period, charges should be levied on a graduated scale.

102. The symposium reviewed the role of semi-public agencies in providing technical services and facilities. It noted that in several developing countries, institutions for technical services organized as autonomous agencies have been functioning effectively. They have a great degree of flexibility and freedom in their operation, particularly in such matters as recruitment of staff. At the same time, technical services may be administered through government departments in developing countries, and this system has certain distinct advantages. The staff may be able to influence the formulation of policy at high levels in the Government, and in certain countries, service in the Government carries high social prestige, and government departments are therefore able to attract qualified technical personnel in spite of comparatively low salaries. A prerequisite for the effective functioning of any organization engaged in technical services is a large measure of autonomy, and this should be ensured in the planning of any organization, public or semi-public.

103. The symposium also reviewed the role of credit institutions, such as commercial banks and industrial development banks, in providing technical services and facilities. In some developing countries, credit institutions are directly responsible for providing all types of technical services to small industries, and the role of the Government is limited to giving financial support to these institutions. The symposium was of the view that, in countries where credit institutions have already gained experience in providing technical services and facilities, there is no need for the Government to set up a parallel agency for this purpose. In such countries, the role of the Government should be to encourage credit institutions to extend technical services not only to those small industries that applied for or received credit facilities, but to non-borrowers as well. Credit institutions have a vital interest in the economy and technical efficiency of small industries and are therefore quite suitable for providing the technical services required. The symposium felt that Governments should provide financial

support to credit institutions in the operation of those facilities and services that could not be set up on a commercial basis in the early stages.

104. It was noted that in most developing countries, the role of private associations of industrialists or co-operatives of industrialists in providing technical services and facilities is negligible. Trade associations, wherever they exist, have been engaged primarily in representational activities. The symposium recommended that such associations be encouraged to engage the services of specialists and experts to render technical services to member units. They should arrange seminars of technical personnel to review technical problems and to share each other's experience in solving such problems. They should organize common service facilities and also arrange for the training of workers and supervisors. Governments should give financial support to trade associations undertaking such activities.

105. The symposium noted that universities and technical institutions in developing countries have not been playing an active role in providing extension services to small industries. In view of the extreme shortage of technical expertise in developing countries, the symposium recommended that Governments assist these institutions with suitable grants in order to enable them to undertake technical services for small industries.

CO-OPERATION AND CO-ORDINATION

Inter-agency co-operation at the national level

106. Most of the participants in the symposium emphasized two primary difficulties in promoting technical services and facilities for small-scale industries in their countries, namely, the inadequacy of financial resources, both in foreign exchange and local currency, for the establishment of extension service centres, small industry service institutes, industrial research institutions, quality-testing laboratories, marketing organizations, export-promotion centres, management development and productivity centres, and training institutes and workshops; and the shortage of qualified, experienced staff to carry out promotional work in such agencies. In view of these difficulties, it is imperative that an effective system of co-ordination and co-operation be established to maximize the combined contribution of such agencies to industrial development.

107. There was a consensus that the stated objectives be well defined and areas of operation demarcated before any new public or private agency is established in order to prevent unnecessary duplication. Pre-planning should take into consideration not only techno-economic but also social factors. The establishment of different agencies under one central national council, at the highest level of authority possible, was considered very useful for the promotion of inter-agency co-operation and co-ordination.

108. Human failings, such as professional and personal rivalries, were identified as a common cause for failure of national agencies to co-operate, and it was agreed that in spite of initially ill-defined objectives and other similar restrictions, duplication could be avoided almost completely, and co-ordination and

co-operation greatly fostered, if the heads of the respective agencies made a combined and conscious effort. Personal contacts should be established at all levels, both in public and private agencies, through discussions, conferences, seminars, symposia, radio and television programmes and other similar joint activities, in preference to communication through correspondence and other paper work.

109. Interchange of staff and of services and facilities, such as workshop, laboratory and library, among the different agencies would result in maximum efficiency and economy of time and money for the agencies as well as for the industrialist-customer.

Organization of technical services on a regional or subregional basis

110. The participants generally approved the conclusions of a report on the conditions for setting up and operating technical services for small-scale industries on a regional or subregional basis in the light of the experience of the Central American Research Institute for Industry (ICAITI),[4] which is one of the few existing multinational centres devoted to industrial research and development and to the rendering of technical services to small-scale and medium-sized enterprises. The report dealt with the functions of a regional or subregional institute; the size, resources, level of development and degree of economic integration of the participating countries; the financial arrangements, the organization, staffing and facilities of the institute, and the agreements and obligations of the participating countries. Its conclusions were considered to be of particular importance in view of the proposed establishment of several regional or subregional centres for the development of small-scale industry, with assistance from the United Nations and its regional economic commissions and offices, for the West African subregion, Latin America and the Arab states of the Middle East.

111. There was general agreement that regional or subregional centres may play a very useful role in providing technical services and facilities for small scale industries in developing countries if they are established to fulfil real needs of the countries concerned. Some participants expressed the view, however, that for relatively more advanced countries that already have certain institutions capable of providing these technical services, it might be preferable, instead of creating new regional centres or superimposing multinational institutions, to strengthen and/or expand the existing national agencies through national efforts or international co-operation. Yet even then the exchange of personnel and of technical information, certain training activities at the higher levels, and some research work on the utilization of natural resources common to several countries could very well be organized on an international basis.

112. The symposium agreed that some desirable conditions for setting up regional or subregional institutions include a relatively similar degree of economic

[4] Document ID/CONF. 2/12, reproduced in part X.

development of the participating countries, similarity of their industrial structure and of their natural resources, their proximity and communications facilities among them. Similarities in the size of the countries and the composition of the population were considered to be less important. Economic integration and co-ordinated planning among countries were considered very helpful, but not a prerequisite for setting up a regional or subregional centre.

113. An essential condition is that the Governments of the participating countries make the decision to undertake such a joint venture, and be fully committed to back up and finance in an appropriate and increasing manner the activities of the new centre.

114. In regard to the functions of regional or subregional institutions, it was felt that techno-economic studies, industrial surveys, regional investigations, market research and industrial feasibility studies are among the activities that can well be performed on a regional scale. Technological research on the utilization of indigenous resources or raw materials, process and product development, analytical work and materials testing, and other similar tasks that require substantial investment in laboratory equipment, pilot-plant facilities and modern library and documentation services are also activities that can be performed more economically in regional centres, especially when there are no national institutions capable of undertaking such tasks, and when financial and human resources for setting up physical facilities and undertaking research and related activities on a national basis are limited. On the other hand, industrial extension services, in-plant studies and other forms of technical assistance to small-scale industries at the plant level, as well as some measures for raising productivity, are normally best performed by local centres or, in the last instance, by national branches of a regional technical service institution.

115. Some participants felt that certain new technical assistance activities, such as aid for export promotion of manufactured products, could very well be carried out by regional institutions. The same would be true of activities designed to promote the industrial integration of countries within the framework of a common market. In this connexion, some participants from Latin America reported on the efforts of a group of countries of similar size and comparable economic development to set up a subregional centre devoted to industrial studies and development.

116. On the subject of staffing regional or subregional centres, it was considered essential to recruit highly qualified personnel possessing both academic and practical industrial experience and preferably gifted with the ability to understand socio-economic problems, to overcome cultural barriers and to deal adequately with human relations.

117. In regard to the financial structure of a regional or subregional centre, it was considered very important to rely on sound financial sources of support, commensurate with the tasks entrusted to the new institution and provided in such a way as to guarantee its viability and growth. Though institutions of this kind are normally operated on a non-profit basis, many of their services should be provided to industry on a cost basis. Only in exceptional circumstances should the services to small industries be given free of charge or at a

nominal cost. Some services, like dissemination of technical information, should be supported from the general resources of the centre.

118. The symposium stressed that such institutes should not supplant private initiative, when it exists, and should complement, rather than compete with, well-established services to industry.

United Nations technical co-operation

119. The symposium noted with appreciation the work carried out under the United Nations Development Programme (UNDP) and the programme of Special Industrial Services (SIS) in the field of small-scale industry. Part of this work is concerned with the establishment and operation of technical services and facilities. More than 100 projects set up with the assistance of the Special Fund component of UNDP (UNDP/SF) are specifically intended to help develop and support industry, most of them serving small-scale industry directly or indirectly. Only 12 of these projects (10 small industry service institutes or similar centres and 2 industrial estates) are specifically designed to promote small-scale industry through the provision of technical services and facilities. The other projects include 68 management development, training and productivity institutes or centres, 42 research institutes and 6 industrial development centres[5].

120. The symposium considered that there is much scope for the establishment, with UNDP/SF assistance, of facilities especially devised for the promotion, assistance and servicing of small-scale industries. The main needs are to create small industry service institutes and industrial extension centres, industrial estates with common service facilities, especially toolrooms and testing and quality-control laboratories, and centres for the training of extension workers. The symposium recommended that Governments avail themselves increasingly of the assistance offered under the UNDP/SF programme for the establishment of such institutions. It noted that assistance in drafting requests to UNDP/SF could be obtained from UNIDO and, in their fields of competence, from ILO and FAO.

121. The symposium noted with approval that projects for the establishment of regional or subregional centres for the development of small-scale industries

[5] Figures as of January 1967, included in document ID/CONF. 2/13 submitted to the Vedback symposium. This document has been revised on the basis of data as of 31 January 1970 and is reproduced in Part II, No. 10. In the light of the more recent data, the above passage would read as follows:

> About 150 projects set up with the assistance of the Special Fund component of UNDP (UNDP/SF) are specifically intended to help develop and support industry, most of them serving small-scale industry directly or indirectly. Only 15 of these projects are specifically designed to promote small-scale industry through the provision of technical services and facilities and industrial estates. The other projects include 78 management development, training and productivity, maintenance and repair institutes or centres, 45 research institutes and 13 industrial development centres.

While the number of projects bearing on small industry development has increased between 1967 and 1970, the general conclusion reached by the symposium in paragraph 120 still remains valid (Editor's note).

are under consideration in Africa, Latin America and the Middle East. These centres, which would provide technical assistance to participating countries in the formulation and implementation of policies, programmes and major projects, train officials in charge of small industry development and undertake action-oriented research, mainly in the form of feasibility studies and pre-investment surveys in the participating countries, would also be of assistance in setting up and operating institutions extending technical services and facilities at the plant level.

122. There is also scope for increased requests for assistance under the Technical Assistance component of UNDP (UNDP/TA) and, when appropriate, under the SIS programme for expert missions in the above fields and for operations relating to the development of supervised credit schemes, including hire purchase; the establishment of subcontracting exchanges; the improvement of design, quality and standards; the facilitation of marketing and export promotion, including the establishment of certification marking centres; and the organization of intensive campaigns. The symposium noted that Governments have taken relatively little advantage of fellowships offered by the United Nations and recommended that the number of requests for training at the Delft Institute, the Hyderabad Small Industry Extension Training Institute (SIET) and the Asian Productivity Organization be increased. It noted with great interest a project to organize, under the fellowship programme of UNDP, group training courses and study tours of industrial estates for participants from various regions.[6] In general, there is scope for increased operations in the various fields of small industry development described in a brochure submitted to the symposium.[7]

123. The symposium recognized that because of limited experience, there are greater difficulties in recruiting experts in small-scale industry than in other fields of industrial development. Few engineers and economists from the industrial countries which still supply the majority of technical assistance experts have knowledge of and experience in industrial estates, common service facilities, supervised credit, subcontracting exchanges and so on. It noted with appreciation that a French state corporation for technical co-operation (SATEC) has organized, in collaboration with the International Federation of Small and Medium-Sized Enterprises, three to six months' training courses for young engineers intending to make part-time or full-time careers as technical assistance experts. The training includes on-the-job instruction in subcontracting exchanges, equipment-leasing centres, common action groups for purchase, sale and export management, research, financing etc. Training can be provided to foreign participants, preferably French-speaking. The services of the trained experts can be put at the disposal not only of the French bilateral programme and European multilateral programmes but of United Nations programmes as well.

[6] A Group Training Programme on Industrial Estates was organized by UNIDO at the SIET Institute of Hyderabad, India, from January to March 1965. It was attended by 15 English-speaking trainees from 15 developing countries. (Editor's note.)

[7] United Nations (1966). *Technical Co-operation for the Development of Small-Scale Industry* (Sales No.: 67.II.B.3).

124. The symposium expressed its conviction that the developing countries would, in the course of time, become an increasingly important source of expertise in small industry promotion and assistance. Some countries are already providing, and many others could supply, some experts to serve under United Nations programmes. The symposium recommended that lists of experts from the participating countries be submitted to UNIDO. The scarcity of such experts should not be an obstacle: Governments should consider such secondment to United Nations projects as an investment in personnel that would eventually benefit their own countries.

125. It was also recommended that Governments requesting assistance in the field of small-scale industry should carefully identify their needs and their relative priorities and take great care in preparing job descriptions listing the functions of the experts and other relevant information. When in the country, experts should not be used in functions corresponding to those of government officials. In spite of the shortage of competent nationals in many countries, all efforts should be made to provide able counterparts to the foreign experts, even on a part-time basis if absolutely necessary, and to see to it that the counterpart assumes the expert's functions after he has left.

126. The symposium noted that there is sometimes duplication in technical assistance operations in small industry development undertaken under bilateral, multilateral and international programmes. It felt that co-ordination of requests for assistance is the responsibility of the Government concerned and recommended that this problem be given due attention.

127. Several participants pointed out that there is considerable delay between the approval of a request by the United Nations for technical assistance and the appointment of an expert or experts. While they appreciated the difficulties in recruiting experts, they felt that recruiting procedures could be improved and the time lag between the acceptance of a request and the posting of experts reduced.

128. The symposium noted with great interest the research programme of UNIDO, which includes symposia and seminars in the field of small industry and, in particular, projects relating to technical services and facilities. It felt that the projects on financing, common service facilities, specialized industrial estates and subcontracting will be of great value to government officials, extension officers, foreign experts and others involved in small industry development. Much interest was expressed in projects concerned with the contribution of small-scale industries, either as subcontractors to large firms or under joint production programmes, to the production of certain products of great importance to the developing countries. It was felt that a series of studies on the production and assembly by small establishments of parts and components of producer goods, especially machine tools, would be particularly useful.

129. The participants recommended that the present report be widely circulated to Governments and small industry promotion and service agencies in all developing countries. Many of them stated that upon their return home they would not only inform the interested government agencies but would, with their co-operation, study conditions and needs for improving the provision

of technical services and facilities for small-scale industries, including technical co-operation projects in this area.

130. Finally, the symposium recommended that measures be studied and adopted for organizing, with the co-operation of UNIDO and other international agencies, as required, exchange of personnel from small industry agencies, sharing of facilities, organizing training courses and study tours and disseminating information among developing countries, on a bilateral, regional or subregional basis, in the field under consideration.

ANNEX 1

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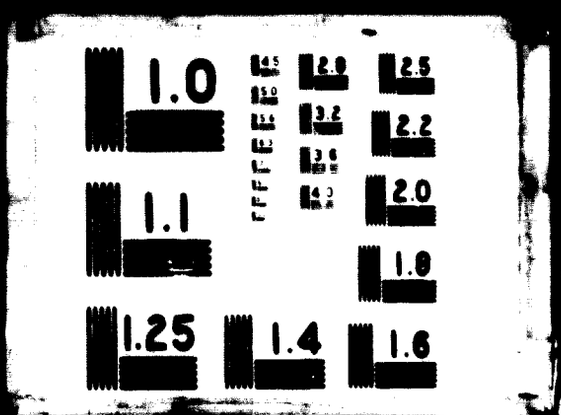


ANNEX 2

AGENDA

1. **Opening addresses**

2. **Adoption of the agenda**

3. **Review of the technical services and facilities for small-scale industries in the countries of the participants and general evaluation of experience**

   Economic, technical and management problems of small industry development

   The role of technical services and facilities in over-all programmes of development of small-scale industries

4. **Functions and operating methods and procedures by type of institution**

   (a) Functions and methods

   Promotion of entrepreneurship and assistance at the pre-investment stage, including facilitation of financing

   Technical counselling

   Technical servicing

   Improvement of design, quality and standards

   Management assistance

   Marketing assistance

   Industrial research and demonstration

   Facilitation of subcontracting between small and large industries

   Collection and dissemination of technical, economic and legal information, organization of seminars and discussion groups

   Other functions and methods

   (b) Scope of functions

   General-purpose facilities or specialized facilities

   Industry specialization and/or functional specialization

   Centralization or decentralization of facilities; extension of technical services for development of small-scale industries in rural and less developed areas

   (c) Technical services and facilities on industrial estates

   (d) Recruitment and training of extension personnel

5. **Sponsorship, organization, financing and management**

   Government, private or mixed sponsorship; degree of autonomy of public agencies; provision of technical services and facilities by associations of small

industrialists, chambers of commerce and industry and other groups, and by large industries

Financial arrangements; capital investment and working capital of servicing institutions; free services versus paid services; subsidization; financial control

Requirements in staff and equipment by type of facilities

Administrative and management problems; selection of projects, programme scheduling; contractual practices

Location of agencies and facilities

6. Co-operation and co-ordination

(a) Between national agencies

Inter-agency co-operation in use of staff, workshops, laboratories and other facilities; exchange and dissemination of information on technical problems and research

(b) International co-operation

Scope for organization of technical services on a regional or interregional basis

Scope for international co-operation: sharing of facilities, exchange of personnel and technical information, training courses

United Nations technical co-operation for the establishment, development and operation of technical services and facilities for small-scale industries

ANNEX 3

LIST OF DOCUMENTS

Working papers

ID/CONF. 2/1	Provisional agenda
ID/CONF. 2/1/Add. 1	Annotated provisional agenda and proposed questions for discussion
ID/CONF. 2/2	A summary list of technical services and facilities for small-scale industries and related institutions, by UNIDO
ID/CONF. 2/3	The role of industrial extension services in small industry development programmes, by UNIDO
ID/CONF. 2/4	Short background of the origin of the Danish Technological Institute and Danish handicraft and industry, by the Technological Institute, Copenhagen, the Jutland Technological Institute of Aarhus and the Danish Textile Institute
ID/CONF. 2/5	Problems in the application of technical assistance to small-scale industries in developing countries, by A. Neilson
ID/CONF. 2/6	Advisory services in management, by Erik J. A. Ohrt
ID/CONF. 2/7	Technological Institute's Wood Department, by Morten Knudsen
ID/CONF. 2/8	Technological research and industrial extension in Canada, by R. E. McBurney
ID/CONF. 2/9	Training of small industry extension workers, by Yap Kie Han
ID/CONF. 2/10	Sponsorship, organization and financing of technical services and facilities in the light of the Indian experience, by P. C. Alexander
ID/CONF. 2/11	Operational problems of small industry service institutes in the light of the Indian experience, by G. Sain
ID/CONF. 2/12	Conditions for setting up and operating technical services for small-scale industries on a regional or a subregional basis, in the light of the experience of ICAITI, by M. Noriega Morales and S. Wittkowsky
ID/CONF. 2/13	United Nations activities relating to technical services and facilities for small-scale industries, by UNIDO
ID/CONF. 2/14	Research and extension for small-scale industries in India: the role of the Council of Scientific and Industrial Research, by Baldev Singh, J. C. Srivastava and M. C. Chatterjee

ID/CONF. 2/15	The development of indigenous small-scale entrepreneurs in Africa, by Keith Marsden
ID/CONF. 2/16	Technical services and facilities for rural industries, by FAO
ID/CONF. 2/17	Promotion of entrepreneurship, by K. L. Nanjappa
ID/CONF. 2/18	Summary of the development conditions for the small and medium-sized enterprises and their harmonious integration in the market economy, by Robert Holtz

Background papers

ID/CONF. 2/BP. 1	Policies and programmes for the development of small-scale industry, by UNIDO
ID/CONF. 2/BP. 2	Stimulation of entrepreneurship and assistance to small industrialists at the pre-investment stage, by UNIDO
ID/CONF. 2/BP. 3	Industrial extension services for small-scale industries, by P. C. Alexander
ID/CONF. 2/BP. 4	Training for industrial production of prototype machinery, by A. D. Bohra
ID/CONF. 2/BP. 5	Services and facilities for small-scale industries in industrial estates, by A. D. Bohra
ID/CONF. 2/BP. 6 (67.II.B.3)	Technical co-operation for the development of small-scale industries
ID/CONF. 2/BP. 7	Problems of procedure, administration and relationship to be considered in establishing the United Nations Organization for Industrial Development
ID/CONF. 2/BP. 8	Notes on discussions between the Centre for Industrial Development and the International Labour Office regarding areas in the field of small-scale industry of special interest to each organization

Country papers

Country	*Author*
1. Argentina	R. P. Tjebbes
2. Botswana	P. Reardon
3. Colombia	N. Young L.
4. Cyprus	A. Papakyriakou
5. Ecuador	G. Espinosa Z.
6. Haiti	J. C. Saint Louis
7. Indonesia	S. Kusomonegoro
8. Iran	K. Sh. Yeganegi*
9. Republic of Korea	K. H. Park
10. Senegal	L. C. A. Alexandrenne*

* Did not attend symposium

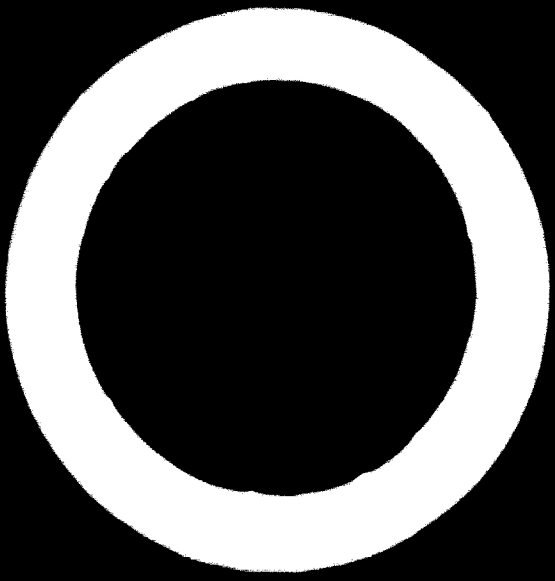
Country papers *(cont'd)*

Country	Author
11. Republic of China	Chi-chang Chao
12. Turkey	R. Onen
13. Israel	A. Hakner
14. Mexico	A. Navarro Gergely
15. Honduras	B. Membreno*
16. India	K. L. Nanjappa
17. Peru	I. M. Harrison Costa
18. United Republic of Tanzania	N. W. Nshau
19. Sierra Leone	S. D. Lamin
20. Yugoslavia	L. Blagojević
21. Ceylon	K. Mahadeva
22. Zanzibar	M. A. Lakha
23. Kenya	Kipng'enc Arap Ng'Eny
24. Thailand	J. Divari
25. Uganda	E. D. Bewayo
26. Poland	W. Spruch and Z. Mikolajczyk
27. Nepal	R. N. Rimal
28. Chile	E. Ortega R.
29. Venezuela	A. Ruiz
30. Pakistan	I. M. Idris
31. Saudi Arabia	S. Robaishy
32. Greece	G. Th. Cambitsis

* Did not attend symposium

PART II

SELECTED PAPERS PRESENTED TO THE SYMPOSIUM



THE ROLE OF INDUSTRIAL EXTENSION SERVICES IN SMALL INDUSTRY DEVELOPMENT PROGRAMMES*

INTRODUCTION

The need for integrating the promotion of small-scale industry in an over-all development programme has been expressed on many occasions, in particular in United Nations publications, articles and reports. As stated in a recent report:

> "Individual measures will be ineffective unless supported by complementary action. For example, credit funds may remain unused, standard factories on industrial estates may remain unoccupied unless steps are taken to stimulate entrepreneurship. Equipment may not be modernized if financing is not provided. Vocational training alone will not improve productivity if industrial extension services are not available to managers. Guidance, advice and support will be needed at every step, in each operation, and over a relatively long period of time. Such integrated and sustained assistance can only be provided by the Government through appropriate institutions, often with the help of foreign experts. The main purpose of such assistance is to support small industrialists through the initial stages and to lead them towards effective, self-reliant management; high-quality, low-cost production; and self-sustained growth."[1]

Industrial extension services, in the limited sense of technical and managerial assistance to small-scale industry, play, or should play, a central role in over-all development programmes for this sector. There is hardly an aspect of small industry development to which they are not related—from the establishment of a single undertaking to that of an industrial estate, from financing to marketing, from processing to research. Yet, in many developing countries, measures for the promotion of small-scale industry are all too often introduced piecemeal without being related to, or co-ordinated with, complementary programmes, if, in fact, such programmes have been set up. The measures may then be ineffective or only partly effective, and the resources in capital and professional and administrative skill allocated to them may be under-utilized or wasted. Because of their ineffectiveness, partial measures may become discredited, and failure to introduce more comprehensive or better integrated programmes which

* Paper presented to the symposium by UNIDO.

1 "Policies and Programmes for the Development of Small-Scale Industry", *Industrialization and Productivity Bulletin* No. 14 (Sales No.: 69.II.B.12).

could achieve the desired results might in a few instances be attributed to the lack of success of the piecemeal measures.

Particularly close relationships should be established between industrial extension services and, respectively, financing, research, industrial estates and special incentive programmes. These relationships are briefly discussed below.

EXTENSION SERVICE AND FINANCING

A two-way relationship exists between extension service and financing: on the one hand, financing of small-scale industries may be ineffective if it is not supported by technical assistance, both when credit is applied for and when the funds are used; on the other hand, technical assistance may not be fully productive if financial resources are not available to put some of the recommendations into effect.

The obstacles to the financing of small-scale industries are well known. Commercial credit institutions are reluctant to grant loans because the risks of lending to weak and often inefficient enterprises are relatively high; the security offered by the small entrepreneur is often inadequate; his financial means are deficient; the loans are small, the cost of processing them is relatively high and operations are unprofitable unless the interest rate is raised to a level at which compensation for risk, service charge and profit are covered a step which presents a further obstacle to financing. A small industrialist, especially a new entrepreneur, is often unaware of his own needs or may have difficulties in identifying and expressing them in terms of financial requirements. In addition to the difficulty of providing acceptable collateral, he may not be able to find a satisfactory co-signer or guarantor.

Where public financial institutions for small-scale industry have been set up, a technical staff has generally been appointed to evaluate applications for loans as well as to assist in preparing them and to supervise the use of funds. In effect, such a staff functions as an industrial extension service that helps not merely the financial institution but the small industrial borrower as well. Technicians not only advise the small borrower on means of meeting his requirements but also identify his needs, make recommendations on the use of proceeds, for instance, on the placing of orders for machinery, assist in obtaining import licences and foreign exchange authorizations, help in installing, operating, maintaining and repairing equipment and so on. This type of work is essential to the operation of any "supervised credit" scheme, in particular of hire-purchase plans for the supply of machinery to small-scale undertakings. In some countries, the technical staff of the financing institution serves as the industrial extension agency for small industry in general, its services being available not only to the borrowers but also to any small entrepreneur in need of help.

In several countries, the technical work related to financial operations is carried out not by a specialized credit institution but by a separate industrial extension agency. Such an arrangement, together with other measures such as government credit guarantee or insurance schemes, may contribute to inducing the participation of commercial banks in the financing of small-scale industry.

Such banks are usually unable to bear the overhead cost of a sizable permanent technical staff and are reluctant to pay fees to consulting firms for services relating to small operations. The extension agency may thus help the banks by assisting the small industrialists "free of charge" in making applications for credit and in supervising the use of funds. It may also help the credit institution directly by training its officers in project evaluation, which is a regular banking function. Such training would normally be provided for a fee.

The credit-worthiness of a small industrialist is determined not merely by ownership of plant, equipment or stocks of goods and by the financial standing and integrity of the owner, but also by his efficiency as a producer and his ability as a manager. The improvements in productivity, product quality and management brought about by technical assistance tend to improve credit-worthiness by reducing risks of default. On industrial estates, in particular, tenants receive technical counselling in all aspects of their operation as often as required. While such support by an extension agency is not a guarantee in the financial sense, it may help to raise the credit rating of the entrepreneur. Technical assistance may offset to some extent the handicap that small entrepreneurs, whether on or outside industrial estates, seldom own a building that could be offered as collateral.

Close association between technical and financial assistance is indispensable in any programme for the stimulation of new entrepreneurship. There is little purpose in orienting a prospective entrepreneur towards an industrial occupation by giving him the necessary economic and technical information and assistance but not the financial means for setting up his business. The closest form of co-operation in this field between extension and financial agencies may be achieved through "intensive promotion campaigns" for the stimulation of entrepreneurs, such as those undertaken in India. In this country, mobile teams composed of extension and finance officers travel from one town to another with industry fact sheets and demonstration equipment, organize meetings and hold individual consultations with prospective entrepreneurs in the course of which they not only give information on industrial occupations but also ascertain requirements in technical assistance and financial aid and make arrangements to provide these when a decision has been taken to set up an industrial establishment.

In many countries, funds for loans to small industries are available but remain unused because there is no demand, because applications are inadequately justified or because projects are unsound. In such cases, promotion of entrepreneurship and technical counselling through industrial extension are the only means of making effective use of the financial resources earmarked for small industry development.

Many recommendations of industrial extension officers, in particular those for the modernization of existing small-scale industries, may remain academic if financing is not available to carry them out. Here again a team approach in what might be called "intensive modernization campaigns" may yield maximum results. In an experiment made in a Latin American country, teams of extension and finance agents visited small enterprises in certain industrial sectors, made

recommendations on mechanization and modernization the need for which was not even suspected by the entrepreneurs and made arrangements for financing. When modernization of existing enterprises is a condition of admission to an industrial estate a sound policy aimed at precluding the use of the estate simply for rehousing the rule can be effectively enforced only if financial and technical assistance are made available to the relocated industrialists.

Industrial extension and industrial research

A two-way relationship also exists between industrial research and industrial extension. On the one hand, much of the research carried out by technological research institutes in developing countries may be of special interest to small-scale industries, though it is generally undertaken for industry irrespective of size. This applies particularly to research into the industrial use of agricultural, mineral and forest products, of substitute materials such as wastes and by-products and of certain local materials. As a rule, small enterprises have little or no access to the findings of research and seldom ask for consultations with a research institution, especially if work is to be undertaken on a contractual basis. It should be one of the functions of an industrial extension agency to inform itself of achievements in science and technology, to screen out what is particularly relevant to small-scale industry in its region, and to apply it as part of the technical assistance provided to small enterprises. On the other hand, extension work may reveal areas in which research should be undertaken, and projects may be referred by extension agencies to research institutes. Some research projects may be of exclusive concern to a particular industrial enterprise, while others may be of interest to a whole industrial subsector.

A type of research of considerable importance for small-scale industries would be the development of machinery and equipment that they could produce and use. In India, this need was considered to be of such importance that three institutes the Prototype Production and Training Centres were set up for that purpose by the Government. For certain reasons, only limited progress has been made in this direction. Another area in which extension agents may help small industries is that of industrial design.[2]

Because of the importance of their work for small industry development, technological research institutes in certain developing countries also serve as industrial extension centres. Such institutes sometimes continue to provide technical counselling to small-scale industries even after extension agencies have been established. In such cases, a division of work according to the main lines of competence should be agreed upon and close co-operation maintained between the institutions.

[2] See "Training for Industrial Production of Prototype Machinery", *Industrialization and Productivity Bulletin*, No. 6, United Nations, Sales No.: 63.II.B.1; and "Industrial Extension Services for Small-Scale Industries" (ID/CONF. 2/BP. 3), to be published by UNIDO in 1971 in *Promotion of Small-Scale Industry in Developing Countries*.

Where research is conducted independently from industrial extension, technical information should be disseminated and exchanged through lectures, seminars and discussion groups organized by research institutes for the benefit of extension agents.

INDUSTRIAL EXTENSION AND INDUSTRIAL ESTATES

An industrial estate for small-scale industries is not, and should not be, a mere real estate project offering land, infrastructure and standard factories. In the absence of other measures, these inducements will seldom suffice to stimulate entrepreneurship in new undertakings – a paramount objective of any development programme. In some countries, factories on industrial estates remain empty or are only slowly occupied even in favourable locations because of the lack or inadequacy of guidance to entrepreneurs, of financing, of training of manpower, of fiscal and other incentives, and of other complementary measures. Quite often the only candidates for admission are enterprises desiring relocation in better premises. Mere rehousing without modernization of equipment, increase in employment, improvement in productivity and product quality, and sometimes diversification of production would obviously be counter to the objectives of an industrial estate project. Rapid occupancy of an industrial estate and achievement of a satisfactory level of productivity among the tenants therefore require a combined effort in which industrial extension should play a major part.

An extension agency or other small industry promotion institution should be involved in the establishment of an industrial estate from the earliest planning stage. It should be responsible for, or co-operate in, the preparation of the surveys of the prospects for industrial development in a given region, in the light of which the location, site, type, size and facilities of the industrial estate will be determined. It should have the main responsibility for steering prospective entrepreneurs towards industrial occupations and for assisting them both at the pre-investment stage and after operation has commenced. It should help to screen candidates, to facilitate financing, to hire and train personnel, to select machinery and raw materials, to maintain quality control, to make market surveys etc. It should assist in, or might be in charge of, the operation of some of the common facilities of the estate.

Because of economies of agglomeration, an industrial estate of relatively large size makes it possible to integrate most – if not all – of the measures for the promotion of small-scale industry. On smaller estates, complementary measures should include, as a minimum, technical assistance and financing on liberal terms – preferably linked together, as discussed earlier. Industrial extension facilities should therefore be located either on or in the vicinity of an industrial estate. If a fully developed industrial extension centre cannot be set up, technicians trained in extension service should be appointed to staff the management team of the estate; in particular, the manager, the supervisors of technical common facilities and the accountant should be so trained.

INDUSTRIAL EXTENSION AND OTHER PROMOTION PROGRAMMES

Programmes for promoting small-scale industry may include a variety of inducements and measures of assistance such as preferential purchase of small industry products by government agencies, facilitation of subcontracting with large industries and encouragement of export promotion. These programmes can be successfully implemented only if the small enterprises turn out products conforming to standards and specifications and of acceptable quality, and if they deliver them on time, calculate correctly costs of production and sale prices and meet other requirements of the buyers. Technical and managerial assistance will in general be necessary to enable the small enterprises to obtain the orders and to carry them out effectively. For this reason, wherever such programmes have been devised, the closest co-operation of industrial extension agencies has been secured. In India, for instance the government procurement programme is administered by a purchasing agency the Directorate General of Supplies and Disposals (DGS&D), with the co-operation of the National Small Industries Corporation (NSIC) and the Central Small Industries Organisation (CSIO) and its small industry service institutes and extension centres. The small industry service institutes process applications from small industries interested in government procurement and certify their capability to produce satisfactorily the items for which they want to be registered. NSIC screens the proposals and registers the small industries. It co-operates with DGS&D in listing items to be set aside for production by small-scale industries and in granting price preferences to small industries when these compete with large ones for government orders. Technical assistance to small industries is, in effect, a guarantee of their capability.

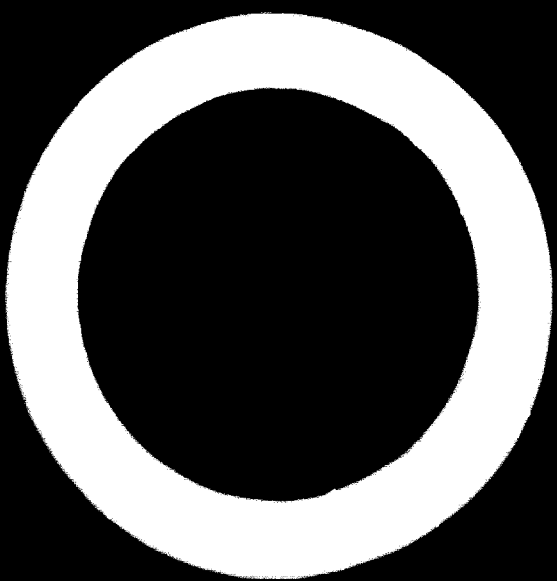
Technical assistance is also a condition for the successful discharge of subcontracting obligations by small establishments. Industrial extension agencies provide information on subcontracting opportunities, facilitate the negotiation of contracts and help in carrying out the orders. In Chile, the Servicio de Cooperación Técnica (SCT) guarantees the quality of the products of small industries to induce large industries to place subcontracting orders. The large company often provides technical assistance and even financial aid. The staff of subcontracting exchanges—a new type of facility set up in recent years in European countries for bringing together supply and demand in this field—is often able to provide technical counselling to the small subcontracting enterprises.

Quality control, preferably accompanied by quality certification marking, is a key to the success of export-promotion schemes; here again, the role of industrial extension agencies or of special export-promotion and assistance organizations such as JETRO in Japan and the Export-Promotion Councils in India is of decisive importance.

Some training is necessarily involved in the activities of an industrial extension agency: the aim of the training provided to managers, foremen and workers of small enterprises—whether in the agency workshops or on the job—is more to upgrade existing skills than to develop basic knowledge, which is the responsibility of business and technical education institutions and

vocational training centres. The training is also more specialized than that provided in the latter institutions. There is scope for some co-operation in the field of training between industrial extension agencies and educational institutions. Resources and time permitting, the agencies may organize courses on extension techniques or on subjects in which they have gained particular proficiency. They may also exert some influence on the curricula of vocational training institutions to bring them closer to the requirements, present or prospective, of industries in a given region.

Industrial extension agencies may also be involved in the formulation and implementation of other small industry promotion schemes, such as priority allocation of scarce raw materials, reductions in transport and utility rates or tax and tariff concessions.



SPONSORSHIP, ORGANIZATION AND FINANCING OF TECHNICAL SERVICES AND FACILITIES IN THE LIGHT OF INDIAN EXPERIENCE*

NEED FOR GOVERNMENT INITIATIVE IN PROVIDING TECHNICAL SERVICES FOR SMALL INDUSTRIES IN DEVELOPING COUNTRIES

Industries, whether small or large, need a variety of technical services and facilities in developing countries. Large industries secure such services mainly through foreign collaboration.

Some developing countries offer special incentives and concessions to foreign entrepreneurs to establish new industries or subsidiaries and branches of existing industries in the hope that these industries, though entirely owned and managed by foreigners, will eventually stimulate indigenous entrepreneurship. They hope that the middle- and junior-level managers and technical supervisors who are nationals of the country will in due course acquire sufficient skill and experience to start industries of their own. They also expect that the example of a successful industrial venture, though managed by foreigners, will provide the confidence to indigenous entrepreneurs to start similar ventures. Other developing countries do not permit the establishment of entirely foreign-owned industrial units but, instead, try to promote joint ventures in which indigenous entrepreneurs will have a share. Still others go a step further and allow joint ventures only on condition that the majority of shares are owned by the indigenous party.

The three types of foreign collaboration referred to above often mark three stages of industrialization in a developing country. In the initial stage, the country needs foreign capital, management and technical know-how. In due course technical know-how will become the main contribution of foreign entrepreneurs; technical know-how is either paid for outright, or, as in most cases, the foreign company obtains a share in the capital and management. This pattern of securing technical know-how and services through foreign collaboration, which has become a uniform feature of developing economies, is, however, true only of large industries. The position of small industries is quite different.

In newly industrializing countries, there are two broad groups of small industries. The first is the group of traditional craftsmen and artisans who are

* Paper presented to the symposium by P. C. ALEXANDER, Joint Secretary, Ministry of Commerce, and former Development Commissioner for Small-Scale Industries of the Government of India. Mr. Alexander served as Senior Technical Adviser on small-scale industry in the Centre for Industrial Development, United Nations, New York.

in the process of modernizing their skills, tools and techniques of production. The second is the group of modern small industries which produce a variety of consumer goods and simple producer goods as well as components and parts required by large industries. In either case, small industries, owing to the smallness of their operation, do not attract the interest of foreign entrepreneurs. For the first group, i.e. artisans in the process of modernization, technical assistance from foreign sources, even if available, may not be very useful. The modernization and transformation of the traditional artisan should be carried out with special reference to the historical background and peculiar circumstances of each country and each trade, and foreign experience may often not be relevant.

Small industries in developing countries are therefore obliged to look for services and facilities from indigenous sources. A typical feature of a developing economy is the absence or inadequacy of institutions providing the services and facilities required by industries. This is true not merely of technical services and facilities but also of other facilities such as credit, training, management counselling etc. While most developing countries have made some effort to set up institutions for providing credit, institutions providing technical services are almost non-existent. The problem is even more complex. The number of small industrial units is inadequate to induce private agencies to organize such services and facilities, and thus a vicious circle develops; the absence of services and facilities prevents the development of small industries, and the non-development of small industries discourages the establishment of institutional agencies to provide such services and facilities. Such a situation calls for government initiative and intervention. In fact, in just such a situation the Government of India decided about twelve years ago to assume direct responsibility for providing a wide range of services and facilities, including technical ones, to small industries.

Evolution of the Indian programme

Within a year of Indian independence, the Government of India adopted and announced a policy of positive support for the small-scale sector.[1] In April

[1] Small industries in India are broadly divided into three categories:

(a) Those forming an integral part of the village economy—the village-industries such as oil pressing, bee keeping, paddy husking, cane and bamboo work;

(b) Those representing traditional skills and crafts—handicrafts, handlooms etc.;

(c) Those using modern tools and techniques of production and closely linked to the corresponding large-scale industry.

The term "small-scale industry", as used in this paper, refers to the third group mentioned above. In the early stages of the implementation of the small industries development programme, small industries were defined as industries having less than Rs. 500,000 ($105,000) investment in fixed assets and employing not more than 50 workers, if power is used, and not more than 100, if power is not used. Later, the employment criterion was omitted from the definition of small industries, and a small industry was defined as one with capital investment of less than Rs. 500,000. This definition has recently been changed, and now a small industry is defined as one with investment of less than Rs. 750,000 ($100,000) in machinery and equipment. The cost of land and building has been omitted from the capital ceiling, and the ceiling itself has been raised from Rs. 500,000 to Rs. 750,000, although in terms of dollars it remains more or less the same because of the devaluation of the Indian rupee in June 1966.

1948, the Government issued the Industrial Policy Resolution defining government policy on small industry development in the following terms:

> "Cottage and small-scale industries have a very important role in the national economy, offering as they do scope for the individual, village or co-operative enterprises and means for the rehabilitation of displaced persons. These industries are particularly suited for the better utilization of local resources and for the achievement of local self-sufficiency in respect of certain types of essential consumer goods."

The resolution further observed:

> "The healthy expansion of cottage and small-scale industries depends upon a number of factors like the production of raw materials, cheap power, technical advice, organised marketing of their products and where necessary, safeguards against intensive competition by large-scale manufacturers, as well as on the education of the workers in the use of the best available techniques."

Even though the crucial importance of the technological improvement of small-scale industries was recognized by the Government in this resolution, modern small industries received very little attention by the Central Government or the state governments until the adoption of the First Five-Year Plan (1951-1956). Some technical services and facilities were provided for certain traditional industries, such as handlooms and handicrafts, through agencies set up by the Central Government.

Under the Federal Constitution of India, the primary responsibility for industrial development lies with the constituent states of the Indian Federation. However, in 1951, the Central Government enacted an important legislative measure called the Industrial Development and Regulation Act under which it assumed extensive powers of control and direction over the development of medium-sized and large industries. The Central Government was empowered to assume control of 38 main groups of industries listed in the first schedule of the act. These industries, generally referred to as "scheduled industries", include practically all major industries. The main objective was to ensure the development of these industries in conformity with over-all national policies. The act required that every industrial undertaking falling under the list of scheduled industries be registered with the Central Government and that no new industries in the scheduled list be started except under a licence issued by the Central Government. It empowered the Central Government to investigate any scheduled industry in which production or quality declined, prices rose abnormally or other undesirable trend was evident and to issue appropriate directives regulating production, distribution of articles or controlling prices. The act also empowered the Central Government to regulate the supply and distribution of articles related to any scheduled industry in order to ensure equitable distribution of such articles at fair prices.

Thus, the Central Government became directly responsible for the planning and development of all the important medium-sized and large industries in the country. It soon became obvious that industrial planning and development could not be achieved in sectors and that the modernization of small industries constituted an integral part of over-all industrial development. The Government

was convinced that, to build up a sound and stable sector of medium-sized and large industries, an equally sound and stable base of small industries was necessary and that the modernization of small industries was as important for the progress of large industries as for that of the small industries. However, it was equally obvious that, in view of the great number of small industries and their widely dispersed location, the Central Government could not assume full responsibility for their development.

The need for government initiative in providing certain essential technical services and facilities became obvious, and the Government considered the establishment of a central institute for this purpose. However, before taking any step in this direction, the Government decided to obtain the services of international experts to formulate a comprehensive programme for development of small industries. Accordingly, an international team of experts was assembled in 1953 with the help of the Ford Foundation. After a thorough study of the problems of small industries, the team submitted its report in March 1954 recommending a comprehensive development programme. The most important recommendation was the establishment of an industrial extension service to provide technical advice and assistance, common service facilities and training to small industrialists. The team recommended that instead of one central institute for providing technical services to small industries, there should be four regional institutes.

The major recommendations of the team were accepted by the Government, and four regional small industries service institutes were established with headquarters in Delhi, Calcutta, Bombay and Madras. The Government also recognized that an effective assistance programme for small industries must be an integrated one, and it introduced a series of measures designed to meet the requirements of small industrialists for credit facilities, marketing, training etc. In this comprehensive programme of development, the Central Government and the state governments were to assume substantial responsibilities. The Central Small Industries Organisation (CSIO) was established under the Development Commissioner for Small-Scale Industries, and it was charged with the direct responsibility for providing industrial extension service and for co-ordinating the activities of various federal and state agencies engaged in the development programme.

The Second Industrial Policy Resolution, issued in April 1956, reiterated the Government's support for the modernization and technological improvement of small-scale industries. It stated *inter alia*:

> "The State has been following a policy of supporting cottage, village and small-scale industries by restricting the volume of production in the large-scale sector, by different taxation, or by direct subsidies. While such measures will continue to be taken, whenever necessary, the aim of the State policy will be to ensure that the decentralised sector acquires sufficient vitality to be self-supporting and its development is integrated with that of the large-scale industry. The State will, therefore, concentrate on measures designed to improve the competitive strength of the small-scale producer. For this, it is essential that the technique of production should be constantly improved and modernized, the pace of

transformation being regulated so as to avoid, as far as possible, technological unemployment."

PUBLIC AGENCIES PROVIDING TECHNICAL SERVICES AND FACILITIES

The Central Small Industries Organisation

In pursuance of the government policy of improving and modernizing the small-scale sector, a series of measures was taken by the Government during the period of the Second Five-Year Plan (1956–1961). The most important of these measures was the strengthening and expansion of the technical services and facilities of CSIO. In the place of the four regional small industries service institutes, seventeen small industries service institutes were established, one in each of the sixteen states and in the Union Territory of Delhi. Moreover, four branch institutes and about sixty specialized extension centres were also established. The office of the Development Commissioner, which is the headquarters of CSIO, was strengthened by the appointment of several senior directors to provide effective direction to the programmes in the field.[2]

The following are the important services and facilities provided by CSIO to small industrialists:

(a) Advice on improved technical processes and use of modern machinery and equipment;
(b) Preparation of designs and drawings for machinery and machinery parts, equipment, dies, jigs, tools and fixtures;
(c) Technical assistance in the use of raw materials and improved designs;
(d) Demonstration of modern technical processes through model workshops and model production units;
(e) Training of workers, supervisors and managers in technical trades and skills such as heat treatment and foundry practice;
(f) Common service facilities such as electroplating and heat treatment;
(g) Technical assistance in the development of ancillary industries;
(h) Assistance with advice and training in proper methods of business management, including marketing, financial and cost accounting, production management, industrial engineering, factory legislation and personnel relations;
(i) Conduct of economic surveys in particular industries and areas, and advice on the prospects of starting new industries or expansion of existing ones;
(j) Publication of bulletins, pamphlets, model schemes and other promotional literature.

Lack of knowledge of modern tools and methods of production and management has been the main handicap of small industries in India. The functions of CSIO described above have been especially designed to help small industrialists overcome these problems.

2 CSIO has on its staff over 1,300 technical personnel of various grades and an equal number of non-technical and administrative personnel.

The director of each small industries service institute is a senior technical officer who is responsible for supervising the work of other technical staff under his control and who provides direct advisory service to small industries in his line of specialization. The technical staff of the institutes and extension centres not only deal with specific problems brought to their attention by small industrialists, but also visit small factories on their own initiative. The assistance programme covers all aspects of development of small industries. Advice is given on the selection of industries, and this is followed up by guidance in the selection of machinery and raw materials, factory layout, designing of tools, and day-to-day production programmes until the industry is able to stand on its own feet. The institutes and extension centres are located in areas where small industries are concentrated or where there is potential for the growth of small industries.

The institutes have also a number of mobile vans which visit semi-urban and rural areas in order to demonstrate the use of modern machinery and equipment. These vans are fitted with tools and equipment for artisans such as blacksmiths, carpenters, shoemakers, electricians, electroplaters and welders. The artisans are allowed to operate the machines mounted on the vans in order to become familiar with modern equipment. The staff attached to the mobile workshop gives information about sources from which the machines can be purchased and helps in sponsoring applications for supply of machinery under the hire-purchase scheme.

Assistance to small industries in improving the design of their products is another major service rendered by CSIO. This programme aims at improving the design of various industrial products by undertaking studies on consumer tastes, functional values and aesthetic appeal and by producing prototypes of improved design. The prototypes along with drawings are offered to small industrialists for commercial production.

The National Small Industries Corporation

Besides CSIO, which is organized as a department within the Ministry of Industrial Development, another organization, set up within the same ministry as a private limited company, provides certain technical services and facilities to small industries. This is the National Small Industries Corporation (NSIC). The main functions of NSIC are to assist small industrialists to obtain imported and domestic machinery on a hire-purchase basis and to secure orders for small industry products under the store purchase programmes of the Government. NSIC has also been entrusted with the management of the three prototype production and training centres that have been set up with foreign collaboration at Rajkot (Gujerat State), Okhla (near Delhi) and Howrah (near Calcutta). The principal objective of these centres is to design, adapt and develop machine tools and equipment suitable for manufacture by Indian small industries. Under the scheme, proved machines with complete designs and drawings will be made available to small industrialists for production. In the initial stages of transfer, the staff of the small industrial unit will be trained at one of the centres, after which they will be given production responsibilities according to a phased schedule. The centres will supply components and parts that the small industrial

unit may not be able to manufacture initially and will also be given technical guidance at every stage. Ultimately, the small unit will be expected to manufacture the item on commercial lines.

The centres also train apprentices and various categories of technical personnel belonging to small-scale industries. Further, their workshops and laboratories provide common services to small industries. This form of assistance is not limited to those who participate in the prototype programme but is available to all small industrialists who ask for it.

State government agencies

The state governments do not generally attempt to provide technical services and facilities if these are available within the state under CSIO programmes. However, some state governments have set up common service facility centres to supplement those set up by CSIO. Most of these centres are located in industrial estates. State governments have also set up training-cum-production centres, which are intended to provide training in actual production.

Another service provided by state governments is in quality marking and testing. Centres for quality marking and testing have been set up in localities where there is a concentration of a particular trade. Some state governments have also set up extension centres on the model of the CSIO extension centres to cater to the needs of specific trades.

TECHNICAL TRAINING FACILITIES FOR SMALL INDUSTRIES

Technical training for small industries is provided through the following channels:

(a) Vocational training sponsored by the Ministry of Labour and other departments of the Central Government and state governments;

(b) The National Apprenticeship Scheme;

(c) Special training courses organized by CSIO.

The chief institutions providing vocational training in India are the industrial training institutes sponsored by the Ministry of Labour of the Central Government. They provide training of 18 months' duration in 29 engineering trades and a year's training in 22 non-engineering trades. This training is followed by in-plant training in industries.

The National Apprenticeship Scheme was introduced under the Apprenticeship Act of 1961. The Central Government determines the ratio of apprentices to skilled workers for different categories of trade, taking into consideration the facilities available for training, and ensures that the industrial units concerned satisfactorily complete their obligations to train apprentices. At present, training is provided in 23 trades. Over 127 industries have been brought under the purview of this Act.

While the industrial training institutes provide training for new, inexperienced men who, after training, may join industrial establishments, CSIO provides training for those who are already employed in small industries. The following are the important training courses conducted by CSIO:

(a) Shop practice courses - these are full-time courses to prepare senior artisans to assume supervisory responsibilities in shop operations such as machine-shop practice, toolroom practice, foundry practice, blacksmith and forging-room practice.

(b) Trade-oriented courses - these are full-time courses intended primarily to provide semi-skilled and skilled workmen, such as toolmakers, fitters, mechanics or sheet-metal workers, with advanced knowledge in a particular trade.

(c) Process-oriented courses - these are full-time courses for persons who are already familiar with the production process in some form or the other, or are qualified tradesmen. Training is given in subjects such as heat treatment, electric and gas welding, tanning or leather finishing.

(d) Product-oriented courses - these are full-time courses for persons having basic knowledge of the manufacture of the products in some form or the other. Products covered include footwear, paints and varnishes.

(e) Blueprint-reading courses - these consist of evening classes of short duration.

In addition, CSIO also provides training, mostly through evening classes, to managers of small business on various subjects relating to business management and marketing.

Evolution of the Role of Public Agencies

The government programme of providing technical services and facilities to small-scale industry has been part of an integrated programme of assistance to small industries, which includes a wide range of facilities such as factory accommodation through industrial estates, supply of machines on a hire-purchase basis, credit on easy terms, and preference in government store purchase programmes. To judge from the over-all results, it can be said with certainty that the development programme as a whole has been a significant success. It has resulted in the creation of thousands of new, healthy small enterprises and has provided the much needed strength and viability to thousands of existing units facing the prospects of decline and extinction. It has contributed significantly to the development of an integrated industrial structure where large and small industries coexist and complement each other.

While the provision of various services and facilities to small industries by the Government has undoubtedly yielded good results, some important questions remain to be answered. How long should the Government continue in this role? How and to what extent should public agencies withdraw from their current responsibilities?

Recent trends in India indicate that there are reasonable prospects that the Government will reduce its direct responsibilities for providing credit and certain physical facilities, such as factory accommodation through industrial estates. Commercial banks and other institutions are becoming increasingly aware of their responsibilities for providing credit to small industries. The Government's role in due course may be reduced to providing the necessary

guarantees and assurances to these institutions. Because of the technological improvements they have achieved, small industries are increasingly becoming credit-worthy and risk-proof in the eyes of the credit agencies. As regards industrial estates, private associations and co-operatives of small industries are coming forward in large numbers to assume responsibilities that were previously the direct concern of public agencies. Thus, also in this field the Government's role may be limited to supplementing the resources of private agencies. However, no such trend is seen as far as technical services and facilities are concerned. They still remain the direct responsibility of the Government, and there are no indications that any private institutions or associations of small industries will come forward to assume such responsibilities.

This should not be taken to be a tribute to the excellence of the services rendered by government agencies or a recognition of any special merits in the existing arrangement. Although government agencies have been endeavouring to provide technical services and facilities to the best of their abilities, the experience of the last twelve years has brought to light several shortcomings in this arrangement. The most important of them are the following:

(a) Government officials responsible for rendering technical services and facilities are also responsible for a variety of regulatory and control duties, such as recommending applications for import of machinery and raw materials or sponsoring applications for loans. The regulatory and administrative functions often occupy the greater part of the time and attention of the technical staff. This has led to the danger that "service" institutes may become less service-minded and more bureaucratic.

(b) Since CSIO is a regular department of the Government, it has to conform to all the administrative and financial rules and regulations of the Government. Technical officers, who have neither the taste nor training for administrative work, find themselves entangled in administration and complain about the large number of statements and forms they have to fill out and the reports they have to receive and send. The valuable time and talents of technical officers are wasted on routine problems that could well have been avoided in a non-governmental set-up. Senior technical officers who are in administrative charge of institutes or extension centres, finding that they have to spend so much time on administration, may in due course discover that they have become administrators and ceased to be technicians.

(c) Recruitment of all senior staff, whether technical or administrative, for the Central Government or state governments is carried out by the respective Public Service Commissions. Central recruitment results in long delays in filling vacancies and reduces flexibility in selection, which is absolutely necessary in a technical service organization. Problems of small enterprises vary from region to region, and often from state to state. Some places and some industries have problems that require the attention of specialists. There is no scope for recruitment and posting of such specialists under the present system.

(*d*) Promotion from one grade to another is made according to strict government rules, which attach great importance to seniority or the length of service. Further, there are strict rules about the number of vacancies to be filled by promotion in various categories of posts. The operation of these rules makes the promotion system very rigid and leaves little scope for rewarding outstanding work done by technical staff.

(*e*) Since recruitment and appointment of staff in CSIO are made on an all-India basis, technical officers are subject to transfer from place to place. Such transfers become necessary for promotion. These frequent transfers destroy the "personalized" nature of extension service.

(*f*) Absence of regular in-service training for the technical staff prevents them from keeping their knowledge up to date and reduces their usefulness. Opportunities made available to the technical staff, particularly those at senior levels, to keep themselves informed of the latest developments in technology are quite inadequate, and this affects the quality of their consulting service.

(*g*) The equipment and tools in some of the service centres and workshops are no longer the best suited or most economical for small enterprises. CSIO, handicapped by government rules, has not been able to replace these tools quickly or supplement them with new ones. In this respect, they have lost their "model" value.

(*h*) In various regions and towns the occupational patterns have changed rapidly. Towns that used to be centres of the woodworking trade have developed into metalworking complexes, and centres of metal-working trades have developed into centres of electrical and electronic industries. CSIO, however, has not been able to make the corresponding adjustments in the services and facilities it offers or in the staffing pattern. This has resulted in machinery and equipment lying unused in some places.

(*i*) In some areas, mainly as a result of the promotional activities of government agencies, private groups have set up common service facilities. But they have to work in unnecessary competition with government centres, as the latter have not reduced or withdrawn their activities. This defeats the very objective with which these centres were originally set up by the Government.

Some of the shortcomings mentioned above are inescapable when the Government provides these services and facilities directly. However, the Government can take two immediate steps to improve the position. They are:

(*a*) Complete withdrawal from the responsibility for providing those services that can be readily undertaken by other agencies on a commercial basis;

(*b*) Withdrawal from those areas where technical services and facilities are, or can be made, available from other sources, in order to concentrate on areas most needing assistance.

Among the various services and facilities now offered by public agencies, common service facilities can be singled out as a typical "commercial" service that can be readily transferred to private agencies. Government agencies have been operating these services on a payment basis, and there is no reason why individual small industries or associations or co-operatives of small industries cannot provide these services effectively. Some of the government extension centres, even though called extension centres, are now working primarily as common service facility centres, and they, too, should be handed over to private agencies. Similarly, there are some demonstration production units, originally started by state governments to serve as models for small industrialists, that have served their purpose and should therefore be transferred to private agencies. If they have failed to produce any demonstration effect during the last ten years, that by itself would be a justification for closing them. Ten or twelve years should be considered more than an adequate period for the Government to be responsible for such centres.

The second step, namely, withdrawal from areas having alternative sources of technical services and facilities is advisable because it enables the Government to make the most economic use of its limited resources. In a vast country like India, government agencies cannot ever hope to meet the entire requirements of small enterprises. By attempting to provide services everywhere and to everyone, they will reduce the quality and impact of their services. Government agencies, therefore, should try to withdraw from areas where their services have now only marginal usefulness and concentrate on areas where they are in greater demand.

It has frequently been suggested that in order to give operational flexibility to CSIO, it should be converted into an autonomous society or corporation. But so long as all its funds come from the public exchequer, a mere change in the form of organization is not likely to be of much help; for it will remain fully accountable to the Government, and therefore may not be able to acquire the freedom and flexibility of a full-fledged corporation. Further, CSIO is not intended merely to provide certain technical services and facilities to small industries; it has a far more important role, and that is, to function as the national organization for evolving sound policies for the development of small industries and for co-ordination of the programmes of various agencies engaged in this field. To function effectively in this role, it should remain a government organization. However, it can improve its usefulness by divesting itself of some of the responsibilities as indicated in the preceding paragraphs.

CHARGING FEES FOR TECHNICAL SERVICES RENDERED BY PUBLIC AGENCIES

When the Government assumed the responsibilities for providing industrial advisory services to small industries, it took a deliberate decision that the services should be provided free at least in the initial stages. This was an exception to the normal rule that all facilities and services provided at government expense should be paid for by the beneficiaries. The Government was aware that public

funds cannot be used for the benefit of a small class of the population, and that if such services are provided for the small industrialists, other occupational groups will request similar services and facilities. Nevertheless, the Government felt its decision was justified by special circumstances.

Small industries are in a particularly weak position as regards financial resources. They cannot afford to engage the services of consultants or specialists. In fact, many of them need assistance even in identifying their own problems. It was felt that if fees were to be charged for the services given to small industries, the benefits of these services might go to those who could afford the payment and not necessarily to those who deserved the assistance. It was further felt that industrial advisory services should be provided free in the initial stages in order to demonstrate their usefulness. However, what was intended to be an exception in the initial stages has come to stay as a rule even after a decade of industrial extension work. With one or two exceptions, such as distribution and surveys and certain common service facilities, all services and facilities are still provided free. The Government even pays stipends to the trainees who are sent by the small industries for some of the technical training courses conducted by CSIO.

Responsible bodies like the Estimates Committee of the Parliament and the International Perspective Planning Team organized in 1963 with assistance from the Ford Foundation have suggested that CSIO charge for the services and facilities it provides. It has been pointed out that in the absence of fees, small industries may exercise no restraint in asking for advice and may ask for assistance even on non-essential matters. This would be a heavy burden on the limited resources of the organization. Advice or assistance may not always be taken seriously when it is rendered free. The absence of fees also may reduce the sense of responsibility of those who provide the services. It was further pointed out that small industries in India today are far stronger than they were ten years ago. The vast majority of them could well afford to make a contribution to the cost of the services they receive. The true value of services rendered could only be assessed under a payment system. However, the Government did not accept these views, and extension services are still provided free. It may be considered that the availability of free services and facilities from government sources is one of the main reasons why private agencies have refrained from assuming such responsibilities.

Even the weakest small industries pay for certain services and facilities. A compromise solution might be for the Government to charge fees for technical services at a concessional rate in the initial stages and at full rate after a few years.

Even in a system of services on a payment basis, exceptions can be made for some categories of small industries, if necessary. For example, payment may be waived for small industries in industrially backward areas. Industrial development of backward areas and planned dispersal of industries are important objectives of the Government's economic development plans. In several countries, including industrially advanced countries, special incentives and concessions are offered to attract industries to depressed or backward areas. They include accommodation in industrial estates at concessional rates, rebates in duties and

taxes, special transport facilities etc. These concessions are generally offered to industries of all sizes. In India, there is no special scheme for the industrial development of backward areas; but if extension services are provided free of charge to small industries in backward areas, a good beginning step will have been taken to attract industries to these areas.

It has been suggested that if small industries are charged fees, the fees should be based on the size of the small units, size being determined by capital investment. For example, for the same service rendered in the same locality, a small industry with a capital investment of Rs.100,000 would be charged less than another with a capital investment of Rs.200,000. The smallest of the small industries, i.e. those with a capital investment of less than Rs.50,000, would be exempt from payment altogether.

This suggestion of differentiating between small-scale industries on the basis of capital investment for purposes of levying fees has several drawbacks. Small industries are broadly distinguished from large industries on the basis of capital investment for administrative convenience, but it would be impracticable to reorganize further subdivisions among them for determining their eligibility for different services and facilities. Because their capital structure changes rapidly, small units would frequently have to be reclassified, and this would create administrative difficulties. A system of graduated fees might even prove to be a disincentive to modernization. For example, a small unit entitled to free services might be discouraged from acquiring new machinery or equipment if the cost of the additional machinery increased its capital investment to the extent of making him liable for payment for the services. It could also lead to abuses that might be difficult to check.

Apart from practical considerations, a system of different scales of payment based on different scales of capital investment does not appear to be basically sound. This suggestion is based on the presumption that the smaller a unit the weaker it is. But this is not necessarily correct. The size of a unit may be determined by economic and technological factors and not necessarily by the financial resources of the entrepreneur. Different products and different manufacturing processes require different levels of capital investment, and the size of investment is no indicator of weakness or strength. An industrialist with adequate financial resources may start an industry with a small capital investment for the simple reason that the small investment is sufficient for efficient operation. This should not give him the advantage of free services. Since size of investment is not a safe indicator of the weakness or strength of a unit, it should not become the basis for determining the scales of payment for services received.

Once the principle is accepted that technical facilities and services should be provided on a payment basis, the question will arise as to how and when this system is to be introduced. Since small industries have been receiving these services without charge for a long time, they will naturally be reluctant to avail themselves of these services on a payment basis. To overcome this difficulty, it may be desirable to start with low fees in the first few years. In due course, small industrialists will get used to paying for the services they receive, and fees can be gradually raised.

It may also be desirable to introduce the payment system in different stages for different categories of services. Certain services and facilities can be conveniently grouped as "commercial" as distinguished from "promotional", and a beginning could be made with the former. Similarly, certain services may be required exclusively by some units, and here payment for service should be the rule.[3]

Improving the Quality of Technical Services and Facilities Provided by Public Agencies

The basic presumption in introducing fees for technical services is that the customer will get full satisfaction for the payments made. This will call for considerable rethinking and qualitative strengthening as far as the staff of the public agencies is concerned. Staff for CSIO was initially recruited at a time when small industry development was mainly in fields such as woodworking, simple hand tools and machine tools, parts and components of cycles, and sewing machines and domestic electrical appliances. The small industry sector has become considerably more sophisticated and diversified during the last few years, and as a result a demand for a variety of new services and facilities has arisen. New raw materials and new products are now in use, and small industries are no longer satisfied with the services and facilities that CSIO provided earlier. New items produced by small industries in recent years include electronic instruments, electrical measuring instruments, diagnostic apparatus, precision-type machine tools, carbide tools and dies, film projectors, water meters, hearing aids and cameras. Plastics have opened up an altogether new field for small industries. CSIO will have to acquire a highly competitive team of technicians with sound, practical experience and up-to-date knowledge in these new fields if it is to render useful service to small industries. Similarly, its workshops and laboratories will need considerable strengthening in order to enable it to cope with the new demands from small industries.

To improve the quality of their services, public agencies should draw upon the services of private consultants and experts. Even though CSIO may

[3] Fees for the following services and facilities might be appropriately charged in the first stage:

(a) Preparation of model schemes at the request of parties;
(b) Preparation of detailed working schemes with sketches, drawings, sequences of operations, specifications of machinery and other working details;
(c) Preparation of specific manufacturing projects and rendering technical services in implementation of the project;
(d) Designing of jigs, fixtures, tools etc.;
(e) Machinery layout of factories and consultation on the setting up of workshops from time to time;
(f) Exclusive use of designs prepared by the industrial design cell;
(g) Integrated plant study of the unit (management consultancy service);
(h) Specialized economic information requiring regional or all-India inquiry;
(i) Distribution aid surveys carried out for a particular manufacturer.

function as a government department, it should have the freedom to utilize the services of experts from private industry, research organizations, universities etc. on a part-time consultation basis whenever necessary. CSIO will not always be able to obtain the best experts on a full-time basis because government salaries are comparatively low, but some experts may be willing to serve as part-time consultants. Again, some technical experts may not wish to leave the professions of their first choice, which may be private industry or research or teaching, but may be willing to make their services available to the Government for specific, short-term assignments. In some trades the demand for technical services may not justify a full-time staff, and it will be more economical to engage the services of private consultants on a part-time basis. In fact, the responsibility of CSIO should be to arrange for the best technical service to the industry in question. It should try to provide the service through its own staff if possible, but, when necessary, should not hesitate to arrange for such services from outside the organization.

CSIO should maintain panels of consultants for different trades, whose services can be drawn upon at short notice. Apart from facilitating prompt, efficient service to the industry, this system would also help in providing training to the regular staff of CSIO.

Another measure for improving the quality of service is to associate representatives of the industry with the planning and implementation of different programmes of the public agencies. Forming advisory committees for the various small industries service institutes consisting of one or two representatives of the industry has not proved to be very successful; much more intimate participation by private industries in the programmes of the institutes is needed, for only through such close association with the industry can the staff of the institutes plan their work realistically.

It has sometimes been argued that such close association of private parties in the planning and execution of work is not possible in a government organization. The important point to be stressed is that CSIO, although organized as a government department, is not like any other department; it is essentially a service organization, which has to formulate its programmes to suit the actual requirements of its clients, and therefore its procedures of work differ from those of other government departments. There is nothing basically wrong in providing industrial services through government agencies, as is in fact done even in some industrially advanced countries. The Netherlands Consulting Services is a government department within the Ministry of Economic Affairs. The Institute of Technology, Oslo, Norway, is a government institution, though partly financed by the municipality. In Sweden, the Handicrafts Institute is a government department, and its directors and heads of departments are government employees, although a large percentage of the staff are paid from contingencies and other income of the institute and not covered by government service rules. Even though a government department, it is governed by a board of directors consisting of representatives of Government, labour, industry and the local municipality. The adoption of some of these procedures might well be considered by CSIO.

Role of Semi-Public Agencies in Providing Technical Services and Facilities

There are a few semi-public agencies which, along with their other activities, also provide technical services and facilities to small industries. The most important of these are the industrial research institutes and laboratories controlled by the Council of Scientific and Industrial Research (CSIR), the Indian Standards Institution (ISI) and the National Productivity Council (NPC).

The Council of Scientific and Industrial Research

CSIR is primarily an organization for industrial research. Its main functions are the following:

(a) To promote, guide and co-ordinate scientific and industrial research, including the financing of specific research;

(b) To establish or provide assistance to special institutions or departments of existing institutions for specific study of problems affecting particular industries and trade;

(c) To utilize the results of the research conducted under the council's auspices for the development of industries in the country;

(d) To establish, maintain and manage laboratories, workshops, institutes and organizations to further scientific and industrial research and to utilize and exploit for purposes of experiment or otherwise any discovery or invention likely to be of use to industry;

(e) To collect and disseminate general information on industrial questions;

(f) To publish scientific papers and a journal of industrial research and development.

The council, though entirely dependent on government funds, functions as an autonomous organization under its director general. It is responsible for 37 research laboratories and institutes. The institutes are designed to serve important industrial groups such as fuels, metallurgy, glass and ceramics, food and leather.

Even though the main function of the laboratories and institutes is industrial research, they also provide industry with certain direct technical services and facilities, such as training, testing and certification and analytical work, on a payment basis. Each laboratory or institute has a liaison division or unit to maintain contact with industry and to assist in the practical application of the results of research. Most of the laboratories and institutes publish technical bulletins and digests. At CSIR headquarters there is a central liaison and co-ordinating unit, which co-ordinates the work of the liaison units of the laboratories and institutes and supplements their efforts to maintain contacts with the public and the agencies engaged in industrial development.

The laboratories and institutes act as consultants to industries having specific requests. Field officers of the laboratories and institutes are located in or near industrial centres. They assist the industries with their day-to-day technical problems and also carry out special services such as testing of raw materials and finished products and quality control. Some field centres also conduct

periodic demonstrations for the industrial units through special teams of experts. Such demonstrations are usually held in the premises of selected industries.

CSIR has a special programme of assistance to small-scale industries. It has established an information and liaison cell to provide guidance to small industries on their technical problems. This cell disseminates information regarding research projects worked out by the CSIR laboratories and institutes and maintains liaison with, and provides technical support to, the extension agencies working with small-scale industries.

The CSIR laboratories and institutes are among the best equipped in the country. They are staffed by highly qualified scientists and technicians. However, it is doubtful whether small industries are making adequate use of their services. In many developing countries, industrial research and industrial consulting services are undertaken by the same institution. In a vast country like India, there is no doubt need and scope for separate organizations, but they should function in close co-operation and complement each other, in order to maximize their usefulness to industry. The best arrangement would be for the small industries service institutes, branches and extension centres to function also as the field centres for the CSIR institutes and laboratories as far as technical services to small industries are concerned. The CSIO field staff should maintain close liaison with the CSIR staff and refer to them problems in the field that need deeper attention. They should particularly refer to the CSIR laboratories and institutes problems calling for research and experimentation. CSIR in turn should utilize the services of CSIO's extensive field centres for carrying to industry the fruits of their research. This two-way traffic between CSIR and CSIO should be increased considerably from its present level, if small industries are to get the full benefits of the services of these organizations.

The Indian Standards Institution

The Indian Standards Institution (ISI) is the national organization responsible for standardization in the country. It is an autonomous society functioning under the control of a director appointed by the Government. Its main functions are the following:

(a) To prepare and promote the general adoption of standards on a national and international basis;

(b) To promote standardization and quality control in industry and commerce;

(c) To co-ordinate the efforts of producers and users for the improvement of materials, products, appliances, processes and methods;

(d) To provide for the registration of standardization marks applicable to products, commodities etc.;

(e) To provide or arrange facilities for the examination and testing of commodities, processes and practices and for any investigation or research that may be necessary;

(f) To communicate information to members on all matters connected with standardization through periodicals, books, leaflets etc.

ISI has accorded very high priority in its programme to the development of standards for industrial raw materials and products. The implementation of standards is voluntary, except in a few vital sectors.

An effective means of implementing standards is the certification marking system. A certification mark is a third party assurance to the purchaser that the goods have been inspected, tested and certified by or under the supervision of a competent authority. ISI is the national agency for providing the certification mark.

The over-all control of ISI rests with its general council, which consists of representatives of industry, the Central Government and the state governments, scientific organizations and subscribing members. The administration of ISI is carried out by an executive committee through its director. Its main sources of income are grants-in-aid from the Government, subscriptions from the members, sale of standards and fees for certification marking.

ISI's facilities are available to all groups of industry and trade; its main contribution to small industry has been to educate industrialists to be standard-conscious. It is very encouraging to note that more and more small industries are taking advantage of the services of ISI and using its standards.

The National Productivity Council

The National Productivity Council (NPC) is an autonomous organization under the Ministry of Industrial Development. Its main objective is to promote efficiency and productivity in industry as well as in business and trade. It has established six regional branches and sponsored over fifty local productivity councils. The local councils are fully representative of industrial enterprises, trade unions, government agencies, and technical and professional institutions.

The following are the main functions of NPC:

(a) To stimulate and sustain productivity movement at local levels by guiding and assisting local productivity councils in their programme;

(b) To plan and organize seminars in productivity subjects;

(c) To sponsor industrial executives and labour representatives for training abroad;

(d) To sponsor study teams composed of representatives of management and labour that will study specific industries or application of productivity techniques abroad, to record their findings and to recommend adoption of improved methods;

(e) To sponsor study teams within the country;

(f) To provide a full efficiency service to industry, including surveys of fuel utilization in industrial establishments, to recommend ways and means of increasing fuel and heat utilization and to train appropriate personnel;

(g) To conduct productivity surveys in order to locate problems and to improve operational efficiency;

(h) To provide a technical inquiry service;

(i) To produce and present films, film strips, slides and other audio-visual media that aid and supplement training activities.

Thus, it is clear that the activities of NPC are directed towards the organization and technological improvement of industries. NPC undertakes studies on the operation of individual industrial enterprises, in particular their organization, management, production and technical procedures. It assists enterprises to locate and overcome their difficulties by introducing methods of work-study, quality control, production planning etc.

There is no doubt some overlapping of functions between NPC and the extension agencies, particularly the extension agencies of CSIO. However, NPC and CSIO make special efforts to co-ordinate their programmes. NPC assists in the training courses conducted by CSIO by lending the services of its senior staff. CSIO similarly helps NPC in sponsoring suitable small industry units for NPC's training programmes. On the whole, the two organizations try to co-operate closely as far as extension work to small industry is concerned.

Role of private agencies in providing technical services and facilities

As already explained, public or semi-public agencies in India are almost the only agencies providing technical services and facilities for small industries. When the Government assumed the responsibility for providing direct technical services to small enterprises, it was mainly intended to be a "pump-priming" operation, and it was expected that private agencies would eventually provide many of these services. But, as stated earlier, progress in this direction has been remarkably slow. A few private individuals have set up industrial consulting bureaux in some of the big cities, but their activities have been mainly confined to preparation of feasibility studies, project reports etc. In some big cities private consultants have been offering their services for selection and installation of machinery. They have also undertaken trouble-shooting assignments. However, such services are still offered on a personal rather than institutional basis.

Role of trade associations

In spite of the phenomenal growth of small industries in India during the last decade, it is surprising to note that trade associations have not yet produced any worth-while programme of self-help or service. The need for such voluntary efforts by trade associations was stressed from the moment the development programme for small industries in India began to be implemented. The international planning team sponsored by the Ford Foundation had strongly recommended in its Report (1954) that small industries organize themselves into associations and undertake programmes of self-help. The report stated:

> "The general function of trade associations should be to perform and execute things of mutual interest to the members; things which each of them would not be able to do by himself. This activity should touch a large number of aspects, e.g. promotion of vocational training, demands for better credit and finance, purchasing of raw materials, market investigations, collective publicity and information, contribution to experiment and research for the benefit of the members, etc."

> "The association should act on behalf of all members, when negotiating with Government and municipal authorities or in relation to other sectors of business and social life. The associations can also perform internal service of different kinds for the benefit of their members, e.g. consultation in the technical field, business management, finance calculations, book-keeping, etc. They can arrange conferences for discussions of, and information on, business or trade problems. They can organize study and training activity, supply regular information for members and so on."

The expectations regarding voluntary efforts by the industry have so far not been fulfilled. Associations of small industries have been formed in almost all states of India, and a Federation of Associations of Small Industries has also been set up with headquarters in Delhi. The federation has been providing enlightened leadership to the state associations and vigorously promoting the cause of small industry with various government agencies responsible for assisting this sector. The federation has developed into an influential forum to voice the grievances and demands of small industries and has been fairly successful in influencing the formulation of policy at government levels. But it has not seriously attempted to provide some of the essential services needed by small industries, such as technical facilities, training or information services. In this field also the trade associations in the Scandinavian countries should serve as a good model for India.

The Federation of Crafts and Small and Medium Industries (SHIO) of Sweden provides an excellent example of non-official leadership and initiative in arranging services and facilities needed by small enterprises. Over 45,000 small units are members of constituent trade or regional associations, and about a third of these have membership in both functional and area organizations. Forty-six trade associations, each comprising a particular industry or trade group, are affiliated with the federation. One of the important services rendered by SHIO is its "economy service". It provides monthly book-keeping for a large number of its members and also offers tax counselling, profitability analyses and special economic investigations. A Ford Foundation consultant who made a study of SHIO has confirmed the increasing vitality of the federation:

> "The well-qualified professional accountants and related specialists who man SHIO's economy service undergird its internal research competence on small business problems, and thereby give realism to the Federation's policy formations. Maintenance of a direct clientele among thousands of many firms, at a high standard of service keeps the Federation in first-hand, daily touch with its industrial constituents. This establishes a communication network, on a professional level, which undergirds, supplements, and strengthens the Federation's formal ties to member associations."[4]

In Denmark, consulting services to small firms are efficiently organized by industrial trade associations. Each association appoints its own consultants for which it receives subsidies from the Government. Subsidies are given on a graduated scale, averaging about 50 per cent of salaries and direct expenses.

[4] "Sponsorship and Management of Industrial Advisory Services"—Note by Mr. Richard Morse, November 1965.

The association meets the remaining 50 per cent from fees charged to individual client firms. The qualifications of the consultants appointed by the associations are reviewed by the Government to ensure that they are of the requisite standard. New consultants undergo a two-months' course in the principles of management consultancy.

Consultants serving a region are approved by the Council for Handicrafts, which is the representative federation of artisans and small enterprises in Denmark. They are responsible for organizing management and trade courses and for providing general information services to member firms.

The Indian small industry associations are organized mostly at the state level. In some places, there are separate associations for the tenants of industrial estates. However, little progress has been made in organizing associations for specific industries other than the traditional industries. Regional associations of specific trades and crafts and even an all-India association should be formed. These associations should engage the services of specialists and experts to render technical services to the member units, following the Scandinavian pattern. Periodic seminars and meetings of the technical personnel in particular industries should be arranged to review technical problems and share experience in dealing with them. The associations should also arrange for the exchange of workers and supervisors for training in the factories of the member units.

The workshops of some of the better-equipped and better-staffed units should also undertake specific services and facilities needed by the others. The associations should function as the clearing-houses for requests for such services and facilities. They should advertise space available among member units and arrange for utilization of such services and facilities by those who need them.

If the associations of small industries are to provide, in addition to their representational activities, direct services to their members, the provision of grants and subsidies by the Government may be necessary.

Role of large industries

Promotion of subcontracting, or ancillary, relationships between small and large industries is one of the major programmes undertaken by the Government of India. An essential feature of this programme is that a large industry provides certain technical services and facilities to the small industry that is to supply the components and parts needed by the former. Large industries, both in the public and private sectors, have been encouraged to establish industrial estates for ancillary units in close proximity to their own premises in order to facilitate effective technical assistance. Such assistance includes selection of plant and machinery required by the small industries; installation and maintenance of machinery; technical guidance in production planning and delivery schedules; supply of processed sheets, drawings, specifications etc.; training of workers; and supply of raw materials of the right quality and specifications.

The extent of technical assistance provided by the large firms to the small firms depends on the contractual relations in each case. Large industries, however, do not generally provide technical assistance to small industries that have no ancillary relationship with them.

Role of universities

The universities in India have so far remained almost completely out of the field of extension service to small industries. A few years ago an attempt was made to interest the universities in the industrial estate programme. The universities were encouraged to set up within their own premises workshops and production units under the supervision of their technical staff. However, the scheme did not make any appreciable progress.

The role that universities in the Western countries, particularly in the United States, play in providing advisory services to industry could be profitably studied by Indian universities. In the United States, most state universities have some programme of liaison with industry. Small enterprises, in particular, have found the services of universities helpful in solving problems in production, marketing etc. Since qualified technical personnel in India is scarce, there is special justification for mobilizing the resources of the universities to provide technical services and facilities to the small industries. Engineering colleges and institutes of technology, in particular, can play a very useful role in this field. Here again, the Government should assist the universities with suitable grants and subsidies to undertake such programmes. Government support will be particularly needed for equipping the university workshops and laboratories adequately.

On the whole, small industries in India have tended to look to the Government for all types of assistance. The Government has to some extent unconsciously encouraged this tendency by trying to provide every type of service. Although this may have been justified in the past, it is now time for the Government to withdraw from some of these activities and to assume a new role of stimulating the interests of others and providing leadership and support. This will not only result in tapping new resources and talents for the benefit of small industries, but also conserve government resources for more important tasks in this field.

OPERATIONAL PROBLEMS OF SMALL INDUSTRY SERVICE INSTITUTES IN THE LIGHT OF INDIAN EXPERIENCE*

Introduction

The problems with which industrial extension agencies have to deal vary from one country to another. As a rule, the experience gained by such agencies in the industrial countries cannot be transposed to similar agencies in the developing countries without considerable adaptation. For example, in West Berlin, an institute to provide extension services to artisan and handicraft undertakings has a staff of three — two management consultants and one industrial engineer — as against twenty technical advisers exclusive of an industrial economist and of management consultants in a similar centre in India. In the Berlin institute, engineers in mechanical, electrical, metallurgical, chemical, ceramics, glass, leather and other technologies are not provided because, under existing law, no one can ordinarily start an artisan workshop or a small industry unless he is a qualified master craftsman, and no one can be engaged as a skilled worker unless he has gone through a strenuous course of apprenticeship training after his schooling. In these enterprises, day-to-day technological problems can be solved by the entrepreneur, his foremen and workers; recourse to counselling agencies or research institutes is necessary only for the solution of complex problems. The single industrial engineer attached to the institute is therefore able to handle most of the work on the production side. However, the entrepreneurs are weak in management techniques, and the institute provides considerable assistance in this area. Even book-keeping for small units for taxation and other purposes is often done by the institute on payment.

The largest extension agency in the world concerned with small industry is the Central Small Industries Organisation (CSIO) of the Government of India. Attached to the Ministry of Industry, CSIO administers 17 small industries service institutes (SISI), one in each state of the country and in the Union Territory of Delhi; 4 branch institutes; and 57 extension centres. The experience it has gained during its eleven years of existence may be of particular value to other developing countries. This paper considers some of the problems with

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which the author was confronted in his work for CSIO and some of the small industries service institutes. In India, several additional agencies directly or indirectly extend assistance to small-scale industry: directorates of industries in the states, state finance corporations, state small industry corporations, the National Small Industries Corporation (NSIC), State Bank of India, national research laboratories, national and state productivity councils, the Small Industries Extension Training Institute etc., but this paper deals mainly with the operational problems of the small industries service institutes.[1]

For administrative purposes and for eligibility for certain incentives and facilities such as factory accommodation in industrial estates, hire purchase of machinery, free extension services from SISIs, common facility services at concessional rates, preference in purchases by government departments, credit facilities etc., small industry is defined in India as follows: "Small-scale industries include all industry units with a capital investment of not more than Rs.750,000 ($100,000) irrespective of the number of persons employed; capital investment for this purpose means investment in plant and machinery only". For ancillary industrial units in sixteen specified industries, the capital ceiling is Rs.1,000,000 ($133,333), the value of land and building being excluded.

Organization of small industry service institutes and industrial extension centres in India

In India, CSIO and the small industry service institutes are all central government departments. NSIC, a government corporation, is responsible for such programmes as hire purchase of machinery, government purchase, development of prototypes, training, operation of raw material depots, and supply of imported components.

A small industry service institute is a multi-purpose institution. It is by and large an advisory agency rendering services to small-scale industry and to government departments, semi-public institutions and other agencies directly or indirectly responsible for the development of the small-scale sector, but it has no authority to enforce its proposals or advice.

Under the Indian Constitution, the state governments are responsible for the development of the small-scale sector under the over-all guidance and assistance of the Central Government. The state governments are responsible for setting up industrial estates, distributing loans under the State Aid to Industries Acts and Rules, setting up state finance corporations, providing extension services, distributing scarce raw materials and providing other measures of assistance.

The co-operation and co-ordination of SISIs with their state counterparts is essential for their successful operation. An SISI director is normally a member of all advisory committees, councils, set up by the state for the development of small-scale industries. In fact, if the director of an institute is influential enough,

[1] The organizational and staffing pattern of a small industry service institute is presented in appendix 1.

he is consulted by the state government on all matters concerning the small-scale sector.

The SISIs were set up as government departments because of their developmental role. However, there has been some thought of giving them an autonomous status. For the present, there has been no change except that an advisory committee was recently established to advise the directors of the institutes in programming and operation. The advisory committee consists of the state director of industries, as chairman; one representative each of the federation of associations of small industries, the associations of small industries in industrial estates, the advisory council of the state government, NSIC, the chairman of the regional ancillary committee (wherever constituted), as members. The director of the institute is member secretary and is helped in this committee by his senior staff. Meetings are held every month, and the decisions are acted upon not only by the director, but also, when necessary, by CSIO and the ministry concerned. This step is a compromise between operation as a governmental or as an autonomous body.

The operation of a SISI as a government department has certain drawbacks. Since the employees are public servants paid on fixed scales, the good workers can hardly be rewarded and the sluggish ones cannot be dismissed easily; furthermore, salaries are modest. Extension work requires initiative, drive and devotion but cannot be readily measured by any yardstick; and supervision is difficult, so that some officers may get by without doing much work. The efficient staff members find better opportunities in private industries with which they are constantly in touch; this happens at almost all hierarchical levels. Institutes are thus depleted of experienced personnel. The gain by private industry does not offset the loss by the institutes, since the work of the latter is expected to have a multiplier effect on the national economy. This is clearly lost when an extension officer joins a private enterprise.

An autonomous body may offer more flexibility in work and better incentives for good workers. This, however, requires very competent and reliable managers, and these are scare in most of the developing countries.

The Indian industrial extension centres are affiliated to the SISIs, and are supervised by the directors of the SISIs. The difference between an extension centre and a SISI is one of scope rather than function. While the SISI caters for all types of small industries, the centre serves only one or two industries. The trade specialization of the extension centre is determined on the basis of the concentration of existing enterprises or the development potential of certain industries. The choice of location and of staff of an extension centre should be thoughtfully decided, since the centre must work within a limited area and with limited means. The staff should take a good deal of initiative. In the area covered by the extension centre, industries generally require much managerial and technical help, and the small staff of the centre is expected to deal with all subjects and problems. The SISI experts should, therefore, visit each extension centre frequently and provide it with the necessary guidance and follow-up action. The officer in charge of the centre, who is normally an assistant director, should be capable of identifying the problems and report for guidance to the

institute. Besides, he should be acquainted with administrative work. Technical officers put in charge of extension centres have often not been able to work properly as administrators. The SISI director should supervise the operation of the extension centre closely. In states where there are a number of centres attached to an institute, a senior SISI officer with expert knowledge of the trade is charged with liaison with the centres.

Each extension centre provides training to workers in small-scale industries in its field of specialization. It is frequently difficult to get trainees, either because the number of industries is limited, because the entrepreneurs are unable to spare them or to find replacements, or because the industrialists are not sure that the workers would return to them on the terms they had before training.

SISIs and extension centres conduct demonstrations on improved processes and techniques. Because of the limited number of industries in the area, centres having common facilities for such trades as mechanized carpentry, foundry, and sheet metal have an inadequate work load, even after a period of three to four years. When an extension centre is being planned, very great care should be exercised in the selection of machines and equipment on a long-term basis. Where the equipment is not adequately utilized, it may be necessary, after some time, to shift it to some other developing area and to substitute more useful equipment.

Thus, the main problems of the extension centres are to find suitable officers willing to go to small towns in preference to the state capitals where most of the SISIs are situated; to utilize adequately the facilities for training; to select equipment for common service facilities; and to obtain expert counselling and administrative supervision from the institutes.

RECRUITMENT, TRAINING, DEPLOYMENT AND REQUIREMENTS OF EXTENSION OFFICERS

Qualifications

An extension officer should have considerable practical experience in his profession and be able to identify operational problems in an industry, determine their solutions and convincingly demonstrate, at all levels, the need for adopting these solutions. He should have an almost missionary zeal and be keen to serve under unusual situations with humility and diligence.

In the developing countries, it is hard to find technical personnel with experience, and it is even harder to find extension officers with the above qualifications. This problem was faced in India in an acute form for a long time, and many posts remained vacant for want of suitable personnel. With the introduction of various training programmes, the situation has improved somewhat, but is still not absolutely satisfactory. There is still, in particular, a large turnover of technical personnel. The possible remedies are discussed elsewhere in this paper.

Level of extension officers

The levels of extension officers in the small industry service institutes in India are as follows, from the top to the lower level: Director, Grade I; Director, Grade II; Deputy Director; Assistant Director, Grade I; Assistant Director, Grade II; Junior Field Officer (JFO); Investigator.

Procedure of recruitment

A selection board set up from time to time in the Office of the Development Commissioner (Small-Scale Industries) initially interviews prospective investigators. The investigators for technical posts are expected to hold diplomas in the subjects concerned, but in certain cases lower qualifications are accepted if the candidates have sufficient practical experience. Skilled workers, draftsmen with suitable qualifications from CSIO, are also eligible for these posts. Some posts at the JFO level are filled by promotion (about 50 per cent) on a seniority-cum-merit basis from among the investigators, and others are recruited on the same basis as investigators. The basic minimum qualification required is a diploma in the subject concerned, with about three years of practical experience. The post of Assistant Director, Grade II, is filled by promotion from the JFO level on the basis of seniority and merit. The post of Assistant Director, Grade I, is sometimes filled on this basis from among the Assistant Directors, Grade II and I, recruitment is done on the same basis as for Assistant Directors, Grade I, the minimum qualification being a degree in the subject.

Training

At present, on initial entry in service there is no regular on-the-job training for extension officers at any level, except that the director of the institute may attach junior officers to a senior officer for some time to learn the job; this, however, is not always possible because of shortage of staff. This is a greatly felt lacuna in the system, as new recruits are usually not sufficiently proficient in their jobs.

Training is provided to all extension officers by sending them for a certain period to specially selected plants either in the country or abroad and placing them in the Small Industry Extension Training Institute of Hyderabad and other national and foreign institutes.

Organization

A small industry service institute has normally the following divisions, each headed by a deputy director or assistant director as the case may be:

(a) Administration, including accounts;
(b) Economic investigation;
(c) Industrial management and training;
(d) Mechanical;
(e) Electrical, including electronics;
(f) Metallurgy;
(g) Chemicals;

(h) Leather;
(i) Ceramics and glass;
(j) Industrial design.

The common facility workshops and laboratories are the responsibility of the divisional heads of the concerned division. The strength of officers in a division depends upon the concentration of industry in the state; it varies from ten to one as the circumstances may warrant. The deputy director for economic investigation is responsible for an information and documentation centre and a library, and the mechanical division is responsible for a showroom.

Staff functions

The main duties of technical officers are:

(a) Advising small entrepreneurs on the type of equipment, machinery and tools, plant layout, preparation of designs and drawings for dies, jigs, tools and fixtures and certain special equipment required in a factory;
(b) Preparing model schemes or industry fact sheets for certain industries, which describe requisites, such as land, machinery, raw materials, skilled workers, cost of the product and anticipated profits on sales, for establishing these industries;
(c) Preparing technical bulletins on how to overcome common difficulties in the day-to-day operation of certain processes, e.g. blow holes in castings;
(d) Operating workshops and carrying out development and testing in the laboratories;
(e) Advising visitors on their technical and other problems and providing guidance for setting up new industries;
(f) Helping to increase productivity in the small units;
(g) Enlisting small units for purchase programmes of government departments, railways and defence and issuing competency certificates, visiting factories and providing guidance for the execution of orders from government departments;
(h) Advising the state bank and other banking institutions and the state government on programmes of financial assistance to small units;
(i) Helping units in their export-promotion programme, especially in connexion with the export-promotion schemes of the State Trading Corporation;
(j) Extending guidance and assistance to the state governments in the development and processing of their various schemes for the growth of small units;
(k) Serving as members on the expert committees of various organizations—Indian Standards Institution, Council of Scientific and Industrial Research and various state and central government bodies;
(l) Training workers and foremen from the small-scale sector to use improved equipment and machinery;

(iii) Formulating and carrying out special intensive development programmes for the growth of small industries in small towns and in rural areas;

(iv) Operating mobile workshops for demonstration and training purposes in rural and other areas.

Extension officers may have to be seconded within and outside the country to receive specialized training.

Staff requirements

It has been estimated that technical officers spend at least 30 per cent of their time in work other than direct technical help to small industrial units. On the basis of this estimate, one technical officer may be able, at the most, to take care of about 50 units if they are situated in one locality. In certain states there may be concentrations of small industrial units, but not in others. Even in the latter case, a certain minimum strength of technical officers should be maintained. Otherwise, whatever units are located in these under-developed states will not get the necessary assistance; in fact, it is these units that require the maximum support. Thus, considering all these factors, the author assessed the total number of technical officers required by CSIO as 3,300 for 100,000 units. This is arrived at as follows:

(a) One technical officer for 50 units and so for 100,000 units the requirement will be 2,000;

(b) Add 30 per cent for additional essential non-technical work as work in office for visitors and others = 600;

(c) Add 25 per cent of 2,000 for additional requirements in less developed areas = 500;

(d) Plus 10 per cent for extension centres and common facility workshops = 200;

(e) Total = 3,300.

Assuming a 10 per cent increase in the number of small units every year, the requirements in 5 years will be 4,950.

The number of officers required for economic investigation and industrial management and training has been roughly estimated at 7/5 for 100,000 units. The total number of CSIO officers required for providing extension services to 100,000 industries has been estimated as 5,725. Even this number is inadequate, since officers are specialized; and no specialist may have sufficient experience to advise small industrial units in all processes—foundry, machine shop, heat treatment, electroplating etc. Thus, the problem is immense. The actual strength of the extension officers in the entire small industries organization in 1963 was about 1,000, or only about one sixth of the real need.

Staff training

As already mentioned, it is not easy to find suitable technical officers for extension services. The Government of India stated in the mid-term appraisal

of the Third Five-Year Plan that the shortfalls that had occurred were to a great extent attributable to the inadequate number of technicians.

In the author's view, the extension service should evolve its own scheme of recruiting and training apprentices to meet its requirements for extension officers, as the Indian Railways do for their cadres and technical services. Bright young men between the ages of 18 to 22, with educational qualifications at a certain level in mathematics, physics and chemistry as compulsory subjects and drawing as a desirable subject, should be recruited through competitive written and oral examinations. They might be called apprentice officers. These officers would be trained for a period of three years in specialized subjects, according to the need, initially through prototype production and training centres, the Small Industry Extension Training Institute, Hyderabad, SISIs and then through attachment to large-scale industries. Necessary examinations and tests would be conducted at intervals of about six months, those unsuitable being removed and those who successfully complete the course being appointed as Assistant Directors, Grade II. There might be two groups in such training courses – junior and senior. This type of course would preferably be arranged at the SISIs in regional centres, such as Bombay, Calcutta, New Delhi and Madras.

The course would provide basic and specialized knowledge and both theoretical and practical aspects of the technical subject concerned, besides training in extension service techniques, administration, account-keeping in a SISI and an extension centre and field work. Almost all categories of officers need training in extension services, and the proposed scheme would have the necessary broad coverage. A few specialists for senior posts might be recruited from the open market. Special incentives should be given to officers posted in rural and other difficult areas.

Extension officers require training abroad as well as within the country in modern technological and management techniques if they are to keep abreast of recent developments. This is especially important, since small industrialists should be encouraged to adopt modern techniques.

After the Government of India had organized the small industry development programme through SISIs and other institutions, the state governments also organized their own programmes, in some cases on lines identical to those of the SISIs. If the state governments and the Central Government could avoid duplicating their efforts, they would need to recruit fewer extension officers.

For operating an extension service successfully, the extension officers should know the local language, habits, culture and conditions. They should remain in their posts for long periods. Frequent transfers from one institute or extension centre to another should be avoided. There is much evidence that technical officers and even administrative officers leave the organization mainly because of better remuneration elsewhere. Although this process cannot be fully stopped, it could be significantly slowed down if salaries and allowances were fixed at levels equal to those in the private sector.

In India, nearly all services are provided by SISIs free of charge. Some charges are levied for jobs carried out in the common facility workshops, and

for the distribution of old surveys and printed technical bulletins, these were previously provided free of charge and are now nominally priced to avoid misuse.

The author believes that extension services in the developing countries should be provided free of charge in the initial stages, to help small entrepreneurs to set up and begin to operate their enterprises. As the industries develop and start moving forward on their own, some charges may be levied for certain services. However, services that may be covered by normal operating costs, such as those given by common service facility workshops, should be provided at cost. Before a decision for levying charges is taken, it should be determined whether the competence of the extension officers is great enough to justify the fee. The charges should not be excessive, and the executives should be left free to vary the charges at their discretion.

Operation of an information centre, collection of economic data and preparation of feasibility reports

The information centre may be considered as the hub of a SISI. To be effective, it should have in ready reference form all the economic information collected through area, industry and market surveys, as well as information on the procedures, methodology and operation of other organizations and departments working directly or indirectly for the development of industry in general and small industry in particular.[2]

In the early days of the SISIs, the main task of the information centres, which were manned by junior staff members, was to give visitors routine guidance, such as arranging appointments with other officers who could be of assistance or distributing literature. This arrangement proved to be unsatisfactory: a centre should not be a receptionist's office, but a unit providing substantive service. Each centre was then put under a senior economist from the economic investigation division of the institute, under the direct supervision of the head of the division. Its documentation included all the reports on industry prospects, the feasibility, area and market surveys, model schemes, information sheets, and literature on other concerned organizations. All the information was properly classified and codified. Each centre also had at its disposal information on the industrial units in the region in respect of type of products manufactured, specifications of plant and machinery available with capacity utilized and not utilized, whether the units worked as subcontractors, handled government contracts and orders and so on. A centre was manned by two persons: the senior officer able to hold discussions and answer inquiries from the prospective entrepreneurs and other visitors, and a receptionist attending to visitors requiring routine information. This arrangement proved to be quite effective. About 25 per cent of the visitors were given guidance at the information centre, and the time of both the specialists and the visitors was saved.

2 The type of information collected in the New Delhi SISI is presented in appendix 2.

However, two problems in particular arose in operating the information centre. It was difficult to keep senior economists for very long, since they felt they had no chance of going to the field and were losing the necessary experience in conducting investigations and surveys. Keeping the information up to date and properly coded was a task of great labour and patience. It could be done only if the various divisions, in particular, the economic investigation division, continuously provided the necessary feed-in. The information officers had to be quite alert to get the necessary information from all concerned. They were expected to give the necessary feedback to the various divisions as to the type of information wanted by the visitors. The information officers had to be tactful, resourceful and patient with the visitors. Written inquiries were mostly handled in the economic investigation division in the institute, in collaboration with other divisions.

The first problem was solved by arranging that no senior economist be kept as information officer for more than four months at a stretch. This necessitated the training of two or three officers for this job. There was no doubt some initial difficulty in switching over from one officer to another; but, once the officers had been trained, the advantages of the system became apparent; rotation of duty at the specified interval went smoothly, and it became easier to provide a substitute whenever the regular incumbent was absent for any reason. Every institute in India has two or more officers in the economic investigation division and the arrangement has presented no difficulty.

Information was kept up to date with the help of some specialized firms, such as Remington Rand of India, which, in order to sell their equipment, cards, indexes etc., provided free guidance. A clerk was trained for this work, and placed under the guidance of the information officer. The technical officers providing extension service to industrial units supplied information to the economic investigation section for use in the information cell. In the beginning, there was some resistance to this procedure because of the paper work involved, but it soon evaporated.

Economic information is collected by a small industry service institute for two main purposes: to guide the planners and administrators of the small industry development programme and to assist existing and potential small entrepreneurs to make sound economic decisions with or without the help of extension officers.

Initially the work of economic investigation consisted mainly in preparing industry outlook surveys for the government planning agencies and area surveys for the planning programme of the Community Development Ministry. The economic investigation staff of the regional institutes (Delhi, Bombay, Madras and Calcutta) was accordingly divided into two groups in charge of these two types of surveys. The work of these teams was supplemented by smaller teams from the state institutes.

These programmes were no doubt necessary, but they were time-consuming and proved to be useful mainly for planning and administration. The entrepreneurs did not benefit from them as had been expected, especially the prospective entrepreneurs, who were mainly interested in receiving techno-economic

information in simple form and within the shortest time possible. Industry outlook surveys with comprehensive information were replaced by simple information sheets on prospects and feasibility of industries. Area surveys were carried out only for those areas selected for intensive development.

The teams of economic investigators, composed of staff ranging from deputy director on down to investigators, encountered various problems. A general problem was to find personnel with the basic qualifications needed for a new type of work. The job required training in economics and business management — a rather rare combination. Also, selection procedures were cumbersome and time-consuming. Training was provided with the help of international experts.

Another problem was to obtain accurate and dependable data on which reasonable and practicable conclusions and recommendations could be based. This problem arose both from the lack of experience of the investigators and the difficulty of getting accurate basic data from a large number of agencies. Careful supervision and scrutiny were necessary so that too sweeping and unrealistic conclusions would not be drawn from inadequate supporting data. It was sometimes impossible to withstand pressure from government officials to prepare reports quickly, and reports were prepared on the basis of inadequate data.

It was difficult to get correct information from dealers, merchants and manufacturers because of fear that the information would be used by income tax, excise, sales tax and other similar revenue collection departments. It was hard to convince individuals that the economic investigators from SISI were not tax collectors and that they were there to help them. It took time to build up confidence and to get the desired information. Some dealers and manufacturers considered it an encroachment on their business time to attend to economic surveys. Officers had to be patient and tactful to get the information; they often had to pay several visits to suit the convenience of these businessmen.

The investigators were somewhat reluctant to go to certain areas, in particular to rural and semi-urban problem areas where transportation was likely to be hazardous and accommodation poor. The *per diem* allowances were so meagre that investigators frequently had to pay out of their own pockets; when this was the case, they would try to avoid the visits.

The problem of finding experienced industrial economists and other technical staff arises in all developing countries. International experts (industrial economists) can play a very useful role in providing guidance and in training national counterparts. The experience in India with international experts, in particular, industrial economists, has been by and large very encouraging and pleasant. However, the process is slow and its impact is limited.

Once confidence had been won and experience gained, it became much easier to obtain information from manufacturers and dealers. However, some were approached on several occasions to give information on different aspects of the same topic. This was not only expensive to the organization but also a source of irritation to the dealers and manufacturers. With some imagination and proper co-ordination, this difficulty was considerably reduced.

Operation of common service facilities

Most of the SISIs in India have attached workshops, laboratories, libraries and showrooms. The workshops may include a toolroom, heat treatment, forging, electroplating, a machine shop, a small chemical laboratory for organic and inorganic chemical industries, development testing and quality marking, metallurgical laboratories for physical and analytical testing, foundry sand testing and the like. The shops are headed either by a deputy director, an assistant director, or a JFO, depending upon the size, location and importance of the centre. A JFO or assistant director is in charge of each shop. The main problems encountered in the shops are concerned with recruitment of skilled workers, book-keeping and determining charges.

Well-trained, experienced skilled workers are not easily found; those qualifying for higher posts, in particular, have the opportunity to obtain employment in the private sector. A regular programme of training of semi-skilled workers has been carried on to make up for the shortages. Since a charge is made for shop services, a proper system of account-keeping is indispensable. Defaults have occurred when proper scrutiny and a simple system of accounts were not maintained. The charges may be based on the actual expenses in each operation, that is, direct charges and overhead costs; or on the number of man-machine hours for all types of machines; or on the number of man-machine hours for each machine according to the cost of the machine; or on the number of man-machine hours, the machines being grouped according to different cost categories.

The main consideration is that the cost should not be higher than the market rate, but that it should not be too low either. The author favours fixing rates on the basis of grouping machines according to their cost, for instance, in costing groups of $250 to $1,000; $1,001 to $5,000; $5,001 to $10,000; $10,001 to $15,000; $15,001 and above. The categories make it possible to take account of depreciation and cost of maintenance according to the value of the machine, so that operations would cost more on expensive machines than on less expensive ones.

It is essential that, for the same type of job, the cost chargeable to different customers remain at the same level. Some workers may be slower than others or may otherwise delay the work, and it is up to the foreman and the assistant directors to supervise the work of the machinists.

The common service facility workshops and laboratories are by and large jobbing establishments. Unlike production shops, costing should be determined and an estimate provided to the entrepreneurs for each job—a fairly difficult task, especially in a government-run centre. When a private party runs a jobbing shop, adjustments are made according to market conditions, and the charge varies accordingly. In certain SISIs, charges for certain types of inspection gauges can be made only according to a specified formula, and the charges amounted to about one quarter of those of private shops. In some cases, especially for jobs such as ordinary lathe work or foundry work, the charges of the SISI are higher than the market rates because of outside competition. Private parties

may even charge below cost for certain competitive operations, but may make up for it in others. The result is that only the jobs that are expensive outside come to the service centres, and only the most expensive and out-of-the-ordinary machines remain busy.

Sometimes jobs are spoiled, either owing to carelessness of the workers or wrong reading of drawings, or wrong marking or wrong supply of material by the entrepreneurs. The director should then decide what to do according to the merits of each case.

The choice of machines and equipment of common facility centres is of paramount importance. In many cases, the wrong choice of machines has left the workshops idle, blocking large amounts of capital and manpower. Experience has shown that the machines and equipment in mechanized woodwork shops, sheet-metal and foundry shops serving as common service facility centres are under-utilized.

Normally the small industrial units require assistance from common service facilities for the following purposes:

(a) Toolroom service for manufacturing dies for special tools, jigs and fixtures, special measuring and testing gauges etc.;
(b) Use of some machines for certain processes which industrialists cannot afford on their own, or which have limited utility;
(c) Training of foremen and skilled workers from small industrial units to use modern machines;
(d) Testing and developmental work.

The machines and equipment in various shops and laboratories should be such as to serve these purposes, and not to undertake production work competing with other small- and large-scale manufacturers.

For the effective operation of toolrooms, machine shops etc., there should be a design and drawing section. The design section will develop the required designs of tools, dies, jigs and fixtures, and other appropriate equipment and even machines. It is desirable to provide toolrooms with heat-treatment equipment.

Personnel should be selected carefully. Officers should be imaginative, have initiative, drive and practical experience. They often have to make innovations and introduce improved technology in the industry. In many developing countries, such personnel may not be available, and recourse to foreign experts may be needed.

In India, common service facilities are part of the organizational structure of SISIs and extension centres and are usually located in SISI premises. Sometimes, they are set up near or in industrial estates or other central places where they can serve a large number of industries. The state governments may also provide such services in or outside industrial estates.

The common service facilities of the New Delhi SISI were first located in one of the factories of the Okhla industrial estate. When the institute's own building opposite the industrial estate was constructed in 1961, the service workshops were shifted to the new building, and the industrialists in the estate

continued to take advantage of these facilities. However, in 1963, when these facilities, especially the toolroom, were evaluated, it was found that about 85 per cent of the small-scale industrial customers were other than those from the industrial estate, and out of these about 10 per cent were from places outside Delhi, even as far as 100 to 150 miles away. This was mainly because very large numbers of industrial units were located far from the industrial estate and had no dependable facilities of this type in their own neighbourhood. The survey revealed that additional toolroom facilities were needed in two different parts of Delhi.

Another study revealed that the average net utilization of machinery in toolrooms had been about 76 per cent, the balance being accounted for by shutdowns caused by failure of electricity or by normal maintenance procedures. The average utilization of workers was about 94 per cent. These were quite high figures by any standard. The toolroom and heat-treatment shop were most in demand. Of the mechanical testing machines, the hardness tester was most used. The impact-testing machine and the universal testing machine were used only rarely. In the author's opinion, the hardness testing machine is useful, but others like the impact-testing and the universal testing machine need not be provided as a common facility if they are available in technical colleges, institutes or other organizations, even within a radius of 100 to 150 miles. Sand-testing equipment was found to be quite useful in foundries for formulating and controlling the composition of sands for casting of different qualities. It was considered desirable that foundries keep their own sand-testing equipment to check the composition of sands when diversifying their castings both as regards type and quality. The SISI should provide training to entrepreneurs but supervisors in selecting and using the equipment.

It is essential to be very selective in the choice of locality and equipment for an extension centre. In a small town, the equipment may be installed, the staff in position, the foreign exchange spent, but the utilization of the equipment may remain unsatisfactory.

Common service facilities are as much, if not more, needed in towns other than capital cities and metropolitan centres, since industries in the smaller places may not even find facilities for ordinary repair and maintenance of their equipment. The choice of location will depend upon the type and number of existing and prospective industries. Experience shows that the equipment of common facilities in the smaller centres should not be permanent but rather mobile and changeable. The reasons for this are as follows:

(a) The equipment in the extension centre may have been put up after due consideration of the needs of the area, but the type of industry requiring such facilities may still not develop.

(b) The few industries that become established in such an area find it more convenient after a while to set up in their own factories some of the equipment they may have been using from common service centres. Having achieved its objective, the centre would then move the machinery no longer required for common services to some other location.

(c) Only a few industrial units in an area may be using these facilities as a regular feature of their production programme. The units should

be encouraged to acquire their own equipment. The common services are meant for general use as a tool of development, and not for producing regularly something for a few privileged enterprises.

These considerations suggest that there would sometimes be no need for a permanent building for the extension centre. The workshops could be located in a rented building, or a folding, portable type of workshop might be used, which might be shifted to other places as required or replaced by something more suitable.

Industrial Extension and Other Promotion Programmes

Financing

Ordinarily, small-scale industries have difficulties in obtaining credit, since they do not usually have regular audited balance sheets and other satisfactory proofs of their credit-worthiness. In India, the SISI works as an advisory and co-ordinating agency with the financing institutions and reports to them, upon request, on the marketability and quality of products of the prospective borrower. The director of a SISI or his deputies are members of a committee set up with every branch of the State Bank of India to consider applications for loans from small entrepreneurs. The other members are the director of industries of the state government, the local manager of NSIC and other officials. The State Finance Corporation also consults the institutes.

Export promotion

The State Trading Corporation is mainly concerned with exporting and importing. It has a separate division for the promotion of exports from the small-scale sector. The SISIs co-operate with it to determine suitable small units that could manufacture for export, which they help through training, inspection of products, and other means. The training provided by some SISIs is progressing well.

Research

Co-operation between a SISI and a research institute is greatly needed. The technical officers of a SISI come across problems which they may not be able to solve and which should be referred to research institutes. Unfortunately, the co-operation is not extensive enough to be of much mutual advantage, although some improvement has taken place in this respect in recent years. The research scholars are frequently out of touch with the operational problems, especially those of the small-scale sector, do not easily comprehend them and do not give simple, practical solutions; moreover, it usually takes a long time to get results.

Design and development of appropriate technology

The shortage of finance and space and the smallness of orders and turnover usually prevent the small entrepreneur from purchasing expensive special production machines. He may have to switch from one type of product to another,

and should therefore have easily adaptable machinery that can be used for many processes. Considerable ingenuity is required to design and develop for the small entrepreneurs simple jigs, fixtures and tools to carry out such processes. In deciding on which machinery and equipment to purchase, an extension service should carefully consider the effects on the cost of production of interest on capital invested, depreciation, wages and output. Sometimes a costly, sophisticated machine would appear to be useful; but, in view of the capital cost, the maintenance and operating charges and the amount of production, it should not be recommended.

Since most developing countries have a shortage of capital and foreign exchange and an abundance of labour, the machines to be designed should be simple, cheap, productive and, as far as possible, locally produced. It should be possible to maintain and operate such machinery easily without recourse to imported components and spares.

Imported machines sometimes cannot be used for want of spares or skilled operators. This is a very serious problem and a challenge to extension service agencies. It may happen, for instance, that an imported special-purpose machine does not work properly. The manufacturer or his representative may respond to complaints only after a long delay. They may be reluctant to pay travelling and other expenses for sending one of their engineers. Sometimes the engineer fails to rectify the defects in the machines, either because the original design is faulty or the engineer is not up to the task. The situation of the small industrialist can well be imagined: he has invested a big slice of his capital, most of which may have been borrowed, and his machinery is not working; his capital is blocked, he gets no income, and yet he has to pay interest on the capital, rent for the building and wages to workers, supervisors and office staff; he may have to pay for the expert provided by the supplier, only to find the machine unsuitable. A situation of this type may be a serious obstacle to entrepreneurship and to further small industry development.

It is essential that a machine purchased abroad be rigorously inspected before shipment. While it may be difficult to persuade the manufacturer to provide training of skilled workers in the operation, maintenance and repair of the machine, importers in the developing countries, especially hire-purchase agencies, should insist on adequate after-sales service and on suitable performance guarantee clauses in the contracts; when expensive special machines are being considered, training of workers should be a condition of purchase.

In view of the difficulty of relying on the manufacturer and his representatives, a SISI should be ready to provide assistance in the development of designs. Thus, in addition to a toolroom, a design and drawing office should be set up under the supervision and guidance of an experienced designer; machines should be tested and tried before being passed on to the small industrialists; if possible, prototype machinery should be developed in the country. Work in this field requires careful studies of the techniques applied in the production of the original equipment as well as the development of simple, productive and relatively inexpensive new equipment that can be both produced and used by small-scale industries.

Ancillary development

The Government of India has recognized that the development of large-scale and small-scale industries should as far as possible be complementary. Small manufacturers should specialize in production that complements rather than competes with that of large manufacturers. After consideration of various techno-economic factors, the Government has reserved the development of certain industries for the small-scale sector.

CSIO began systematically to establish subcontracting relationships between large and small industries in December 1960, when, on the recommendation of the Small-Scale Industry Board, a separate ancillary division was set up in CSIO, and regional ancillary committees were created in important institutes.

Sixteen industries were selected in which special efforts to encourage the development of ancillaries would be made. These industries are:

1. Industrial machinery;
2. Agricultural and earth-moving machinery;
3. Machine tools;
4. Industrial scientific and mathematical instruments (mechanical);
5. Locomotives and rolling stock;
6. Steam engines, turbines and internal combustion engines;
7. Bicycles;
8. Boilers and steam generating plants;
9. Automobiles;
10. Commercial office and household equipment;
11. Electrical machinery, equipment and appliances;
12. Telecommunications equipment;
13. Industrial instruments (electrical);
14. Radio and electronics equipment;
15. Air-conditioners and cold-storage equipment including refrigerators;
16. Mineral oil and petroleum products.

Besides a more liberal definition of small-scale ancillary enterprises, special incentives are provided to encourage the establishment or modernization of ancillary units. These units may pay lesser amounts as earnest money and be granted longer periods for paying the instalments for purchase of machinery on hire purchase than the other small-scale units.

The SISIs, through the regional ancillary committees presided over by a prominent large-scale industrialist selected by the Government, play a prominent role in bringing together the large-scale and small-scale industrialists. In each institute an officer is assigned exclusively to the development of ancillary units. Showrooms exhibiting the components required by large-scale units are arranged in the SISIs. The institutes keep records of the various manufacturing capacities of the small industries.

The following problems may need to be solved by a SISI in connexion with subcontracting:

(a) Small-scale units complain that the large firm for whom they undertake ancillary work does not place long-term orders. After a small-scale

unit has developed certain toolings at considerable cost for undertaking subcontract work, the large firm has on occasion ceased to place orders after even getting satisfactory supplies for some time.

(b) The components and parts from the subcontractor have been rejected though they were of acceptable quality.

(c) The large firm has been extremely slow in paying its bills to the small subcontracting units, which can ill-afford to lock up their capital.

(d) Frequently the prices give only a bare profit margin to the subcontractors.

(e) The management of the large firm tends to favour friends and relatives in awarding subcontracts for parts and components.

On the other hand, the large firms have their own grievances; for instance:

(a) The subcontracting units do not supply components and parts on time; this holds up the production and delays the fulfilment of the commitments of the large firm.

(b) The ancillary units sometimes supply components and parts they produce to the replacement market, where they may get prices higher than contracted, rather than to the large firm; this severely affects the production schedule of the latter and causes ill will.

(c) The small-scale unit ruins or does not return the necessary dies, jigs and fixtures loaned to them after completion of the contract.

(d) Small units use substandard materials in production.

The SISI has to step in and make proper working arrangements through joint meetings and discussions. The problems mentioned above can, to a large extent, be solved by building up mutual confidence between the parties concerned.

After initial troubles, the subcontracting programme in India is progressing well. Private and public large-scale industries recognize its usefulness. A number of ancillary industrial estates have been set up to encourage the establishment of complementary relationships. Subcontracting is now developing not only between large and small industries but also between small industries, which find it of mutual profitability.

The major contribution of the SISIs to the development of this programme was to provide technical and managerial guidance, in particular, to improve costing procedures, including cost analysis and cost reduction, programme planning and financial inventory control. In respect of technical know-how, much had to be done. For instance, the blueprint drawings were often not properly understood by the subcontractors and had to be explained to them; sometimes the drawings were found to be deficient in some respects, and after discussions with the engineers of the large firm, the shortcomings were corrected; the necessary tooling jigs and fixtures for production on the machines available to the small units had to be designed and produced; inspection procedures had to be developed and working gauges and other instruments supplied, sample pieces taken and inspected to see whether these complied with the specifications of the components to be supplied. When these arrangements were being made, it was borne in mind that the costs of production should include a reasonable return for the subcontractor. It was an uphill task but a rewarding one, not only

to the entrepreneur, but also to the extension officers, whose work brought them satisfaction and won for them the respect and gratitude of all concerned. In some cases, the large-scale industrialist was prevailed upon to supply material of the required specifications; otherwise, the SISI officer would help to select the raw materials, if need be after carrying out the required tests. The toolroom, including office facilities for heat treatment and design, was found to be extremely helpful in this programme.

As already mentioned, assistance was not confined to production techniques; the managerial and production planning aspects were also considered. This required the combined efforts of management experts, cost accountants and production or industrial engineers, who carried out jointly in-plant studies covering management as well as production and other technical aspects. The preparation of integrated studies of this type was no doubt a time-consuming service, but a very helpful one, especially when rendered to properly selected units, for instance, those undertaking specialized ancillary work. Sometimes parts and components could be produced at a considerably lower price than that of imports. It was a challenging task that could be satisfactorily completed only through a complete study of the operation of the small unit and technical and managerial assistance at all stages of production.

Associations and federations of small-scale industries

The Government of India and the state governments encourage the growth of associations of small-scale industries. These may be organized for small industries in general or on a trade basis, for instance, bicycles, sewing machines, foundry and the like. The latter societies normally look to the Government to solve their organizational and financial problems and arrange training and other useful programmes for their members through the SISIs. The representatives of some of these bodies are members of the industrial advisory councils and boards of the state governments and of the Central Government. It is hoped that these societies will become increasingly active and will take over some of the extension work of the SISIs, but this goal is not yet in sight.

Training of workers, foremen and managers

Training of workers

Besides making arrangements to train workers in other organizations, the small industry service institutes and extension centres themselves train workers from small industry in certain trades. The training may be of three to six months' duration, eight hours a day, six days a week. The trainees are paid stipends of Rs.50 to 60 ($7.00 to $8.00) per month. The training is normally in machine-shop practice, tool and die making, fitter's trade, heat treatment, welding, electroplating, woodworking, sheet-metal work, forging, leather-goods manufacture, sports-goods manufacture, lens grinding etc. Evening courses are also arranged in blueprint reading and other techniques. In large cities like Delhi there is

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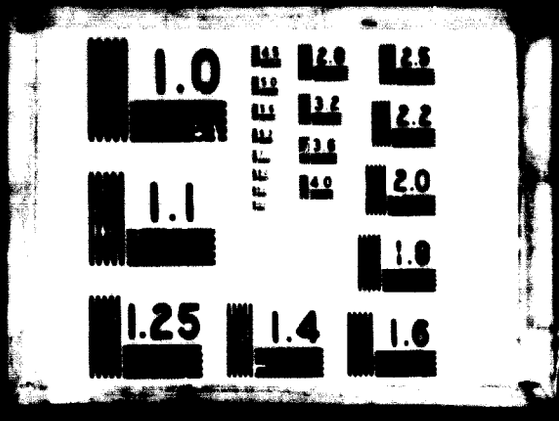


considerable demand for this type of training, which is mostly arranged in the common facility service workshops within normal working hours.

As a rule, small industrialists release their workers for training only on the condition that they resign from their jobs, so that the entrepreneurs will not have to pay them anything during the training period. Industrialists often discourage workers from undertaking such training because substitutes are difficult to find and they fear that, after training, the workers will demand higher wages or will find employment in another enterprise – a not infrequent occurrence. Nevertheless, some workers come for training, even if they have to resign from their jobs or enter into some understanding with the employers, since workers find the training useful and know that the demand for their services in the market will increase. It has been found that after training, their wages increase by about 25 to 50 per cent. Also, trained workers become eligible for higher training in the prototype production and training centres, and this opens up good job possibilities.

The training provided is both theoretical and practical. Simple tests are conducted and certificates are awarded after completion of training, provided the trainee attends 80 per cent of the total number of days of the course.

In smaller towns it is difficult to get trainees from industry, since the number of industrial enterprises and of workers is small.

Training will be particularly effective if it is open to all who have some minimum standard of education and practical experience. It is well known that trained workers often seek employment in medium-sized and large-scale industries where their pay will be better, and while this is difficult to accept for a small entrepreneur, it still benefits the economy as a whole.

Training of foremen

The Indian SISIs do not train foremen on an organized basis. *Ad hoc* training is provided to supervisors, mainly for testing lathes and other machine tools, reading of blueprints etc. There is no doubt a need for systematic training of foremen, especially in respect of machine drawing and design, metrology, inspection and testing procedure for production of machine tools, basic knowledge of foundry work and heat treatment etc. Many supervisors in small industries lack such knowledge and work by rule of thumb gained through long experience. This does not help them to make much progress nor to advance.

The training of foremen and supervisors has been attempted through "open houses" (round-table discussions), where a particular subject is introduced by a technical officer of the SISI and followed by a general discussion and sometimes by demonstrations. To ensure attendance, these open houses are normally arranged in areas where industry is concentrated. The trainees are provided with written notes on the subject. This type of training is normally arranged twice a week for about two or three hours a day. It is attended mostly by entrepreneurs – managers. No certificates or stipends are awarded.

It is estimated that about 650,000 skilled workers for small-scale, medium-sized and large-scale industries in India are needed. The training facilities of the SISIs and extension centres meet a very small part of this requirement, and other

training facilities have been introduced, not to mention the training under the compulsory Apprenticeship Training Act, whereby factories of certain sizes must make arrangements for training apprentices, the number being dependent upon the size of the factory.

It may be appropriate to mention here the training of workers and supervisors from small-scale industries provided in the Indo-German Prototype Production and Training Centre at Okhla, New Delhi. Training is provided under a bilateral assistance agreement with the Federal Republic of Germany.

The centre organizes courses for the following categories of workers and supervisors:

(a) Skilled workmen with a minimum experience of three years in small-scale industry, excluding the period of earlier training;

(b) Foremen who hold diplomas and have had three years of experience; or skilled workers who, after finishing the course under *(a)* above, have further experience of about two years; or non-diploma holders with five years of experience and the prescribed qualifications;

(c) Shop superintendents and shop masters and foremen with a minimum experience of five years.

The skilled workers from small-scale units should be able to read, write and understand English. The SISIs make the preliminary selection of the candidates.

The training courses cover the following subjects: turning, milling, gear cutting, planing, grinding, fitting and assembly, heat treatment, electroplating, toolroom, foundry, forge and sheet-metal work, welding, woodworking, pattern making, material testing, inspection, draughtsmanship and maintenance. The teaching is focused on those aspects that allow the trainees to understand the reasons for each task and its advantages. Most of the training courses last for six months, but some last for three years.

Skilled workers are given theoretical training covering fundamental principles of different operations, types of machines and tools, reading of blueprints, knowledge of raw materials used for the trade etc.; and practical training in the skills required. Foremen are given practical and theoretical training covering the respective trades and processes, the materials used, inspection and testing, reading of blueprints, design and manufacture of simple tools and components of machines and machine tools.

In addition to the training received by foremen, shop superintendents are given courses in time and motion study, cost accounting, design and manufacture of simple machines, jigs and fixtures and workshop management, including planning and production control. After the trainees have had a few weeks of initial training, they are attached to permanent staff members on production jobs, so that their practical training approximates closely the conditions of normal production.

Training of managers and entrepreneurs

The small industry service institutes devote considerable time and attention to the training of managers and entrepreneurs, since this is of vital importance

for the development of industry. Entrepreneurs and industrialists also show considerable interest in this training. In large cities like Delhi, the number of applicants from small industry is generally found to be three to four times the capacity of the training class (40 participants), and admission is arranged strictly by set standards of selection. One problem is to find suitable teachers, since the institute cannot afford to employ specialists in all subjects. In centres like Delhi, Calcutta, Bombay and Madras it is possible to obtain guest speakers from industry, different departments of the Government and other organizations, but this is not so in district towns, and even in some state capitals. In such cases, the scope of the programme has to be restricted, and assistance provided from the specialists available in other institutes in the vicinity.

The various management training courses undertaken are as follows:

(a) Management appreciation;
(b) Production planning and management;
(c) Marketing, including export marketing;
(d) Financial management and cost control;
(e) Supervisory development;
(f) Work-study.

The management appreciation course, the main course, covers the various aspects of management, including labour laws, factory acts and rules, import and export legislation, financial matters, functions of various agencies providing assistance to small industry etc. It lasts about ten weeks. The other courses, each lasting about six weeks, are of a specialized nature; the entrepreneurs may attend any or all of these courses.

They are mostly held during evening hours from 6 to 8, four days a week. Certificates are awarded after completion of each course to trainees whose attendance covers at least 80 per cent of the working days of the course.

Besides the above courses, a number of *ad hoc* courses are organized in various subjects. Special courses on export marketing are held with the help of international experts.

A notable feature of a course on export marketing was that the commercial attachés and counsellors from various embassies in Delhi, representatives of export-promotion councils, the State Trading Corporation (this corporation promotes export trade from small industry), the State Bank of India and the Punjab National Bank were invited to discuss trade procedures and patterns in various countries. This very practical course evoked great interest.

A course for the community project officers, block development officers and others connected with the development of industries in rural areas in the northern region was conducted at the Delhi Institute, at the request of the Planning Commission. This course lasted fourteen days and was intended to provide guidelines and information on the prospects of various industries and measures for their development in rural areas. A special training course was organized to instruct the appropriate officers of SISIs and the state governments in the appropriate technique of assessing capacities for raw materials required for industries consuming non-ferrous metals.

Seminars on export promotion of small-industry products have also been held and have proved to be extremely useful, since the participants (exporters and representatives of various government agencies dealing with exports, private export Houses, export-promotion councils, the National Productivity Council etc.) have had an opportunity to discuss their problems and difficulties face to face.

Experience shows that an association of the former trainees in management courses may be a very useful link between industrial managers and the SISIs. Such managers are kept informed of the latest developments in management and production techniques through their association. Meetings of the association have often been addressed by experts from different SISIs on important topics concerning the development of small industry.

A very important aspect of the management training courses is that the participants are taken to large and small factories, and the actual management problems and their possible solutions are discussed. Some entrepreneurs are awarded fellowships for study in the country or abroad.

PROMOTION OF ENTREPRENEURSHIP AND DEVELOPMENT OF SMALL INDUSTRIES IN RURAL AND OTHER UNDER-DEVELOPED AREAS

Intensive campaigns

India has about 550,000 villages, and about 75 per cent of its population lives in rural and other under-developed areas. In the past ten or twelve years, small-scale industries have appreciably grown in number and size, but growth has mostly taken place in and around large cities like Delhi, Madras, Bombay, Calcutta, Ludhiana etc. It is estimated that about 70 to 80 per cent of the small industries are concentrated in such cities.

Special efforts are needed to develop small industries on a decentralized pattern. Industrial growth tends to concentrate in areas having external economies and other prerequisites for development and where people are in a better position to avail themselves of the facilities provided by government agencies. Industries located in the metropolitan centres take the maximum advantage of measures of promotion. It is estimated that ten cities have availed themselves of 60 per cent of the total hire-purchase assistance, out of which 48 per cent has gone to Bombay, Madras, Calcutta and Delhi. The position in regard to government purchases from small-scale industries under the Government Store Purchases Programme is again particularly favourable to these cities. This trend has resulted in distinctive regional imbalances in industrial development, particularly in the small-scale sector.

The Indian Government's Industrial Policy Resolution of April 1956 lays down as a major objective the achievement of balanced industrial growth in all parts of the country. The country had to launch a programme of industrialization in rural areas to improve employment and income levels and to arrest the trend towards migration to big cities and towns caused by the heavy pressures of rural unemployment and economic distress. Some employment was provided

through the development of cottage and village industries, but this was evidently inadequate, and stress was laid on the development of modern small-scale industries.

Taking industries to the people in industrially under-developed areas, rather than allowing the people to migrate to big cities for employment, with the consequent adverse social and economic repercussions, was a stupendous task. The small industry service institutes and industrial extension centres played a major role in this programme.

One of the most important projects undertaken by the SISIs in selected under-developed areas of each state was the promotion of entrepreneurship through "intensive campaigns". These deserve to be described briefly, since they may be of interest to other developing countries as a means of stimulating not only the industrialization of rural areas, but also entrepreneurship in all parts of a country.

An area for an intensive campaign is selected in consultation with the state government, that is, the director of industries, and the director of the SISI and his staff. The area should offer the best chances of success so as to have the desired demonstration effect. It should be selected on the basis of strictly economic considerations; political pressures, in particular, should be resisted.

An economic investigation team consisting of industrial economists is sent by the SISI to the selected area to make a rapid preliminary survey to assess the potentials for industrial development and the possibilities for expanding the existing industries or establishing new ones. This survey should normally be completed within three to four weeks. To make it as comprehensive as possible and to complete it within the prescribed short period, the co-operation and assistance of all concerned is required: government departments and institutions, eminent public men Members of Parliament, members of state assemblies, members of district and municipal boards, industrialists etc. These persons should be informed beforehand by the state government and the director of the SISI. The director should visit the area with the team for a day or so to explain the objectives of the survey and the campaign and to introduce the team to local government officers and other individuals.

After the survey has been completed, a detailed report is prepared. Salient features, including recommendations of interest to entrepreneurs, are sorted out in co-operation with the state director of industries. The report is printed for circulation in the area, and model schemes about prospective industries and informative literature describing the assistance provided by various agencies are gathered.

A date is fixed for the inauguration of the campaign, in consultation with the state government and local authorities. A team consisting of the extension officers of the SISI, including the director, state director of industries and his officers, the local manager of NSIC, representatives of the State Bank and co-operative bank, move to the area on that day. It brings detailed information and schemes for prospective industries, area survey reports, informative literature and application forms of each of the agencies directly and indirectly concerned with the development of small-scale industries. Mobile vans fitted with power-

driven machines for machine shop, carpentry, smith, leather work, fruit and vegetable preservation and canning, electroplating etc. are also taken to the area for demonstration purposes. Such an inauguration meeting is normally presided over by the state minister of industry or a senior official. Among those invited to the meeting are the revenue authorities and development officers of the area, private persons connected with different developmental and technical organizations and prospective entrepreneurs. During the meeting detailed information, including case histories, is given on the various facilities offered through different departments and organizations. The procedures to be followed are explained by the representatives of the various organizations. Questions and answers are encouraged.

The SISI sets up a temporary office in a central place in the area, where it displays and distributes, free or for sale, as seems appropriate, technical schemes giving factual data on capital, machines, covered area, workers, raw materials, probable margin of profit and other requirements for setting up and operating various small industries; technical bulletins and information sheets, relating to hire purchase of machinery, the government programme for purchasing from small industries through NSIC, financial assistance from the state government, State Bank, State Finance Corporation, extension services including common service facilities, training schemes for managers and workers, salient features of area surveys, and so on. Success stories that have been filmed are shown. Extension officers of SISI and representatives of other organizations participating in the team are available for consultation; and, whenever feasible, immediate action is taken, for instance, completion of formalities for hire purchase of machinery. The prospective entrepreneurs are told convincingly of the economic advantages of industrial activity and are informed of the various facilities provided by the Government. In a programme of this type, some procedural formalities, for instance, processing of applications for hire purchase or for small loans from the state government, are normally cut short, and decisions are often taken on the spot.

This type of campaigning, by lectures, demonstration, visual display and proper presentation of data, creates a desire in the local entrepreneurs to invest in small industries. SISI extension officers, together with other agencies, continue to pay special attention to such areas and in time succeed in creating entrepreneurship in new undertakings and in modernizing existing ones. Such campaigns will evidently be fruitful for industrial development only in areas where industrial prerequisistes like transport, electricity and water are available. A similar programme has also been launched in recent years by NSIC in co-operation with SISIs and others, in connexion with its hire-purchase scheme; it has made considerable impact.

The difficulties of developing small industry in rural areas, such as absence of infrastructure, lack of markets, entrepreneurial skills, financial facilities or repair and maintenance workshops, may sometimes be tackled simultaneously through the establishment of rural industrial estates.

The problems confronting extension officers working in these areas are personal and professional. The personal problems are raised by hardships or

inconveniences and high costs with respect to transport, board and lodging, medical aid, educational facilities for children, not to mention the lack of urban amenities and entertainments. These problems are quite significant, since extension officers are reluctant to go to precisely those areas in need of maximum attention. This situation is not limited to industrial development: in these areas, dispensaries go without doctors, schools without teachers. Not every extension officer may be expected to show missionary zeal and to sacrifice his and his family's personal comforts and needs to work there, especially when he can find equivalent jobs in more comfortable surroundings. The professional problems include the difficulty of collecting from various sources and analysing the information necessary for preparing area surveys of agricultural, mineral, forestry and other resources, and the extreme shortage of entrepreneurs (although there may be many unskilled and unemployed workers available). The work of an extension officer is judged by the number of entrepreneurs created.

In view of these difficulties, the Indian programme has been confined to a few viable areas. It is expanded steadily as experience is gained. Such a programme requires a cautious approach. Small industry cannot grow where nothing else grows.

Mobile workshops

Another important tool employed to awaken interest in modern industries, to create entrepreneurs and to train artisans and others in the use of modern machines in rural and under-developed areas is the mobile workshop.

The various common facility centres in India are located mainly in large towns. These centres cannot possibly cater for every nook and corner of the country. Industries require training and other extension services in a great variety of trades, and no centre can possibly be equipped to provide service to all types of industries. An effective solution of these problems is the mobile workshop.

Specially designed trucks are equipped with machinery and tools for the required trade for wood workshop, sheet-metal work, electroplating, shoe-making, ceramics, glass blowing and so on. Equipment is normally of a light demonstration type. There is either a separate oil engine-driven generator or the engine of the vehicle is used as a prime mover. The vehicle is taken to rural and other areas after the authorities concerned have been notified, and the block development officer or some other official makes an announcement to the public. The mobile van is parked in a central place in the locality, and the operation of the machines is demonstrated; if time permits, some artisans are allowed, under supervision, to operate the machines. Vans are also used for demonstration purposes during village fairs and exhibitions in large and small cities. To be effective, the mobile workshops should be in one place for a sufficiently long time.

The difficulties experienced in India were that the capital cost of the vehicles to accommodate the machinery was heavy, and since these vehicles frequently travelled on rugged, broken roads, the cost of maintenance was also very high. The machines deteriorated sooner than they otherwise would have because they were handled by large numbers of untrained persons. The staff assigned

to the vehicles found it difficult to travel extensively with inadequate subsistence allowances. The staff was not always fully utilized and the programme was frequently halted. To account for the use of raw materials for production and training was complicated. There is no doubt that the mobile workshop is one of the best ways to reach the rural areas, but experience shows that it is very expensive to maintain and operate.

The author tried another way of achieving the objective of reaching rural areas and small towns at a much lesser cost. The method was mainly concerned with the servicing of agricultural implements given on hire or on outright sale. The repair and maintenance equipment in this case consisted of lathes, shapers, drilling machines, fitting tools and spare parts for replacement. The machines were adaptable to electric or oil engine drive and even to manual drive. A foldable workshop was built of galvanized sheet and angle irons bolted together, so that each sheet could be put together or separated as necessary. The whole equipment could be loaded in a hired truck or even on bullock carts. The workshop was set up in a plot of land in a village.

The arrangement proved to be quite effective and not very expensive. It could perhaps be adopted for training in difficult areas. It is not easy to find a building for a workshop in small towns, and the folding type of workshop sheds would be a good substitute. It is not always necessary to invest a great deal of capital on trucks with special bodies and then to spend heavily on operating and maintaining them. The mobile training-demonstration workshops are useful for extension work, but the problem of keeping them properly utilized requires attention.

COMPLEMENTARY ASSISTANCE: FOREIGN EXPERTS AND PRIVATE COUNSELLING AGENCIES

Foreign experts in extension services

The programme of small-scale industry development in India was devised and guided with the help of the Ford Foundation, the United Nations and other organizations. Many foreign consultants have participated in this programme since its inception. These consultants have made a significant contribution in formulating, carrying out, expanding and accelerating the programme. They provided the technical skill and experience which were lacking in the newly recruited staff of CSIO and its affiliated agencies.

Several problems, however, arose in connexion with foreign assistance. In some cases, experts were appointed for a trade for which there was not much need, such expertise being available in the country. Some experts, though competent in their field, were found to be temperamentally unsuited for extension work, at least in the local environment. In a few cases, the foreign consultants did not measure up in terms of skill and experience to the standard expected, but they had to be kept on until their contracts expired, and this created problems.

The experts attached to an institute as advisers to the director received a much higher salary than the director. A few of them tried to ignore the director and approached higher officials directly. This antagonized the director, and relations became strained. It was difficult to find suitable counterparts either because of procedural delays in recruitment or unavoidable shortages of certain categories of staff. The consultants, coming in most cases from developed countries, found it inconvenient and difficult to adjust their advice to suit the economic and technological requirements of the country. The consultants were accustomed to certain standards and were not provided with the necessary amenities. They did not always receive proper orientation in respect of the traditions and social and economic conditions in the country.

These problems must be solved by the national authorities and by the foreign agency, respectively. Clear-cut job descriptions should be drawn up after thorough surveys of the conditions and needs of the institution and locality to which the expert is to be assigned have been made. Panels of Indian consultants in various fields should be kept up to date, and foreign consultants should be engaged only when qualified national experts are not available. Proper recruitment procedures should be followed by the foreign technical assistance agencies.

A poor relationship between the expert and the director and other staff of the institution to which the expert is attached need not arise if the departmental system of work is explained to the expert from the beginning. He should identify himself as a member of the department in which he works. At the same time, he should be given his rightful place as an adviser. (Difficulties on this account were rare.)

The provision of suitable counterparts was a very serious problem at the outset of the programme. However, it was largely overcome as technical education facilities in universities, technological institutes, and other national institutions were expanded, modifications in the system of recruitment modified, and the allocation of technical officers to SISIs increased. Some difficulties were experienced when the counterpart was transferred from the institute after the expert left, and sometimes even when the expert was still there. This matter is largely one of internal organization; it may often be rectified, but sometimes cannot be helped. Domestic organizations must realize that foreign experts are not substitutes for national officers, that their task is mostly advisory and that their advice will be of maximum effectiveness if it is combined with training of counterparts who will take over after the experts have left.

Private counselling agencies

Since India has developed a vast network of advisory services throughout the country—regional, state and local small industry service institutes, extension centres, and other agencies—little scope has been left for private counselling agencies to provide services to small-scale industries, especially since the services of the institutes are free of charge. However, with the rapid and extensive growth of small industries, the institutes have not been able to extend assistance to everyone. This situation has encouraged the establishment of private counselling

agencies in large cities where industries are concentrated. However, only those who can afford to pay rather heavy fees go to these agencies. These agencies could extend their services to customers by taking advantage of the various publications, library and documentation facilities of the SISIs.

Private counselling agencies can usefully supplement the efforts of SISIs. Extension officers of the SISIs, with their heavy work loads, may not find time to approach various government agencies to expedite action on individual cases of small entrepreneurs, but private counselling agencies could undertake to do this for their clients. The role of such agencies is useful, especially when a shortage of raw materials, foreign exchange, electric power, factory space etc. has resulted in a multitude of rules and regulations for compliance, as in India.

Many of the counselling agencies do not yet have the stature of those in the developed countries but they will improve as the demand for their services increases. In the early stages, developmental programmes should be on a governmental level, and only when development has gained some momentum can private counselling agencies be encouraged. Then there is much scope for them to complement the action of government-sponsored assistance and promotion institutions.

The Government of India does not provide any subsidies to private counselling agencies. However, it appears that with the increase of small industries in size and number, it may be desirable to encourage private advisory agencies to undertake feasibility and techno-economic studies, to provide management counselling, and even in some cases to solve some intricate technical problems, such as plant layout, selection of machinery or negotiation of collaboration agreements.

Feasibility and techno-economic studies and related projects are also carried out by the National Council of Applied Economic Research, a private organization. Its studies cover a broad range of problems, including small-scale industry. On payment of certain charges, the Government and the state governments commission studies. These studies have been quite helpful in the formulation of policies and programmes of industrial growth, including that of small-scale industry. Management problems may be dealt with by local productivity councils on payment of certain minimum charges.

Private counselling agencies operated by either individuals or groups of individuals can work successfully when small industries have achieved a firm footing and are progressive and prosperous enough to pay for services. However, in certain situations it may be worth while to subsidize their operations, though it may not be easy to find out a satisfactory formula for granting subsidies. As a rule, small industrial units require free extension service for periods of seven to ten years and are required to pay concessional charges only for workshop or laboratory work.

Conclusions

It is quite likely that the problems of extension service are by and large identical in most of the developing countries. The following conclusions, derived from Indian experience, may thus be generally applicable.

In countries where no industrial extension facilities exist, it may be advisable to begin with a modest, carefully planned, practical programme and to set up one or a few centres in locations having the best prospects for small industry development. After the programme has taken root, attempts should be made to expand it steadily, both functionally and geographically.

The extension programme should be sponsored by the Government, but the agency administering it should enjoy a large measure of autonomy in day-to-day operations. It should be integrated in the over-all programme of development of small-scale industry, which, in turn, should be part and parcel of the country's general plan of economic development.

The main problem that industrial extension agencies in the developing countries are likely to face is the lack of experienced extension personnel. Even if foreign experts are obtained, there will be difficulties in appointing qualified counterparts. Persistent efforts should be made to solve this critical problem. As a rule, it will not be necessary to engage large numbers of extension officers a few competent and willing workers, well paid and rewarded, will be sufficient in the early stages.

If experienced economists and technologists are not available, young, bright university graduates should be awarded fellowships under international or bilateral programmes for training in organizations like the SISIs and the Small Industry Extension Training Institute in India, the Research Institute for Management Science in Delft, the Netherlands, and other organizations either in developed or developing countries. The training provided in these institutions is not merely theoretical, but includes in-plant training and some practical experience. To the extent possible, national institutions for training extension workers should be set up. In some cases, such training may be organized as a joint effort of several countries on a regional or subregional basis. Training will be required not only for the senior officers of the extension service, but also for personnel at lower levels; in-plant training will be of particular value for the latter.

The training should cover the following main areas:

(*a*) Economic survey techniques including area, industry and market surveys, feasibility and pre-investment studies and preparation of project reports;

(*b*) In-plant studies including plant layout, production planning, production techniques, testing and quality control;

(*c*) Management training, including personnel management, production and inventory control, financial management, and cost accounting.

Especially at the early stages, there are advantages in setting up an extension service department within an industrial development bank; the services of the department should not, however, be restricted to the borrowers, but should be available to any small entrepreneur in need of assistance. Whatever the arrangements, close co-operation should be maintained between extension and financial institutions, since financing of small-scale industry is particularly effective when it is closely linked to technical assistance, and *vice versa*.

An industrial extension agency should have a well-organized information centre and library, common facility workshops with well-selected equipment a toolroom, and a testing and quality-control laboratory will be required in most cases and training facilities. These facilities should cater to managers and foremen as well as skilled workers. They should be equipped to provide services in various parts of a country or a region, including rural areas. mobile workshops will be effective for this purpose.

Promotion of new entrepreneurship should be as important a task of an extension agency as assistance to existing enterprises. In countries at the earliest stages of industrialization, it should be the main task. Intensive promotion campaigns are effective both for steering entrepreneurs towards new industrial activities and for modernizing existing small-scale industries. They may be particularly useful when combined with industrial decentralization programmes, especially those for small towns and rural, backward areas.

The industrial extension agencies should encourage the development and adoption of simple, inexpensive and productive technologies and processes of production. As far as possible, they should facilitate the establishment of complementary relationships between large and small industries. High quality, sound management, reasonable costs are conditions that should be met by small enterprises working as subcontractors to large firms; this can be achieved, as a rule, only if technical and managerial assistance is available.

Industrial extension services will be particularly useful when provided to the occupants of industrial estates. The extension agencies should be closely associated with the planning, establishment and operation of the estates and should often be in charge of the operation of their common service facilities. Close co-operation and co-ordination should be maintained between extension agencies and other organizations furthering small-scale industry, such as training centres, research and design institutes or export-promotion centres.

APPENDIX 1

Organizational and Staffing Patterns of a Small Industry Service Institute

The sections and staff of the Small Industry Service Institute of New Delhi are as follows (the staffing pattern changes from time to time):

The institute is headed by the director.

A. *Ceramics Section (including glass and lenses)*
   - 1 Foreign Consultant for lenses
   - 3 Assistant Directors
   - 4 Junior Field Officers
   - 1 Investigator
   - 1 Draftsman

B. *Chemical Section*
   - 1 Deputy Director
   - 1 Assistant Director
   - 1 Junior Field Officer
   - 2 Investigators
   - 1 Skilled worker

C. *Electrical Section (including electronics)*
   - 1 Foreign Consultant
   - 1 Deputy Director
   - 1 Assistant Director
   - 1 Junior Field Officer
   - 1 Investigator

D. *Leather Section (including tanning)*
   - 1 Assistant Director
   - 1 Junior Field Officer

E. *Mechanical Engineering Section*
   - 1 Deputy Director
   - 3 Assistant Directors
   - 3 Junior Field Officers
   - 2 Investigators
   - 4 Draftsmen

(workshop staff not included)

F. *Metallurgy Section*
   - 1 Deputy Director
   - 1 Assistant Director (heat treatment)
   - 2 Junior Field Officers
   - 1 Draftsman

G. *Economic Investigation Section (including information centre)*
1 Deputy Director
5 Junior Field Officers
6 Investigators

H. *Industrial Management and Training Section*
1 Deputy Director
3 Assistant Directors
3 Junior Field Officers

I. *Industrial Design Cell*
1 Foreign Consultant
2 Industrial Designers
7 Assistant Industrial Designers
10 Draftsmen

J. *Works Division*
1 Deputy Director
3 Junior Field Officers
2 Investigators
2 Draftsmen
(This division was abolished after the construction of the institute's buildings.)

K. *Administration Section*
1 Assistant Director
1 Superintendent
10 Clerks[8]

L. *Accounts Section*
1 Assistant Accounts Officer
6 Clerks – both senior and junior

M. *Co-ordination*
1 Superintendent (now Assistant Director)

In addition, there are four workshops for common facility services, e.g. for toolroom, machine shop, heat treatment, forging, ceramics, lense grinding. Testing facilities are available for foundry sands, metals, sewing machines and cycle parts etc. There are chemical laboratories for analysis, development and research, for development of small chemical industries, leather, ceramics and electrical industries.

N. *Extension Centre, Balsahyog, New Delhi*
1 Assistant Director
3 Junior Field Officers
1 Investigator

Besides the above, there are some skilled workers for the training workshop. The Balsahyog Extension Centre is quite different from other extension centres. It operates in close collaboration with Balsahyog Home, a social organization for the development of young delinquent boys. The centre imparts training to young boys in carpentry, tin-sheet work, tailoring, cane work, leather trade (shoes and other leather-goods manufacture), general mechanics – as machinists and fitters. It provides extension services for small industries in these trades.

O. *Extension Centre – Faridabad*
1 Assistant Director
1 Investigator

The Faridabad centre provides common facilities, training of artisans to be carpenters and blacksmiths and extension services in and around Faridabad. A centre at Rewari has similar functions for shoe manufacture, electroplating, non-ferrous castings etc.

APPENDIX 2

INFORMATION ON SMALL-SCALE INDUSTRIES COLLECTED BY A SMALL INDUSTRY SERVICE INSTITUTE

The Small Industry Service Institute of New Delhi collects information on small establishments in the surrounding area. Index cards similar to those used in a library present the information by industry (e.g. electric motors, sewing machines, bicycles, machine tools) and by location; in the latter case, industries are listed by towns and town zones. Because of their small number, industries in small towns are listed together in one group. Cards also refer to industry prospect survey reports and area surveys.

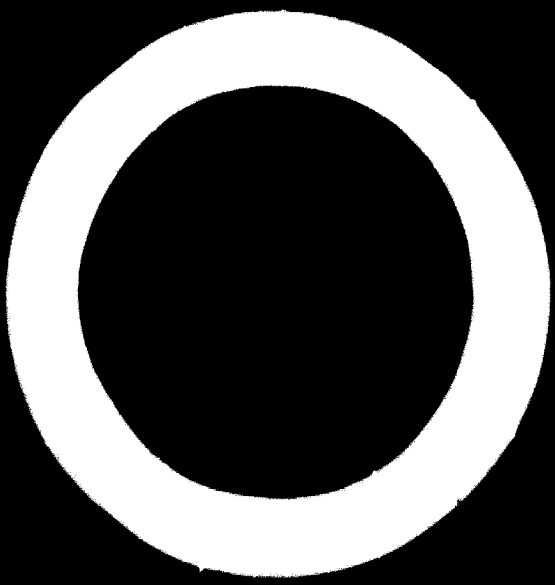
The cards contain the following information:

1. Category of industry.
2. Name and address of the factory.
3. Telephone number and telegraphic address.
4. Name and address of the business office (i.e. head office) of the factory with telephone number and telegraphic address.
5. Type of enterprise: family/co-operative/partnership/public or private limited concern. Date of establishment.
6. Capital investment for
   - *(a)* Land and buildings;
   - *(b)* Machinery and equipment;
   - *(c)* Other capitalized expenses.
7. Working capital.
8. Source of capital
   - *(a)* Own capital;
   - *(b)* Loan under State Aid to Industries Act;
   - *(c)* State Bank of India under the special financial assistance scheme for small industries;
   - *(d)* Loan from other sources – other banks, friends, relatives etc.
9. Details including value of machinery and equipment installed, with their capacities; whether machinery is acquired on hire-purchase basis.
10. Details of items manufactured – giving in each case quantity and value of manufacture.
11. Whether the unit is registered under the Government Purchase Programme; if so, whether it received any tender, inquiries and if so, whether it bid and got the order and completed it satisfactorily.
12. Whether the unit is engaged in subcontracting; if so, information is given in respect of quantity and nature of items supplied and the particulars of the principal firm are provided.
13. Details of raw materials and components used, indicating quantity and nature of each; imported items are indicated.
14. Number of workers – skilled, semi-skilled and unskilled, office hands and others.

15. Any special remarks regarding quality and marketability of the product, spare capacity available if any, on machinery for special processes, e.g. for forging, foundry, electroplating, automatic turret, capstan lathes.
16. Information on some salient features of extension services rendered to the units.

There is a separate card for each unit. To show information at a glance, each card is tagged with signal pieces of different colours; for example, red indicates an ancillary unit; blue, a unit carrying on government purchase work; yellow, special extension services provided; and there may be separate signals indicating some special-purpose equipment available with some units, such as automatic turret and capstan lathes, die-stamping and forging hammers, heavy-duty power processes, electroplating, enamelling, anodizing equipment and testing equipment. This information is very useful in locating units for ancillary work and also for undertaking government orders.

Separate cards indicate industries for which "prospect" information sheets have been prepared, industries banned because they have reached their saturation point, industries reserved for the small-scale sector etc. Information is also collected on the rules and regulations of other organizations providing assistance to small-scale industries, such as financial institutions, NSIC for hire-purchase of machinery, registration under Government Purchase Programme, export promotion through State Trading Corporation; and collaboration terms acceptable to the Government.



4.

TECHNOLOGICAL RESEARCH AND INDUSTRIAL EXTENSION IN CANADA*

Introduction

The purpose of this paper is to present Canada's experience in technological research and industrial extension as applied to small industry so that other developing countries may benefit from this experience. Rather than providing a simple description of existing services, this paper describes the factors that have influenced the development of these services. The following brief sketch of the Canadian scene is given to provide a better understanding of these factors.

Canada comprises ten provinces and two territories, each of which in many ways and to a varying extent is comparable to a developing country. Many of these provinces are larger in area and smaller in population than some of the developing countries participating in this symposium. Each one is struggling to develop its natural resources and its provincial industries through its provincial government departments of industry and commerce, provincial development funds, provincial research organizations, and manufacturing and trade associations. They compete strongly with each other in the Canadian and foreign markets, and each has local and regional problems arising from its geography and history. Superimposed on these provincial structures is the Federal Government with its corresponding departments, which is endeavouring to upgrade Canadian industry as a whole and to achieve a better balance in the distribution of population, industry and wealth among the provinces.

Canada, one of the world's largest countries (9,976,200 square kilometres) and one of the most sparsely populated (20 million, or 2 inhabitants per square kilometre) may be considered a strip of land some 4,000 miles long from east to west and from 200 to 300 miles wide. This strip is divided geographically, historically and economically into five main regions.

British Columbia on the Pacific coast contains approximately 9 per cent of the population and 11 per cent of industry of the country. It is well on its way to developing a more or less self-sufficient economy because of the tremendous natural resources of its mines, forests, fisheries and undeveloped hydroelectric power and its ebullient, forward-looking and "aggressive" people.

The three Prairie Provinces, containing 17 per cent of the population and 12 per cent of industry, form one of the major granaries of the world. Discovery

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* Paper presented to the symposium by R. E. McBURNEY, Chief, Technical Information Service of the National Research Council of Canada, Ottawa.

and exploitation in recent years of vast oil fields and potash deposits are leading to the development of petrochemical and associated industries.

Ontario and Quebec, with 35 per cent and 29 per cent of the population and 36 per cent and 32 per cent of the industry, respectively, form the heartland of industrial Canada. This has been brought about, among other things, by their very early settlement and population expansion, the growth of trade with the nearby eastern United States, the fairly rapid exploitation of their natural resources, the abundance of cheap hydroelectric power and the early development of road, rail and water communications. Nevertheless, these two provinces are separate regions because of their cultural backgrounds.

The four Maritime Provinces on the Atlantic coast form the fifth region, with 15 per cent of the population and 9 per cent of industry. Isolated from the markets of Ontario and Quebec by long lines of communication, and from United States markets by competition, they have tended to base their economy on the primary industries of fishing, lumbering and mining. These provinces have a lower income *per capita* and a lower standard of living than the others. Strenuous provincial and federal efforts are being made to change the situation.

This sketch of the regions of the Canadian economy, brief though it may be, will serve to relate these regions to analogous situations in many countries represented at the symposium.

DEVELOPMENT OF RESEARCH ACTIVITIES

Government research

The widespread and unequal distribution of population and industry in Canada has resulted in an unequal distribution of the scientific and technical resources of the country. In 1916, when the National Research Council (NRC) was formed, relatively little research was being undertaken in Canada, either by the Government, universities or industry. Federal government departments responsible for geology, agriculture, fisheries and forestry had small research organizations concerned essentially with natural resources and the raw materials to be derived from them.

NRC was created to undertake, assist and promote scientific and industrial research including the utilization of natural resources; to improve technical processes and methods used by Canadian industry and discover new processes that may promote expansion of existing industries or creation of new ones, utilization of industrial wastes, determination of standards and methods of measurement, standardization and calibration of scientific and technical apparatus and instruments used by the Government and industry, investigation into the nature of and standards of quality of materials used by the Government and industry; to undertake research for industrial firms, organizations or persons; to carry on work and manufacturing of an experimental and development nature; to license, sell or grant patent rights owned or controlled by the council; and to publish, sell or otherwise distribute scientific and technical information.

Before these broad responsibilities could be assumed, scientists had to be trained to meet the future requirements of industry. During the first nine years

of its existence, NRC allocated its funds entirely to scholarships and grants-in-aid for research. These funds have continued and in 1965/66 amounted to $17.2 million[1] for university research, including the work of 2,196 university professors and their 3,500 student assistants, 988 scholarships and 251 post-doctorate fellowships held in Canada and abroad by both Canadian and foreign students. Without this catalytic injection of funds into the universities, the growth of university research and the output of scientists and engineers, now exceeding the requirements of Canadian industry, would have been seriously delayed and Canada's entire industrial expansion impeded. Developing countries must consider as a matter of first importance the establishment of institutions for training scientific and technical personnel.

In 1925, the first NRC laboratories were set up in rented premises, and work initiated here resulted in the establishment of a viable magnesite industry, which has grown steadily over the years. In 1932, the first permanent laboratories, permitting large-scale research, were erected, and these now have expanded into eighteen large and many smaller buildings in Ottawa, occupying over 2 million square feet of floor space and 300 acres of land, as well as two major laboratories in western Canada and on the east coast and several smaller laboratories in scattered localities. Over 2,700 people are employed, including a scientific staff of 800.

Concurrent with the growth of NRC, the Departments of Agriculture, Fisheries, Forestry and Mines have had a similar expansion, creating in Ottawa, the capital, a huge government research centre. There are, in addition, many branch laboratories and experimental establishments located in various parts of Canada, as the distribution of natural resources dictates, but the bulk of federal government research is done in Ottawa. The problem of communication between these central laboratories and industry, both large and small, has existed for many years. It is one of the main reasons why the use of extension services is favoured in Canada.

The centralization of government research also has resulted in a corresponding centralization of government sources of scientific and technical information. The NRC library, by agreement with the National Library of Canada, has become the National Science Library of Canada. This library, together with the special departmental libraries of the government departments previously mentioned, and the statistical and economic information services in the Dominion Bureau of Statistics, the Canadian Patent Office, and the Departments of Trade and Commerce and Industry, forms the major organized source of scientific and technical information in Canada.

With few exceptions, the scientific and technical collections of the public libraries across Canada are very limited, and the collections of the university libraries are not readily accessible to industry. Although the National Science Library provides a comprehensive service to Canadian industry through a library network of which it forms the focal point, it is recognized that it and other sources must be greatly expanded and improved to meet the modern,

[1] In this paper, reference to dollars is to Canadian dollars.

rapidly changing requirements of industry. A national survey is now under way to examine the existing information facilities, the needs of industry and ways to effect improvement.

University research

University research in Canada has been mostly academic and fundamental in character, producing scientists of good qualifications. However, there has been a serious lack of the ties between university and industrial research groups such as are found in the United States. Both groups realize this, and corrective measures, supported by government funds, are being undertaken.

Industrial research

Industrial research in Canada has not developed so rapidly or extensively as government research. A major factor inhibiting such growth has been the predominance of foreign-owned industry in Canada. Foreign parent companies prefer to conduct their over-all company research in their own home-based laboratories for many reasons, not the least of which are economy of operation and availability of scientific manpower. A comparable situation exists within Canada itself, where most of the company-owned research laboratories are located near the head offices in Ontario and Quebec, and company plants elsewhere are limited to production.

The Canadian businessman tends to be more conservative in his outlook than his counterpart in the United States, bases his decisions on other people's experience and is more timid in venturing into research and development. There is only one industry-supported research institute in Canada similar to the research association laboratories of the Netherlands, the United Kingdom, and the Scandinavian countries, namely, the Canadian Pulp and Paper Research Institute. There is no organization corresponding to the Battelle Institute, nor is there anything corresponding to the extensive contract research undertaken by United States universities on behalf of industry.

This situation is changing because industry, the universities and the Government alike recognize the urgent need to expand production and markets. A number of government programmes provide grants-in-aid for industrial research. The specific activities of NRC may now be examined.

The National Research Council of Canada

In carrying out its responsibilities to industry, NRC has organized its ten scientific divisions into two groups, one concentrating on pure and applied science and the other concerned with engineering science. All the divisions undertake both pure and applied research to varying degrees, in recognition of the need for a balance between the two so as to establish a high standard of excellence and to attract and retain staff of a high calibre. However, of the five science divisions (Pure Physics, Pure Chemistry, Radiation Biology, Applied Chemistry and Biosciences), the latter two, together with the four engineering

divisions (Building Research, Mechanical Engineering, Radio and Electrical Engineering, the National Aeronautical Establishment) and the Applied Physics Division, provide direct assistance to industry for research of nation-wide interest to industry as a whole or to a particular industry. This assistance includes contract research, testing of products that cannot be done by industry for lack of special equipment or highly qualified personnel, in-plant investigations of unusual problems relating to failure of equipment or new designs and development, provision of laboratory standards of measurement and calibration services, and the provision of scientific and technical information.

It is general policy that government research laboratories avoid competition with commercial research and testing companies, but the lack of highly sophisticated facilities requires that government laboratories undertake work that might be done in other countries by research associations or the Battelle Foundation type of organization. Such work is not sought after as a source of revenue but is undertaken on request from industry. It may be done free of charge if of industry-wide importance, or on a contract basis with the charges covering, in general, salary and 100 per cent overhead costs.

Examples of the free type of applied research include improvements in railway and automotive equipment and lubricants, with particular regard for operation in cold weather; in the design of refrigerated storage warehouse railway cars and automotive truck bodies to improve the storage and transport of refrigerated foodstuffs; in the reduction of impact damage to railway shipments; in the design of propellers, marine hulls and superstructure of vessels ranging from large cargo ships down to fishing vessels; in materials, components, design and construction used in buildings; in the equipment involved in the transmission of power at high voltage over long distance; in telecommunication and radar equipment and components for special purposes; in the design of machine tools and production techniques; in the application of gas-lubricated bearings in industry etc.

Some of the work is undertaken to meet government or industrial needs that are not large or profitable enough to justify any one company's undertaking the initial research and development, although many might be qualified to do so. However, the results achieved often turn out to be exploitable commercially in other ways, and the opportunity for such exploitation is afforded through licensing of manufacturing rights to industry through the Canadian Patent and Development Corporation.

This corporation is a subsidiary company of NRC and is responsible for patenting any inventions, processes or products resulting from NRC research and licensing them, preferably to Canadian industry for exploitation. A number of government departments, universities and provincial research councils also use the corporation to handle their inventions. The corporation operates on a non-profit basis, and any surplus from royalties is used to finance development contracts when industry needs convincing of the value of an item. Its income in 1966 was $370,000.

Canadian companies in the past have been somewhat slow to make use of licences, which foreign companies have then exploited successfully. This situation

is improving, and several small companies are manufacturing such items as measuring instruments, aircraft crash-position indicators; small, inexpensive lasers for commercial and educational use; a low-cost, transistorized marine radar for small vessels; ear-defender headphones used by airport ground crews to avoid jet-engine noise; medical and medical-electronic instruments and equipment; absorption-type refrigerators for tropical countries; and lobster-splitting machines.

Contract research is undertaken mainly for large companies whose own research facilities cannot meet special requirements for lack of essential equipment or qualified personnel. This work is confidential, and the results belong to the company paying for the research. Examples of this include separation processes for solutions and for mixed solids; investigation of electrical and other properties of carbon black reinforced rubbers; causes of poor cutting and sewing characteristics of cotton drill; deterioration of plastic-coated sportswear fabrics; textile flammability; resistance to weathering and abrasion of textiles and disposal of industrial wastes.

The standard testing of industrial products and the materials used by industry is avoided if it can be done commercially, since it interferes with research and more sophisticated testing programmes and adds to the administrative load. Three NRC divisions, the Mechanical Engineering Division, the Building Research Division and the National Aeronautical Establishment, provide special testing facilities for industrial use, such as large wind tunnels, full-scale fire-testing facilities to test building materials in structural form, and a large tow tank to test marine hulls. In addition to these unique and expensive facilities, other costly and sophisticated equipment, which medium-sized or small industry cannot afford to own for occasional use, is available throughout NRC to undertake testing required by industry. A typical example is the testing of a large, high-voltage, power transformer under low-temperature conditions. NRC had the only low-temperature facility large enough to enclose the transformer.

Personnel in NRC and other government research laboratories always are available for personal consultation and advice on industrial problems. If not too much time is required, this is given without charge on an informal basis, and the company pays only the cost of travelling to the government laboratories. Furthermore, the government scientist may visit the company to investigate unusual industrial problems in the plant, sometimes bringing along special equipment such as high-speed photographic devices. Obviously, such a service must be restricted because of travel costs and the need to avoid undue diversion of time and effort from the primary research and development work. Accordingly, companies within reasonable travelling distance of Ottawa have an advantage, which is overcome to some extent by the provincial research councils, which will be discussed later.

The possibility of setting up an industrial laboratory in NRC to provide technical assistance in solving technical problems in industry, and thus relieve the other divisions of this specialized work, has been considered. A major problem would be to keep the various specialists fully employed because of varying work loads. Equipment would have to be duplicated, competent research staff would

be difficult to attract, and the opportunity for direct contact between industry and the NRC research divisions would be reduced.

Although such a laboratory might form the initial step in a developing country, leading to the establishment of an institute to provide research and development support to industry, problems such as those found in Singapore can arise. Here it has proved difficult to attract suitably qualified research staff, and the laboratories have been unable to develop their research capabilities and thus upgrade their technical support.

The Applied Physics Division has the responsibility for establishing and maintaining national standards of measurement, their integration with international standards and their application to Canadian industry. Its functions are comparable in many ways to those of the Bureau of Standards in the United States and the National Physical Laboratory in the United Kingdom. Its work in acoustics, optics, electricity, heat and solid-state physics, interferometry, evaporated thin films, metrology, photogrammetry, X-rays and nuclear radiations has resulted in the production of standards and instruments used throughout industry. Examples of these include six- and five-figure standard potentiometers, a direct reading bridge for resistance thermometers, low-level mechanical choppers, a hundred-position rotary switch, transistorized temperature controls, lasers and laboratory salinometers.

The division operates a calibration service, which supplies physical standards and accurately calibrated instruments for use as standards by companies across Canada. For example, it supplies a variety of types of length standards, calibrated each year in terms of standard wavelengths to an accuracy of two millionths of an inch. It calibrates and certifies instruments for measuring pressure over the range 1×10^{-3} to 3,000 atmospheres. It calibrates aerial survey cameras and other photogrammetric equipment for aerial survey companies. Reference standards for radio frequencies and time are made available to industry and other users through radio broadcasts.

Although the need for such services in developing countries, on first consideration, may seem questionable, it must be remembered that industries in these countries now face extremely competitive markets, both domestic and foreign. Small products are made to higher standards, more rigid specifications and finer tolerances. This is reflected in the technical level of requests from industry for technical assistance and information. Developing countries would be well-advised to consider making standards and calibration services available to industry and to encourage their use.

The National Science Library

The position of the NRC library as the National Science Library of Canada has been mentioned earlier. In 1916, when NRC was first formed, Canadian universities and other organizations lacked significant scientific and technical libraries. Accordingly, a policy was adopted whereby the limited funds available were to be used to build up a strong, central scientific library at NRC that would support scientific activities as they developed elsewhere in the country. In accordance with this policy, scientific and technical publications of value to

the Canadian scientific community have been collected comprehensively, but there has been no attempt to duplicate the collections of government departments in certain fields such as agriculture, fisheries, forestry, geology, mining and atomic energy. The resources of these departmental libraries can be made readily available to scientists anywhere in Canada through loans or NRC's central photocopying service. The National Science Library supplements these collections by purchasing any worth-while items not bought by other departments because of their high cost or limited use.

The collection of the library has grown from about 1,000 volumes in 1920 to over 6 million volumes today, including journals and other serial publications, books, pamphlets and technical and research reports, many of the latter in the form of microtext. It is the national depository for documentation received from other countries, such as the reports issued by the Clearinghouse in Washington. The bulk of this material is housed in the main library, with smaller and more specialized collections located at six branch libraries set up to serve NRC divisions some distance from the main library, e.g. the National Aeronautical Establishment and the Building Research Division.

The professional staff of the National Science Library, having a background knowledge of scientific literature and the various fields of science, is trained to seek out all types of information and data and to compile bibliographies and abstracts. The resources and information service of the library are brought to the attention of scientists and industry through a number of library publications.

The inter-library network described above makes the world's scientific literature accessible to Canadians. The larger industrial companies use this network to supplement their own libraries, which generally are oriented towards their particular fields. Small industry does not as yet make much use of these facilities, and the Technical Information Service of NRC was created to remedy this situation.

The Technical Information Service

The National Research Council established the Technical Information Service (TIS) in 1945 to keep small and medium-sized secondary manufacturing companies abreast of new technological developments and the results of research. It was felt that large companies, in general, had the money, the facilities, the affiliations and information channels necessary to keep themselves reasonably well-informed. The smaller firms, however, many of which had been employed in defence work during the Second World War, were faced with the conversion to peace-time operations and the development of new processing techniques and new products without the technical aid so readily available from the large prime contractors during wartime. Out of 33,000 industrial firms in Canada today, 95 per cent employ 200 workers or fewer, accounting for 40 per cent of the factory labour force. They produce 40 per cent of factory shipments and form an important market for the primary producers.

Many of the small firms have a limited professional staff, or none at all, and find it difficult to spare the time from the immediate everyday problems of production, sales, financing etc. to visit the nearest technical library, which may be 100 miles or more distant. Some firms do not have the technical ability to search for the information and apply it satisfactorily to their operations. Such companies may rely for technical information on one or two technical or trade association journals dealing with their own industry or on information picked up at conventions and association meetings, or from their suppliers. Developments in other fields that might have application to their own industry thus escape them.

Inquiry and answer service

The initial efforts of TIS concentrated upon developing an inquiry and answer service, the important feature of which was its field operations. It was felt strongly that if the service confined itself to NRC headquarters in Ottawa and waited for small industry to come to it for information, the service would fail. Although NRC enjoyed a good reputation for the quality of its research and facilities, it was, and still is, difficult to maintain a real awareness in industry of NRC's capabilities because of the limited opportunities to visit it. Furthermore, small industry generally is reluctant to approach such an eminent organization with its problems or is incapable of describing the technical problems satisfactorily in a letter. Accordingly, a network of field offices was organized in the major cities across Canada from which field officers could make personal visits to industrial firms in the province to discuss their problems and needs.

Field operations co-ordinated with provincial research councils

In 1952, one of the provincial research councils proposed that it take over the NRC field service in the province. There are six of these provincial councils active in Canada. They are much smaller than NRC and primarily undertake fundamental and applied research aimed at the development of the natural resources of their province and the exploitation of these resources through provincial industry. Their operating budgets run from $0.6 million to $3.0 million, and all of them receive support from government funds, varying from 35 to 75 per cent of their budget. Two of them in particular depend considerably upon revenue from contract research, development and testing for the Government and industry. Revenue from endowment funds contributed by the Government and industry make up the remainder of their budget. None of them has succeeded in becoming completely independent of government support.

With one exception, each council has its own research laboratories and has built up competent research teams and facilities in particular disciplines associated with the natural resources and the economic development of its province. One council has for many years co-ordinated and administered provincial research programmes which have been placed, project by project, in suitable research facilities of provincial universities and other research organizations. However, it, too, will have its own laboratories shortly.

These research councils operate field services, which visit industry to locate industrial needs for research and technical assistance and to provide a connexion between the laboratories and industry. To avoid duplication of effort and travelling expense and confusion on the part of industry as to the identity of the NRC and provincial services, the proposal was made to amalgamate them. It was felt also that the two services were complementary and that the provincial men, being closely acquainted with and directly interested in the development of industry in their own provinces and supported by their own laboratory associates and facilities, should be able to do a more comprehensive job for the same expenditure.

Agreements were entered into with the six councils to undertake the TIS field work for an annual fee. Two councils are responsible for adjoining provinces where there is insufficient industry as yet to justify a field office. TIS continues to operate four field offices in Manitoba, Eastern Ontario and Quebec.

These arrangements have worked well in general, although it is more difficult for TIS to obtain data and assess results than when it operates its own offices. The effectiveness of one of the largest councils, which depends largely upon its contract research for revenue, is doubtful as far as information work with small industry is concerned, since small companies are not potential research clients and do not receive as much attention as the larger companies. It eventually may become necessary to revert to a TIS field office in that province.

In total, the field operations involve the equivalent of 24 men full time. These men are mainly chemical, mechanical and industrial engineers and a few electrical engineers. They are between 30 and 45 years of age and have had several years of experience in industry. Much of the inquiry work has to do with mechanical and chemical problems common to most industries, whereas the electrical and electronic industries generally are adequately staffed with professional engineers who seldom require assistance. The food industries require increasing attention, and biochemists and food technologists will be added to field staffs in the future.

The field officer is a key man, and TIS success or failure depends greatly on his personality, sales ability, technical education, industrial experience and versatility. He must be able to approach and win the confidence and support of all executive levels in the larger companies — the president, the general manager, the production manager, the shop foreman, or the owner of a small business and his men. These companies vary greatly, from heavy foundries to small electrical parts manufacturers, from woodworking factories to food-processing plants. He must cope with them all.

Extension methods

Field officers differ in their methods and approach. Some mail cards to companies advising them of the date they will be visiting their town and ask for prior notice of any problems. Others visit a town or area without warning and take their chances on finding people available to see them. Boards of trade and chambers of commerce or mayors of towns may be asked to arrange interviews with interested companies.

Some representatives follow up visits by mailing cards to check whether an answer was satisfactory, or if they received no answer to their inquiry, whether further amplification was needed. Others check these points on their next visit. Indexed files are kept on the visits made and activities undertaken with each company. Several field offices mail out newsletters covering interesting items of research or development and include mailing blanks inviting inquiries.

These methods are successful in some areas and fail in others, but of all methods, the personal visit is the most effective. The field men literally "ferret out" the problems of small industry. The owner or production boss of a small firm of 5 to 25 employees is frequently a man in his shirt sleeves, working with his men all day and handling the paperwork as best he can. He has neither the time, inclination, or, perhaps, the ability to sit down and write a letter about the problems he is aware of in his own operations, but he can always find time to discuss them personally with the field man over a cup of coffee or at lunch or in the evening. Often problems exist that he has not recognized, and a well-trained and knowledgeable field representative can spot these during a tour of a plant and diplomatically bring them out into the open. The field officer must always be aware of the sensitivities of his client and not offend him by a "know-it-all" attitude, or lower his own prestige by incautious observations based on limited personal experience.

If he cannot solve a problem from his own knowledge or from the resources of his provincial council, the field man must make a careful presentation of the problem to Ottawa. Not only must he give sufficient technical background and operating data which are relevant to the problem, but he must also provide some general information on the position the man occupies and the nature and the size of the firm he is dealing with, as this will have a definite bearing on the kind of answer provided from Ottawa. An answer to a small wood-working or machine shop will be considerably different from the reply to the chief engineer of a textile mill or the chief chemist of a plastics plant.

The field officer also performs an important cross-fertilization function in small industry. It is a basic principle that he must maintain strict commercial security as to what he sees in various plants that give a company a competitive advantage in its field of industry. Nevertheless, he often notices ingenious production devices, methods and techniques that could be employed advantageously in other industries not in competition with the company originating the idea. If necessary, he obtains the company's consent to suggest the application of the idea, or a modification of it, to replace inferior procedures or to solve production problems in other companies.

The field offices operated by the provincial research councils have some definite advantages over those operated by NRC staff. They have the technical facilities, the staff and the budget from provincial sources to provide technical assistance to small industry in addition to technical information. They have an official position in the provincial government organization and official relationships and channels of communication with those provincial government departments concerned with industrial development, taxation, labour, education etc. Thus, they can influence government thought and action to help the

small industries in many ways. On the other hand, while the NRC offices can and do keep in touch with provincial government departments and, in fact, are generally more knowledgeable of the individual companies in the province than are these departments, which lack the immediate contact provided by field officers, the NRC offices are not in a position to press for provincial action as can the provincial research councils.

The NRC field officer does enjoy one advantage. The small industrialist, while inwardly recognizing the need for government action with respect to tariffs, taxation, rules and regulations etc., nevertheless tends to resent government officials to some extent and to be suspicious of their motives, often because of personal experience in which he considers he was unjustly treated. NRC field men generally receive a warm welcome from small industrialists, particularly so when the industrialists have become acquainted with them. On initial visits the industrialist often is polite but wary until he establishes what government agency NRC represents and its purpose. This seems to be associated mainly with the possibility that information may filter through to the tax authorities or to competitors.

NRC's position as a federal research and technical agency having an objective interest in assisting industry in general, separate from a government department, and remote from political influences and pressures, gives it an entrée into the confidence of the small industrialist. The provincial research councils enjoy a similar position, but their closer relationship to the provincial government and their technical involvement with competitor companies sometimes creates reserve of a minor nature in the company's attitude.

Experience in other countries

The advantages of associating a field office directly with a scientific and technically oriented institution have been recognized elsewhere. In the Netherlands, which was the first country to set up a field type of information service, field officers serve particular industries. They are able to refer difficult problems to the research association for the industry. The United Kingdom has industrial liaison centres based on technical colleges and universities, staffed by industrial liaison officers who also serve on the college staff. These centres have direct channels to the United Kingdom research association laboratories. The Scandinavian countries, particularly Denmark and Norway, also operate on this principle, and the United States has adopted it in the new State Technical Services Organization.

Among the developing countries, the Light Industries Service of Singapore is a good example of a field service directed towards small industry, although the service is only in the fledgling stage. It is associated with a research institute, and both are under the direction and control of the Economic Development Board. It visits some 2,400 companies, provides advice on technology, financing, marketing, gives short training courses in demonstration workshops, conducts short courses on simple management techniques, operates a technical information service and arranges loans for working capital and purchase of equipment. It refers problems requiring short-term research and technical assistance to the

research institute, but is establishing laboratories of its own in fields not covered by the institute, such as food technology. Here, as in Denmark and the Netherlands, the small size of the country and the concentration of industry close to the facilities of the service enhance its effectiveness.

Substantive support

The field offices in Canada are supported by a staff of 26 scientists and engineers at NRC headquarters in Ottawa. This group includes 7 mechanical engineers, 6 chemical engineers, 3 chemists, 2 biochemists specializing in food processing, 1 metallurgical-chemical engineer, 1 mechanical-electrical engineer, 3 electrical engineers, 1 biologist and 1 physicist. All but one have university degrees, including 3 Ph.D.s, 5 M.Sc.s and 17 B.Sc.s. One man holds a Higher National Certificate from the United Kingdom in mechanical engineering.

These staff officers are chosen for their breadth of knowledge and experience, maturity and judgement, and their ability to express themselves in writing. Field officers prefer to send in questions they know will be answered by officers experienced in that area, and tend to avoid questions likely to receive less competent treatment. Most of the staff have had from 10 to 30 years or more of industrial experience, which helps them greatly to understand the viewpoint of the man in the factory and his problems.

The ages of these men vary between 30 and 65. NRC has no hesitation in engaging people up to 55 or 60 years of age if they are physically fit, mentally alert and progressive in thought, since they can contribute usefully for at least 5 years before compulsory retirement at 65.

Three staff members are bilingual in French and English and handle the translation of correspondence with French-speaking Canadians when necessary. Others have a knowledge of Dutch, German and Spanish. The facilities of the library translations staff are available for other languages if needed.

It is not difficult to train professional people for TIS work. The actual routine of where and how to obtain information is relatively simple. The amount of effort to be put into the answer requires development of judgement, which is achieved with the personal assistance of a senior staff officer appointed to work with the newcomer for the first month or two, coupled with some basic instructions contained in a manual. Some men, accustomed to the sophisticated operations of large companies, take a little while to develop a feel for helping small industry and to exercise their imagination and initiative in locating unusual or obscure sources of information.

Staff officers are allotted certain fields in which to specialize, such as plastics, textiles, metal processing, food technology, electronics, construction materials, chemical specialities, corrosion and packaging. They must be prepared, however, to handle miscellaneous questions so as to prevent overloading of any one officer.

Although the field representatives belonging to provincial research organizations can, and sometimes do, participate in the testing and applied research programmes of the parent unit, the Ottawa TIS group undertakes no testing or research. Such requirements are referred to commercial laboratories if available, otherwise to NRC, provincial research organizations or universities.

The Ottawa personnel is occupied entirely with answering problems received from field offices, or those mailed or telephoned directly from an inquirer to the Ottawa office. In this regard, TIS performs a very useful service for NRC and other government departments, which receive many queries of a technical nature. Formerly these departments did their best to answer such questions from their own resources, but now they refer many of them to TIS. Similarly, TIS is able to relieve NRC's scientists of time-consuming work that would interfere with their laboratory research.

TIS staff officers have several major sources of information. They depend first of all upon their personal knowledge and the files they have built up in their own specialized fields. They may consult their colleagues, who, with their wide and varied experience in industry, are frequently able to make useful suggestions. They may refer to TIS files containing technical articles from publications such as company technical bulletins and journals, which are not always covered by the standard commercial indices. They may draw upon some 70,000 previous inquiries and answers, which have been indexed and filed in TIS files from the inception of the service. Duplicate or very similar questions often are received and may be answered readily by bringing a previous answer up to date or extracting relevant parts from it.

The National Science Library is one of the most important sources of information, and TIS staff officers usually conduct their own searches of library material. Since they can quickly identify and select material relevant to the query, they can save considerable time and leave the library staff free for other duties. In doing this they often come across information useful in answering other queries. Being relieved of the responsibility of maintaining a library, with its many problems of documentation, TIS is able to concentrate its entire effort on dissemination of information. Co-operation with the library is very close and most effective, so there has been no need to build up a separate TIS library. In fact, TIS is most fortunate to be associated with a library of this size, and developing countries should consider this point in setting up an information service. TIS does maintain a small section of reference books and indices, which are constantly used by staff officers in searching the literature and locating sources of products, trade names, trade marks, addresses of associations, commercial laboratories and so forth.

Specialists in the National Research Council and other government laboratories and departments are consulted in their special fields. Some laboratories give advice as to sources of information, provide suitable information from their own sources, or undertake to reply to the query directly. Others, such as NRC Building Research and the Forest Products Laboratories, ask TIS to refer to them all questions in their areas of interest. TIS receives copies of the replies and may supplement them from other sources. This occasionally happens when scientists are handling an inquiry in an area in which they have had little or no experience. They sometimes send a negative reply rather than undertake a time-consuming literature search or, perhaps, do not go further than their own library.

Other valuable sources of information are the foreign technical information

centres and services in many parts of the world. TIS maintains personal contact with many of these centres, and information is exchanged freely and on an informal basis with them.

Finally, TIS may go to industrial companies and associations for information. Canadian industrial associations are organized primarily to deal with commercial problems or government legislation of concern to a particular industry, and their technical interest generally is confined to standards and specifications. Nevertheless, such associations, both in Canada and abroad, often are able to suggest likely sources of information, and may even consult their members on behalf of TIS.

Individual firms have been most co-operative. They will not reveal commercial or trade secrets, but they are quite willing to provide information that should be common knowledge in a particular industry but often has not reached the small company. TIS is careful to explain the background of the inquiry and not reveal the names of either the inquirer or the source of information unless permission is obtained, so as to avoid any embarrassment or revelation of commercial secrets.

Unless circumstances require a reply by telephone or telegram, TIS answers inquiries by letter, with the letter tailored to suit the technical and personal background of the inquirer and his location. This is not easy to do, and good background information from the field is essential if it is to be done well.

TIS tries to provide a definite answer, which may summarize the general state of progress in a particular field and relate this to the problem, and give a professional opinion or suggestion as to action that might be taken. This usually is supported by a selected bibliography that will enable the recipient to pursue the subject more deeply if he wishes. TIS avoids answering a question with bibliographical references only unless this is specifically requested, as sometimes happens when a client is a professional man.

When technical libraries are not readily available in the inquirer's locality or fast action is important, TIS sends photocopies of pertinent articles free of charge, if they are not too long. Otherwise the client is referred to the NRC photocopying service, which provides photocopies at a nominal charge, or informed where the nearest library having the publications to which he has been referred is located.

TIS might be accused of "spoon feeding" its clients in this respect, but it has two objects in mind. First, TIS wishes to convince the new client that it can provide him with useful information. Second, it wishes to help the small business firm to overcome some of the disadvantages of its size or isolated location. Once people are convinced of the value of the service, they will be prepared to do much more on their own in following up references TIS gives them.

In addition to inquiries from industry, numerous questions are received from inventors, private individuals, students, and, unfortunately, mentally unbalanced people. TIS may give an opinion as to the practicability of an invention and advice on what action should be taken, but it avoids endorsing any device or product that could be used for publicity or advertising. TIS does not condemn a product outright even if it is of doubtful quality. Instead, it provides

critical comments from published sources. To promote good public relations, TIS answers queries from private individuals but restricts the time and effort involved.

Industrial Engineering Section

The inquiry and answer service met an immediate need of small industry, and the demands for this service grew as fast as manpower and money could be provided for the field operations and the supporting staff in Ottawa. At first, TIS concentrated its total effort on this type of service, an error that other countries should avoid, if circumstances permit.

This passive type of service was inadequate for keeping industry informed of new technology and research, and it was decided that information should be provided in an active way. For several years TSC had been receiving requests from small firms for assistance with production control and some aspects of business management. Aside from their technical problems, many small entrepreneurs were having difficulty because of their elementary cost accounting systems, poor records and limited knowledge of elementary business management. Although much of this hardly could be classified as technical information, it was relatively easy for TIS to obtain suitable articles and texts on cost accounting, for example, and to help the small entrepreneur install simple but effective systems and controls. Strange as it may seem, there was, and still is, no major organization in Canada, such as a productivity centre, to help small industry in this area. Nor is there any co-ordination of the various programmes sponsored by several federal and provincial government departments, educational authorities and industrial associations which cover various aspects of business management and productivity.

Accordingly, in 1962, it was decided to initiate a second section within TIS, the Industrial Engineering Section. Qualified industrial engineers were recruited for the field offices and Ottawa staff, and they now total nine in the field and three in Ottawa. The provincial research councils which, in some cases, were rather lukewarm to the idea, have found these men so useful that they have provided for additional staff in their provincial budgets.

Most of these men are mechanical, chemical or electrical engineers who have taken formal training in industrial engineering subjects and have acquired many years of experience in manufacturing companies and consulting firms. Some of them have industrial engineering degrees, but, since the output of industrial engineers from Canadian universities is very limited at present, they are difficult to obtain and command high salaries from industry. In some cases TIS had to select suitable men from its inquiry section and train them in work-study schools. With the initial guidance and help of their industrial engineering colleagues, these men have done very well, and developing countries lacking experienced industrial engineers might consider having them trained in this manner, either within or without their country.

The field industrial engineer visits industry, as does the inquiry officer, and they co-operate very closely in their work. The industrial engineer has such a heavy work load that he seldom has time to make introductory calls.

The inquiry officer, when he sees a company in need of industrial engineering services, refers the company to his colleague. Similarly, the industrial engineer often refers technical inquiries, which he encounters in the companies he is working with, to the inquiry officer. In addition, the industrial engineers have been so successful that their satisfied clients recommend TIS to other small companies.

The industrial engineer differs somewhat from the inquiry officer in that he is qualified in a particular field and works only in that field as a specialist, whereas the inquiry officer must handle technical problems of a great variety and not necessarily within his competence. This means that the industrial engineer does not need to refer many problems to Ottawa, although he may do so when dealing with larger companies having an industrial engineering organization that requires sophisticated information not readily available in the field. Accordingly, the Ottawa support consists of the selection and abstracting of industrial engineering material from the literature to keep the field officer informed on new techniques, methods and applications and to improve the field officer's knowledge in areas in which he lacks experience. This literature also is made available to clients.

The Ottawa industrial engineering staff also conducts field operations in the Ottawa area to obtain first-hand information on the requirements of industry and to experiment with and develop techniques to meet these requirements. It is difficult to initiate experimental programmes in the field offices, which are too far away to establish the personal communication necessary to explain and follow up such a programme and whose staff are too occupied by their normal work to take a real interest in experimentation.

The industrial engineer field officer usually begins his work with a company by discussing with the owner or president, in a general way, the principles, methods and techniques of industrial engineering practice as applied to the production facilities of the company. The next step is often a tour around the plant, during which it is very easy for an experienced industrial engineer to point out obvious deficiencies in plant layout, use of men and machines, handling of materials and inventory control and so forth. Very often the production people are aware of these deficiencies and welcome the industrial engineer's support in convincing management to take action.

At this stage, a consulting firm would normally undertake to survey the plant and its operating records, recommend and make changes to improve the over-all productivity of the plant. However, most small companies cannot afford the heavy fees involved for a complete overhaul of their operations so that the offer of free assistance from TIS on a do-it-yourself basis is welcomed.

Some companies, to be sure, do not wish assistance. Often these are family-owned firms which have had no competition with their special products for many years and fail to realize the need to raise their productivity or are too lethargic to do so. Other small companies lack the intelligence and the ability to upgrade their operations, but there are far more firms eager to improve their performance through TIS assistance than TIS can handle.

The next step is to have the company produce certain data from its operating records. This may take several weeks. TIS then goes over the records with company officials, pointing out the areas of weakness that are revealed and suggesting remedial action. This again may take several weeks, or even months, and from time to time the company may ask TIS to help it implement some of the suggestions. Usually the firm is encouraged to concentrate on some particular aspect, such as plant layout, and proceed, step by step, with a programme to improve various parts of the plant. A TIS man may spend from 30 to 60 hours in 5 to 10 visits with a company.

TIS always encourages companies to have some of their staff trained in industrial engineering techniques, even though this training may be limited to some of the elementary work-study methods. This raises the question as to where staff can be trained. TIS devoted much effort in the first year of operation to promoting and organizing work-study schools, industrial engineering courses in universities, work practitioner courses in technological schools, and short seminars and courses in various cities. However, training and education of this nature does not come within the competence of TIS and, although the provincial research councils engage in such activities using their own funds, TIS now confines itself to a promotional role. TIS informs schools as to the success of their pupils in industry, suggests desirable changes in the curriculum, and continues to persuade companies to send their staff to the schools.

TIS field men also become involved in various regional activities having to do with industrial development generally. In some of the remote and less accessible parts of Canada, these field officers, both inquiry and industrial engineering officers, are the only engineeres with whom local industries have contact. As a result, TIS is asked for advice on promotion of co-operative enterprises, on how to attract new industries and the tourist trade, and on other community problems that properly belong in the hands of other authorities. TIS offers the best advice it can, puts the community in touch with the proper authorities and, sometimes, continues to act in a liaison capacity.

The results of the industrial engineering service are most encouraging and worth while. Although it lacks sufficient staff to meet the need, its work has a catalytic effect, and its ultimate indirect effects on industry will be far-reaching. It is significant that many TIS industrial engineering officers have received very attractive offers from companies, yet have chosen to stay with TIS because of the challenging nature and variety of the work and the satisfaction they derive from their personal accomplishments in helping small firms.

Technological Developments Section

A further step in providing positive information was taken in 1965 when a third section, the Technological Developments Section, was formed in TIS primarily to supply Canadian industry with selected technical information of value to specific industries. Its office is in Ottawa.

During the course of their literature searches and general reading, TIS staff officers frequently come across items of industrial importance describing new materials, new production tools, new processes, new trends in development

and research and new products. The staff officer's own background of industrial experience and his work in answering technical inquiries give him some concept of the kind of item that might be of interest to various companies. He refers these to the Technological Developments Section, which adds items selected by its own staff from specific technical journals, abstract journals, technical bulletins etc. These items receive further careful screening as to their ultimate value, and the selected items are indexed and filed.

A further selection is made, as material accumulates, of six items pertaining to a particular industry, such as the baking industry, machinery manufacturers, electrical, metal and food industries etc., in accordance with the Standard Industrial Classification List used by the Dominion Bureau of Statistics (DBS). Although this list is far from satisfactory for TIS purposes, TIS is able to use the DBS mailing list, which covers all Canadian manufacturers and is the only mailing list kept currently up to date. Abstracts of the six items are mailed to industry. Manufacturers interested in any of the abstracts may write to the original source or to TIS for more information, which often develops into a technical inquiry. Many of the items are applicable to more than one industry, and these lists of abstracts are a means of transmitting ideas from one industry to another.

This work still is regarded as experimental, although it appears to be filling a need. TIS has made one attempt to evaluate it by requesting 100 electrical companies, of all sizes, to provide a profile indicating their technical interests. Each company was sent a list of items that appeared to apply to them, and they were requested to comment on the value of these items for immediate use, for possible future use or on their lack of value. Seventy companies responded, including many large and medium-sized firms. Forty reported keen interest in the programme and mentioned at least one item as being of excellent or good usable value. The other thirty companies indicated that items were not applicable to their company or that they did not wish to continue the experiment.

A second experiment with the metal industries will involve computer selection from a computerized index of the information available in TIS files. The abstracts cover recent items, but companies are also interested in receiving information going back perhaps three or four years. This applies particularly to small firms or firms entering a new product field. Accordingly, check lists are sent out in the same way as abstracts but listing only the titles of some fifteen selected items. These also have aroused considerable interest, as evidenced by requests for items. All of these mailings are referred to the field officer serving the area in which the companies are located, and field offices report a number of new clients getting in touch with them as a result.

TIS frequently receives duplicate queries, particularly following the advent of publicity on new developments such as the application of ultrasonics, thermoelectricity, radioactive isotope tracers, spark erosion machining or explosive forming to manufacturing processes. If the queries or heavy coverage in the technical press indicate interest in a special subject, the Technological Developments Section may prepare a TIS review. This gives a summary, at the level of a technical layman, of the state of the art involved and a bibliographical reference

of selected articles and texts. It is available for distribution by field officers or in reply to queries.

The Technological Developments Section also is responsible for audio-visual information material. This is restricted, at present, to industrial engineering films that illustrate useful techniques as applied in various industries. The commercial films available are limited in number, contain a good deal of extraneous advertising material and tend to be out of date in setting, if not in content.

TIS is experimenting, with the help of the film production unit of the NRC public relations branch, with the production of 8 mm cinema film loops of 5 minutes duration, which illustrate industrial engineering methods and unusual processing techniques such as spark erosion machining. These will be used by the field officer to present to individual firms or groups of company representatives.

This section also is experimenting with the use of computer retrieval of information. It is storing all of its own items of information, the industrial engineering literature, and the technical inquiries on tape in reference form and is maintaining a computerized index of the material. The availability of the NRC computer service is a great convenience and help.

Costs and charges

The TIS budget for 1967/1968 was $842,000, of which $497,000 was required for salaries of the 26 professionals and the 16 clerical staff in the field and Ottawa offices, $300,000 for fees to the provincial research councils, and the remainder for operating expenses such as travel, duplication, office equipment, and supplies. This budget does not include charges for office space, library facilities and administrative services provided by NRC.

The services of TIS are completely free of charge. In this TIS differs from most information services, which usually charge for some of their services. In some respects TIS might be regarded as a form of welfare service to assist the "have not" segments of industry. However, TIS does not waste its limited efforts on the ineffective, uninterested company, which eventually will close down.

TIS help is intended to promote the growth of small companies that can use the assistance effectively to expand their operations to the over-all benefit of the Canadian economy. TIS expenditures will eventually be recovered through the resultant increase in the normal sources of government revenue. TIS has achieved savings in some government departments through its technical assistance.

Technical information services elsewhere feel that a charge for a service makes it more valuable in the client's view and that he is more likely to be careful in his requests and utilize fully the information given. This has a certain validity, but TIS feels that, with a free service, it can reach a far greater percentage of small industry under the difficult conditions imposed by the vast distances in Canada, and that a certain amount of wasted effort is more than offset by wide acceptance. The constantly increasing number of companies making repetitive use of TIS service, without solicitation, is indicative of this acceptance.

Nevertheless, TIS finds, as do most technical information services, that small industries need reminding of the existence of its service, even though

TIS has served them successfully in the past. Publicity in the form of bulletins, newsletters, articles in newspapers and journals all serve this purpose to some extent, but the results are rather fleeting in nature. Advertising, unless it is done continuously on a large scale, which is financially prohibitive, produces only little interest. The personal visits of field officers are the most productive of results, and they can be controlled to maintain a balance between the demand upon the supporting staff and their capability to meet it. Undue delays, caused by overloading of the central office staff, can be frustrating to the clients and the field officer alike.

Types of services for developing countries

One general observation might be made here concerning the relationship between technical information services for industry and national productivity centres. In many countries the two are separate entities, yet both are directed towards the same user. Generally, the productivity centres seem to have a wider and more direct contact with industry and, perhaps, are better organized to promote and institute international co-operation.

The Danish Technical Information Service (DTO) is an example of an effective combination of a research organization, a productivity centre and a technical information service, operating from a central office in a relatively small country and in complete contact with its industrial community. The Netherlands Technical Information Service (RND) provides essentially the same combination, although it is more loosely organized. Singapore is organized on this basis and the German (Federal Republic) Centre (RKW) and the Greek Productivity Centre are examples of combined productivity and technical information centres.

The developing countries should give some thought, in organizing their services, to the combination or co-ordination of activities in research, technical information and productivity.

International activities

TIS has a definite interest in promoting co-operation and communication among technical information centres serving industry throughout the world. TIS has provided the chairman and secretariat of the Study Group on Technical Information for Industry in the International Federation for Documentation since 1960. TIS is represented on a Standing Committee of the Pacific Science Association, concerned with scientific and technical information, and has served in various capacities in OECD on matters concerning technical information for industry. The technical information services in developing countries should make every effort to be represented on international organizations in this field, within the limits of their manpower and finances, and to establish direct personal contacts with their counterparts elsewhere in the world. Such contacts have been most valuable to TIS in developing its own service and in providing assistance in return.

TIS is interested in the possibility of providing information support from Ottawa to a field office in a developing country whose technical library resources

are limited. Experience shows that the problems of small industry around the world are similar in nature, although the solutions may be different. There undoubtedly would be problems owing to language difficulties and unfamiliarity with local conditions concerning labour, equipment, processing methods and general facilities. However, there is a reasonable chance that these could be overcome, perhaps through the loan of a TIS staff officer to assist in the establishment of a field office and TIS assistance in training field office personnel.

TIS has an informal arrangement with the Light Industries Service of Singapore and the Greek Productivity Centre in Athens. The latter has made continual use of the TIS service and others in the Netherlands and the United Kingdom for the past three years. TIS has undertaken to train a Greek engineer and a Syrian librarian to operate field services similar to those of TIS.

TIS has no budget for this type of activity, and its efforts are limited by the over-all capabilities of its staff to absorb this extra work. However, it is thought that formal arrangements through official government channels might lead to the inclusion of this type of assistance in the external aid programme.

INDUSTRIAL RESEARCH ASSISTANCE PROGRAMME

TIS has been given the responsibility for administering a federal government fund provided to NRC to stimulate and promote interest in research in Canadian industry and to establish competent research teams in industrial companies. In view of TIS's contacts with all branches of Canadian industry, it was felt that TIS might be in a good position to promote the programme. The programme is not part of the information work of TIS. The fund is administered under the general policies and directions of a committee of senior government officials representing departments concerned with research. A secondary objective of the programme is to promote a better understanding and contact between industrial laboratories and the scientists in government laboratories and universities, and a better knowledge of the requirements of industry.

Companies may submit research projects of their own choosing and which involve the permanent addition of new personnel to undertake the research, including scientists, engineers and technicians. Government scientists advise the committee as to the quality of the research, the capability of the research staff proposed, the feasibility and prospects of success. They also act as liaison officers with the company following approval of a project.

NRC pays only the salaries of the research personnel included in the project, and this makes administration of the programme relatively simple. Long-term, applied research projects of three to five years are encouraged, and the company is expected to assume the salaries of the research team permanently upon completion of assistance. Support of the salaries of summer students engaged on these projects is given to encourage students to adopt research careers in industry. Support of professors' salaries also is given to provide their assistance in the staffing and training of the research teams, in directing the research and in improving the competency of the teams.

Approximately 25 per cent of the 90 companies currently participating in the programme employ 100 employees or fewer, including some with no more than 10 employees. Many of these small companies are making great progress, some of them at a high level of research. The failure of small companies in this programme, when this has occurred, has been due to insufficient capital to maintain their share of the expenditure, failure to differentiate between research in the laboratory stages and engineering development in the pre-production stages leading to a product, the diversion of research effort to solve production problems, and difficulty in attracting and retaining well-qualified research staff.

There are four other government-sponsored research programmes intended to stimulate research and development in Canadian industry. One of them is similar to the NRC programme but is restricted to research projects connected with defence. Two of the programmes, one for the defence industry and one for commercial industry, are concerned with supporting development of products based on inventions or the results of research and which represent more of a commercial risk than a company is prepared to undertake entirely on its own. Here, all costs are shared equally, and the Government's share is recoverable if the project is commercially profitable, whereas the NRC support is not.

The fifth fund provides a rebate of a specified percentage of that portion of a company's annual expenditure on research which represents an increase over its average research expenditure in a preceding period. The rebate applies to expenditure on the company's own programmes or the government-sponsored programmes, and it has encouraged a number of small companies to undertake research and development.

These programmes have resulted in a very marked rise in the amount of research undertaken in Canadian industry, including subsidiary companies of foreign firms, a considerable increase in capital investment in new laboratories and research equipment, an expansion of career opportunities for Canadian scientists, an upgrading of the level of research in many of the larger companies, and the introduction of research into a number of companies, both large and small, which had never undertaken research previously.

Developing countries may find programmes of this nature of value in promoting industrial research, provided that funds are sufficient, adequate support can be supplied by qualified research personnel in universities and other research organizations, and a source of scientists and engineers to enter industrial research is available.

APPENDIX

Types of problems handled by TIS

The following examples of technical problems submitted to TIS have been selected to illustrate the wide variety of requests for advice in various industrial fields submitted by both large and small companies. The inquiries and answers are in summary form to save space, but sufficient detail is given to enable the reader to visualize the problem and its solution.

1. A field officer sent in an inquiry from a small commercial bakery (10 employees) in a small town in Quebec – owner wanted recommendation of high-temperature (400 °F) lubricant for baking machinery present lubricant turned black, making machinery dirty he had heard there was a special white or colourless grease.
   Action: Enclosed photocopies of section from textbook dealing with high-temperature lubricant for bakery machinery and gave address of a company in Montreal specializing in such lubricants. Also discussed use of silicone greases for this purpose and gave addresses of two companies selling such greases.
2. The works manager of a large metal-tube manufacturer in Ontario wrote to request information on design factors involved in using smaller tubes in a heat exchanger than the size normally used. Gave a sample design problem and his own calculations up to the point at which he had difficulty. Requested a solution to the design problem, comments on the economics of using small tubes and advice on problems that might be expected in using them, and some literature references on heat exchanger design and applications.
   Action: Referred request to a research engineer in the Gas Dynamics Laboratory of the NRC Mechanical Engineering Division, who answered all four aspects of the inquiry in specific detail.
3. The works chemist of a large heavy chemicals manufacturing plant in Ontario wrote for information on stabilizing sulphurous acid used as a laboratory reagent. To reduce the frequency of checking the titer of the sulphurous acid used in volumetric analysis, mineral oil was used to exclude the air. Suggestions on possible inhibitors or other methods that might be used were requested.
   Action: Photocopies of pages from a textbook dealing with chemical analysis describing equipment used to exclude air from other reagent materials and which might be used with the sulphurous acid solution were supplied, and suggestions based on years of laboratory experience were offered on materials that could be added to the acid solution in an attempt to keep it at a standardized strength.
4. A representative of a small community in Nova Scotia seeking information on items that might be manufactured without large capital outlay or highly

skilled labour on a community basis asked for detailed information on the manufacture of candles of the type used in churches as votive lights.

Action: Detailed information on the manufacture of candles was supplied, including discussion of the ingredients used, waxes, acids, wicks and colouring materials, and sources of supply were indicated. Statistics on production and uses of candles were given, and a source of information on production costs and selling prices was suggested.

5. A large fish-processing company in Quebec requested assistance in improving production efficiency in several plants operated by the company.

Action: TIS industrial engineers visited the various plants and held discussions with the plant managers in Montreal over a period of six months. With assistance from plant personnel, industrial engineering techniques, such as diagnostic analysis, flow process charts, multiple activity charts, time studies, and camera studies of space and activities, were used to study the operations. Studies of photographs revealed obstacles that could be removed to facilitate movement of personnel and material, and adjustments that could be made to work spaces, such as lowering conveyor lines to make the work easier. Critical analysis of various operations revealed some areas, thought by management to be generally unimportant, where considerable savings in time and cost could be effected. Sustained tests in one plant with present equipment, but revised methods, showed an increase in usable quality products from 30 per cent to 41 per cent, resulting in an increase of factory production of 40 per cent and an almost equal percentage of profit. Improvements on a somewhat similar scale were made in other operations. The company is now aware of what can be accomplished by applying industrial engineering techniques and is preparing to apply them generally throughout its entire operation.

6. Through regular TIS channels a request was received from a manufacturer of clay bricks in Greece for information that might assist in overcoming trouble from cracks, occurring apparently from too-rapid drying of the bricks after they come from the shaping machine.

Action: Although it is recognized that specific recommendations cannot be made without detailed knowledge of the complete brickmaking process and possibly without samples of the bricks themselves, literature giving general information on brickmaking techniques and copies of articles from the technical literature dealing specifically with the drying of bricks were supplied. These articles, which review the various methods used to control the rate of drying in brickmaking, would suggest methods by which the manufacturer might overcome his difficulties.

7. A medium-sized manufacturer of laundry equipment requested information on the design of hydrostatic bearings.

Action: The matter was discussed with engineers in the NRC Division of Mechanical Engineering, where both hydrostatic air and hydrostatic oil bearings are used in a number of applications, and arrangements were made for the inquirer to visit their laboratories to see the applications and to discuss techniques. Comments prepared personally by one of the engineers in the division were forwarded to the inquirer along with a list of 25 references to articles in the periodical literature dealing with the design and application of hydrostatic bearings. It was determined that almost all of the articles referred to were readily available to the inquirer through libraries in his community.

8. An inquiry received from a town in western Canada asking for information on the economic feasibility and design features of a beet sugar factory was referred to the Department of Agriculture at Ottawa.
Action: After discussing some of the economic factors that should be considered and the relatively high competitive position for beet sugar produced in Canada, details on soil and climatic conditions necessary to develop beets with high sugar content required for economical production were given. Literature describing the production of beets and the manufacture of sugar was sent to the inquirer, and he was invited to visit one of the Department of Agriculture research stations to discuss his proposed factory with specialists.

9. A firm in Quebec, having trouble with graying, or "bloom", on prepared chocolate coatings on biscuits requested suggestions for preventing the trouble. Details of his formulation and information on the methods he used were supplied.
Actions: References from recent textbooks on biscuit manufacture indicated that bloom of two types might be expected with coatings made from the ingredients he was using, and suggestions for overcoming trouble by varying the cooling procedures and using correct storage or shipping conditions were supplied. In addition, formulations of coatings less susceptible to bloom and not requiring such careful handling for preventing it were sent.

10. An inquiry was received from a general engineering firm in the Maritime Provinces by the local provincial research council for information on the design and operation of a hydraulic winch suitable as a lobster trap hauler. A search of the literature revealed some information on hydraulic winches but nothing specifically on equipment for this purpose. Inquiries made to the fishing industry showed a widespread need for equipment of this type, and consequently the provincial research council set up the study, design and construction of such equipment as a major project.
Action: Visits were made to government establishments to contact personnel knowledgeable in hydraulics and their use, as well as to industrial organizations to locate manufacturers of equipment of this type. Visits were also made to the fishing industry to establish the type and size of winch most likely to be used on maritime trawlers. Work on the design of hydraulic equipment, along with associated electronic control apparatus, was undertaken in the provincial research council laboratories; and, with the co-operation of the Fisheries Research Board and industry, prototypes were tested and suggestions regarding desirable changes were made. Manufacturers of pumps supplied information on hydraulic pumps and design parameters. After several months' work, the designs of the winch and the control apparatus were completed, and sea trials were arranged. Several patents on equipment were obtained, and arrangements were made for commercial production.

TECHNICAL SERVICES AND FACILITIES FOR SMALL-SCALE AND MEDIUM-SIZED INDUSTRIES IN DENMARK*

GENERAL DESCRIPTION OF EXISTING SERVICES IN DANISH TECHNOLOGICAL INSTITUTES

The Technological Institute of Copenhagen

The Technological Institute of Copenhagen was founded in 1906, when the Danish economy was predominantly based on agriculture and industrial exports amounted to only 8 per cent of total exports, compared with 51 per cent in 1965. In 1906, 36.5 per cent of the population was employed in agriculture, against 18.6 per cent in 1960. Over the same period, employment in industry and handicrafts rose from 27.2 to 34.6 per cent of the total population. The purpose of the institute is to promote technological development within industry and handicrafts through training, consultation, research and information.

The institute is a self-governing body under the auspices of a committee of 44 members, who nominate among themselves a board of governors consisting of 14 members. Committee members include representatives from the Government, local governments, industry and handicrafts, employers and trade unions. The necessary funds to meet operating costs and expansion are obtained partly from the Government, the municipalities, organizations, institutions, foundations and partly through fees for tuition and advisory services. Government grants amount to about 60 per cent of annual operating costs.

The staff of the institute has risen from 5 in 1906 to 395 in 1967. Of these, 116 have university degrees and 153 various technical degrees. The number of staff will be increased to 700, which is considered to be a maximum for a polytechnological institute from the standpoint of efficiency. The total area

* Summaries of three papers presented to the symposium:

1 Short background of the origin of the Danish Technological Institute and Danish handicraft and industry—general description of existing services in Danish technological institutes, by the TECHNOLOGICAL INSTITUTE, COPENHAGEN, the JUTLAND TECHNOLOGICAL INSTITUTE OF AARHUS and the DANISH TEXTILE INSTITUTE, in collaboration.

2 Technological Institute's Wood Department—An example of co-operation with a specific branch, by Morten KNUDSEN, Head of the Wood Department, Technological Institute, Copenhagen.

3 Advisory services in management—recent and present trends in the development of a body of industrial consultants attached to industrial organizations in Denmark, by Erik J. A. OHRT, Assistant Director, Danish Employers' Confederation.

for laboratories, workshops and offices at present comprises 36,000 square metres; in the next 20 years, it is planned to increase it to 60,000 square metres.

The activities of the institute include research, consultation and training, accounting, respectively, for 20, 35 and 45 per cent of total activities. In recent years, 9,000 students have been enrolled, and the consulting and advisory service has answered approximately 40,000 inquiries, of which 25 per cent have resulted in paid consultations. The institute's activities are carried out by eighteen technical departments, organized in the following four divisions: Iron Division, Building Division, Chemistry Division and Business Management Division. Besides these, there is a special Division for Training and Teaching, which includes a library and a publishing department.

Since the beginning of the 1950s, the institute has, under the auspices of several United Nations agencies, functioned both as a centre for study for fellowship-holders at various levels and as a source of expert guidance in developing countries.

The Jutland Institute of Technology, Aarhus

The Jutland Institute of Technology was founded in September 1943. Economic support was granted for two years from private sources. Later, grants were received from municipal authorities, the County Council and, in 1949, from the Government. The activities of the institute include research and development, consultation and technical courses. The institute does not deal with basic research, but consultation and contract research will be further developed in the future.

The management of the institute consists of a board of representatives, a committee and the director, who is aided by a number of technical advisory committees, a secretariat and an administrative department. The institute is organized in departments for iron and metalwork, building, chemistry and business organization. It has a staff of 200, of whom 156 have university degrees and various technical degrees. Since 1948, the institute has established laboratories, workshops and offices, which will soon cover an area of 16,000 square metres.

The Danish Textile Institute

The Danish Textile Institute was founded in 1959. Its objective is to assist in the promotion of technical developments in the textile and clothing industries. Sixty-five per cent of its budget is covered by a government grant; of the remainder, 10 per cent comes from industry and about 25 per cent from its own income. Thirty per cent of its work is devoted to education; 50 per cent to investigation, consultation and research; and 20 per cent to information and services. It has a total staff of 36, of whom 20 are engineers and technicians.

The institute has premises of 800 square metres at the Danish Technical University, and 100 square metres rented in the town of Vejle, which is the centre of the textile industry in Jutland. It is managed by an executive committee of nine, appointed by the textile industry. It has the only specialized textile library in the country, providing a complete information service to the textile industry.

Despite its relatively short period of operation, the Danish Textile Institute has created a good name for itself throughout the textile industry. The more forward-looking firms in the industry collaborate closely with it, but many are still outside its circle, although this may be due to the tough competitive conditions in the industry.

The Technological Institute's Wood Department as an example of co-operation with a specific industrial branch

Since the establishment of the Technological Institute in 1906, assistance has been given to the Danish woodworking industry principally through a special department on wood and woodworking. One of the characteristics of this industry is that the great majority of its component firms are small (fewer than five employees) and their production is based on craftsmanlike methods. Between 1948 and 1958, major alterations took place in the various industrial groups, and the number of small shops (those with up to five employees) was reduced by about 33 per cent. The group of large firms (more than 100 employees) doubled in the same decade.

Purpose

The purpose of the Wood Department is to promote the development of industries that use wood. To this end the department:

(a) Conducts research, mainly of a practical nature, that is in the public interest and paid for by money put forward by the Wood Council, foundations etc., and research for individual firms on payment of a fee;

(b) Provides a consulting service covering all aspects of timber technology for the woodworking industries, their suppliers and customers;

(c) Conducts special courses on technical aspects of wood, holds short courses for management personnel in the timber industry, develops new courses and methods of training, and assists education in wood technology at other institutions;

(d) Supplies the woodworking industry with information concerning major technological breakthroughs in the field of wood at home and abroad.

To obtain optimum use of resources, the department co-operates with other departments in the institute whose fields of training are relevant to the woodworking industry (accounting department, construction department, paint-testing station etc.) and with other institutions and organizations, such as the State Building Research Institute, the Technical University, technical schools, trade unions, executives' and employers' organizations, and, in particular, the Wood Department of the Jutland Institute of Technology. The Wood Department of this institute engages in training and consultation, but does not carry out research or publish literature. Research on Danish forest products is concentrated in the Wood Department of the Technological Institute of Copenhagen.

Clientele

The clientele of the department consists of impregnation firms, "gluelam" factories, sawmills, furniture manufacturers, joinery firms, wood-preservation firms, suppliers of woodworking machinery, tools, glue and varnish, veneer manufacturers, chipboard manufacturers, handicraft firms (excluding furniture), specialist joinery firms and other timber trades. Contact so far has been rather sporadic with carpentry firms, timber boat-building yards, timber stockists, furniture retailers, forestry specialists, consulting architects and engineers. In the future, the department will endeavour to increase contacts with these firms and specialists.

Most Danish timber trades operate an apprentice system, training being conducted by the firms and technical colleges. The Wood Department's clients are mainly skilled craftsmen, journeymen, works managers and master craftsmen, particularly from the joinery trade. In trades that do not operate an apprentice-training scheme (such as sawmills and impregnation firms) the clients are mainly foremen and works managers who have had many years of practical experience but have a fairly limited theoretical background, often acquired in another sphere, for example, in forestry.

Another important group of clients consists of engineers, men employed in the timber trade or timber suppliers. Because the industry is composed of so many small firms, only relatively few engineers and other highly trained technicians are to be found in it. A number of clients with commercial backgrounds are engaged in the sale of timber and timber products.

Spheres of operation

The work of the department has in particular been influenced by – and has influenced – the tremendous rate of development of the Danish furniture-making industry, particularly in the following areas:

(a) Timber materials – quality of raw timber, cutting, storage, separation into species, material's characteristics, structural strength, improvement of quality (stabilizing, plastic impregnation);

(b) Timber and moisture – timber drying, moisture content on location of use, steaming, moulding;

(c) Timber jointing – glues for furniture-making and joinery work, glued timber, glueing processes and equipment, veneering and moulding, sheet materials, high-frequency jointing;

(d) Surface treatment – materials, methods and machinery for polishing, staining and surface treating, particularly of furniture;

(e) Timber destruction and protection – biological deterioration of wood, wood and fire, chemical preserving methods and substances;

(f) Mechanical woodworking – maintenance of machinery, setting up machinery, machines for joineries and other woodworking firms, construction of special machines and aids, tolerances;

(*g*) Product development – development of various items of furniture and other wood products in co-operation with manufacturers and/or architects, with a view to improving techniques of production;

(*h*) Company management – fitting out of workshops, production planning, calculation and organization, technical and economic analysis, quality control, state-loan matters.

The institute intends in the future to devote some time to the following spheres: upholstery, new materials for the woodworking industry, product development and standardization in the construction industry, data processing for the woodworking industry.

Activities

One of the basic ideas behind the establishment of the Technological Institute is that progress in business is best promoted through an institution which, by engaging in a combination of research, consultation and training, supplemented by literature, can keep abreast of techno-scientific developments and the needs of the industry. The knowledge assembled can then be processed and distributed, kept up to date, related to practical operations and be absorbed easily by firms. The emphasis in the Wood Department is therefore on a combination of these activities and on a positive exchange effort so that the research projects under way are linked with the major requirements of clientele revealed by consultation, and the results are circulated by means of further consultation, training and literature.

Research. In 1966, about 11,000 employee-hours were spent on research. The primary object of the institute's research is to produce results that can be applied to practical, everyday projects within the industry. Consequently, the work is not normally of a basically scientific nature, but concentrates on a practical solution to the problem at hand. The experimental problems are selected with a view to satisfying the needs of the widest possible range of clients of the woodworking industry. With the support of the Danish Wood Council, which is a co-ordinating body with representatives of the woodworking industrial organizations (employees and employers, higher colleges, the Technological Institutes and the Academy for Technical Science), experimental and research work is conducted into timber problems of a technical type, and experiments are also carried out for private firms on payment of a fee.

Consultation. In 1966, about 12,000 employee-hours were spent on consultation on specific problems. Consultants can be summoned by firms all over Denmark, and further study can be undertaken at the institute by means of special equipment designed for the purpose. Consultation is offered by the Wood Department to the whole sphere of the woodworking industry, partly through collective arrangements, partly to individual bodies or firms, particularly joinery firms specializing in furniture-making, and also to sawmills and wood-preserving firms. As a rule, consultation is requested in cases of acute production difficulties or the expansion of production (including choice of new materials, methods and machinery).

Collective arrangements consists of the following:

(*a*) A subscriber system, which covers about 100 firms, which, on payment of 100 Danish crowns[1] for half a day or 175 Danish crowns for a whole day, can receive a visit from one of the department's master joiners;

(*b*) Quality marking of furniture: the department acts as consultant and secretariat for the Danish Furniture-makers' Control Association, which is supported by about 100 manufacturers;

(*c*) Supervision with regard to protection of timber.

The Danish Furniture-makers' Control Association was founded by Danish furniture producers, who, in collaboration with the Technological Institute in Copenhagen, have established standards and specifications for craftsmanship of high quality. The association is open to all Danish furniture manufacturers who comply with the technical regulations in their production and who subject themselves to the control measures of the association. The approval entails the right to use the quality mark, which is for the buyer a guarantee of the technical quality of the product.

The Wood Department of the Technological Institute acts as technical secretariat and laboratory. Before being admitted to the association, a factory is subjected to an expert inspection for six months to determine whether the factory is complying with the stipulated technical regulations. During the period of inspection, random samples are taken of the production and subjected to exacting tests; the manufacturer realizes that these tests may mean complete or partial destruction of the samples. After the trial period is over, the production of the factory is checked through unannounced visits, and the factory may immediately lose the right to use the quality mark if the fixed rules are not strictly adhered to. Moreover, a member factory is obliged to give full compensation if complaints are due to failure to comply with the technical regulations.

Rules are prescribed for wood quality, construction, gluing and surface treatment. Types of wood must be described by their correct names. For the control work, the Technological Institute has a number of testing devices in which the furniture is exposed to rigorous treatment. Chairs with a 70-kilogram load on the seat are placed in a rocking device, which is then set in motion. A good chair should stand at least 10,000 rockings, but the best Danish chairs have undergone 250,000 rockings without breaking. In other devices the laboratory tests the strength of gluing, the durability of the construction and the resistance of the finish. Through the laboratory tests, a good deal of valuable experience has already been gained.

Individual consultations amount to about 5,000 annually, of which about 4,000 are conducted by telephone or discussions in person. The others take the form of written reports, which are sometimes based on laboratory or workshop tests or other study. About 1,500 working hours are spent annually on consultations provided free of charge.

[1] One dollar = 7.50 Danish crowns (1967 value).

Training. In 1966, about 11,000 work-hours were devoted to training, of which approximately 1,500 were spent in the institute's evening school courses, the remainder for daytime education: about 7,500 hours in the institute's courses in Copenhagen, about 1,000 hours in the institute's provincial courses, and about 1,000 hours in courses held by other institutions or organizations. Training is provided for the whole of the trade with which the department is concerned. The individual courses last from one day to one year and cover the following subjects, among others: timber and timber materials, timber drying, gluing, surface-treating, costing, production planning, woodworking machinery. A one-year course for timber technicians (managers) has been started, including timber technology, drawing and construction, mechanical training, operation techniques, physics, mathematics, costing, production planning, company structure, office routine and languages (Danish, English and German).

New courses are also being developed to enable apprentices to transfer to technical colleges. Staff from the department lecture on special aspects of timber technology in engineering and architecture courses and in adult education classes for various professions. A certain amount of training is also provided through lectures at professional association meetings or on radio and television, and an annual conference is held for joiners and cabinet-makers.

Literature. In 1966, about 3,000 hours were spent on compiling literature and other information. The department's experimental results are normally published in the magazine *Træindustrien* (The Timber Industry) in the editorial preparation of which the department participates. Instructions, short informative articles, trade handbooks and brochures and reports as well as articles for other publications are also compiled. The department operates a fairly extensive library on wood subjects and a filing system.

The department disseminates information about its work and recent advances in timber technology by participating in exhibitions. It plans to intensify this work through the employment of a "literary engineer" and intends to support a special publication to be distributed among members of the Danish Furniture-makers' Control Association.

Equipment. The department has a well-equipped joinery and furniture-making shop, modern hydraulic presses with special measuring equipment, a high-frequency generator, spray shop, impregnating plant, various measuring apparatus for registering the capacity of woodworking machines, laboratory equipment for chemical and mycological analysis (including laboratory scales and microscopes), testing equipment designed especially for furniture, and an atom-absorption-spectrophotometer. It also has electric calculating machines and typewriters, drawing materials, a wide selection of wood samples and products, and a colour-slide collection for use in training.

ADVISORY SERVICES IN MANAGEMENT

Industrial organizations and the productivity drive

By the beginning of this century, a number of industrial organizations had been established in Denmark. The two principal organizations existing today

are the Danish Employers' Confederation, which deals with wage problems and working conditions, and the Federation of Danish Industries, which is concerned with commercial, legal and other problems not directly related with wages.

The pre-war situation, characterized by unemployment, import restrictions and the like, was not favourable for a joint productivity drive. In 1947, however, a voluntary agreement on joint consultation committees was arrived at, and the increase in employment and the growth in the economy created a mutual understanding of the need for higher productivity.

The industrial organizations expanded their services to members in such areas as education, training and at a later stage advisory service. The Danish Productivity Council, with representatives from the public administration, industrial organizations and trade unions, backed the productivity drive by means of detailed productivity surveys, joint labour-management missions to the United States, visits of American consultants to Danish industries, documentation, exhibitions, periodicals and propaganda.

The organizations, on their part, increased their services and supplied the information on productivity disseminated by the Productivity Council.

Selection and training of organization consultants

In 1954–1955, it was mutually agreed that a further staff of Danish consultants was needed. The Productivity Council launched three training programmes for consultants. The first group to be trained for the industrial organizations and trade unions consisted of twelve consultants with a technical background, six economists and six consultants appointed by the trade unions. The selection procedure included careful screening of written applications, interviews, group tests and other psychological tests. The formal training programme included theoretical training for six months, practical training for approximately twelve months, study tours and field visits to various European countries and the United States for approximately six months.

Upon completion of the training, the consultants were attached to their various industrial organizations and trade unions. To facilitate the operation of this new service in its first year, the Productivity Council offered financial support to the organizations providing advisory services. The Council also supervised two different training programmes, one for commercial organizations, and one for handicraft organizations.

A certain turnover among consultants must be expected, and by 1960, the industrial organizations needed to have a new group of consultants trained. Selection procedures similar to those carried out in 1954 were used, and the training, based upon the experience of the first programme, was carried out under the auspices of the Danish Employers' Confederation. Ten consultants were trained.

The Productivity Council offers a formal introductory course of six to eight weeks for consultants. This course is normally part of the training given to new consultants for industrial organizations.

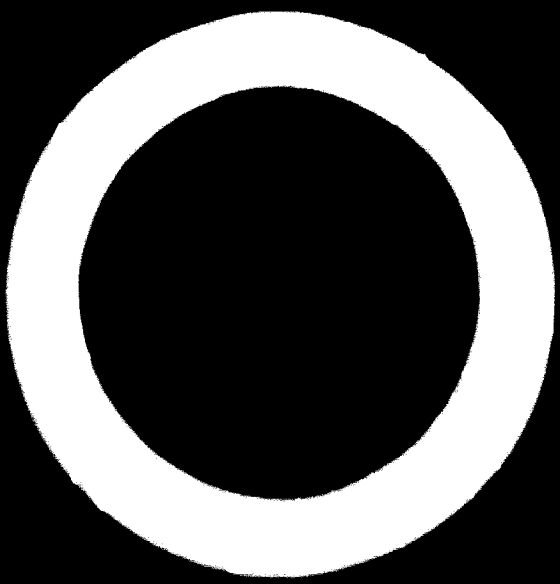
Types of advisory services

The Danish Employers' Confederation and the Federation of Danish Industries are principally responsible for the educational aspects of advisory services. Direct consultations to individual member companies are normally aimed at analysing their problems, so that the company staff itself, or the staff assisted by private consultants, can solve them. Another type of consultancy includes a detailed approach similar to that of private consultants. Some modest research projects and investigations are also carried out by the organizational consultants, normally by establishing survey groups consisting of consultants and specialists from the industry who prepare reports on particular problems.

Evaluation of advisory services

The number of consultants in industrial organizations increased from about 70 in 1955 to approximately 250 in 1967. Although some reservations were expressed by private consultants at an early stage, good relations have been established between private consulting firms and organizational consultants. The need for consultancy is indicated by the increase of private consultants employed by industry since 1953.

Since 1964, industrial organizations providing advisory services may receive financial support from the Government for such services. This covers 50 per cent of travel costs and a maximum of 22,000 Danish crowns for annual wages and approximately 2,000 crowns for administrative costs.



6.

TRAINING OF SMALL INDUSTRY EXTENSION WORKERS*

Introduction

Twelve years ago the author began to work in the field of specialized international training for small industry extension work.[1] In subsequent years, a number of international training facilities were established in various parts of the world. Such training is organized in different forms at the regional, bilateral and national levels. For the further development of these training activities it would be desirable to establish internationally a common conceptual basis regarding the training objectives, selection requirements, professional standards and other related matters. Such a framework is suggested in this paper, which describes the career development possibilities for small industry extension workers, considers the basic requirements from a personnel point of view, outlines the contents of the training and examines the programme structure and training methods.

In the professional ranks four levels are distinguished:

(a) Field officers and training officers proficient in the use of analytical techniques and in executing pre-defined tasks in small industry extension work (primary level);

(b) Field officers and training officers with full professional qualifications for undertaking small industry extension work in specialized fields (intermediate level);

(c) General advisory officers, senior specialists and chief training officers (next higher level);

(d) Senior officers responsible for institutional co-ordination (highest level).

An analysis of possible career patterns shows that individuals with a secondary education enter extension work at the primary level and subsequently move to higher levels. University graduates enter at the intermediate level or higher. In both instances it is desirable that the candidates have several years

* Paper presented to the symposium by YAP KIE HAN, Director, Centre for Management and Industrial Development, Rotterdam, the Netherlands.

[1] Small-scale industry is considered here an industrial sector distinct from handicrafts (where the manager participates in the productive work) and cottage, or household, industries (with workshop at home and not in a special industrial location). Compared with medium-sized and larger enterprises, small industry has a simple line-organization structure.

of industrial experience before joining small industry extension work. The possibilities for individuals to join this extension work at more advanced points in the career stream must also be considered.

The work of the primary-level field officer is closely related to the specific operational activities of the small enterprise. The responsibilities of the intermediate-level field officer are broader; they cover a major sector of the small enterprise's activities (production, sales or administrative control) and its relevant institutional relationships. The general advisory officer deals with the small enterprise as a whole and is closely involved with institutional and macroeconomic development aspects.

The structure, operational activities and control of the small enterprise, extension work techniques, institutional measures and development policies are major subjects of training programmes. The establishment of new industries has also been considered a major subject because of its special importance to developing countries. This includes industrial estate development and the establishment of common production facilities.

In the broadest sense, training encompasses all forms of transfer of knowledge, including the on-the-job counselling and instructions of the field officers to the personnel of the small industry plant. Training methods and communication techniques have therefore been considered basic extension work techniques, together with tools for diagnosis of plant problems, implementation of solutions and progress evaluation. In addition, the extension officer should, to the appropriate degree relevant to his duties, be well acquainted with the more specialized extension work tools in the field of product and manufacturing technology, plant facilities, marketing and export promotion, financial assistance and co-operative measures between enterprises.

The following are the principal types of training programmes:

(a) Basic training in small industry extension work to prepare suitable candidates with a secondary professional background for primary-level functions (BP-course-series, several variations);

(b) Basic training in small industry extension work techniques for university graduates and persons with equivalent scholastic qualifications (BU-course-series);

(c) Intermediate career development training to produce fully qualified intermediate-level officers (IC-course);

(d) Advanced training aimed at preparing suitable candidates for general advisory, senior specialist and institutional co-ordination functions (AD-course).

The above-mentioned courses, consisting largely of practical professional instruction, are designed to promote professional advancement. They will, therefore, be referred to as career development courses, as distinct from the so-called refresher training. The latter generally comprises courses of short duration and provides additional opportunities for small industry extension workers to remain professionally up to date.

SELECTION, CAREER DEVELOPMENT AND TRAINING OBJECTIVES

Some general considerations

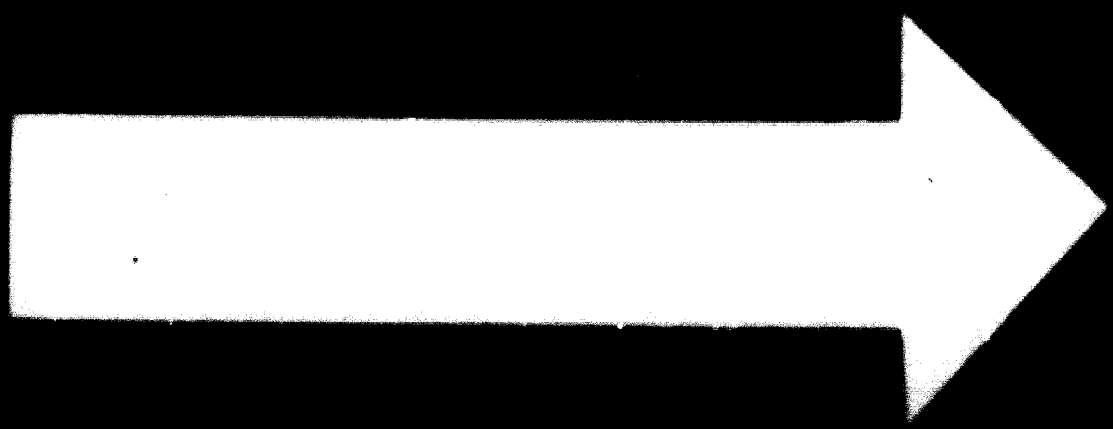
The main function of small industry extension workers is to render professional services for the improvement and expansion of existing small industries and for the establishment of new enterprises that will stimulate the country's growth. The extension worker is also expected to contribute, directly or indirectly, to the creation of a favourable climate for development and to help to provide institutional facilities necessary to stimulate and support entrepreneurship. The more senior extension officers must often also provide advice on national development policies relevant to the small enterprise sector.

To perform extension services for existing small enterprises, an intimate knowledge of the conditions under which small industry operates is required. Extension workers should have an adequate degree of industrial experience before joining the staff of the small industry extension institute. To establish new enterprises, a broad and comprehensive range of activities must be performed. Besides professional and industrial experience, extension workers in this field should have good organizational and executive abilities.

As small industry can afford only a very limited professional specialization within its own organization, it must to a large extent rely on the extension workers to act as the professionally specialized staff common to a number of enterprises. This aspect logically links up with the earlier-mentioned duties of extension workers to promote suitable conditions for small industry development. Extension workers, and especially those in more senior functions, must therefore not only be able to solve specific plant problems but also have the interest and ability to institute collective improvements.

In the developing countries, which lack trained and industrially experienced personnel, a large discrepancy may often be observed between the actual capabilities of the extension officers and the tasks assigned to the small industry extension or development institute. To meet these tasks, more often than not, unqualified personnel is engaged, and this seriously impairs the effectiveness of the extension work, sometimes even to the degree that the usefulness of the small industry institute as a whole may come into doubt. It is therefore desirable to limit as much as possible the scope of extension activities to those functions for which the institute's staff can bear a reasonable degree of professional responsibility. Only then can training of the extension workers be expected to contribute effectively to the improvement and expansion of the institute's activities. In other words, training should not be considered as a cure for structural inadequacies in the institute's set-up, but as a means for improving existing skills and for accelerating the development of potential capabilities.

Training may also be necessary for reorienting the staff of an existing institute to meet evolutionary changes that can be anticipated in the institute's work. This type of reorientation training should be included in the normal activities of the small industries extension institute. Through special courses, the training of new small industry extension workers may be accelerated and the basic shortage of experienced personnel thereby eased.



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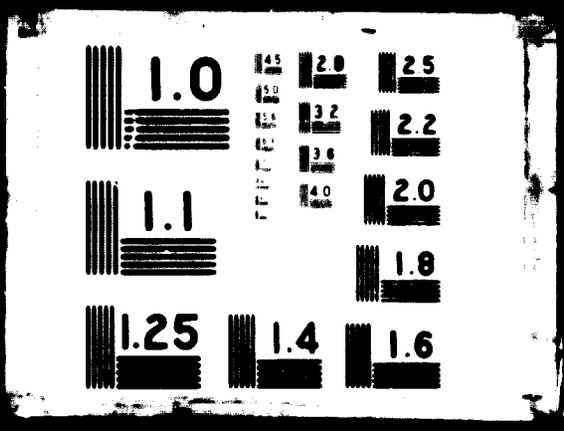


Professional qualifications and career development

The professional backgrounds of extension workers fall into three major streams: technology, economics or cost accounting, and humanities. In each stream three types of formal educational qualifications may occur. The first relates to university graduates. The second concerns persons with a secondary education. The third type is the autodidact, or self-made man, who may often develop himself to a level comparable to the secondary scholastic or university level. Personal abilities rather than formal degrees should therefore be used as a guide for selecting extension workers.

In the organizational structure of relatively large institutes, up to four levels of seniority can generally be distinguished. The first level is the primary level. The primary-level field officer provides day-to-day assistance to the supervisory plant personnel of small industry and to the training instructor. These officers generally have secondary scholastic qualifications or may be autodidacts with comparable experience and professional abilities. At the second level of seniority is the intermediate field officer, who may be a person with academic qualifications and several years of industrial experience, and the more senior training officers. At the third level is the general advisory officer, who must be an experienced senior person capable of directing activities covering various fields of professional specialization. Senior specialists and chief training officers may also be ranked at this level. At the highest level are the individuals responsible for co-ordination.

The distinction of seniority levels is to a large extent interwoven with the pattern of professional specialities. At the primary level, the largest differentiation into specific techniques and skills occurs. In the progress towards more senior levels two major directions can generally be distinguished. The first direction is the broadening of the original specialization to include other professional disciplines. This direction may extend up to the level of institutional co-ordinator. The second direction follows more strictly the path of the original professional occupation and extends towards higher levels of expertise in the same field. Following this direction, the extension worker ultimately assumes the post of senior specialist. The individual characteristics of the extension worker and the manner in which his personality evolves over the years are the major factors in determining which of the two directions he should follow.

Character and personality of the extension worker

The small industry extension worker in developing countries must believe that small industry can make a positive contribution towards the development of his country's economic progress. This belief must be founded on a clear recognition of the specific functions and comparative advantages of small industry in a developing economy. For example, the industrial history of other countries shows that small industries may form the nuclei from which important future industries develop. Small industry may also contribute significantly to the development of a national cadre of industrial entrepreneurs.

The extension worker should be able to diagnose situations rapidly; be inventive, pragmatic, objective and tactful; and have initiative, a good intellect, a sense of responsibility, emotional stability, perseverance and energy. Physically, the extension worker must be able to withstand itinerant work often coupled with long working days. When assisting small industries in rural and sometimes rather inaccessible locations, the extension worker must live under relatively primitive conditions. Good health, physical fitness and adaptability are therefore essential.

Contents of training programmes

Structure and characteristics of the small industrial enterprise

Small industry performs a number of specific functions in the economy of developing countries. In the first place, it provides a broad range of consumer goods whose manufacture is not, or is not yet, feasible on a larger scale owing to a shortage of certain production factors or to restricted market demand. Relatively low levels of purchasing power and difficulties in transport and communications are some of the factors causing market restrictions, which may be gradually removed as the country's economy progresses. Simultaneously, this progress provides small industries with the opportunity to grow into larger undertakings. In this manner, small industry performs a vital role in the construction of a sound industrial structure. Small industries can be established where market opportunities are limited and risk capital, industrial skills and managerial talents are scarce.

The same considerations apply to small industries manufacturing products for industrial use, such as packaging materials, tools, specialized equipment and other types of industrial supplies. The manufacture of components, either as a standard product or on a subcontracting basis, is another important function that small industry performs. Subcontracting may also make possible specialized manufacturing operations, which under the prevailing conditions could not otherwise be undertaken. Small industries thus contribute to the advancement of technological specialization in industry.

Repair services are also typically performed by small industries. Often these repair services and some of the subcontracting and industrial supply undertakings grow out of traditional craftsmanship. This is sometimes true for small industries in the consumer products sector, such as garment manufacture and bakeries. Many consumer product industries, however, have developed as a result of trade and commerce.

The structure and over-all business practices of the small industrial enterprise are strongly influenced by the technical or commercial origin of the enterprise. Because of the limited scope of the undertaking, the abilities and shortcomings of the owners or managers of the enterprise are decisive for its success. Hence, management training in the small industrial sector, and over-all guidance by the extension worker on matters of business policy are extremely important. As the small enterprise often represents all the possessions of the

owners and, frequently through informal arrangements, also considerable financial resources entrusted by relatives and friends, the counselling on management is a very heavy responsibility for extension workers and should therefore be entrusted only to highly experienced persons at the general advisory level.

Operational activities

In the operational activities of small industries, three major fields may be distinguished: the design and development of products and services; manufacturing activities; and sales activities and customer contacts. The aspects of managerial cost and administrative control that concern the small enterprise as a whole will be considered separately.

The efficiency of the enterprise is demonstrated by the quality of the products or services rendered and their costs. To the small industry with its very limited staff, responsibility for these aspects will to a large extent rest with the owner himself (or the technical manager when ownership is shared). Fostering the technical ingenuity and inventiveness within the enterprise's organization is a major task for the extension worker. It not only involves the design and/or specification of the products and services, but generally also the development of appropriate production techniques. It will often be advantageous to provide the extension worker with prototype design and workshop facilities. Such facilities will also be desirable when assistance is given in developing for the local market products under a foreign licence.

Manufacturing activities are concerned with the purchase and supply of raw materials and their transformation to end products. (In the case of services rendered, a similar series of activities takes place.) The choice of manufacturing technology and of the related equipment, its maintenance and upkeep, the provision of tools and other supplies required for production and also their appropriate utilization are the responsibility of the supervisor or manager. Compared with the situation in industrially advanced countries, the production supervisor has to take into consideration that material and equipment costs are relatively more costly, skilled labour in shorter supply and unforeseen shortages, power breakdowns and similar disturbances occur more frequently. Good costing, especially under the described conditions, is one of the most important tools for the production manager. He should also have an intimate knowledge of the essential production operations in the small workshop and leadership ability. Furthermore, the ability to improve methods and to embody the improvements in self-made tools and auxiliary equipment is important.

In small industries manufacturing for the industrial market and in service industries, a direct contact with the end users exists. In the consumer goods sector, sales are generally made through wholesale and retail channels. The relationship between the enterprise and the end user is therefore mostly an indirect one, and the sales and distribution activities are more complex. Pricing and development of distribution channels are key elements for improving sales. Co-operative efforts may provide further benefits and may be especially important in the export field.

The over-all guidance of the above-mentioned operational activities is generally the major task of the small industry manager. The major tools for control are considered next.

Cost and managerial control

Cost control occupies such an important place in the managerial guidance of the small enterprise that it deserves special consideration. At the same time, it should be recognized that it is one of the most difficult fields of extension work in the developing countries. The obstacles are not only of a technical nature; they may also arise from lack of confidence between small industrialists and extension workers. Moreover, the professional function of the extension worker has often not been fully recognized by society. Nevertheless, much useful work can be undertaken. Suitable standard cost control schemes can be developed and promoted through training and possibly through plant-level assistance during initial installation. Order costing and liquidity controls are some other important financial controls. Cost controls may further be essential in connexion with the supervision of credit.

Managerial controls are concerned with personnel questions, of which recruitment, dismissal and maintenance of good working conditions are the most important. Programmed instruction may open new possibilities for solving training problems in view of the rather limited numbers of personnel in the small enterprise.

Basic small industry extension work techniques

Knowledge of the small industry and professional subjects alone does not suffice for the extension worker; he must also be proficient in special techniques of extension work. These techniques concern his responsibilities for diagnosing a problem, finding the solution and providing the necessary instructions for follow-up. Furthermore, training in communication techniques is important.

Extension work also requires a special outlook on the part of the extension worker; this will have to be developed (after the candidates have been selected and found to have adequate potential qualities). The extension worker should inspire confidence and generate informal authority arising from professional competence without trespassing on the prerogatives of the company's personnel. The extension worker must be able to express his recommendations quite specifically so that they can be implemented, once the management has given its assent. The development of these skills requires years of experience in addition to training.

Tools for quantitative diagnosis of plant problems

Plant problems should be diagnosed on the basis of quantitative data, which may be obtained partly from the administrative records of the enterprise and partly from direct observation or interviews. Each extension worker should be able to collect, sample, analyse and interpret data. In small industries where administrative records are relatively simple, the necessary data will have to be

obtained largely from direct observation and interviews. This disadvantage is offset by the compactness of the small enterprise, which enables the extension worker to obtain a comprehensive picture of the situation in a relatively short time.

By major field of activity, the most important quantitative tools for diagnosing plant problems are:

(a) Sales and distribution – analysis of sales records;
(b) Customer contacts and distribution channels – forecasting;
(c) Product design and development – profit and cost analysis by product;
(d) Manufacture – work-study, quality control, production planning, maintenance;
(e) Managerial controls – accounting and book-keeping, cost analysis and liquidity control, analysis of personnel capabilities.

In addition, special methods have been developed for diagnosing the over-all problems of the small enterprise plant.

The problem-solving approach should lead the extension worker to propose alternative solutions, which should be within the means of the small enterprise; the expected benefits from each should be compared with its costs. To facilitate the decision by the company's management, a priority rating should accompany the list of possible solutions.

Implementation of decisions and progress evaluation

Transfer of knowledge and guidance during the implementation of decisions require special skills on the part of the extension worker. For adequate transfer of knowledge, the extension worker must be adept in roundtable discussion methods and job-instruction techniques. The former concerns the transfer of conceptual ideas, whereas job instructions elaborate the specific tasks of the plant personnel. The job instructions also require that the extension worker be able to foresee major obstacles that may arise in the course of the work of the persons concerned and that he has consequently provided an appropriate means of overcoming these difficulties. Furthermore, scheduling of the implementation and periodic evaluation of the progress achieved are essential. To be successful in these undertakings, the extension worker must be especially tactful and persuasive, for he will become personally involved in the day-to-day activities of the enterprise.

Training methods and communication techniques

Besides the job instruction and communication methods described above, the small industry extension worker should also be acquainted with group training methods, visual aids and techniques of mass communication. These techniques are themselves a field of specialization for the training officers, but should also be known by all extension officers, as they may often be called upon to provide instruction in training programmes. Moreover, small industry extension workers in developing countries often have to operate on their own or in small teams in rather remote locations. Besides visiting plants, they may

have to speak in public when on such duty tours. When an audience has relatively little formal education, the use of good visual aids may greatly contribute to the effectiveness of these talks.

Establishment of new small enterprises

In developing countries the establishment of new industries is a major undertaking, at least equivalent in its importance to the improvement of existing enterprises. The work involved calls for additional extension work techniques beyond those mentioned above, and these may be grouped under two major headings: *(a)* feasibility analysis and industrial location studies; and *(b)* plant design and construction. Furthermore, as collective assistance to a group of small enterprises, the establishment of industrial estates and of common production services will be considered.

Feasibility analysis and industrial location studies

The purpose of feasibility studies and industrial location studies is to identify opportunities for the establishment of new industries in the small-scale sector and to determine product or service programmes, the scope of initial activities, the most suitable plant locations, the required investments and personnel and the development potential. Often the extension worker is requested to help obtain financial support or other facilities for the small entrepreneur. Because these studies are comprehensive, they generally should be undertaken by a team of specialists rather than by an individual extension worker.

Plant design and construction

As mentioned elsewhere in this paper, the whole range of activities from the design of a new plant, its construction (building and machinery) and assistance during its initial operation should preferably be entrusted to a special extension group. These activities should, however, also be considered part of the basic orientation training of all plant-level extension workers.

The main subjects to be covered in this training are the design of plant layout and the arrangement of production facilities, construction plans for standard industrial buildings suitable for small industries, related costing aspects and scheduling of plant construction (e.g. application of network analysis). It may also be important to study the development and use of well-prepared model schemes to promote the establishment of new industries.

Industrial estates

Economies in the provision of infrastructure facilities for smaller industries and other advantages can be obtained through the establishment of industrial estates (that is, areas specially developed for locating industrial plants, providing roads and other transport facilities, electric power and water supply, waste disposal and other facilities). The provision of workshop buildings on the estate may be an incentive to entrepreneurs to start a small industry. Such buildings may be rented and therefore the small entrepreneur does not have to make such

a large initial capital investment. To assist the small entrepreneurs, an extension unit may be established on the estate. Common production facilities may also be provided. The estates may be an important component of over-all physical planning schemes, and the small industry extension workers may thus have economic responsibilities of broader scope. Whenever adequate housing of workers or other social aspects are to be considered, it would be desirable to broaden the industrial estate project until it becomes a plan for an industrial community. Other combinations of functions are possible, such as the establishment of industrial export processing zones.

Common production facilities

Efficient common production facilities may be an important instrument for concentrating technologically affiliated small industries geographically. A galvanizing plant or a heavy forge shop, for instance, may be a common production facility for metal industries. Similarly, a wood-treatment plant or a dyeing plant are examples of common facilities for the timber industry or the textile industry. These common production facilities may make it possible to introduce specialized technological skills that are economically justified on a collective but not on an individual basis. Initial investment and operation risks are often borne to some extent by public funds available to the small industry extension institute. It is, however, often highly desirable to make the common production facility a self-supporting and even profitable venture as soon as possible.

Specialized institutional services

Technical information, troubleshooting, design and manufacturing of prototype products

In addition to the above-mentioned extension activities at the plant level, the promotion of small industry requires certain institutionalized services. These services often have considerable overhead costs and should preferably be introduced only when these costs can be adequately underwritten by contributions and subscription fees from industry.

In the technical field, provision of a competent technical troubleshooting, inquiry and answer service and the design and manufacture of prototypes (possibly linked with licensing of foreign products) may be considered. The maintenance of a close relationship between individual enterprises and (external) technological research institutes should be considered a major task of technical extension services for small industries.

Marketing and export promotion

Institutional services to small industry in the field of commerce may include detailed market information, information on public tenders, export opportunities and other aspects of trade. In addition, the services may include market surveys and more specific market research for certain types of products. Since important differences often exist in the quality of products for the domestic market and those for the export market, effective quality control should

be introduced for exports. Quality control may be carried on best by an agency that collaborates closely with the extension institute but is a separate entity.

Management and technical training

Training should be considered a major task of the small industry extension institute. It may involve management and supervisory training and mobile demonstrations of certain product designs, manufacturing techniques, plant safety practices and other matters that can be physically displayed. Vocational training requires a rather extensive outlay for machinery, and it may generally be undertaken by separate vocational training schools with which the small industry extension institute should remain in close touch and, preferably, develop co-operative programmes. The extension institute itself may also undertake other technical courses, for instance, blueprint reading or packaging techniques.

Financial assistance and hire-purchase schemes

Inadequate financial resources and insufficient understanding of industrial investment and costing are serious difficulties hampering the progress of small industries. To meet their financial credit needs, special institutional arrangements are necessary because of the relatively high cost of handling small loans and the need to investigate credit applications and to supervise the use of loans. Supervision of loans may be part of the responsibilities of the small industry development institute.

The shortage of adequate collateral has furthermore led to the establishment of hire-purchase schemes for production machinery. Such schemes are particularly important when the purchase of machinery involves foreign exchange.

Co-operation among industries

Extension work for small industries in developing countries often entails promoting co-operation between enterprises. Such co-operation may, for example, concern the establishment of a common production facility as a joint enterprise or the establishment of a co-operative purchasing agency or export-promotion organization. In rural areas, small industry extension work may include the establishment of industrial enterprises on a co-operative basis (for instance, dairy-product plants or a cardboard factory using agricultural waste materials).

Development planning at different levels

The macro-phase of small industry development planning includes a consideration of the functions and possible contributions of small industry to the national income, its total investment requirements, consumption, imports and exports and other characteristics. Various alternative courses of action must be evaluated, and, at the government level, decisions must be taken on the volume of resources and type of facilities to be apportioned to the small industry sector. A further subdivision of the macro-phase into branch and regional plans is generally necessary.

Planning at the branch-of-industry level involves the breakdown of the macroeconomic factors into figures for the various branches. It implies the allocation of priority to certain branches that are expected to make the major contributions to the national economy during the planning period concerned. It may also involve the stimulation of a specific development within a certain branch, such as the adoption of labour-intensive methods, the increased use of locally available raw materials and components or the stimulation of suitable export products.

As small industry has a distinct local function to perform, it is desirable to integrate macro and branch planning with regional development targets. These may be expressed in terms of number of new enterprises, new employment opportunities created etc., and also of physical and institutional facilities established, such as industrial estates, common production facilities and specialized institutional services. These regional targets will permit the impact and contributions that small industry has made to the local economy to be evaluated in the future.

Programmes and methods of training

A series of training courses can be linked with the career development patterns of small industry extension officers and, preferably, programmed at least one phase ahead of actual promotion. These courses will be referred to as career development courses. The pattern of interrelationships between courses and extension work functions is shown in the diagram below. The following courses are distinguished:

(a) Basic training in small industry extension work to prepare primary-level officers (reference in diagram: BP-course-series, subdivided into plant extension work and training);

(b) Basic training in small industry extension work for university graduates (reference in diagram: BU-course-series);

(c) Intermediate career development training (reference in diagram: IC-courses);

(d) Advanced training (reference in diagram: AD-course-series).

The main contribution of training is the development of potential skills and talents. Training cannot replace careful selection. Though geared to career development, training should not be considered the only requirement for promotion. Promotion may also depend upon the number of actual posts available. An approximate balance between trained candidates and available posts within the immediate future is obviously desirable in order not to create undue expectations.

The career development courses will also have to provide for the possibility that persons from other sectors of society may join the small industry extension work at intermediate and even advanced points in the career stream. "Refresher" training, which may consist of courses of short duration or a programme of periodic meetings conducted at the small industry extension institute, is also necessary.

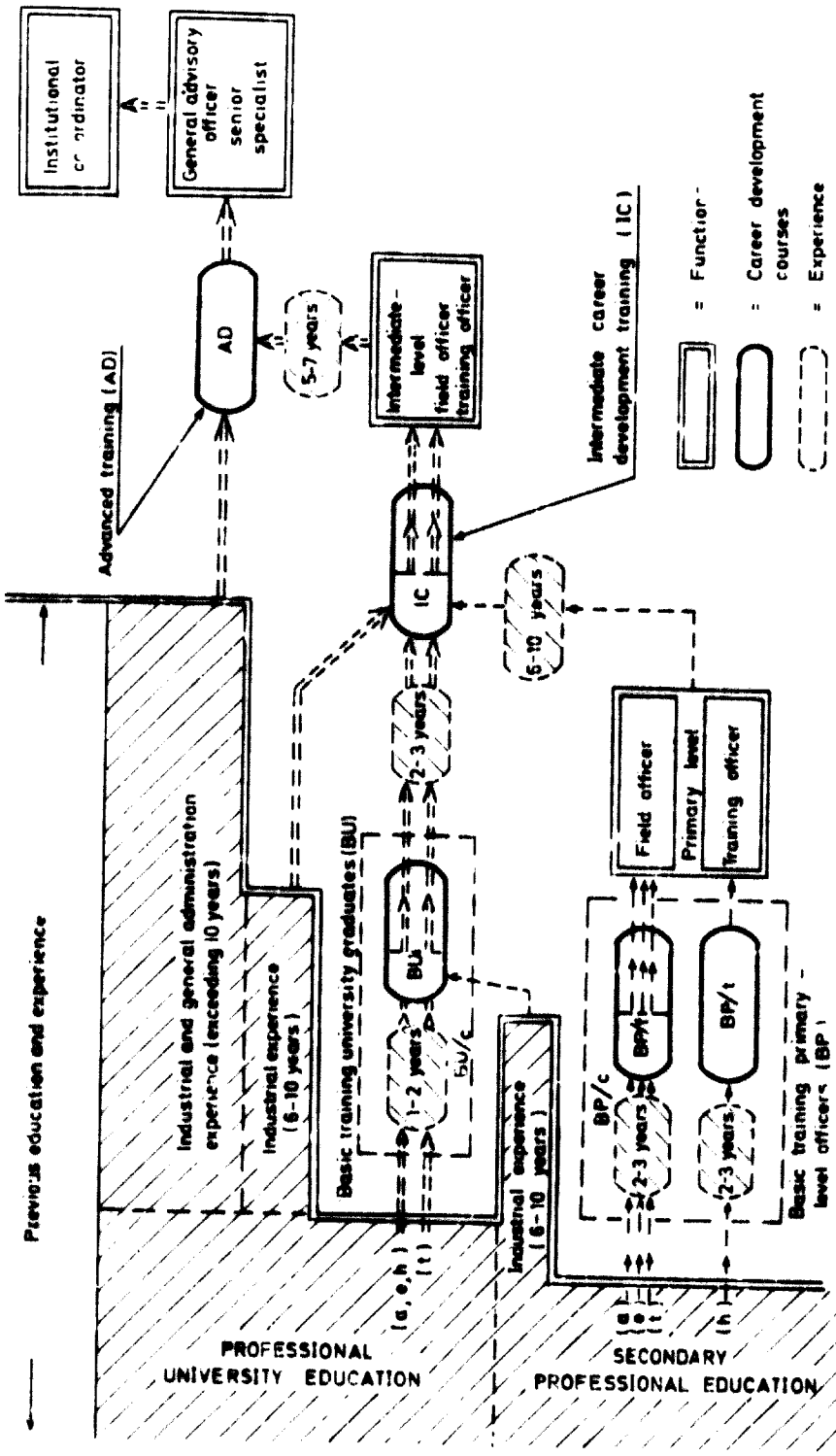


Figure 1. Career development courses and small industry extension work

Government officers or other persons (such as special officers of research institutes) engaged in small industry development could also benefit from training.

Basic training for primary-level field officers and training officers

Training programmes for primary-level field officers and training officers are aimed at developing suitable candidates with a secondary education into primary-level extension work officers. The secondary level may, in general terms, be defined as about twelve years of education starting with primary school and including at least three years of full-time professional education or its equivalent. As a certain degree of personal maturity and of professional and industrial experience is required, the candidates should be at least 22 years old and should have worked in industry for 2 to 3 years. These are minimum requirements. Preferably candidates should be older (up to 35 years) and more experienced (including also persons who have gained an equivalent general knowledge through self-education).

For the field workers, three types of professional backgrounds are of main interest: technical (leading to primary-level field officers concerned with manufacturing operations, production organization and/or product design); cost accountancy (mainly book-keeping and cost-control); and economics (mainly for sales affairs). In addition, suitable candidates with a general secondary education and a pronounced professional interest in the humanities may be considered for development into training and personnel officers.

Two major training programmes can be distinguished for the above-described persons: basic training in field extension work for small industries; and basic training in personnel development and training methodologies suitable for small industries. Some considerations are also given to the situation where professionally qualified personnel is extremely scarce.

To develop adequate competence in the extension work skills required at the primary level, a training period of twelve to fifteen months is required (BP/f-course). At least half of this time should be devoted to practical instruction in industry, the other half being reserved for theoretical instruction and related practical exercises at the training establishment.

The core of the training (for instance, 70 to 75 per cent of the whole period) should be directed to the development of professional skills immediately related to the field in which the extension workers are expected to devote their efforts (i.e. manufacture, production organization or product design for the technical stream, costs for the cost-accountancy stream, and sales for the economics stream). Practical instruction in industry should be integrated with this major part of the training. The aim of the training is proficiency in the application of the relevant analytical tools and evaluation and job-instruction techniques.

The extension worker trained in one particular stream should also gain a general appreciation of the work in the other two streams. A general understanding of the structure of small industry, its specific problems and its infrastructure needs, institutional framework and other development policies is also required.

The basic programme for primary-level training officers (BP/c-course) includes instruction in group communication and personnel development techniques. Special emphasis is given to techniques and fields of application (e.g. visual aids or mobile demonstration) that are important to small industry development. A total training period may cover six to eight months, of which at least half should be devoted to practical instruction in the field. The training should provide a good understanding of both the small industry itself and the institutional and development efforts undertaken by the small industry extension institute. A general appreciation of small industry development policies is desirable.

The types of specialized training described above may be directly applicable in countries that have an established educational system. In countries in which the educational system is still at an early stage of construction, it may be necessary to develop the basic training for primary-level extension officers on a somewhat different basis (BP/c-course). In these instances, a programme can be envisaged of somewhat longer duration and composed of three major parts.

The first part, a general orientation in which all candidates would participate, would provide a comprehensive understanding of small industry. When the candidates have had no previous industrial experience, this part should also include a substantial period (4 to 6 months) of on-the-job training in an industry. The second part would aim at developing a certain degree of professional specialization according to the various streams mentioned earlier and comprise a somewhat accelerated instruction in those subjects that would otherwise have been provided by secondary professional education. The third part would be chiefly directed towards extension work practices and the integration of the previous two parts into field extension or training activities for small industries. The specific subjects concerning extension activities need not be exclusively reserved for this third part. On the contrary, it would be desirable if an understanding of the role of the extension worker and the activities of the small industry extension institute could be imparted from the beginning so that the last part could concentrate on practical proficiency in extension work techniques.

The specific programme for this type of training will depend on the level of development of a country. Smaller countries may find it advantageous to organize regional programmes. In most cases a minimum duration of two and a half to three years (including the periods of practical experience in industry) may be necessary.

Basic training in extension work for university graduates

The main objective of the training programme for persons with a university education and several years of industrial experience is to impart basic extension work techniques. Well-qualified persons with a secondary background and extensive industrial experience (8 to 10 years or more) may also be considered for this training.

For persons with sufficient industrial experience, basic training for intermediate-level extension work can generally be completed in six to eight months (BU-course). The aim of this course is to develop an understanding of small industry and proficiency in areas related to the candidates' professional

background. Three major specializations can be foreseen, namely, manufacturing technology and production organization (possibly also product development) for those with an engineering background; cost control and economics for those with an economics background; and personnel relations for those with a special aptitude for this field. The programme should provide for substantial periods of practical exercises as well as practical instruction in industry (possibly as much as 15 to 20 and 50 to 60 per cent, totalling 65 to 80 per cent of the available time).

The programme should emphasize, in particular, extension work techniques and their application to the relevant sectors of the operational and control activities of the small enterprise. A general appreciation is needed of the structure of the small enterprise and of the role of the extension worker in the over-all small industry development process. All university-level extension workers should be familiar with group training, communication and personnel development matters (these would constitute a separate field of specialization for persons with a secondary educational background).

Practical training in industry should be structured in such a way that the candidate has the opportunity to analyse a certain problem, work out a possible solution, implement it and evaluate (periodically) the results achieved.

When the supply of candidates with adequate industrial experience is limited, it will be necessary to provide for a training programme of longer duration for recent university graduates (BU/e-course). The programme should include a practical period of at least eight to twelve months covering different types of industrial experience, such as on-the-job training in a technical as well as non-technical function in preferably more than one industrial enterprise in addition to the practical in-industry instruction in extension work described above. The whole training programme may be structured as a "sandwich course", with alternate periods of theoretical instruction and practical exercises on the one hand and of in-industry work on the other. The duration of such programmes may vary between fifteen and eighteen months.

Intermediate career development training

Intermediate-level training is aimed at developing field or training officers fully qualified in the technical, economic or training aspects of extension work. Candidates should be university graduates who have undergone the basic training and have had two to three years of extension work experience. After training, they should be able to diagnose company problems related to their fields of specialization. For university graduates this level could be reached when they are about thirty years of age.

Other persons may also qualify for this intermediate-level training, e.g. university graduates with six to ten years of experience who hold a responsible position in industry. They should, obviously, possess the specific personal qualifications required for extension work. The intermediate-level training may also provide the possibility for competent and experienced (e.g. 5 to 10 years) primary-level officers to qualify for promotion to the intermediate level.

Intermediate-level training (IC-course) lasts from four to six months. The programme includes, in particular, subjects classified under the headings of the small industrial enterprise, extension work techniques, establishment of new small enterprises and institutional framework. A general appreciation of the whole field is needed, and also an understanding of small industry development policies. The programme should provide intensive specialized instruction in the major types of professional activities at the intermediate level as described earlier. The engineer should be offered instruction in product design and production matters, related extension work techniques, the technical aspects of establishing new industries and industrial estates, the role of technological research, information and related institutions. Similarly, the economist should be offered instruction in the costs, sales and financing of small industry; the economic aspects of feasibility studies; and related institutions and measures in the fields of credit, marketing and export promotion. These specialized studies should include case studies and an analysis of practical plant problems.

A major part of the practical field work should deal with methods of guiding small extension work teams effectively. This prepares the intermediate-level officer to supervise primary-level extension workers. The design of training and demonstration programmes may be a particular subject to emphasize.

Intermediate-level training requires good facilities for instruction. It may, therefore, be particularly suitable for establishment on a regional basis, since only a few very large countries would have the necessary facilities. In view of the practical instruction required, such regional training activities should be located in areas where national small industry development programmes are already under way.

Advanced training

Advanced training is aimed at preparing suitable candidates to assume the general advisory, senior specialist and institutional co-ordination functions. These functions are the final series of steps in the career development pattern described earlier. The training generally extends 5 to 7 years beyond that required for intermediate-level officers.

Candidates with other backgrounds, such as general managers of industrial enterprises and senior government officials with equivalent standing but no experience in extension work, may also be trained through this advanced instruction to assume senior extension work functions.

The training should last about 6 to 8 weeks (AD-course). It may include: a refresher course on extension work techniques for dealing with the problems of small industry and on the establishment of new enterprises; a thorough analysis of subjects directly related to business policies; study of the over-all tools for diagnosing company problems, comprehensive feasibility analysis; and a study of the role of the extension worker and of general development planning.

Much attention should be given to the guidance of teams of extension workers, the design and evaluation of promotion programmes and matters of

an institutional nature (i. e. internal administration of the small industry extension institute and co-ordination of its varied external relationships).

The programme should be deliberately focused on fostering broad, mature judgement. To this end, an international environment may make important indirect contributions. Advanced small industry development courses are, therefore, particularly suitable for regional and international sponsorship.

Refresher training and internal training at small industry development institutes

The rapid changes taking place in industry require the extension worker to keep himself up to date or even ahead of actual events. He can do so partly through individual reading, but he may also need to take some specialized refresher courses. These may range from a few days to a few weeks.

The refresher courses deal with specific subjects (in contrast to the career development courses, which provide orientation in extension work). Suitable subjects for refresher courses for extension workers include, for instance, technological developments in a particular branch of industry, export marketing of certain products and the institution of a new type of small industry credit. Because they deal with subject matter, these refresher courses may, as far as appropriate, be attended by persons at all levels of extension work.

The refresher courses held in small industry development institutes of medium and large size may meet periodically, perhaps once a week. This arrangement meets the need both for individual reading and for continuous intellectual stimulation, which is essential to successful extension work.

APPENDIX

THE PROFESSIONAL PERSONNEL STRUCTURE OF SMALL INDUSTRY DEVELOPMENT INSTITUTES

This appendix contains a brief description of the organization and principal activities of small industry institutes in developing countries. The description is not exhaustive and is meant only as a general background against which the training of extension officers for small industry may be considered.

Main categories of professional extension workers

The main categories of professional extension officers and their functions in the field of small industry are the following:

Primary-level field officer. Analysis and day-to-day assistance at the supervisory level of the plants (e.g. technicians, or equivalent administrators, book-keepers, commercial analysts and instructors).

Intermediate-level field officer. Industrially experienced person with specialized professional competence to analyse and solve small industry problems in the technical field, or commercial, financial and managerial fields and who has received adequate training and experience in small industry extension work. Assists the small plant in developing and maintaining specialized institutional relations with banks, research institutes etc.

General advisory officer. Experienced extension worker with professional competence in the technological, economic and managerial fields. Guides teams of intermediate- and primary-level field officers and advises the management of small enterprises on over-all business policy and planning.

Senior specialist. Highly qualified extension worker, specialist in technology or industrial economics and equal to the general advisory officer in rank. Undertakes research work with broad significance to small industry.

Training officer. Specialist in training methods in instruction of technical and managerial subjects and equal to the primary- and intermediate-level field officers in rank, with the chief training officer possibly equal to the general advisory officer in rank. Deals with group training, visual aids, programmed instruction and mass communication methods.

Institutional co-ordinator. Highly qualified person with broad experience in small industry extension work. Directs the institute's activities in conformity with national development aims (most senior of the functions).

The primary-level field officer, the intermediate-level field officer and the general advisory officer are fully occupied with problems at the plant level. The senior specialist deals with these problems also but is concerned with matters of general interest to small industry as well. Though the training officers are specialists in training methods, instruction in special subjects may often also be a part of the responsibilities

of the other extension officers. In carrying out their plant-level extension work, these officers also undertake on-the-job training of enterprise personnel. The institutional co-ordinator is chiefly responsible for directing the institute's activities (operational and/or administrative).

Possible field work teams

For small industry extension work at the plant level, the following categories of teams of extension workers can be distinguished:

Branch-of-industry teams. Branch-of-industry teams assist small enterprises in certain branches of industry. The teams are mostly composed of technicians. An intermediate-level field officer with special experience in the branch of industry concerned may act as team leader. The team may include several primary-level field officers (e.g. some technicians and an assistant for cost analysis and book-keeping) and one or more additional intermediate-level field officers. Some of the most important industries to which teams in this category can provide assistance are: metalworking, processing, (e.g. food, plastic products etc.) printing and service enterprises (including repair). The composition of the team is determined according to the specific needs of the branch of industry to be assisted.

Functional teams. Functional teams are composed of experts in the same field at the intermediate and primary level. These teams are guided by the ranking intermediate field officer. For small industry extension work in developing countries, the most important types of functional teams are those in the fields of marketing and distribution, export promotion (at the enterprise level), cost-control procedures, safety engineering, industrial engineering and similar activities.

General-purpose teams. The general advisory officer is the key person in a team of extension workers that can provide a broad range of extension activities. The general-purpose team not only assumes some of the functions of the branch-of-industry team and the functional team but also provides general advice on over-all business policies and planning. The team may be small and consist of only a few intermediate-level field officers with technological and economic backgrounds. The team may, as required, also be expanded to a larger group consisting of several units, each composed of an intermediate-level field officer and several primary-level field officers. It may also include special units for diagnosing business problems, for supervising the provision of credit by banks etc.

Teams for developing new industry. Since industrialization in the developing countries requires the establishment of new, viable small industries, it may be desirable to set up special teams for this purpose. The team should be composed of at least two units, one concerned with feasibility studies (pre-investment) and the other with plant design and construction; the responsibility of the latter may extend to the turn-key phase and possibly into initial operations. The teams are guided by a general advisory officer and the units by intermediate-level field officers. The feasibility study unit should have a techno-economic composition. The plant design and construction unit should include civil, mechanical and electrical engineers as well as managerial experts. The effectiveness of these activities may often be facilitated if well-prepared model schemes are used to promote new small industries.

All the teams described above work at the plant level in the field. Training, research, and the development of common facilities are considered next.

Training, development of common facilities and surveys

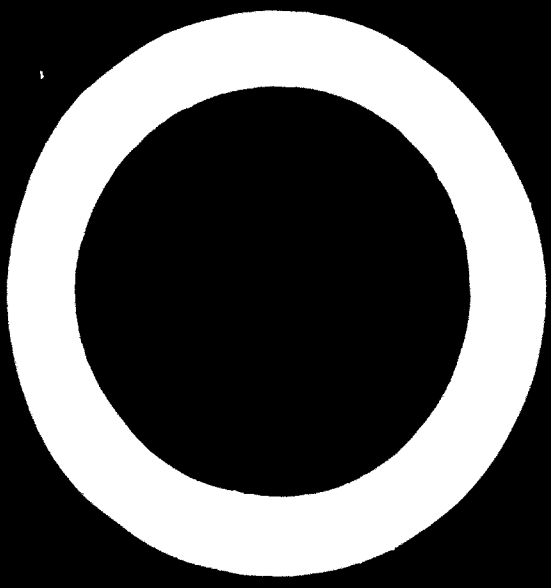
The major objective of the activities listed below is to stimulate small industry through activities benefiting a group of enterprises rather than through activities directed to a particular enterprise. The most important of these activities are:

(a) Training, either undertaken on a group basis or through mobile demonstration units;

(b) Development of common facilities, such as industrial estates or common laboratory testing services, and specialized production units (e.g., a common galvanizing plant for manufacturers of small metal products);

(c) Survey and research work, carried on by branches of industry, function or region, which is of importance for small industry development.

Training and survey work are often undertaken on the basis of *ad hoc* co-operation between the training officers (or research specialists) and the other extension workers. When establishing common facilities, extension workers may often find it desirable to undertake the initial stage of development only, letting the project evolve as soon as possible into a regular self-supporting and autonomously operated venture.



TECHNICAL SERVICES AND FACILITIES FOR RURAL INDUSTRIES*

AGRO-INDUSTRIES

Characteristics of processing industries

Processing industries based on agriculture, forestry and fisheries are one of the key growth points in the economies of developing countries. Sometimes they provide the only conceivable basis for developing other industries. In this process of industrialization, due attention should be given to the development of small-scale enterprises. For the purposes of this paper, a strict definition of "small-scale industry" is not necessary, but a few characteristics of small-scale agro-industries will be described.

The planning and development of small-scale industries based on agriculture, forestry and fisheries must take into account various aspects of production or "catch", the handling of raw materials and certain social factors. Farmers, fishermen and forest workers are directly concerned with these activities, all of which take place predominantly under rural conditions. Processing plants can never operate effectively unless full participation of the primary producers in the entire chain of operations is ensured, from production or "catch" to the processing plant. Forestry, where some crops take only a few years to mature but others require many years, offers a striking example of the need to co-ordinate raw material planning and planning for the ultimate product (e.g. pulp and paper). Fisheries and food-processing industries, which encounter additional problems owing to the perishable nature of their raw materials, could provide other examples.

Thus, although processing industries are very diversified owing to the variety of the raw materials used, a common characteristic is that most of the raw materials are produced in areas with a predominantly rural population. The successful development of processing industries demands close relationship between the primary producers and the industrial enterprise or processing plant. That such a relationship does not yet exist in the non-industrialized countries, or is poorly developed, is a major obstacle to the accelerated growth of processing industries. Governments should concern themselves more actively with this problem.

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* Excerpts from a paper presented to the symposium by FAO.

Another characteristic, which is often overlooked when plans are being made to establish industries based on agricultural, forestry and fisheries products, is that the production methods and processes almost invariably need adaptation to meet specific requirements of industrial processing, regardless of the scale of operation. A few examples, with particular reference to the food industry, may be cited.

Food processing, particularly canning, is expanding in many countries, especially in those in which the costs of cold storage and refrigerated transport are still prohibitive. A processing plant requires readily available raw materials. An adequate supply at a reasonable price and reliable deliveries can seldom be assured under the conditions of agricultural production prevailing in many non-industrialized countries.

Variations in yield owing to poor-quality seed, unfavourable weather, diseases and so on often restrict the availability of fresh produce. To be sure of his supply, the processer should be in a position to contract with farmers or be permitted to acquire land on which he can grow produce specifically designed for processing.

Raw material requirements have been strictly determined in the industrialized countries over the last twenty-five years. Thus, for each product (e.g. peas, beans or tomatoes) and for each process (e.g. canning, freezing, or dehydration), specific requirements have been formulated in respect of shape, size, texture, colour, flavour, odour, acidity, pH, viscosity, maturity, specific gravity, soluble solids, total solids, vitamin content and so on. It requires careful planning in plant breeding and cultivation practices to produce a raw fruit or vegetable suitable for canning, freezing, dehydration or concentration. (Earlier strains of fruits and vegetables have also been modified, and new varieties have been developed to meet the technical requirements of canning and freezing.) In this respect, it is necessary to warn against overenthusiasm in thinking that seasonal surpluses guarantee a successful processing industry.

The livestock industry provides an illustration of the need for adaptation to meet the specific requirements of industry and the consumer. Entirely new methods of rearing cattle and poultry, of which the battery breeding of chickens is an outstanding example, have been developed.

Modern industrialists, including food processers, are not prepared to accept whatever raw material is offered by the farmer or livestock producer. A feedback system between agriculturist and industrialist is thus necessary. In contrast, the utilization of natural resources such as minerals and oils does not depend on the care of the primary producer, nor is the quality of these raw materials influenced by adverse weather. These should be accepted as delivered by nature or made by man (steel, synthetic chemicals, plastics etc.).

To accelerate the development of agro-industries, changes should be introduced both at the technical level (production, processing, consumption and distribution) and at the socio-economic level. In most cases, a basic change in the pattern of production is required. To achieve this, the primary producer should be given guidance. Technical services and facilities for small-scale rural industries should be created. Incentives should be given, for instance, guarantees

for the continuous delivery of raw materials to the industrial processing plants at prices fully commensurate with the additional care the producer should exercise. This, in turn, will depend on the availability of adequate facilities for storage, processing, packaging and distribution. These are lacking in most developing countries, and, as a result, the percentage of waste and losses, especially in the perishable food sector, is very high.

Supporting and related industries

The establishment of processing industries based on agriculture, forestry and fisheries almost invariably leads to the development of supporting and related types of industries. Accelerated agricultural and forestry production requires provision for, and a regular supply of, improved seeds, fertilizers, pesticides, vaccines and other animal medicaments, a wide range of tools for agricultural and forestry production, tractors and auxiliary equipment and machinery. The same is true of fisheries, for which gear, boats, vessels, appropriately designed fishing harbours and ice plants, are needed. Equipment and machinery for handling, processing, storing, packaging (man-made polymers) and a great variety of other products should be manufactured for use in the processing industries. Local workshops should be set up for repair and maintenance and sometimes assembly.

Industrial development, especially in rural areas, also requires adequate supplies of water and energy; improved rural housing and farm access roads; suitable transport facilities, including refrigerated transport for perishable food; improved farm services and market structures; co-operatives and credit systems; and greater managerial competence. The role co-operatives can play in the development of small-scale industries cannot be stressed strongly enough.

A few examples may be given to show how such supporting and related industries may be established. A slaughter-house always produces some waste, such as condemned meat, hooves, claws, intestines, blood, bones and other offal, the disposal of which is often a serious problem. Consideration should therefore be given to the utilization of waste and by-products. If these are available in sufficient quantity, it may be economically feasible to install a small dehydrator or disintegrator, either to manufacture bone, blood or meat meal separately, or to make a mixture, which, in turn, can be used as chicken feed. The minimum size of plant, as available from manufacturers, is one that makes it possible to handle 400 to 500 kilograms of such by-products in one operation.

Processed oil-bearing fruits or seeds leave as residue a presscake containing some oil, all the rest of the fruit or seed being mostly of a fibrous nature. Every effort should be made to have these presscakes used in the immediate area of the oil expeller, or to see how other waste or by-products could be added to set up a feed-mix plant. Converted animal offal from neighbouring slaughter-houses, bran from rice mills or from a pineapple-canning plant, or other dried residues of vegetable origin can then be combined, so that there is little or no loss.

In tanneries, trimmings are usually produced during the tanning process. These trimmings can be converted into glue at low cost.

Pilot processing plants

For a number of industries that process agricultural products, elaborate plants are not required and, indeed, are not advisable, since their planning and construction take a long time and the equipment is expensive.

Aside from large fish-canning plants, pulp and paper mills and other plants that require long-term planning and investment ranging from $10 million to $25 million, the manufacturing industry today produces a great variety of equipment and machinery of various degrees of complexity that are suitable for small-scale and medium-sized processing plants. Investment costs, depending on the raw material, range from some $30,000 to a few hundred thousand dollars (see appendix). Such pilot processing plants, as they could well be named, differ from larger units in size (thus cost), but the appropriate technique or technology (the industrial process to be applied) remains the same.

The viability of particular processing units needs to be determined. This requires somewhat detailed project identification, which will greatly differ with respect to the raw material to be processed and cannot be dealt with in general terms. Factors to be taken into consideration include type of processing, expected value added, magnitude of costs and benefits involved, extent of export-earning or import-saving potential, and a number of other fundamental questions beyond the scope of this paper. To reduce risks as far as possible, expert advice will often be necessary in selecting the equipment and machinery and the technical or technological process.

It is economic, and technologically often necessary, to establish processing industries, particularly those processing perishable foods, close to the source of the raw material, especially when infrastructure is under-developed. Here small-scale industries have certain advantages. These should use modern equipment, but production patterns often need to be adapted. Primary producers should be guided in cleaning, trimming, grading, sorting, cutting and other operations that should preferably be carried out in the field so that suitable raw materials of relatively standardized quality can be delivered to the processing unit.

Thus, through small to medium-sized pilot plants, modern techniques and technologies can be demonstrated; experience gained in the handling of indigenous raw materials and in the production processing, packaging, distribution and marketing of the end product; the required contact established between primary producer and industrialist; in-plant training provided for technical and managerial personnel; and a favourable investment climate created, which will make it possible to set up local farmers' co-operatives and credit unions. Once experience has been gained in managing and operating the pilot plant successfully, duplication or enlargement of such plants is relatively easy.

Another problem that affects the food and food products industries is the alarming and usually unplanned spread of urbanization. Among other things, this makes the supply of both fresh and processed foods in urban areas and towns a critical issue.

One method to increase food supplies for the urban population is to reduce the degree of waste and losses now occurring at every stage between the primary

producer and the ultimate consumer. Few measures are taken to preserve fresh produce during handling in the field and transport to market. Thus, before and during marketing and distribution, losses and waste accumulate. Although it is not always possible to assess exactly the volume and value of these losses, they are certainly substantial and not only reduce the available food supplies but also increase the cost to the consumer. Remedial measures must be taken at every point in this chain so as to control losses and eliminate wastage to the fullest degree possible, such as sheltering public market places, cleaning and drying raw food crops and greater care in handling. Although these simple and inexpensive measures will reduce losses considerably, a point may be reached at which the growing urban population can no longer be supplied adequately with fresh produce—a situation that arose in the industrialized countries many years ago. There is, therefore, a need for a far greater use of processed foods and for the development of new food products.[1] Small and medium-sized food-processing plants established in the primary production areas will be only a first step in this direction. Other essential steps will be to improve transport (in particular, refrigerated transport), cold storage, marketing and distribution facilities.

The fact that measures are required in all these fields, and that, for maximum effect, they should be implemented simultaneously, points towards the development of a vertically integrated system comparable in some aspects to the "adjusted", or "adapted", supermarket chain. The development of such a chain requires a high level of investment, both in the processing industries and the institutional and organizational structure serving agriculture. However, the potential returns from this investment are substantial and sometimes rapid, as is evidenced in the developed countries. A vertically integrated system also makes possible a better use of waste and by-products and, consequently, the establishment of complementary industries. Such a chain of industries increasingly makes available highly nutritive, protective and balanced food and new food products at lower costs, especially protein-rich food products.

The pilot processing plant, introduced as a pre-investment operational project, can be used remarkably well for developing grade standards. Grade standards have been developed in the United States for more than 300 agricultural commodities. Such standards describe the entire range of the quality of a product and, among other things, provide a common language for use in purchase and sale negotiations and agreements and quality-control programmes. Standards for farm products can beneficially affect sales promotion, long-distance trading, and thus greatly aid processers, sellers and buyers. The standardization of agricultural produce usually leads to the adoption of industrial systems of processing.

The Food and Agriculture Organization of the United Nations (FAO) in co-operation with the World Health Organization (WHO), through the Codex Alimentarius Commission, is actively engaged in the development of

[1] World production of processed food is estimated to have increased from 6.5 million tons in 1938 to 20 million tons in 1965.

international standards covering all types of food products, including subjects such as additives, food hygiene, pesticide residues, labelling, sampling procedures, and methods of analysis.

Technological changes resulting from research and development in the processing industry or in marketing, new varieties of raw materials, and trends in consumer acceptance often demonstrate a need for a new standard or a revision of a current one.

Thus, grade standards for processed food products are of equal importance to industry and the consumer. They reflect different quality levels for different needs, serve as a convenient basis for sales, furnish guiding principles for in-plant quality control and provide a basis for purchase specification. A pilot processing plant as a pre-investment operational project, therefore, needs to have a well-established and practical quality-control laboratory so that suitable standards may be systematically developed. Such standards naturally are subject to continuous review and improvement in order to promote the growth of agricultural industries.

Food and Agriculture Organization: services and facilities

FAO's role and responsibility in the field of industrial development is to assist its member Governments to:

(a) Formulate policies and review plans in order to accelerate industrial development based on renewable natural resources;

(b) Analyse economic, social and institutional, organizational and administrative aspects required to implement such plans, and to examine problems affecting implementation; this includes feasibility studies, raw material assessment, compilation of relevant economic data for the processing industries, such as value added, import content of inputs, optimum size and possibilities for regional economic co-operation;

(c) Develop programmes for training personnel at different levels in a variety of disciplines, so that qualified skills may become more rapidly available for industrial development projects;

(d) Develop specific demonstration and research projects, leading to pilot processing plants using the most appropriate modern techniques and technologies as determined by the raw material concerned, taking into due account new products and marketing development, consumer preference, social habits, and other factors affecting profitable operations;

(e) Foster investment in processing industries through preparation of investment plans, feasibility studies and raw material assessment.

With respect to sectors, FAO assists in the development of the following categories of industries:

(a) Food-processing industry, including processing of both animal and plant products;

(b) Industries processing agricultural products other than food (e.g. cotton, wool, tobacco, natural fibres, hides, skins and leather, agricultural residues such as cereal straw, bagasse, agricultural by-products and waste);

(c) Forestry and forest industries, including pulp and paper;
(d) Fishing industries;
(e) Industries supplying essential requisites to develop agriculture, forestry and fisheries.

The technical services and facilities for small-scale processing industries that FAO can provide upon request by Governments cover a wide variety of industries. FAO co-operates with industry in four major fields:

(a) Implementing FAO's pre-investment field work by mobilizing managerial ability, scientific and technical skills and capital resources;
(b) Assisting industry and Governments in implementing projects initiated by them;
(c) Organizing country reviews and missions in order to clarify and, if possible, improve the climate for foreign investment in developing countries and to identify priority projects in the FAO sector as proposed by member Governments;
(d) Exchanging technical and economic information on development activities and in conducting research, demonstration and training programmes.

While industrial initiatives are bound to be based on the interest and support of private business, it is left to the Government of each developing country to decide whether, and in what form, it wishes to take advantage of these possibilities, and what guarantees it is prepared to offer for the security of foreign investment and for the efficient operation and maintenance of new plants.

APPENDIX

CHARACTERISTICS OF SOME PILOT PROCESSING PLANTS

Canning plants

	Capacity (kg/hr)					
	50–100		*500*		*5,000*	
Capital costs *(thousand dollars)*	56	90	180	290	600	850
Labour requirements *(man/year)*	28	56	42	100	66	80

As may be seen, a relatively small capital investment is sufficient to provide significant levels of employment for non-agricultural workers. It is difficult to define precisely the labour requirements for various sizes of canning plants because this figure depends on the nature of the foods to be processed and even more on the labour costs of the area. If wages are high, equipment is available that reduces the manpower requirement, so that fewer people may still produce the same output. Food processing permits this great flexibility in the choice between capital investment and labour requirements. A number of operations, such as weighing, cleaning, trimming, grading, sorting, cutting, slicing or coring can be performed quite satisfactorily by manual labour, yet, when the situation warrants its use, highly sophisticated equipment is available to carry out the operations with only a minimum amount of manual labour.

Rice mills

	Capacity (tons of paddy rice per hour)					
	0.5		*2*		*6*	
Plant equipment *(dollars)*	560	2,800	22,000	31,000	126,000	170,000
Labour requirements *(man/year)*	2	3	6 per shift of 8 hours	8	8 per shift of 8 hours	10

Cassava-processing plants

	Capacity (tons of tubers)			
	0.3/8 hr	*25/24 hr*	*40/24 hr*	*100/24 hr*
Plant equipment *(dollars)*	8	80	150	300
	10	120	160	350

(Ratio: 5 tons of tubers to 1 ton of starch)

Flour mills in Western Europe, approximate construction and operating costs, 1964[a]

Grain milling capacity (tons/24 hours)	*Construction cost per unit of milling capacity[b] (dollars)*	*Investment (dollars)*	*Operating costs per ton grain milled (dollars)*
0 – 10	19,000	190,000	30 – 40
10 – 50	9,000	450,000	18 – 22
50 – 125	6,000	750,000	13 – 17
over 125	5,000	1,000,000	11 – 14

Canning bottling of fruits and vegetables

	Scale of processing/manufacturing facility		
	Small	*Medium*	*Large*
Fixed capital requirements *(thousand dollars)*	145	400	2,000
Working capital requirements *(thousand dollars)*	75	150	700
Sales ex factory per working year *(thousand dollars)*	200	600	2,750
Period of production served by working capital *(days)*	60	60	45
Average period of production per year *(days)*	100	150	250
Direct labour *(average number of workers)*	40	60	170
Raw material input, gross *(tons)*	700	1,750	7,000
Finished goods output, net *(tons)*	150	400	1,800

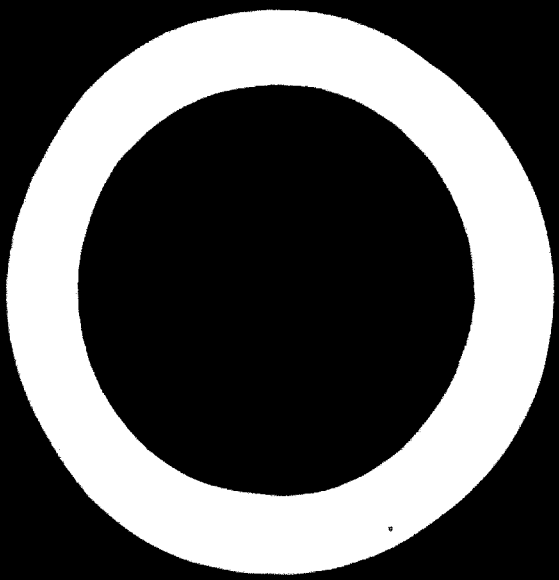
Coffee-processing plants

Processing method	*Capacity of plant (lbs of dry coffee per day)*	*Total cost of plant and building (dollars)*	*Manpower required (no. of workers)*
Small-scale processing	50	56	3
Co-operative dry processing	720	4,500	8
Co-operative wet processing	1,800	5,600	12
Modern wet-method coffee processing	9,000	56,000	20

[a] Sample data obtained from one of the largest European companies manufacturing grain and rice mills and feed-mixing plants.

[b] Cost without building silos and power plant.

[c] Based on 250 working days/year; excluding cost of grain but including wages, depreciation, interest, duties. These costs, however, are only applicable when the capacity of the mill is fully utilized; they would increase with a degree of excess capacity.



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PROBLEMS IN THE APPLICATION OF TECHNICAL ASSISTANCE TO SMALL-SCALE INDUSTRIES IN DEVELOPING COUNTRIES*

The expert's assignment

The term "technical co-operation", or "technical assistance", is sometimes understood to cover not only the straight provision of professional advice but also aid with a substantial element of capital investment. For the purposes of this paper, technical assistance will refer to technical counselling and training of key personnel by a foreign expert assigned to a Government. Irrespective of which label is attached, the aim of technical assistance is to transfer and adapt knowledge, skill and experience to the conditions of a developing country. A mere transfer of techniques might impose so much strain on a traditional pattern that it would be difficult to apply the new techniques. Until the disciplines that are involved in such a change become domesticated, the benefits of the assistance cannot be fully realized.

The over-all objective of technical co-operation is to improve the standard of living in the developing economies through better use of existing human, material and productive resources. In relation to industry, and in particular to small-scale industry, the approach is to help in creating a more favourable investment climate; in increasing productivity through improved methods and training; in selecting products for domestic manufacture to replace imports; in finding new uses for indigenous materials; in fostering the entrepreneurial spirit; and in providing incentives. These sectoral aims, which jointly constitute a development programme, have been the subject of a considerable body of literature, and it is most unlikely that they are unknown to the government officials entrusted with the development of industry. Requests for assistance, therefore, are often related less to the known objectives than to the methods by which they may be realized. This is, indeed, as it should be, provided that the requisite legal and administrative machinery is in existence to allow these aims to be achieved. The problem of priorities is thus introduced. What the Government of a developing country requests may not be what is most needed at that moment.

* Paper presented to the symposium by Alexander NEILSON, who has served as a United Nations Expert in Cyprus, Indonesia, Iran, the Philippines, Trinidad and Tobago, Turkey and Venezuela.

The technical co-operation programmes of the United Nations and its specialized agencies offer Governments of developing countries the services of experts in a wide variety of fields. Presented with such a choice, Governments sometimes make requests which are superior to their actual needs, or for which they are unable to supply the necessary supporting services. Not only is this a waste of the limited funds available for technical assistance, but it is also a major cause of the frustration often experienced by experts in the field.

Other factors may prejudice the success of an expert's mission even before he arrives in the country. It is unavoidable that a considerable period of time should elapse between the receipt of a request and the arrival of the appointed expert at his duty station. In most developing countries there is always a certain amount of experimentation leading to the formation of new and the disappearance of former government agencies, with consequent regrouping of staff functions. The result may be that the agency that formulated the request may have been disbanded and replaced by another with a completely different policy. Even under the most favourable circumstances the new agency cannot be expected to have its predecessor's interest in the project.

In countries where the Government's term of office is for a fixed period, the assignment of an expert within a period of twelve months in advance of a general election is likely to diminish his chances of success. The Government is too immersed in preparing its forthcoming campaign and the office holders are too preoccupied with their prospects of reappointment to give adequate consideration to proposals for projects. There is a tendency to "shelve" everything until after the election. In any case, it is almost certain that if the election results in a change of Government, any scheme submitted to, and not already implemented by, the former administration will be rejected.

Small-scale industry is very seldom highly organized — not nearly to the same extent as its larger counterpart. As a whole, it lacks the means of making known its needs to the Government. The framers of requests for technical assistance usually are government officials with only limited contacts with this sector. It is surprising, therefore, that their assessments sometimes do not exactly correspond to the realities of the situation. The effect of this is to divert a portion of the efforts of the expert to the reorientation of the official viewpoint, a task that may be futile if there are political implications.

The first two or three weeks of an expert's sojourn in the country of his assignment is a critical period. By and large, it is a period of mutual personal assessments. The expert is adjusting himself to the conditions in the new country; meeting the members of the ministry or agency with whom he will work; and trying to ascertain the counterpart and secretarial support he can expect. At the same time, his future colleagues are looking him over, not to determine his technical ability, for that to them is still unknown, but to see what kind of person he is. Thus, he must exercise the utmost tact, since the co-operation he will receive will be determined, in no small measure, by the impression he makes in these early contacts. Any expert who fails to secure the willing co-operation of the officials of the agency to which he is attached will find himself operating in a vacuum.

The expert is usually eager to start the real task of his assignment and is impatient with what seem to him to be unnecessary delays. At this point, he should remember that he is an alien, that the Government of the host country has developed the procedures it considers best suited to its needs and culture, and, in any case, that he should not offer gratuitous advice. Usually it is possible to expedite matters through friendly and informal discussions with the officials concerned. Only as a last resort is it advisable to make an appeal through the United Nations resident representative. While this, no doubt, would be successful, it is likely to prejudice relations with the middle-level officials with whom the expert will have the most contact.

It is not common, but certainly not unknown, for an expert to sense that there is hidden resentment of his appointment. Some of the officials of the agency to which he is attached may feel that they do not need advice in the expert's particular field and regard his presence as a reflection on their competence. Others may regard the acceptance of assistance as being in some way related to dependency upon a foreign country. As Shonfield states: "It is bad enough to be poor; to have to rely on another man's bounty for ideas as well is liable to turn even a normally sensible personality awkward and stubborn."[1] While these feelings may be more understandable in connexion with bilateral than with international assistance, none the less they exist and have to be overcome. And the expert can overcome them: by admitting that he has as much to learn from the people of the country as they have from him; by initially identifying himself with the official outlook as far as is possible; and by making suggestions rather than assertions. This does not mean that the expert should not be firm when he is convinced the circumstances demand it. That may come later, but his opinion is unlikely to receive the consideration it deserves if the expert has not won the acceptance of his colleagues.

It is almost always written into the technical assistance agreement that the recipient Government shall appoint a counterpart to work with the expert. The success of a mission can depend to a great extent on the ability and enthusiasm of the counterpart. The ideal arrangement is to appoint a counterpart having had technical training similar to that of the expert, some practical experience in his field, and holding a sufficiently senior position in the government service to be able to continue the work after the expert has left the country. If these requirements are not met, the relationship between the expert and his counterpart will not be one of co-operation: at best, it will approximate that between teacher and pupil; at worst, the counterpart will become an interpreter and guide.

The Government of a developing country can only seldom appoint a counterpart who fulfils all these requirements. Sometimes no counterpart is provided. The country usually lacks experienced professional personnel, particularly engineers, and the salaries offered by the Government fail to attract the few who may be available. Some qualified people may be reluctant to serve as

[1] Andrew Shonfield, *The Attack on World Poverty*, Chatto & Windus, London, 1960, p. 180.

counterparts because they fear they may miss an opportunity for promotion. Often the only way in which the Government can supply a counterpart is by recruiting an inexperienced graduate. No matter how high his qualifications, unless he has had some practical experience he cannot be regarded as a true counterpart; and his junior position in the government service does not augur well for the continuance of the project after the expert departs.

Hence, it would be advisable for Governments to place less emphasis on degrees and more on practical experience. The world over, the salary structure in government service is based on academic qualifications and length of service. As long as there is an inadequate number of government officials with university degrees, there is no simple solution to the counterpart problem.

The foregoing remarks, which relate to what may be described as the pre-assignment factors, are necessarily subjective, being based on the writer's personal experience over several years on one-man missions of short or medium-term duration. It is believed, however, that they have a validity for most technical assistance missions of this type. In what follows an attempt is made to describe some of the problems that arise in the course of dispensing technical advice in the small-scale industrial sector.

The Expert's Approach

The giving of advice to the owner or manager of a small industrial establishment is not quite so simple as it might appear. Although it may be obvious to the expert that working methods can be improved or that the quality of the product can be raised, it may not be so apparent to the owner. The owner probably considers his methods, plant and products to be equal, or superior, to those of his competitors. Although he may admit that improvements can be effected, he is generally thinking in terms of new or additional equipment and not of rationalization of existing facilities. If the expert senses that his advice is being covertly resented, he should try a different approach. The cause of the resentment is either the owner's conviction that no foreigner can possibly understand his problems or his assumption that the mission of the expert is "just another one of these government inquiries". Owners of small enterprises in developing countries tend to be excessively secretive about their methods and costs. The entrepreneur feels that any information he may give may be passed on either to his competitors or the tax authorities. Thus, barriers of self-satisfaction, suspicion and secrecy must be overcome before the proffered advice can make any impression.

In most cases these barriers can be surmounted if the initial approach is to inquire whether the owner has any particular problems in operating his business. This approach usually releases a torrent of real and imaginary complaints about government policy or controls, the iniquities of the supplier of materials, the labour force, unfair competition, and the impossibility of making a reasonable profit under the present circumstances. At this point it is possible for the expert to express his appreciation of the owner's difficulties and to suggest where he

might be able to be of assistance. From there on the owner is likely to be receptive to suggestions.

A word of caution may not be out of place at this stage. The proprietor of a small undertaking cannot afford to close down his operations to make radical alterations, no matter how necessary and obvious they appear to the expert. Even if the necessity for these alterations can be unambiguously demonstrated to him, the proprietor may be unable to raise the funds, and he has not yet reached the point of complete trust in the expert's assessment. It is advisable, therefore, to confine initial suggestions to simple and inexpensive changes that show early results and to encourage the owner to bring his problems to the expert's agency. Once the owner realizes that the changes have brought benefits, he is more likely to consider making more extensive alterations. The entire range of recommendations should be discussed with the expert's counterpart; and, if possible, the initial suggestions should be presented as the joint views of the expert and counterpart. Indeed, any means within reason of heightening the status of the counterpart in the eyes of the owner should be employed. Recommendations are not effected overnight. It is more than probable that it will fall to the counterpart to advise on the major changes after the expert has left the country.

A considerable portion of the expert's, and his counterpart's, efforts will be directed towards increasing productivity and improving product quality through better use of existing facilities. These two objectives are frequently interrelated. So far as productivity is concerned, good housekeeping, reduced handling and improved working conditions are measures that are likely to be necessary in small undertakings, regardless of the nature of the operations carried on. Fortunately, they can be implemented at very low or at no cost.

It might be argued that what it is hoped to gain by piecemeal introduction of the foregoing measures could be achieved, to a greater degree, by plant re-layout. This is true. But it is also true that in the small-scale sector it is very often impossible to redesign the layout, for several reasons. First, the undertaking very often is accommodated in cramped, badly lit and poorly ventilated premises that were built for commercial or domestic use; frequently the available floor area is subdivided by structural parts that cannot be removed. Second, the type of construction may be such that overhead lifting devices cannot be used; the shape of the floor area and the relative positions of doors, window openings and internal staircases may militate against a rational work-flow. And, third, the owner of the business may not be prepared to accept either the loss of trade during the alterations or their expense. Not all of these difficulties are present in every case, but, in the writer's view, one or another of them is usually to be found. There are certainly exceptions where a new layout is desirable and both physically and financially possible and the owner is willing to interrupt his activities to make this improvement.

It has been the writer's experience that, with the exception of factories regulated by legislation designed to ensure clean food or drugs, the standard of housekeeping in workplaces in the developing countries is very low. It is almost the norm for floors to be cluttered with tools, jobs in progress, scrap or

raw materials to the extent that access is severely restricted. In extreme cases there may not be sufficient free space to work in safety. The cleanliness of walls, ceilings and windows leaves much to be desired. Frequently the fabric of the building, particularly floor and roof, badly needs repair. The result of good housekeeping is not just a cleaner, healthier and tidier workplace – improvements are reflected in higher productivity. One authority estimates that an increase of 10 per cent is possible by this means alone. Good housekeeping can help reduce accidents and can release capital through the sale of surplus and often useless material that formerly was allowed to accumulate. More importantly, it can be introduced with very little disruption of the work, and the results are immediately apparent.

The cost of handling materials in a small factory can be excessive, particularly if the products are heavy. Not only may the layout impose unnecessary distances over which materials must be moved, but also the smallness of the establishment may mean that skilled – and therefore highly paid – labour must be pressed to assist in these transfers. It may not be possible to eradicate all the unnecessary handling, but it can generally be reduced substantially. The provision of benches or stillages, at appropriate levels and points, on which work-in-progress may be held between operations eliminates the effort of raising and lowering work to the floor. The use of baskets or tote pans to carry goods in bulk can save needless trips. Where a hand operation is scheduled to be done between machinings, the placing of a workbench at the site means that the part does not have to be carried to the fitting shop. In the aggregate, simple and inexpensive measures such as these can have a marked effect on operating costs.

It has been the writer's experience that the most serious material-handling problems arise in sawmills. It would appear, in the small-scale sector at least, that little consideration is given to the labour involved in loading a log onto the table of the breakdown-saw and in handling the cut flitches. It is not uncommon to find a log of considerable girth and length being manhandled from the stockpile to the sawbench – a task that may require the entire labour force of the sawmill. In one sawmill where this was the practice, it was possible to build a stillage onto which logs could be rolled from the timber lorries, and from which a log could be rolled as required onto the sawbench. Unfortunately, space did not permit more than six or seven logs to be held on the stillage at one time. Because of other factors it was not considered feasible to reduce the labour employed; but the work was much less arduous, and the time the saw was actually cutting was increased by about 15 per cent. Very often cut flitches, as they are removed from the breakdown-saw, are placed on the floor. The labour of raising and carrying them to the resaw could be avoided if they were placed on stillages of suitable height along which they could be pushed to the saw.

The working conditions in many small establishments can be very poor, especially if the premises are converted dwellings or shops. The principal defects are uncleanliness, bad lighting and ventilation, lack of sanitation, inadequate workbenches and overcrowding. Often the best advice would be to suggest a change of quarters. The owner may have considered this, but be convinced that any move outside the immediate neighbourhood would adversely affect

his business. This attitude partially explains the reluctance of some proprietors to relocate themselves on industrial estates. Within the limits imposed by the type of workplace, it is possible to suggest improvements such as a higher level of illumination where precision work is being done, means of shielding workers from heat emissions in certain processes, the screening of electric welding operations and the provision of an adequate number of workbenches of suitable height. Sometimes it may be suggested that chairs be supplied to allow the work to be carried out in a seated position. It is common in developing economies to find establishments engaged in the assembly of imported components into such articles as radio receivers, ball-point pens and domestic electrical appliances. The correct positioning of the various component bins with reference to the operative, and, in particular, to the hand used by the operative to pick up and secure specific components, can substantially increase productivity at very little cost.

TECHNICAL IMPROVEMENTS

The foregoing suggestions, in the main, relate to non-technical improvements. It will, however, be apparent to the expert that there is often room for improvement in the actual operation of the equipment. The defects are likely to be connected with the speeds at which machines are run, the use of incorrectly shaped, sharpened or adjusted cutting tools, the lack of simple jigs, the inadequate provision of measuring instruments and hand tools, and poorly maintained plant. All of these factors can, and do, adversely influence quantity and quality of production. Two deserve special emphasis because they are frequently encountered and have far-reaching effects: lack of tool-sharpening facilities and neglect of maintenance.

In every industrializing country in which the writer has worked, there has been a dearth of equipment to sharpen wood- and metal-cutting tools. The deficiencies, in the woodworking field, generally are in connexion with the sharpening of hand and circular saws, and the sharpening and adjustment of planer and jointer knives. The dressing of these tools by hand is a tedious and time-consuming task, and rarely is the result as satisfactory as when it is done on one of the appliances designed for this purpose. Indeed, in respect of either a band or circular-saw, the life of the blade is frequently substantially reduced by hand sharpening. The small-scale metalworking undertaking seldom has any means of sharpening milling cutters, reamers and taps. It is very rare to find cemented carbide tip tools in use because of the lack of equipment to dress them. The use of blunt, incorrectly adjusted cutting tools not only reduces the rate of production, but also results in inferior finishes. The appliances needed to correct this situation are relatively expensive and may be beyond the resources of the proprietor of a small establishment, who, in any case, will not be able to make use of them at anything approaching their rated capacity. Commercial tool-dressing services seldom, if ever, are available in developing countries, and the small entrepreneur appears to be disinclined to obtain these services from a larger competitor who has the necessary equipment. It would be highly

desirable if co-operatives or trade associations provided these facilities or if they were included on an industrial estate.

Maintenance, in the context of small-scale industry, usually means repairing a piece of equipment that has broken down. The idea of preventive maintenance is confined to the modern and higher echelon of this sector, and even here the procedures can seldom be described as planned preventive maintenance. The small entrepreneur finds it difficult to understand why it should be necessary to shut down a machine for adjustment while it is apparently operating quite satisfactorily. He regards the breakdown of plant, and consequent lost production, as a normal hazard of his operations. The most he is prepared to do is to keep a small stock of spares, and this is by no means universal practice. Very often a machine has to stand idle until replacement parts can be obtained. To some extent this attitude may be attributable to lack of accepted standards, but it is curious that it does not extend to the servicing of motor vehicles at predetermined intervals; the necessity for this is almost always accepted.

The effective operation of a system of planned preventive maintenance requires a considerable amount of documentation (transfer of instructions from the master to the daily work sheets, recording of information). Small-scale industry, as a whole, has not reached the stage where it is necessary for the management to transmit instructions in writing. The imposition of such a discipline would be so foreign to normal practices that it would be rejected. Yet substantially the same results can be achieved by instituting regular maintenance periods in which the necessary tasks are performed by the machine operators. Such instructions as "Oil every Monday morning", "Check clearance every day" or "Wipe down every Friday evening" can be stencilled at or on the appropriate items of equipment; and if over the first few weeks the management checks to see that these have been carried out, a reasonably good standard of maintenance will be attained. Alternatively, one morning a week may be set aside for maintenance work. The really difficult task is to convince owners that the time so spent is not lost, but will be more than recovered by the elimination of forced stoppages.

It is almost impossible to generalize about the quality of the goods produced by small-scale industry. At best they are excellent and in regular demand, and at worst are salable only in an uncritical market at very low prices. The product of the average small-scale undertaking lies somewhere between these extremes, and in some trades it may be nearer the lower than the upper limit. Quality in relation to manufactured goods, and in particular to machine-made goods, means consistent quality, and this is the result of standardization of materials and methods. Without standardization, consistent quality is impossible and intrinsic quality is a matter of chance. The Governments of most developing countries appreciate the necessity of developing either legal or voluntary standards, but few have reached the stage of publishing their own. Current standard specifications are available from more industrialized countries, but unfortunately the general public is unaware of this and consequently does not exert pressure on the manufacturers to comply with them. Such pressure as may be applied by wholesalers is generally in the direction of lowering costs and may even work

against the production of goods of a quality that could compete with imports.

The principal obstacles to the improvement of product quality in the small-scale sector are the variations in the quality of the raw materials, the lack of inspection at intermediate stages of manufacture, and often the absence of any form of inspection or testing of the completed article before packaging. In so far as these impediments are not the result of ignorance, they are related to the lack of accepted standards and, in the opinion of the writer at least, to a resistance to the concept that even self-imposed standards are necessary if a uniform and satisfactory product is to be achieved.

In obtaining his raw or intermediate materials, the small entrepreneur in an industrializing country is at a disadvantage *vis-à-vis* his counterpart in more developed countries. If he makes use of local materials that are themselves subject to variations - scrap, for instance, is the raw material of many small enterprises - he may have no alternative but to accept them and to do the best he can. He seldom has access to facilities for physical or chemical testing, and he cannot afford to reject supplies if they do not exactly comply with his requirements. Where imported materials are concerned he may be at the mercy of local stockists who represent material on hand as being "just as good and a little cheaper" than what he specified; he may not appreciate the differences between materials bearing the same general name but of different specification. He usually considers imported materials in terms of price rather than quality. He subscribes, unfortunately, to the same belief that he deprecates in his customers, that imported goods must necessarily be superior to local products.

Not every small-scale undertaking has these problems. They are, however, particularly evident in the metalworking industry. While the knowledge of hardening and tempering is commonplace, the selection of special steels for particular duties is seldom practised, and the physical properties of an iron casting more often are the result of chance than design. In fairness to the small entrepreneur, it must be stated that he seldom has the means to control heat treatment accurately, or the equipment to finish hardened parts. On the other hand, the writer is aware of several instances of heating and quenching being carried out with the object of hardening the cutting edges of agricultural tools, with no one aware that the material employed was dead-mild steel. The expert can give useful advice on the use of the correct material for the job. Whether this is accepted or rejected will depend on whether the owner considers his profits will be increased or diminished. The most the expert can hope for is that the owner will make the suggested change when his present stock of material is exhausted; but that may be some time hence, since small establishments usually carry unduly large inventories.

In a developing economy, the small industrialist is unable to exercise adequate control over the size of the inventories of imported materials he is forced to carry. Even in relation to indigenous materials he may not be his own master. The textbook theory that inventories can be equated to projected production and sales characteristics does not take into account such factors as size of minimum order acceptable to the supplier, unpredictable delays in obtaining import licences

and irregular shipping connexions. To give an example, a firm engaged in the manufacture of straw brooms used imported wooden handles. Although the sales of brooms amounted annually to only 3,000 dozen, the minimum order that could be placed was for 5,000 dozen handles. The manager was aware of the disadvantages of tying up capital in this way, but he could do nothing about it. Indeed, he made the position worse by assembling brooms to the extent of his materials and so was forced to carry stocks of finished brooms in excess of annual sales. The solution finally adopted was to have broom handles of the requisite quality made locally and supplied as required. Delays in obtaining import licences, except those caused by non-availability of foreign exchange, are avoidable. However, in many developing countries the procurement procedures are cumbersome and time-consuming. Often the officials dealing with the applications have no real knowledge of the materials in question. It is not surprising, therefore, that the applicant is inclined to place an order for more than his foreseeable needs in the belief that it may be reduced by import controls or to avoid repeating the wearisome process in the very near future.

Even when there is no difficulty over delivery, the small industrialist is still inclined to over-order. To some extent this is due to his experience that prices generally rise, but it is mainly related to the lack of planned production, which in turn is linked to the absence of any projection of sales. Some entrepreneurs are able intuitively to estimate closely their possible sales, and with them there is no problem. Generally the reverse is true. It is not easy for the small manufacturer to assess the potential demand. His sales organization, if it exists at all, is rudimentary. Often he is in competition with foreign producers, and his share of the market may be just what importers are prepared to allow him. The best advice that can be given, in the writer's opinion, is to persuade him to employ a marketing agent. The established importing houses, which are a feature of developing countries, are well aware that the nature of their business will change as industrialization progresses, and that they will be forced to act increasingly as distributors of local products. Their knowledge of the local market and export possibilities can be extremely useful to the small manufacturer. Frequently they are prepared to enter into an agreement to handle the entire output. This guaranteed outlet allows the manufacturer to plan his production and to adjust his inventories to the current situation.

The examination, between operations, of work in progress, with the object of ascertaining that it complies with certain predetermined standards is fundamentally foreign to the small-scale sector in countries beginning to industrialize. The fact that the rejection of defective or substandard pieces early in the process will not only help to maintain a uniform high quality, but also save further unproductive work and minimize the amount of scrap is not appreciated. It often will be found that the only concession made in this direction is a cursory inspection prior to packing for dispatch. It is not that the owner or manager is unaware of this aspect of quality control. Indeed, he carries it out in an attenuated form each time he rejects or attempts to repair an obviously defective part, and he may be conscious that some of the more progressive concerns in the sector practice quality control; but, by and large, he regards it as some sort of

mystique of the large firm. Where this attitude is evident, it is more than a mere reaction against innovation; there is some sort of psychological resistance. The writer feels certain that most experts have experienced this barrier, if not in connexion with this particular problem, at least with some aspect of technical change.

This mental barrier must be overcome. It is the basis of the frequently made charge that import substitutes are inferior to the originals. The indictment is sometimes true. So far as the small-scale sector is concerned, the writer believes that if quality control is divorced from the jargon and "gimmicks" that surround it, it could be introduced in a simplified form. The procedures based on statistical quality control are unlikely to have any application to small-scale industry. The techniques to be employed must be specifically related to the requirements of the job. The small manufacturer certainly wants to know why his product is not selling as well as it might, or why consumers prefer the imported equivalent. The initial approach is to help the manufacturer to discover the reasons through critical analysis of his product. Once he has pinpointed the one or two defects responsible, he will make sure they do not arise in future, and he is well on the way to establishing quality control. An example of this recently came to the writer's attention. A firm of furniture builders required 2,000 pairs of veneered lamina-board chair arms. A licence to import the arms was refused, as a local source of supply existed. Samples were submitted, and an order stipulating a certain rate of delivery was placed by the furniture builder, with some misgiving. The first delivery was made according to schedule, but some 60 per cent of the arms had to be rejected. The matter was investigated, and it was found that almost all the rejections were on account of variations in the curvature of the arms. The supplier was contacted, and it was found that in the final forming operation he was clamping two arms in the bending jig in such a way that one was outside the other and consequently had a greater radius. After bending, rebates were cut on one side of each arm to form connexions with the body of the chair. This determined the "hand" of the arm. As no selection was made to ensure that there were equal numbers of right and left hand arms of the same curvature, the chance of finding matching pairs was small. The jigs were altered to permit two arms being bent to the same radius, and the foreman, on his own initiative, constructed a profile gauge to check the curvature. In subsequent deliveries, rejects on this account were negligible.

Small establishments are unable to support a separate inspection organization. The duties are likely to fall on the foreman. In the operation of a simplified quality control system, he is the key man, and it is as important to convince him of the benefits of the system as it is the proprietor. And it is usually easier. The essential quality of a manufactured article is generally determined by one or two of the many operations performed. Once it has been demonstrated where the control is necessary and to what extent, the foreman will be able to effect it. It is essential to secure the co-operation of the operatives. This will not be difficult when it is realized that it is not a device to obtain more work for the same pay. It has been found, in some countries, that a simple chart showing the number of articles made and the number that passed the acceptance tests has the effect of stimulating higher standards of workmanship.

The quality of an article is often judged by its presentation. This particularly applies to such consumables as prepared foods and cosmetics, but few products are completely unaffected by this prejudice. In the developing countries, it is admitted that the general standards of presentation – printing and packaging – are very low. This is not a matter of inability to produce attractive labels and containers, as is evident from a comparison with those prepared for certain large entrepreneurs, notably the liquor trades, but of lack of attention to marketing techniques, or false economy. Not infrequently the most useful advice an expert can give is in this field.

In his visits to small industrial enterprises, the expert is likely to encounter problems related to the under-utilization of equipment, the continued employment of long obsolete plant, and the use of unsuitable machines. Here it may be possible to offer advice that does not involve radical change, but often the only real solution is ruled out by considerations of cost.

It is something of an anomaly that there should be a great deal of idle equipment in a country in the throes of industrialization. So far as the small-scale sector is concerned, the reasons for this situation are the small size of the local market – small-scale industries are rarely export-oriented – and the paucity of efficient, low-output machinery. In most cases the machinery is imported from countries in which the economic motive is to reduce the labour component in production, and, as it is impossible to eliminate it entirely, the desired result is obtained by increasing the output relative to the labour employed. Often the smallest size of available plant is too great for the entrepreneur's share of the market and, in extreme cases, for the entire national market. Even when it is feasible to operate at rated capacity for a part of the time, the result is that production costs are higher than normal and, if passed on to the consumer, may in turn reduce the already too small volume of demand.

In enterprises where this situation occurs, the only solution is to endeavour to increase the size of the market or, if possible, to produce more lines of goods with the equipment. The following case, which relates to the manufacture of envelopes, is an example that may be applicable to the production of other articles. A firm installed machinery to produce a fairly extensive range of the smaller sizes of "bankers" and "end opening" envelopes. The output of the plant was controlled by the gumming and folding machine, which could form some 4,000 to 6,000 envelopes per hour. Although the importation of envelopes was controlled, sales were poor, and in a short time the firm had some seven million envelopes in stock and was on the point of closing down. On investigation it was discovered that importers were being allowed to bring into the country envelopes differing in size from those made by the firm. The imported envelopes differed by only a small fraction of an inch from those made locally, and sometimes were within the tolerances permitted by the relevant British Standard Specification. The owner was advised to obtain the necessary cutting dies to produce all the standard sizes within the range of the folding machine, and the importation of envelopes within this range was prohibited. The firm is now able to dispose of the bulk of its production.

The use of obsolete processes and machinery by the small-scale sector is sometimes considered to be one of the causes of low productivity, but it is seldom stated whether reference is made to the productivity of labour or of capital. In any case, obsolescence is a relative term. What is obsolete in the United States may not be so in India or Nicaragua. A process or machine becomes obsolete only when it is no longer suited to the current conditions in a country – that is, when the operation has ceased to be competitive or there is no longer a demand for the products. Examples are most likely to be found in the traditional industries – spinning and weaving, dyeing, leather tanning and the processing of minor agricultural crops. Such undertakings survive only if they are protected, remote from competitors or integrated with more profitable units. Where such technological stagnation is found, it is very difficult to offer any effective solution other than complete modernization. Sometimes it may be possible to recommend minor alterations to a process, such as replacing "rule of thumb" methods by simple instrumentation, or to suggest a better method of feeding a machine, but the extent to which advice can be given is obviously limited.

Very often a piece of equipment becomes obsolete in an industrialized country only because a more advanced model that requires less labour per unit of production has been developed. It is economical to replace the old machine if the savings in wages will more than compensate for the capital and installation costs. In the industrializing countries, the cost of labour generally is considerably lower than in the technologically advanced ones, and in such circumstances the latest and most labour-saving plant may not be the most economical. Unfortunately, this aspect is seldom given any consideration. Owners of small enterprises are noticeably reluctant to purchase anything but the most modern equipment, although the over-all operating charges are higher, the servicing more difficult and the output beyond their foreseeable needs. The writer is aware of many instances of automatic steam boilers being installed in locations where the repair of their control systems was beyond the competence of the available facilities, where the nature of the feed-water was unsuitable, and where the functions could equally well have been performed by much less expensive tank-type boilers.

The interests of the owners of small manufacturing enterprises would often be served best if they could be persuaded to consider installing reconditioned second-hand plant. In some developing countries, unfortunately, restrictions are still placed on the importation of used equipment.

It may fall within the terms of the expert's assignment, or he may consider it appropriate, to recommend the local manufacture of certain goods at present being imported. He will certainly be approached by entrepreneurs, with and without capital, for suggestions on possible small businesses they could start. There usually is a fairly wide range of articles that could be manufactured at the current level of technical skills either on existing capital equipment or on machinery to be imported for that purpose, provided that the anticipated demand is sufficient to sustain the means of production. Because of either the broadness of the classification groups or the lack of up-to-date statistics, it is always difficult,

and in some cases impossible, to estimate the extent of the market from official publications. Importers and distributors are seldom willing to disclose their "mark-up", and information gathered from them may be biased. Where it is possible to make a realistic estimate of the demand for the selected product and, more importantly, the share of the market a successful manufacturer could reasonably expect, a start can be made on the preparation of a feasibility study.

The assembly of the data for such a study can present considerable difficulty. It is usually necessary to obtain quotations for equipment from manufacturers in Europe or the United States – an operation that may involve correspondence over a period of one or two months and sometimes produces no results at all. Similar delays are experienced in connexion with the prices of imported materials. In some countries, the real cost of labour bears little relation to the official, or generally accepted, rates, as these are augmented by variable, yet substantial, fringe benefits. It is not unusual after all this to be forced to the conclusion that either the article cannot be produced in the required quantity at a competitive price or that the projected return on the investment would be lower than the return that could be expected from commercial dealings. It is undeniable that what would be considered a reasonable return in the highly industrialized countries would not be so regarded in the developing countries. This view is justified, to some extent at least, by the fact that both the interest rates and the risks are substantially higher in the latter countries. While it is possible to select suitable articles for local manufacture based on the use, in the main, of imported raw or intermediate materials, there is greater scope for the production of goods containing a substantial proportion of indigenous material. As the entrepreneurs in the developing countries are by no means slow to seize opportunities, the obvious possibilities have usually been exploited. Sometimes little thought has been given to increasing the extent of the processing of export materials.

It is often maintained that the shortage of technical skills is one reason for the slow rate of industrialization in some countries. It is generally true that many under-skilled or semi-skilled workers are found in what are usually regarded as skilled occupations, but it is wrong to suppose that there is any real difference in the level of skill between skilled operators in developed and developing economies. The fact is that throughout Asia, the Middle East and certain parts of Latin America, the old skills are being lost because they are no longer in demand, and the disciplines that the new skills involve have not as yet fully taken root. While no one denies that vocational training can do much to ensure increasing numbers of workers with at least basic training in their crafts, the impact is often much reduced by wastage. The principal of a vocational school in Turkey estimated that over the past two years 20 per cent of the students had found employment at their trades, and he regarded this as a significant improvement. This wastage is the symptom rather than the cause of the malady. In the developing countries, the recruits to industry are drawn principally from agricultural communities. The personal adjustments that are necessary to conform to the new environment can be very great. Is it any wonder that many fail to make the grade?

The shortage of skilled technicians, if it means a dilution of skills in many establishments, can, and does, affect the conduct of an expert's mission. It makes it necessary for him to modify his conception of what is practicable and to accept the fact that progress will be slow. What is perhaps even more serious than the lack of adequately skilled workers is the dearth of good foremen. A competent supervisor can do a great deal to make up for the deficiencies of the men under him, and a poor one can neutralize the best efforts of the most skilled team. In some countries the qualities that go towards making a good foreman are not admired. A Malay overseer will hesitate to reprimand a worker, no matter how much the reprimand may be deserved, because he is afraid of getting a "bad name". Sometimes the intricacies of family relationship within a small factory, even if the will is there, make the maintenance of any form of control very difficult. The need to train foremen is very evident.

The small-scale sector suffers, in most countries, from a shortage of capital. While this undoubtedly restricts growth and perpetuates uncompetitive methods, the lack of competent, aggressive management is a contributory factor of almost equal importance. The latter, at the very least, retards the implementation of, and may nullify, the improvements the expert has suggested. The manager of the average small undertaking needs training not only in management techniques but also in costing. Few managers know reasonably accurately the cost of their products. Small entrepreneurs have been known to disregard such factors as interest on loans, depreciation and maintenance charges, and even rent. Any suggestions to maximize profits by variations of the product mix in these circumstances are futile. It is not that the manager is less intelligent than his counterpart in a more developed territory, but rather that he places a different emphasis on certain factors owing to his cultural background. The managers of many small undertakings could certainly benefit from courses of instruction in costing and management techniques, but those most in need of it unfortunately realize it least. Few of them have the time and inclination to attend training sessions. For this reason, the formal approach has a limited impact. What is essential, in the opinion of the writer, is to make the managers aware of their needs. Then they will find the means to cope with their problems.

Much has been written in attempts to explain the emergence of industrial entrepreneurship – why it should arise at a particular moment in one country and not in another. No substantial agreement has been reached as to the evolutionary forces involved. Indeed, the preconditions are likely to differ with dissimilar cultures. What may be more important, from the viewpoint of an agency endeavouring to foster entrepreneurship, is to identify the social and economic obstacles that hinder its development. In some transforming economies, particularly those in the early stages, the great authority of the head of the family, extended family or clan can be an adverse factor. In others, aspirations may be directed to acquiring land or cattle, with little importance attached, in terms of social status, to other forms of wealth. Where cultural elements are involved, change is likely to come about slowly, the result of concerted social pressures rather than any initiated action. If economic conditions are responsible, it may be possible to create a more stimulating climate.

Most, if not all, of the Governments of the developing countries have enacted legislation to encourage the development of industry. The organizations that have been established by this legislation, with some notable exceptions, are concerned with industry as a whole. In some instances handicrafts and cottage industry have been dealt with separately. Where no distinction has been made between large- and small-scale industry, or where one agency has been charged with the development of both, it is always the latter that is neglected. The expert may find that the laws designed to provide assistance or incentives have been framed with large undertakings in mind and may even operate to the disadvantage of the small enterprise. The reason is not far to seek: the establishment of a large factory has a publicity value, and the administration responsible acquires considerable prestige, while small enterprises are seldom spectacular. The expert may find that much of his work is likely to be in vain unless he can persuade officials to adopt a more liberal attitude to the small-scale sector.

Industrial entrepreneurship is not, as is sometimes stated, just the willingness to accept financial risk. If this were the case, there would be no dearth of entrepreneurs in the developing countries. Although risk-bearing is undoubtedly an important element, the capacity to organize the factors of production is even more important. Incentive legislation, where it exists, is generally held to stimulate entrepreneurship by reducing the financial risks involved. In the view of the writer, this is true to some extent, but it probably would be more accurate to say that it encourages entrepreneurs to take risks. By granting income tax holidays and relief from import duties as inducements to establish industries, Governments forgo large sums in revenue. It is open to argument whether these grants, which in any event are more beneficial to large- than to small-scale industry, increase the quantum of entrepreneurship within the countries concerned. It appears probable, to the writer at least, that the incentives may only divert it from one field to another. When financing is provided, it is the practice of a government lending institution to safeguard its investment in such a way that, in theory, there is little or no risk. The result is that this aid is granted only to the possessor of at least a small amount of capital. The emphasis is on security – the security of the almost sacrosanct public funds – and little attention is paid to other factors. The applicant with ideas and potential organizing capacity but no capital is ignored. Surely if a Government wishes to develop entrepreneurship it should exhibit it itself, and be prepared to take reasonable risks.

Concluding remarks

The writer has endeavoured to outline in this paper some of the problems encountered in the field of technical assistance to small-scale industry and to indicate practical solutions. There are usually many possible cures for any given situation, but, in addition to know-how, all involve two components—money and time. The scarcity of capital in the sector and the duration of the expert's mission impose limitations on the effectiveness of technical assistance. In some circumstances all that can be proffered is a palliative.

The provision of financial assistance to small-scale industry involves obvious difficulties. Such varied devices as the creation of industrial estates with workplaces at sub-economic rents and common service facilities, co-operative purchasing and marketing arrangements, the supply of plant on a hire-purchase basis, facilities for the hire of equipment, and low interest, long-term loans are used in some countries to help the small industrialist to conserve his capital. Technical advice and commercial information may be provided, either free or at only a nominal charge, through extension services. All of these measures are excellent, but not all of them can be implemented successfully in every country. In some countries small industrialists are seldom interested in obtaining rented premises, even at subsidized rates. They prefer to own their workplaces and the land on which they are built; they regard these assets as a form of reserve capital on which they can draw in an emergency. Co-operatives, particularly those imposed on an industry by a Government, sometimes function more to the benefit of the officials than to the benefit of the ordinary members. In one country it is not unusual for lending co-operatives to charge interest rates as high as 15 per cent per annum on loans to members, while borrowing funds from the government bank at around 4 per cent. Common service facilities, whether on or off an industrial estate, can be justified only if there is a sufficiently large concentration of establishments of a like kind to make efficient use of the services. Such is not always the case in small developing economies. Some government lending institutions apply the same criteria in making loans to small-scale industry as they do to the large-scale sector, while others may, in effect, discriminate against the former. Although legislation and institutions may exist to help small-scale industry, certain conditions may have the opposite effect and so limit the impact of international technical assistance.

The writer is of the opinion that any country embarking on a plan to develop small-scale industry with technical assistance from the United Nations should set aside funds which it is prepared to loan, at a very low rate of interest, to entrepreneurs for the specific purpose of carrying out improvements recommended by the assigned experts. Such a fund should supplement the normal loan arrangements that may be available to finance new projects. If plant owners were aware that their Government was prepared to help them make improvements, they would be convinced that the Government was seriously concerned to develop the sector and would be more receptive to recommendations. Secure in the knowledge that the cost of the improvements could be spread over two or three years and that technical advice would be available, most of their present objections would disappear. The fund would not need to be large, as the loans would be comparatively small and for relatively short terms; and they should revolve quickly. A fund of this nature, it is believed, would remove one of the most important limitations on the effectiveness of technical assistance.

The second limitation is time. A United Nations expert is usually assigned to a country for a comparatively short period, seldom longer than two years. It is not possible, even under the most favourable circumstances, for the expert to see all of his recommendations put into effect. Nor is it feasible for him to make all the follow-up visits that are desirable and necessary. His counterpart

could assist in this connexion, but it has been the writer's experience that counterparts seldom survive the period of the expert's assignment. If technical assistance is to be other than a series of short, disconnected and unco-ordinated spurts of limited impact, some indigenous organization must be able to provide continuity of effort. An industrial extension service would be a suitable agency for this purpose. An expert operating through such a body, possibly as adviser to the director, can cover a much wider field than he could acting alone or with a counterpart. It would ensure that recommendations were adequately followed up both during the expert's assignment and after his departure. It would provide the foundation on which succeeding experts could build until such time as experts are no longer needed.

No two developing countries present exactly the same problems, with respect to technical assistance; and, probably, no two experts will view any one problem in the same light. It is believed, however, that the various situations on which this paper has commented are present in some degree in every transforming economy. That there is an answer to each problem is certain. In some cases an immediate solution may be possible, but in others only a partial solution may be possible – a compromise until the time is ripe. Whatever advice or assistance is offered should be in accordance with a country's cultural pattern, if it is not to be self-defeating.

9

CONDITIONS FOR SETTING UP AND OPERATING TECHNICAL SERVICES FOR SMALL-SCALE INDUSTRIES ON A REGIONAL OR SUBREGIONAL BASIS, IN THE LIGHT OF THE EXPERIENCE OF ICAITI*

INTRODUCTION

Principal economic characteristics of Central America

Central America[1] has a total population of approximately 13 million inhabitants and a total area of 441,000 square kilometres. The largest country, in terms of area, is Nicaragua, followed by Honduras and Guatemala. Guatemala, however, has the largest population (around 35 per cent) followed by the smallest country (El Salvador) (approximately 25 per cent). The average density of population in Central America is approximately 30 persons per square kilometre, El Salvador having the highest (around 130), and Nicaragua the lowest (around 11). Population growth in Central America is considered among the highest in the world, amounting to nearly 3.3 per cent per annum.

The gross national product of Central America reached approximately $4 billion in 1966. During the past years the annual growth of GNP has been in the vicinity of 7 per cent. Agriculture accounts for 35 to 40 per cent of Central America's GNP, which indicates the great importance of this activity in the area. Principal crops include coffee, cotton, sugar, bananas, corn, beans and other diverse products. Manufacturing industry accounts for approximately 15 per cent of the area's GNP. The above distribution can also be seen in the composition of the economically active population, 60 per cent being engaged in agriculture, 13 to 15 per cent in industry and the rest in services, construction, trade etc.

* Paper presented to the symposium by Manuel NORIEGA MORALES, Director of the Central American Research Institute for Industry (ICAITI), with the assistance and collaboration of Stefan WITTKOWSKY, Special Assistant to the Director of the Institute.

[1] For the purpose of this paper, Central America includes the following five republics: Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua. Panama lies geographically within the Central American isthmus but is not generally considered to form part of Central America economically. However, it is hoped that Panama will eventually join the Common Market established by the five Central American republics in 1960.

The Central American Common Market

Because the Central American Common Market is so important both from the point of view of the individual development of the economies of the five countries as well as from the point of view of assistance to small-scale industries, a brief account of its structure will be given below.

After entering into a series of bilateral and multilateral agreements and treaties, some dating as far back as 1952, the five countries of Central America subscribed in December 1960 to the treaty that laid the basis for the Central American Common Market as it exists today. This treaty, comparable to the Treaty of Rome, which created the European Common Market, contains the following major provisions:

(a) Establishment, in stages, of a common market and free trade for all products manufactured in any of the five countries, the process to be completed by 4 June 1966;

(b) Unification of investment incentive laws and other legislation on industrial development of the five countries;

(c) Establishment of an economic council, composed of the Ministers of Economy, as the policy-making body of the Central American Common Market, an Executive Council, composed of delegates from the five countries, to be responsible for administering the terms of the General Treaty, and a permanent secretariat, directed by a secretary-general, to carry out the administrative needs of the Economic and Executive Councils;

(d) Creation of a specialized organization to serve as a regional financing agency in promoting the economic development of the area.

The following organizations were also created within the institutional framework of the Central American Common Market:

The Central American Bank for Economic Integration (CABEI)
The Central American Research Institute for Industry (ICAITI)
The Central American School of Public Administration (ESAPAC)
The Central American School of Business Administration (INCAE)
The Supreme Council of Central American Universities (CSUCA)
The Institute of Nutrition for Central America and Panama (INCAP)
The Central American Air Navigation Service Corporation (COCESNA)
Federation of Central American Associations and Chambers of Industry (FECAICA).

Each of the organizations listed above serves as a catalyst in the development of Central America: CABEI in the financial field; ICAITI in industrial research and development; ESAPAC in training public officials; INCAE in training business managers; CSUCA in co-ordinating university programmes; and INCAP in improving the nutrition of the region's population.

From 1961 to the present, the impact of the Common Market has been felt in the economic development of the region as a whole. Trade among the countries

has risen substantially; in 1960, total intra-Central American trade amounted to $150 million. During the first years of the Common Market, the main items of trade were food products; in 1966, they comprised only one quarter of the total trade, the principal items being manufactured articles (such as rubber products, paper products, clothing, metal products and furniture), which accounted for approximately 45 per cent of intra-regional trade.

Although these figures indicate the impetus that the Common Market has given to regional trade and the shifting trends of regional production, mention should be made of the other gains that have been made in Central America's economic integration. In the industrial area, agreement has been reached on the stimulus and protection that should be given to local industries; in the area of commercial instruments, agreement has been reached on customs nomenclature, customs laws, uniform external tariffs for 97.5 per cent of the articles imported by Central America from other countries, and free trade within the area for approximately 95 per cent of the products manufactured locally. Agreements have also been signed providing for the establishment of a Central American Clearing House, regional road programmes, telecommunications, tourism, defence, monetary and fiscal policies, university programmes, sanitation etc.

These agreements have been mentioned only to illustrate the general economic, political and institutional background of the Common Market, so that the setting in which industry, and particularly small-scale industry, is developing in Central America and the way in which services can best be made available to this sector on a regional basis may be understood.

Principal industrial activities in Central America and importance of small-scale industry

As was mentioned earlier, industry in Central America contributes approximately 15 per cent of the total GNP and employs close to the same percentage of the economically active population of the area. Total industrial production in the area amounts to $700 to $800 million, of which the food and beverage industry alone accounts for approximately 50 per cent. Production of textiles, shoes and clothing and chemical products accounts for another 30 per cent, distributed evenly among the three groups, and other industries share the remaining 20 per cent. Total fixed investment in industrial activities adds up to approximately $600 million; the food and beverage industry takes the largest share (38 per cent), followed by the textile industry (10 per cent), chemical products industry, clothing and shoe industry, wood industry and non-metallic minerals industry, each having a share of about 7 per cent. Distribution of workers employed (total of about 500,000) roughly follows the pattern mentioned above, the food and beverage industry employing 35 to 38 per cent, the shoe and clothing industries 23 to 25 per cent, and the rest quite evenly distributed among the other industries indicated as most important from the point of view of fixed investment and production.

Small-scale industry and handicraft industries (artisan workshops)[2] predominate in the Central American industrial structure, as shown in table 1.

TABLE 1: CENTRAL AMERICA: STRUCTURE OF INDUSTRY ACCORDING TO GROSS VALUE OF PRODUCTION, TOTAL CAPITAL INVESTED AND SIZE OF LABOUR FORCE (1962) *(percentage)*

	Gross value of production	*Total capital invested*	*Labour force*
Handicraft industries (artisan workshops)	29.1	10.0	58.5
Small-scale industries	23.2	30.2	19.4
Medium- and large-scale industries	47.7	59.8	22.1
TOTAL	100.0	100.0	100.0

SOURCE: Joint Planning Mission, Central America.

It can be seen that establishments with 50 or more workers account for only about half of the value of industrial production and a little more than half of the total capital invested. Small-scale industries and handicraft industries account for the other half, but they employ close to 80 per cent of the total industrial labour force. This is readily understandable when one takes into account that the smaller industries in Central America, and especially the handicraft industries, are very labour-intensive and usually suffer from very low levels of productivity.

Small-scale industries alone employ around 20 per cent of the total industrial labour force in Central America, contribute close to 25 per cent of the total value of production and have 30 per cent of the total capital invested in the region's industry. The above figures, however, represent an average of all industrial activities and therefore tend to underestimate the importance of this sector within the regional industrial structure. When an analysis is made of the separate industrial activities, it becomes apparent that small-scale operations play a preponderant role, as is pointed out below.

Within the food and beverage industry, Central America's most important industry, small establishments account for approximately 40 per cent of the labour force, 40 per cent of the total value of production and 28 to 30 per cent of the total fixed investment. The importance of small enterprises in the clothing and shoe industry is also noteworthy: they account for 60 per cent of the labour force, 50 per cent of the total value of production and 50 per cent of the fixed capital. Within the wood, leather goods and furniture industries the preponderance of small establishments is also apparent: they account for well over 50 per cent of the labour force, of the total value of production and of the fixed capital.

Finally, it is interesting to note that in the textile industry, one of the region's oldest and most traditional industries, small establishments play a very minor role. Only around 20 per cent of the labour force within the textile industry works in small firms, and these account for approximately the same percentage of the total value of production. Small establishments account for only 10 per cent of total fixed investment.

[2] For the purpose of this paper, handicrafts industries or artisan workshops have been defined conventionally as those employing fewer than 5 persons, small-scale industries as those employing between 5 and 49 persons, and medium-sized and large industries as those employing 50 or more persons.

TECHNICAL SERVICES RENDERED TO SMALL-SCALE INDUSTRIES IN CENTRAL AMERICA BY NATIONAL AND REGIONAL INSTITUTIONS

Small-scale industries in Central America have begun to receive specialized assistance from national institutions only during the past decade or so, and although the Governments of the five countries now recognize that it is urgent to provide the necessary aid to these firms, there is still much to be done. In general terms, the national organizations established to provide technical services to industry in Central America can be grouped into three categories: development institutes, national productivity centres and technical vocational schools.

Before discussing each of these three groups, it should be pointed out that individual efforts are also being made by the various ministries in the countries and also by some of the government-sponsored autonomous institutes. For example, in Guatemala, a number of services are rendered to remote villages specializing in one or the other handicrafts with the aim of organizing the workers and small shops in order to improve their production processes and the marketing of their products. Some religious organizations and branches of international organizations have also been active in this type of assistance. These activities, however, are usually limited in scope and are independent of any national programme aimed at assisting local industries. For this reason they will not be further considered in this paper.

Development institutes

In the late 1940s and early 1950s, the Central American countries, following the example of other countries, established national autonomous organizations broadly falling under the heading "development institutes". The purpose of these institutes, in general terms, is to stimulate the economic development of the country through loans, feasibility studies and promotional activities etc. The specific functions and goals of each of the institutes in the Central American countries vary somewhat, but they hold one main goal in common: the development and improvement of industry.

Some institutes have functioned reasonably effectively, and the results of their work have been apparent. Others, owing to external factors, lack of sufficient funds and problems of internal organization, have made little impact on the industrial development of the country, although in certain areas, such as agriculture, their impact has been greater.

In general, the technical assistance the institutes have given to small-scale industry has represented a minor part of their work in the industrial field, the major part having been in the promotion and financing of medium-sized enterprises. This is because the institutes depend to a large extent on governmental programmes in their policy-making and, for a particular Government's record, it is understandably more attractive to cite the largest figure possible for investments it has stimulated, the maximum number of new jobs it has created through the incentives it has offered to industry etc. than to indicate technical services it has provided to small firms.

Another factor limiting the role that these organizations play in assisting small-scale industries concerns the functions they perform as industrial banks. In this capacity they make medium-term loans to firms, and some institutes also participate in the equity capital of an industry or directly promote a project. However, the institutes usually take no interest in small firms, and their statutes do not usually permit them to lend funds without adequate guarantees. Most small-scale industries in Central America are not in a position to offer attractive guarantees for a loan, and from a banker's point of view they do not deserve first priority. Further, the scarce technical assistance that the development institutes are able to give to industries usually is confined to industries that receive loans from the institution, the assistance is generally given for the purpose of guaranteeing a repayment of the loans. The smaller establishments within the small-scale category, therefore, are practically left out of the limited technical services that the development institutes have to offer.

National productivity centres

Starting in 1960, national productivity centres were established in each of the five Central American countries, with the direct assistance of the United States Government and various international organizations, such as ILO and the Organization of American States. Most centres are autonomous organizations, financed through the contribution of the Governments, assistance of international organizations and private enterprise. The policy-making bodies are formed by representatives of these groups.

The principal goal of these productivity centres is to increase productivity in industry and to develop administrative, managerial and technical skills. Specialized courses, given by the staff, are offered, including on-the-job training, lectures and direct assistance in industrial plants or offices. Organizing these courses has been the main activity of these centres up to the present. The courses are advertised, and interested firms send their employees to take them, paying nominal attendance fees. Enterprises can also request specific assistance from the centre, in which case experts will visit the firm and prepare programmes for them. Some centres also carry out economic studies and provide information to potential investors.

With few exceptions, the work of these productivity centres has been of direct benefit to the countries; the enterprises making use of their services have improved their operations. Their employees have acquired a sense of responsibility and have become aware of the benefits to be accrued through better organization and the application of new methods.

The direct assistance and technical services to industrial plants have not been as important as the instruction given to employees and managers of the respective firms through the courses offered. These courses, to take the Guatemalan centre as an example, were attended in 1966 by a total of 2,230 persons representing approximately 300 firms. These figures include industrial plants, banks, commercial firms and retail stores. The courses offered ranged from advanced shorthand for secretaries to cost control in the textile industry. The Guatemalan centre gave direct assistance to only six industries, three of which were among the largest

in the country. Nevertheless, through these centres, small-scale industries can learn of new methods of organization, cost control, personnel administration, programming etc., and the potential importance of these centres should not be underestimated.

Central American productivity centres have, as a general rule, not been able to provide as much direct assistance to small-scale industries as would be desirable mainly because they are not yet sufficiently equipped and organized to extend these services on a broad scale.

Technical vocational schools

With the assistance of international organizations and a number of Governments (especially of the United States and of several European countries), technical or industrial vocational schools have been established in the area during the past few years. These schools provide training in skilled and semi-skilled occupations. Assistance in these schools is usually free of charge, since the programmes are aimed at those who cannot afford the cost of specialized schooling.

Located throughout Central America, these schools have varying programmes. Some limit themselves to giving a simple diploma of attendance after one or two years of instruction, and others have a four- or five-year curriculum leading to a specialized degree in technical secondary education. Areas covered by these schools usually include carpentry and woodworking, metalworking, automotive engine maintenance and repair, general machine repair, soldering, electricity, ceramics, masonry and radio and television.

Although no comprehensive statistics on the subject are available, there is no doubt that small firms have already reaped some of the advantages of these technical vocational schools, since many of the persons trained have gone to work in these industries. Furthermore, it is quite probable that some of the more recently established small-scale industries have been either built by, or with the assistance of, graduates from these schools. However, the real impact of these training centres upon small-scale, medium-sized and large-scale industries will become evident several years hence, since many of them have only recently been established.

The Central American Research Institute for Industry (ICAITI)

The Ministers of Economy of the five Central American countries, meeting as the Committee on Economic Co-operation in Central America, adopted a resolution, in August 1952, requesting the Technical Assistance Administration of the United Nations (UNTAA) to send a mission to examine a proposal to establish an institute for industrial research and technology in Central America. An UNTAA mission studied this request, and in May 1955, its report was approved by the committee. Later that year, the Basic Agreement establishing ICAITI was subscribed to by the five countries, and on 20 January 1956, the institute was officially inaugurated in Guatemala City, Guatemala, where its offices and laboratories are now located.

The main purposes of the institute are the following:

(a) To act as consultant to private enterprise in all phases of the study and implementation of industrial projects;
(b) To give practical advice to manufacturers on production problems;
(c) To conduct research on the utilization of regional raw materials, on the development of new manufacturing processes and on the adoption of the latest manufacturing methods;
(d) To promote and foster the application and adaptation of advanced production methods by Central American industry so as to raise productivity;
(e) To act in an advisory capacity for all public and private institutions engaged in industrial and economic development;
(f) To participate in Central American integration programmes;
(g) To establish ICAITI standards for the quality of Central American raw materials, intermediate and finished products.

As part of its general programme to further Central America's industrial development through applied research and technology, ICAITI services include market research; economic and technical feasibility studies dealing with the establishment of new industries and the expansion of existing enterprises; technological advice on the planning and implementation of industrial projects; and advice on types of manufacturing processes, purchase of equipment and machinery, site of plants and industrial installations. ICAITI also performs laboratory testing, analysis and research, pilot-plant experiments on manufacturing processes and, finally, is charged with the elaboration of Central American quality standards.

At present, the institute has a staff of 120 employees, more than half of whom are in the professional and technical categories. These include economists, cost accountants, industrial engineers, mechanical engineers, chemical engineers, chemists, bio-chemists, geologists and mining engineers. Within this grouping, there are specialized professionals in food technology, leather technology, pulp and paper, textiles, oils and fats, wood technology, standardization and other fields. Most of these experts are Central Americans, although initially most professionals were foreigners.

The present organization of the institute includes the following divisions: Industrial Economics, Engineering and Industrial Services, Technological Research, Geology and Mining, Standardization, Documentation and Library, Finance and Administration. At the head of the institute is the director, who is named by the United Nations with the agreement of the executive committee, composed of the five Ministers of Economy of Central America. The executive committee is the top policy-making body of the institute; the director also receives advice from the United Nations and from an advisory committee, composed of leading industrialists and economic integration officials of Central America. (Further details of the organization of ICAITI are shown in the chart appended to this paper.)

During its first eleven years of existence, ICAITI has provided many services to small-scale industries and investors in small enterprises. This does not mean that ICAITI has not also served larger industries and more powerful

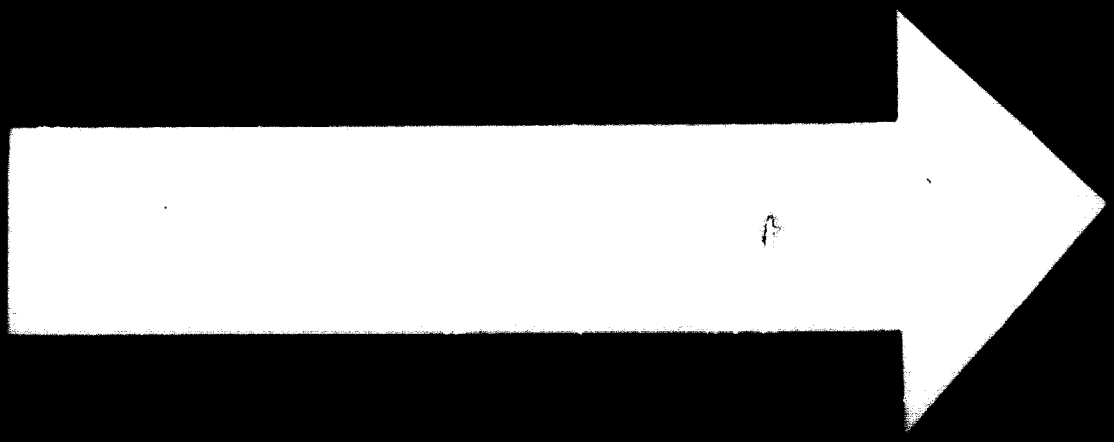
groups of investors, as an analysis of the origin of total income that ICAITI has received for its work would show. However, this figure does not indicate the total number of individual services ICAITI has given or studies it has carried out on a paid basis. It should be explained in this connexion that ICAITI has a double role in the industrial development of Central America. First, it acts as an impartial technical adviser to the Central American Common Market, giving opinions, carrying out studies on regional industrial problems and technological research on the utilization of Central American raw materials and waste products, and making suggestions that the political bodies of the Common Market can use to influence the economic policies of the member countries. These activities are largely financed by the Central American Governments. Second, ICAITI acts as an industrial consultant to local and foreign private enterprise, development banks and other interested sectors. This paper discusses primarily this second role.

Among the most important services that ICAITI offers on a paid basis to firms, investors or institutions are the carrying out of market or feasibility studies for new projects and the working out or evaluation of expansion or diversification programmes for existing enterprises. For the performance of these services, work proposals are submitted to the interested client together with estimates on time of completion and cost. The laboratory analyses, testing and solving of technical problems or development of new processes on a pilot-plant scale are also important. These services are also usually performed on a paid basis, following a general pricing schedule. Geological studies, analyses and quantitative evaluations of mineral deposits are gaining in importance.

The technical consultations, organizational and management advice, library and documentation information, investment opportunity ideas etc. that ICAITI gives persons and firms seeking its advice are as important as the services mentioned above. A large proportion of these services are given free of charge or for very nominal fees, since they usually take up only a few hours of the time of one or more of ICAITI's experts. As a result of these consultations, it is often felt that the problems or ideas should be analysed in greater detail, in which case a proposal is submitted to the person or firm.

Small firms in Central America make particular use of ICAITI's technical consulting services, since most small enterprises are not yet familiar with industrial investigations or are not convinced that the benefits they bring justify their costs. This attitude is not confined to small entrepreneurs. A number of investors and larger entrepreneurs in Central America still do not realize the advantages to be gained from studies of projects or consulting services relating to production problems, processes, internal organization appraisals etc. This way of thinking is rapidly changing with the onset of competition arising from the Central American Common Market, but innumerable examples could be cited in which the institute has had to battle against this attitude.

In spite of strenuous efforts, ICAITI has not been able to expand its work equally in the five countries it serves. Even within its host country, it has not been able to expand sufficiently because of financial and other limitations. Because of its present budgetary problems it unfortunately has to limit the



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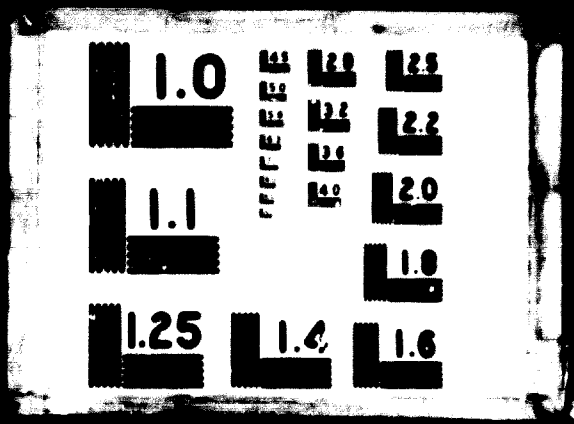


services it can give free of charge, and it has not been able to advertise the available assistance as much as it would have liked in order to attract greater attention from small enterprises in the area. To convince small firms of the advantages of technical services, the proprietor or managing group has to be convinced of their value before he is willing to pay for them; although it is desirable to maintain the principle that there should be at least a nominal charge for any service, many services to small firms have to be given on a cost-free basis — particularly in the beginning.

Nevertheless, every year the total number of consultations and studies that ICAITI makes for industry and investors in Central America increases, and there is no doubt that with adequate financing the institute could continually expand its sphere of influence in the area. Attempts in this direction have continually been made, and one of the ideas has been to create within ICAITI a Productivity Division, composed of a number of specialists in small-scale industries and an equal number of Central American counterparts, which would serve as a supporting body and backstopping centre for the individual productivity centres in each of the five countries. In this way the individual centres would have the benefit of added advice, technical backstopping and regionally co-ordinated programmes, and ICAITI would have the chance to help the national organizations and to give direct assistance to the numerous small-scale industries in each country.

ICAITI recognizes that it needs urgently to expand its services to small-scale industry in close co-ordination with the various national organizations active in the field, and it will continue exerting all possible efforts to obtain the necessary backing for such a programme. The institute believes, moreover, that its experience in the field and its organizational structure make it the most feasible candidate for the job of co-ordinating efforts to assist small-scale industry in Central America.

Conditions for setting up a regional or subregional centre providing technical services to small-scale industry

Several functions of technical service centres lend themselves particularly well to being carried out on a regional basis and, under certain circumstances, should be so carried out to achieve optimum effectiveness. Other functions can better be carried out on a subregional, or national, basis, although they should be programmed and co-ordinated regionally. It cannot be stressed too much that adequate machinery should exist through which the work of the regional centre can be implemented at the national level and proposals for action to be taken by the regional centre can be transmitted to it from the national level.

Functions that can be performed by regional technical service centres for small-scale industries can generally be grouped as follows:

(a) Collection and dissemination of economic and technical information, particularly related to the identification of small industrial plants or artisan workshops that are economic to establish within the region or on a regional scale;

(*b*) Application of new technologies or adaptation of technologies utilized in other regions;

(*c*) Standardization and quality control;

(*d*) Specialized technical counselling relating to processes, organization programming, layout, design, working methods etc.;

(*e*) Management and marketing assistance.

The regional centre is best equipped to handle these functions because it can analyse the general situation of the region as a whole and take into account the collective interest rather than the respective national interests. This objectivity is important in the evaluation of the needs and development possibilities of the regional industrial sector with respect to available resources, established local interests and the interests and competition of other regions. The regional centre is in a good position to identify new investment opportunities or evaluate existing projects, disseminate technical information and apply technologies from other parts of the world to the particular region in which it is located. The dissemination of technical information and application of new technologies requires substantial financial resources and highly qualified technicians and experts; these conditions cannot always be met by a national centre. The same is true for standardization and quality control; a regional centre will generally have more resources to develop adequate standards applicable to local conditions and will be able to do it with greater objectivity than isolated national centres. With respect to quality control, although it is desirable to have the backing of the regional centre, it is difficult to perform the necessary inspections and regular daily advice when the geographical distance separating the plant and the centre is great. Here the regional centre should enlist the co-operation of the national centre by providing capable personnel and the necessary technical backstopping and control.

As far as general technical counselling, marketing assistance and management assistance are concerned, it is desirable to have a regional centre co-ordinate the action at the various national levels and to act as a sort of senior counsellor. However, the practical work and services on a day-to-day basis should be handled by the national centre with the help, when needed, of very experienced resident experts linked with the regional centre. This link is very important. Although a national centre can provide, with its own staff, many services better than a regional centre can because its staff has a greater knowledge of local conditions, economic assistance and some technical services may require the opinion of more experienced experts or experts who are familiar with similar situations in other parts of the world. Also, objective advice is necessary when questions such as possible export markets for the products of small firms are being considered.

The regional centre, therefore, should specialize in fields in which the national centres cannot offer adequate services owing to financial, personnel or other limitations or in which a duplication of facilities or staff is not desirable. National centres, if they exist, should specialize in providing the more simple technical services, management advice, productivity improvement techniques etc. required by small-scale industries, especially in areas in which a thorough

knowledge of local conditions is indispensable. Further, they should devote considerable effort to organizing specialized courses for workers, administrative personnel and managers, with the aim of improving working methods, introducing new techniques etc. The regional centre, on the other hand, while coordinating the services offered by each national centre and providing the necessary technical backstopping through its own experts and facilities, should place its emphasis on fields requiring greater resources, specialized laboratory or pilot-plant equipment, highly qualified experts, greater auxiliary services, such as technical libraries and documentation sections, and above all, a higher degree of objectivity for arriving at decisions affecting the region as a whole or each member country or state. When it is not practicable to set up national centres, the regional centre will have to assume the tasks as described above for the national centre, probably through the establishment of auxiliary or branch offices in each member country.

Industrial research, as defined for this symposium, means "technological research undertaken to solve a specific problem of a small industrial enterprise, but not general technological research". In this context, the combining of research with technical counselling is believed to benefit the centre, the country or countries, and the industrial enterprises. It involves, however, a large initial installation cost and higher maintenance costs for the centre and therefore the participating countries must give greater financial assistance to the centre on a permanent basis.

The advantages to be gained by combining research and technical counselling are, in the first place, the possibility of linking the assistance and recommendations made by experts of the centre with previous research conducted at the centre's laboratories or pilot plant. Second, a particular problem of a small enterprise can be analysed thoroughly outside the plant by the centre's specialists, with adequate equipment required for the research and analysis; in this way costly shutdowns of plant sections or of the whole factory can be avoided. This presupposes adequate laboratory and pilot-plant facilities at the centre. An added advantage of combining these two functions is the practical training that is given to national technicians and experts working at the centre; aside from a higher general level of technical knowledge of the population of the country or region, which in itself is of great importance, the supply of experts or technicians who can be employed by industry or by the technical service centres is gradually being increased.

A similar level of economic development and a similar industrial structure of the member countries are very important conditions for setting up a regional or subregional centre providing technical services to small-scale industry. In other words, the organization and operation of a regional centre will be considerably more difficult if within the participating group there are countries with great differences in their degree of progress and with considerable variations in the role of small-scale industries within the national economic and industrial structure.

The basic resources and level of development of the member republics of the Central American Common Market who are also the members of

ICAITI are very similar. This similarity has facilitated the work of ICAITI as the centre for industrial development for the region. Common programmes and objectives can be established for the region as a whole, and they can be implemented more rationally.

This does not mean that all member countries have to have identical levels of development or resources; the Central American countries, for example, although very similar in their general economic structure, are quite different in size, composition of the population etc. The only really important factor for the efficient functioning of the regional centre, from this point of view, is that all the member countries feel that they can gain individually from the work of the centre. However, one country may derive more benefits than others from some of the activities of the centre, whereas another country may benefit more from other activities. ICAITI's experience has shown this to be perfectly feasible and frequently even beneficial for the economic development of the region as a whole. It should not be forgotten, however, that in each Central American country an important percentage of its labour force and industrial establishments falls within the small-scale sector.

In Central America, economic integration has been an important factor in making possible the provision of technical services to small-scale industry on a regional basis. Uniform customs policies, industrial-promotion policies, common incentives etc. have created a favourable climate for the planning and co-ordination of a regional centre's activities particularly with respect to small industry planning and have permitted a more rational approach in advising on development plans for the industrial sector. Especially in areas of marketing assistance and feasibility studies a common economic denominator has been of great help.

However, economic integration and co-ordinated small industry planning are not prerequisites for setting up a regional or subregional centre. A regional centre could be set up even without these important elements. But economic integration and joint small industry planning will remove many problems of the regional centre and will facilitate its organization and programming.

SPONSORSHIP, ORGANIZATION, FINANCING AND MANAGEMENT

Agreements and obligations undertaken by participating countries

The type of agreements reached and the obligations assumed by countries establishing a regional centre depend, basically, on which functions are assigned to the regional centre, and second, on whether national centres exist. If national centres exist, the participating countries must agree not only on the work of the regional centre, but also on co-ordination of the work of the national and regional centres. If national centres are non-existent in some of the participating countries, the agreements will have to be somewhat different. If the regional centre's functions include, aside from technical assistance and economic

consultations, industrial research and other programmes of wider coverage such as standardization, quality control etc., the agreements and obligations of the member countries will have to be much more extensive.

The basic agreement drawn up by the member countries will probably include the following aspects of the centre:

(a) Purposes and objectives;
(b) Functions;
(c) Structure and organization;
(d) Location and staffing;
(e) Financing and other means required for operation;
(f) Co-ordination of the centre with national organizations and agencies.

With the purpose of extending the services of the regional centre as much as possible, especially if the area covered by it is large, it will probably always be desirable to establish in the agreement the way in which small-scale industries throughout the region will be able to receive assistance. The general trend in this direction is to work through national centres if they exist; to create them if they are not yet organized; or, if necessary, to set up branches or units in the participating countries. If this trend is followed, as seems reasonable, the principal obligations of the member countries would be to provide the necessary backing not only for the regional centre but also for the national centres. In addition, the member countries would have to agree that the regional centre act as co-ordinator of the national centres; this means that member countries must be adequately represented in the governing body of the regional centre so that regional decisions will be executed on a national level.

The regional centre would, then, be in charge of drawing up a master plan for the region as a whole covering technical services, counselling, small-scale industry planning, industrial research etc. and would, in close co-ordination with the various national centres, determine the specific functions to be carried out by each organization. Accordingly, work programmes would be set up, means determined, and, once activities have begun, adequate control and co-ordination mechanisms would be put into effect. Hence, each centre would function more effectively and the resources so allocated would be better utilized.

Organization

If the work of the regional centre is to have the greatest possible impact on the development of small-scale industry, the centre has to be well organized, properly staffed and equipped, adequately financed, and, as was indicated above, its work must be well co-ordinated with the activities carried out on a national level.

Many of the functions of the centre — conceived as a nucleus of industrial research, assistance and information source — have to be carried out on its own initiative and at its own expense. This is especially the case in countries where industry, and in particular small-scale industry, is not yet accustomed to using

consulting services, and where, consequently, a large part of the initial efforts of a regional service centre have to be spent on selling the advantages to be gained from technical assistance. Moreover, if the region in which the centre is to be set up is relatively under-developed, adequate financial sources have to be made available to the centre for carrying out feasibility studies.

In the initial stages of the regional centre, therefore, the participating countries must give generous financial support. When the centre has established itself and has gained the confidence of the region's entrepreneurs, contributions of the member countries can be diminished somewhat, but never completely, since many of its services will have to continue being given on a cost-free basis. In addition, permanent staffing of a regional centre involves considerable fixed costs for the institution. Many of these costs are reimbursed by the fees paid by the clients for certain services, but it cannot be assumed that the total payroll of the centre's staff can be covered from this income. And, finally, if the centre is to include industrial research, equipment has to be provided at the beginning of the centre's operation, and an adequate financial reserve has to be on hand for maintenance and for the acquisition of new machinery in step with technological change.

When the provision of services to small-scale industry is being considered, it should be borne in mind that: *(a)* the full cost of the services will rarely be recovered by the centre; *(b)* a large proportion of the general or overhead expenses will have to come out of direct contributions of the member countries; and *(c)* permanent financing for programmes of general interest to the region will have to come from sources other than the income that the centre receives for the services it renders. In consequence, the provision of services to small-scale industries should be on a paid basis in principle, although for the reasons indicated previously, many of these will have to be given cost-free in the initial stages of the centre's operation.

Staffing and physical facilities required will depend on the particular type of services to be rendered by the centre. If the functions assigned to it involve consultations or studies on very specialized subjects, the centre will need specialized equipment and facilities, the corresponding experts and adequate documentation and library sections. If, however, not very specialized assistance is foreseen, the staff will probably be composed of experts with more general backgrounds and experience, and not necessarily limited to one particular industrial activity. Physical facilities in this case will also consist of readily adaptable equipment and appropriate office space and laboratory buildings.

Staffing should be a primary concern of the organizers. Experience has shown that it is advisable to spend adequate funds on the training of local professionals and technicians, both at the centre and through schooling and practical experience abroad. Foreign experts are indispensable in the first years of a centre's life, but these should gradually be replaced by national counterparts who have had the opportunity of working side-by-side with the foreign experts for an adequate period and who have also received specialized training abroad. As time goes by the centre will be able to use national experts for most services, and when very specialized questions arise or particular technical assistance or

advice is required, foreign experts can be called in briefly as temporary consultants.

The regional centre will usually have on its permanent staff an adequate number of industrial engineers, mechanical and electrical engineers, civil engineers, chemical engineers, chemists, economists, industrial economists, statisticians and accountants. However, as stated before, the exact composition of the centre's staff will depend on the type of small-scale industries in existence in the region, the type of development programmes and the specific services the centre is to provide.

If the regional centre is to function effectively, the member countries should actively participate in the formulation and execution of policies and programmes. Both formulation and execution of policies should be done on a co-operative basis, with adequate representation not only of each of the member countries, but also of the various interested sectors within each country.

Government authorities, public servants, civic and business leaders, and international experts sometimes have excellent ideas on the way a centre should be organized and the types of programmes it should carry out; they can also draw heavily on the experience of other countries in order to expedite matters and prevent costly mistakes. Representatives from these sectors will probably be responsible for the organization and management of the regional centre, if for no other reason than that the centre's principal financial contributions will come from the Governments of the member countries and from international organizations. It is very important, however, that the private industrial sector be taken into account and that advisory committees be formed or a representative be named to act on behalf of this sector.

When programmes and policies are being formulated and executed, the potential clients should be able to voice their interests and requirements directly, so that the activities of the centre — especially those relating to counselling and industrial research — will be oriented in productive directions and, most importantly, so that the centre will be fully utilized. In this way the centre can become part of, and probably the nucleus of, a co-operative development scheme in which Governments, international organizations, public servants, industrial organizations and executives and proprietors of small industries participate. The participants, moreover, will identify themselves with the policies and programmes of the centre, and consequently the centre will better be able to serve the purposes for which it was created.

Management

Management of a regional centre providing services to small-scale industries — a complicated task — requires not only a very clear view of the problems of small-scale industries in the region, but also great executive ability. The managing body, and especially the managing director, has to be able to awaken and maintain the interest of the participating countries, has to co-ordinate the varying needs of each country and industry group, has constantly to promote

the utilization of the services of the centre, and has to administer the centre efficiently so that it produces positive results. The problems involved in each of these spheres require an efficient and modern internal organization, based on scientific principles of administration applied to the particular conditions existing in the country or region.

One of the essential tasks of the centre's management, aside from its obligations as a liaison body between the centre and the member countries and other regions of the world, is to draft adequate work programmes and design control mechanisms for their implementation. These control mechanisms will probably follow a general development plan in which small-scale industry is integrated within the over-all industrial scheme. In accordance with these terms of reference, criteria will be established for selecting or promoting projects. These technical criteria should reflect the recognized needs and development possibilities of the region as a whole - a consideration which is one of the principal arguments in favour of having a regional centre.

Programme scheduling in a regional service centre is of great importance, as is the control of the execution of the programmes. It is also a very difficult task, since it is not always possible to foresee difficulties that may arise, no matter how much experience the centre's programme officers may have had. If properly done, programme scheduling is one of the main management tools of the centre's executives. It should be borne in mind that programme scheduling of individual projects as well as the general programme scheduling of the centre should be carried out on a team basis, with all the executives and experts involved participating, so as to arrive at projects that are realistic and that elicit the personal involvement of those who will carry them out.

Another principal task of the management of the regional centre is to obtain the necessary financial backing from public, international or private sources. Without adequate financial backing, as described earlier, the activities of the centre will be greatly handicapped, and its users will conclude that it lacks a firm foundation. The contractual practices of the centre, therefore, should follow those of sound businesses. This is to say, the centre's clients should not get the impression that the centre is a lucrative business trying to make high profits on them, but at the same time they should not think that it is a philanthrophic or a public organization obliged to give free technical assistance and services to all who request them. A useful procedure is to channel a request for services through a high official of the centre, who determines which staff member should handle the request. Then the request is carefully defined, the scope of work established, and the contractual system to be used determined. When services are to be rendered for a fee, the proposal usually includes the objective and scope of the work, the means to be utilized, the time of completion, the total estimated cost and the method of payment. Depending on the particular centre's policies and its financial resources, payment is made once the work has been finished or the report handed over, or payments are made proportional to the work completed. In some cases, the centre may be willing to defer payment until the proposals have been put into operation or the plant has been established.

Inter-agency co-operation

Co-operation between national centres and the regional centre has been discussed earlier. Co-operation among similarly organized agencies offering services to industry, agriculture etc. or branches of international organizations operating in the same region is considered below.

In Central America, a number of agencies national and international, public, and semi-public offer direct or indirect assistance to industry. These agencies have frequently not been able to function well owing to conflicting areas of interest and duplication of efforts. Regional centres providing services to small-scale industries cannot function effectively unless the various agencies concerned avoid duplicating each other's programmes. Duplication results not only in wasted efforts but also in confusion on the part of the small entrepreneurs, who do not know where they should go if they need technical services. Inter-agency co-operation is a different matter, and if properly planned and organized it can make it possible for the centre to augment its activities.

This co-operation can take the form of simple co-ordination of efforts and sharing of information on the activities of each agency through proper communication channels. Or the co-operation can take more direct forms, for example, the designing of joint programmes, the joint use of certain facilities, exchange of information and solution of technical problems and temporary exchange of staff members. No matter what form this co-operation takes, there is no doubt that if there are areas of common interest, everyone will benefit. If there are conflicts of interest, it is better to solve them through mutual co-operation than to waste the resources of the region and of the financing entities in the duplication of efforts.

One of the first steps to achieve this much desired inter-agency co-operation is to determine which agencies are operating in a particular region and what they are doing or are supposed to be doing. The next step is to establish the necessary communication channels so that information can be funnelled into one particular place and an exact inventory can be taken of the situation. Once this has been done, the particular areas in which each participating agency is best suited to work in the region, taking into account the needs of the countries and the legitimate interests of each agency, should be determined. At the same time, areas of co-operation and the mechanisms for carrying out this co-operation should be established. Finally, frequent meetings of a co-ordinating committee should be organized, in which the activities of the various agencies are made known to each other and possible conflicts are jointly discussed.

Co-ordination is especially important among the agencies operating in a particular region, but it is also essential between the regional technical service centre and similar centres in other regions of the world. Experiences gathered in one region can prove to be extremely valuable for other regions as well, and much time and money spent on the solution of a particular problem can be saved if there is an adequate exchange of information and co-ordination of efforts. General policy-making of the centres can also be greatly aided through

a knowledge of programmes, operating problems and results achieved in other centres.

Technical co-operation

During the first years of a centre's existence, particularly in less developed areas of the world, great reliance has to be placed on foreign experts provided under technical co-operation programmes to staff it. Gradually, as local personnel becomes available and counterpart training has been completed, foreign experts are less needed for certain positions; in very specialized fields, however, it may take longer to find qualified experts.

To utilize these foreign experts fully, it will be necessary to:

(a) Determine, on the basis of previously established programmes, the exact requirements of the various positions to be filled;

(b) Provide the necessary facilities and logistic support so that the experts can fulfil their obligations without difficulties;

(c) Organize the work of the experts in such a way that they will have as much contact with local conditions as possible, especially in the beginning;

(d) Establish the necessary mechanisms for reviewing their work at adequate intervals;

(e) Promote their active participation in the carrying out of the established programmes and in the formulation of new programmes or revision of existing ones.

Foreign experts must be selected with great care if they are to be utilized to the best effect. A regional technical service centre will require experts who are able not only to detect possible problem areas and suggest alternative solutions, but also implement the recommendations they formulate. Hence, a considerable number of the experts will have to be practical men, with direct experience in plants that are similar in size and in other respects to those existing in the particular region where the centre is located. In many cases it is also essential that the experts be able to analyse certain industrial questions from the point of view of a potential investor. This is especially true if they are to undertake feasibility studies or similar tasks that require a certain amount of desk work.

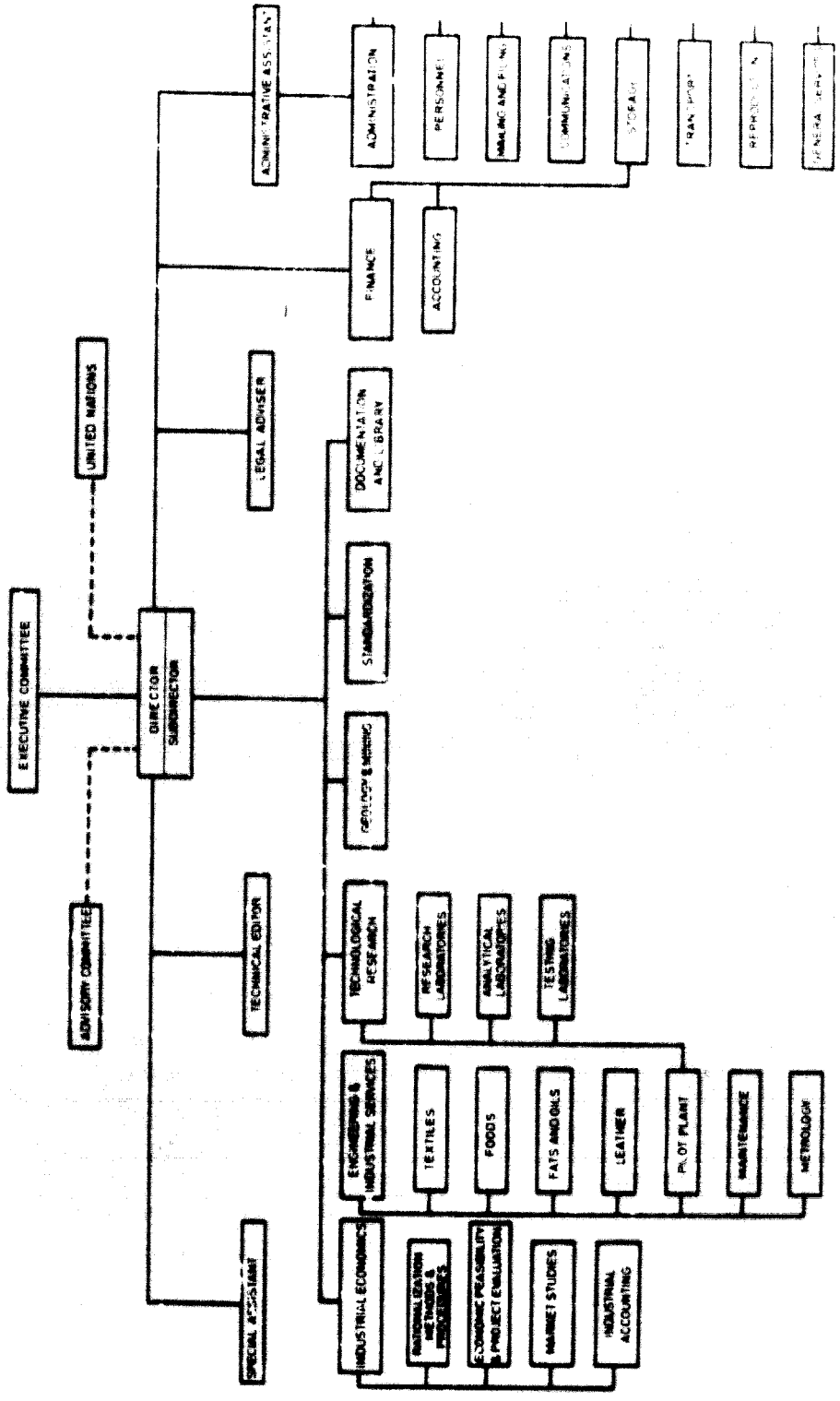
Foreign experts should have a basic understanding of the particular problems and customs of the region or country and in carrying on their work should take these into account, especially the human relations aspects. This implies orientation prior to the arrival of the foreign expert in the country assigned.

Organizations providing technical assistance must try to avoid recommending candidates that are not suited for the type of work required in the centre requesting assistance. Frequently the organization will have to assist the regional centre to draft job specifications, especially when the centre itself is new and its directors are not yet aware of their exact requirements or do not yet have precise working programmes. In such cases, the experience of other regional centres engaged in similar work can be of great assistance.

A regional centre should assign high priority to the organization of counterpart training. If after a few years of existence the centre has not started to develop its own personnel, continuing to rely on foreign experts instead, it will have serious difficulties in maintaining itself, more so if its creation has been made possible by outside help, which can be cut at any particular moment. Not only is it detrimental for the region to rely on costly foreign experts, but also the opportunity is lost to train local personnel and thus to increase the human investment in the region. Even if a centre's sole contribution to the development of the region is to have trained a substantial number of local experts, it will have achieved something very important. If, however, the development of a region continues to depend on the advice of foreign experts, the centre will have done nothing more than to increase the degree of dependence of less developed regions on developed countries.

Hence, it is of the utmost importance that the regional centre provide for counterpart training, not only within its own region but also through long-range training programmes carried out in co-operation with universities, technical institutes, centres in other countries etc. This may create an added financial burden for the centre, and there will always be opponents of the scheme for this reason; but in the interest of the region and of the centre itself, it is certainly worth it. Moreover, for local personnel to be able to assimilate the experience and knowledge of foreign experts, it will usually be necessary for them to have attended a series of training programmes in educational centres and industries abroad; this means that the total number of years that the centre will have to rely on foreign experts will be increased, but there is usually no other viable alternative. Once the local expert returns to the centre, he can work side by side with the foreign expert and gradually take over his functions. As time goes by the centre will be almost completely staffed with local personnel, and foreign experts will be required only for very specialized activities and for short periods. The technical service centre will then be able to call itself "regional" in the full sense of the word.

APPENDIX 1



Organization chart of the Central American Research Institute of Industry

APPENDIX 2

Small-scale industries in Central America

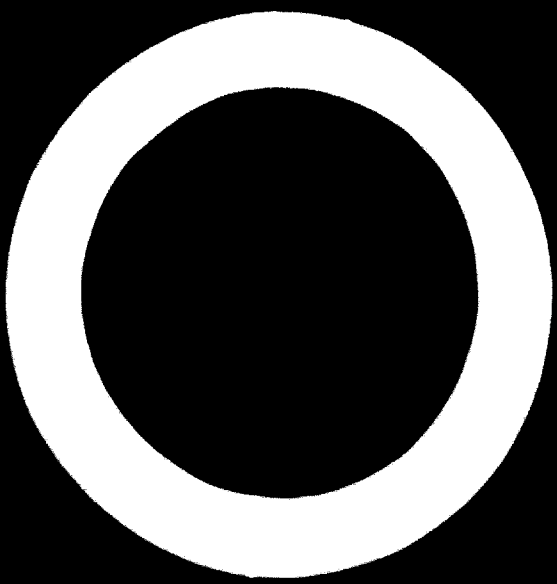
For illustrative purposes, and in the absence of official information, ICAITI has compiled from available sources the following tentative list of the principal groups of small-scale industries in Central America.

Food and beverage industry

- Bread, cakes, biscuits etc.
- Tortillas
- Fruit and vegetable products
- Meat products
- Milk and dairy products
- Various corn products and corn milling
- Sugar and sugar products
- Candies
- Cocoa and cocoa products
- Fish products
- Edible oils, fats and related products
- Jams, jellies etc.
- Ice cream
- Soups
- Rice products and rice milling
- Cereals
- Various preserves
- Chewing gum
- Gelatines
- Spaghetti etc.
- Mayonnaise, mustard etc.
- Carbonated beverages
- Alcoholic beverages

Tobacco products manufacture
Yeast and baking powder
Coffee roasting
Manufacture of starches
Manufacture of spices
Clothing manufacture and repair
Textile industry
Manufacture of cotton products, absorbent cotton etc.
Shoe manufacture and repair
Tanneries
Various leather products

Sawmills
Wood products manufacture
Wood furniture manufacture
Manufacture of mattresses, beds, pillows etc.
Salt extraction and preparation
Wax products manufacture
Candle production
Chemical products manufacture and pharmaceuticals
Soap manufacture and related products
Cosmetics manufacture and related products
Paper products manufacture
Printing presses and printed materials production
Cardboard products manufacture
Manufacture of firecrackers
Cement products manufacture
Brick and brick products
Manufacture of toys
Manufacture of paints, varnishes etc.
Manufacture of animal feeds
Manufacture of baskets, brooms, brushes etc.
Manufacture of hats, bags, ropes etc.
Manufacture of jewellery and related products
Match production
Rubber products manufacture
Plastic products manufacture
Manufacture of cooking utensils
Manufacture of metal products for construction, metal windows, doors, metal structures etc.
Manufacture of metal containers and related products
Manufacture of metal furniture for home and office use
Manufacture of metal hand tools for agriculture
Manufacture of metal articles for construction, plumbing etc.
Manufacture of batteries for cars
Manufacture of flashlight batteries
Manufacture of automotive parts (mufflers, springs etc.)
Assembly of radios, television sets etc.
Assembly of truck and bus chassis
Assembly of various metal products for industrial and home use
Assembly of electrical utensils
Assembly of bicycles and other two-wheel vehicles
Assembly of transport equipment
Assembly of cooling and refrigeration equipment
Assembly of various apparatus for industrial use



10

UNIDO'S ACTIVITIES RELATING TO TECHNICAL SERVICES AND FACILITIES FOR SMALL-SCALE INDUSTRIES*

The promotion of small-scale industry is of concern to several organizations of the United Nations family, especially to UNIDO, ILO and, to some extent, FAO. All these organizations are providing, each in its field of competence, technical co-operation for the promotion of small-scale industry, under both the United Nations Development Programme (UNDP) and their regular programmes of technical assistance. Assistance is also provided under the programme of Special Industrial Services (SIS), which is jointly administered by UNIDO and UNDP. Research and seminars in this field are carried out by UNIDO and ILO.

The purpose of the present report is to present information on certain important projects relating to technical services and facilities for small-scale industries carried out by UNIDO and by some of the above-mentioned organizations. Special attention is paid to fifteen large projects carried out with assistance from the Special Fund sector of UNDP (UNDP/SF) that relate specifically to the provision of such services. Since technical services for small-scale industries are also provided, as one among other functions, by a variety of institutions assisted by UNDP/SF, reference is also made to certain other projects of broader scope. Information is also given on UNIDO's research programme relating to technical services and facilities.

It is not proposed, in this report, to describe the various technical co-operation programmes of the United Nations, the procedures for obtaining assistance, nor the types of projects in the field of small-scale industry that may be assisted by the United Nations. Information on these aspects can be found in a publication entitled *Technical Co-operation for the Development of Small-Scale Industry* (Sales No. 67.II.B.3).

UNDP-ASSISTED PROJECTS RELATING TO TECHNICAL SERVICES, SMALL-SCALE INDUSTRY AND INDUSTRIAL DEVELOPMENT

UNDP/SF projects

Technical services and facilities for small-scale industries

As of January 1970, fifteen large projects assisted by UNDP/SF in fifteen countries were specifically designed to promote small-scale industry through

* Updated version (January 1970) of paper presented to the symposium by UNIDO

TABLE 1: UNDP/SF PROJECTS RELATING TO INDUSTRIAL EXTENSION SERVICES AND INDUSTRIAL ESTATES AS [illegible] JANUARY [illegible]

Project by country	Executing agency	Approved by Governing Council	Project duration (years)	Cost of projects (dollars) — Total	Cost of projects (dollars) — Governing Council earmarking	Cost of projects (dollars) — Government (and other) contribution
1. *Brazil*						
Industrial Development Centre: Feira de Santana, Bahia	UNIDO	January 1970	2[a]	1,561,000	663,000	898,000
2. *Cameroon*						
Centre of Assistance to Small Industries, Douala	ILO	January 1969	2	689,300	330,300	359,000
3. *Chile*						
Department of Small Industries	ILO	January 1966	5	7,633,000	1,036,000	6,597,000
4. *Greece*						
Small Industry Development Service, Athens	ILO	January 1967	5	1,796,200	896,200	900,000
5. *Greece*						
Industrial Area and Industrial Estate near Salonika	UNIDO	June 1969	3	3,105,400	722,300	2,383,100
6. *India*						
Training and Advisory Service in Tool Die and Mould Making for the Plastics and other Industries, Guindy, Madras	ILO	January 1966	5	1,909,700	864,700	1,045,000
7. *Iran*						
Establishment of an Industrial Estate, Ahwaz Development of Small-scale Industries	UNIDO	June 1963	7	4,216,700	1,067,400	3,149,300

[a] Includes supplementary earmarkings of $429,900 approved Jan. 1969

8. *Israel*						
Small Industry Advisory Service, Tel Aviv	ILO	June 1965	4	1,088,000	491,000	597,000
9. *Korea* (Republic of)						
Extension Service Department in the Medium Industry Bank, Seoul	ILO	June 1966	4	1,282,900	765,900	517,000
10. *Panama*						
National Service for Crafts and Small Industries (SENAPI), Chitre	ILO	June 1966	4	1,715,800	933,800	782,000
11. *Senegal*						
National Society of Industrial Studies and Promotion (SONEPI)	UNIDO	January 1970	3	962,200	479,200	483,000
12. *Thailand*						
Small Industries Service Institute, Bangkok	ILO	January 1965	5	2,441,000	917,000	1,524,000
13. *Turkey*						
Small Industries Development Programme	UNIDO	January 1968	5	2,202,800	962,800	1,240,000
14. *Uganda*						
Small Industry Development Programme and Establishment of an Industrial Estate, Kampala	UNIDO	January 1966	5	1,861,395	746,400	1,114,995
15. *Zambia*						
Development of Small-Scale Industries	UNIDO	June 1969	3	902,900	608,400	294,000

SOURCE: UNDP, Status of Approved Projects in the Special Fund Component, as at 31 January 1970, DP/SF/REPORTS, Series A, No. 49.

to provide technical services and facilities. ILO serves as executing agency for eight of these projects and UNIDO for the other seven. The status of the thirteen projects, which are at different stages of planning, establishment or operation, is shown in table 1.

Ten of these projects (in Brazil, Cameroon, Chile, Greece, Israel, Panama, Republic of Korea, Senegal, Thailand and Zambia) are principally concerned with the establishment or strengthening of industrial extension centres for small-scale industries. These centres identify prospects of small industry development, carry out feasibility and pre-investment studies and market surveys, and provide advisory services to small industrialists, including prospective entrepreneurs, for all problems of establishment, operation and management of their enterprises. A major activity of all centres is training of owners, managers and foremen, and extension workers. Most centres have workshops for training and demonstration purposes, and in some cases for provision of common service facilities to small enterprises. Each centre has an information centre with a library and related facilities.

One centre – the Extension Service Department of the Medium Industry Bank of the Republic of Korea – assists the bank in its financial operations and provides managerial and technical consulting services to small entrepreneurs, including feasibility studies for projects for which credit is requested from the bank or other sources of financing.

The Training and Advisory Centre of Guindy, Madras, India, is a technical facility specialized in the design and manufacturing of moulds, dies and tools. It provides training and counselling in this field to small-scale and medium-sized enterprises.

The UNIDO project in Iran was first concerned with the establishment of an industrial estate in Ahwaz; it was subsequently extended to the promotion of small-scale industry throughout the country. The small industry development programmes in Uganda and Turkey also include the establishment of demonstration industrial estates at Kampala and Gaziantep, respectively. In Greece, the UNIDO project deals with the establishment of an industrial estate, an industrial area and an industrial free zone near Salonika, while the ILO project is concerned with the operation of a small industry development service; the two projects are complementary. All industrial estate projects include common service facilities such as a testing laboratory, a mechanical workshop, a toolroom and an information centre. More detailed information on the small industry projects executed by UNIDO will be found in appendix I. The complete list of projects will be found in appendix 3, section I.

Management development, training and productivity centres, maintenance and repair

UNDP/SF assistance is currently provided to 76 projects in 55 countries and to 2 interregional projects with functions in one or several of the following fields: management development, instructor training, vocational training, in-plant training, productivity improvement, and maintenance and repair. ILO serves as executing agency for 66 of these projects, UNIDO for 6, FAO for 4

and UNESCO for 2. A list of these projects will be found in appendix 2, section 2.

The main activity of these centres is training for industry and productivity improvement. Under the guidance of teams of international experts, curricula are being developed, training programmes devised and classroom and laboratory facilities designed and constructed. The centres serve industries of all types and sizes, and small-scale industries benefit from training and other services as much as larger industries. Some of the management development and other centres have specific functions relating to small industry development, especially provision of advisory services to management, including marketing and accounting and technical counselling.

Some projects of this type are complementary with other SI projects relating specifically to small-scale industry in the same country. For instance, the operational responsibilities of the Management Training and Advisory Centre (ILO) and the Small Industries Development Programme and Industrial Estate (UNIDO) projects in Uganda are dovetailed, and both projects share certain facilities testing laboratory, mechanical workshop and toolroom, library and information centre.

Two UNIDO projects in this group are concerned with maintenance and repair centres (Cameroon and Democratic Republic of the Congo); one with an in-plant training programme (Turkey); one with assistance to a holding corporation (Ghana); and two with advanced industrial training (interregional).

Industrial studies and development centres

Twelve industrial studies and development centres have been created in recent years with assistance from UNDP/SF and with UNIDO serving as executing agency. Eleven are national centres (Algeria, Iran, Ivory Coast, Jordan, Kenya, Libya, Saudi Arabia, Syria, United Republic of Tanzania, Tunisia and Yugoslavia) and one is a regional centre (Maghreb). The centres are listed in appendix 2, section 3.

The functions of the centres are to formulate, study and evaluate industrial projects of all types and sizes, to assist in their implementation, and to advise Governments on all matters relating to the industrial development of the country or countries they serve. Some centres also have specific functions in the field of small-scale industry. These include not only carrying out feasibility studies and formulation of promotion measures, but also provision of technical assistance and establishment of industrial estates: this is true of the centres in Jordan, Saudi Arabia and the United Republic of Tanzania.

Industrial research institutes

UNDP/SF is currently providing assistance to 45 national industrial research institutes in 28 countries. UNIDO serves as executing agency for 21 of these projects, FAO for 12, UNESCO for 7, ILO for 4 and the United Nations for 1. The projects are listed in appendix 2, section 4.

Many of the institutes specialize in such fields as food technology, rubber, hides, skins and leather, textiles, petroleum, metal industries, engineering, tool

design, foundry and forge technology, fine instruments, standards etc. Several are general-purpose institutions. This is true of the institutes in Colombia, Iran, Israel, Malaysia, the Sudan, Syria, Thailand, Trinidad and Tobago and the United Arab Republic. Some of the general-purpose institutes provide advisory services to small-scale industries.

The place of small industry projects in over-all UNDP/SF operations in the field of industrial development

Appendix 2 lists 151 projects in the field of industrial development (excluding forestry, fisheries, technical university education etc.) the majority of which serve small-scale industry directly or indirectly. The type and number of projects, as of 31 January 1970, are shown in table 2.

TABLE 2. UNDP/SF PROJECTS RELATING TO SMALL-SCALE INDUSTRY, MANAGEMENT, TRAINING, MAINTENANCE AND REPAIR, DEVELOPMENT CENTRES AND INDUSTRIAL RESEARCH

Type of project	*Number of projects*	*Number of countries*	*Number of projects bearing on small industry development (estimate)*
Small-scale industry, including industrial extension services and industrial estates	15	14	15
Management development, training and productivity centres, maintenance and repair	78	55[a]	64
Industrial studies and development centres	13	11[b]	13
Industrial research institutes	45	28	33
TOTAL	151	108	125

SOURCE: See table 1 and annex 2 to the present paper.

[a] Two interregional projects, included in the first column, are not included in this column.

[b] One regional project, included in the first column, is not included in this column.

Thus, a great many projects have a bearing on small industry development, but it is not known to what extent they contribute to the promotion of this sector. This evidently varies from country to country and from project to project. It is known that special agencies and facilities serving exclusively small-scale industry are needed in many countries. The above data, which indicate that only 15 out of 151 industrial projects relate specifically to small-scale industry, suggest that there is much scope for new projects in this area, in particular, small industry service institutes and industrial extension centres, industrial estates with common service facilities, especially toolrooms, financial facilities for small-scale industries and subcontracting exchanges.

Other technical co-operation programmes

Under the other technical co-operation programmes - UNIDO's regular programme, UNDP Technical Assistance (UNDP TA), SIS - UNIDO provides assistance for a broad range of operations in the field of small-scale industry, many of which relate to technical services and facilities. Expert assignments in the latter area cover technical and managerial counselling, preparation of feasibility and pre-investment studies and model schemes, organization or strengthening of industrial extension and other servicing agencies, supervised credit, establishment of common service facilities in or outside industrial estates, export promotion and so on.

Table 3 shows the trends in technical co-operation activities, including those under UNDP/SF in the field of small-scale industry, from 1969 to 1971. It has not been possible to show separately the operations relating to technical services (many operations also cover other areas of assistance), but it is certain that their increase parallels that of total operations.

With a view to increasing the number of major operations, principally under UNDP/SF, for the establishment or strengthening of industrial extension centres in the developing countries, joint missions to selected countries are being undertaken by UNIDO and ILO. Two such missions took place in 1969 and four are contemplated for 1970.

TABLE 3: TECHNICAL CO-OPERATION ACTIVITIES OF UNIDO IN THE FIELD OF SMALL-SCALE INDUSTRY, INCLUDING INDUSTRIAL ESTATES AND INDUSTRIAL EXTENSION SERVICES, BY SOURCE OF FUNDS, 1969 TO 1971

(thousand dollars)

	1969	*1970*	*1971*
Regular Programme	159.9	160.0	140.0
UNDP/TA			
Approved projects	101.0	219.1	137.3
Forecasts of new projects	—	859.9	922.7
TOTAL	101.0	1,079.0	1,060.0
UNDP/SF			
Approved projects	221.2	967.6	1,135.7
Under active consideration	—	180.0	640.0
TOTAL	221.2	1,147.6	1,775.7
SIS			
Approved projects	153.0	76.2	-

SOURCE: UNIDO, Industrial Development Board, "Programme of Work for 1971, including Report of Activities for 1969 and Updating of 1970 Programme", ID/B/64, Statistical Appendix, table 4.

APPENDIX 1

UNDP/SF SMALL INDUSTRY PROJECTS FOR WHICH UNIDO SERVES AS EXECUTING AGENCY

This appendix contains brief descriptions of seven UNDP/SF small industry projects being executed by UNIDO in Brazil, Greece, Iran, Senegal, Turkey, Uganda and Zambia.

1. Brazil: Industrial Development Centre, Feira de Santana

This project was approved by UNDP/SF in January 1970, with UNIDO designated as executing agency. The duration of the project is two and a half years.

The purpose of the project is to assist the Government in establishing and operating an Industrial Development Centre at Feira de Santana with a view to promoting accelerated industrial development and to improving the efficiency of industrial enterprises, in particular, in the interior of the state of Bahia, which forms a part of the northeast region of Brazil and is a relatively less developed area within the country.

The state government of Bahia has established an organ called Coordenação do Fomento a Industria (CFI) in the State Secretariat of Industry and Commerce to assist existing and new industries, especially in the interior of the state. CFI, which consists at present of 20 professionals in addition to the chief (who will be the national director of the centre) will be merged with the Industrial Development Centre at Feira de Santana. The centre will:

(a) Undertake an industrial survey of the interior with special reference to the prospects for feeder industries for large enterprises in Aratú, industries to meet local demand in the state and industries for export markets;

(b) Assist the State Commission for Economic Planning in preparing a plan for industrial development of the interior and formulating policies and measures for implementing the plan;

(c) Help in making financial arrangements for small and medium-sized enterprises, including the hire purchase of machinery for small manufacturing and some service enterprises, such as those engaged in repair and maintenance;

(d) Organize industrial extension services starting with headquarters at Feira de Santana and the surrounding region and gradually expand the coverage of both territories and services through the establishment of branches;

(e) Prepare feasibility studies and bankable projects for industries in the state of Bahia;

(f) Render assistance in organizing subcontracting relations between the large enterprises in Aratú and small enterprises in the interior of the state for

the supply by the latter of accessories and components, assistance in quality control of the products being provided by the large industries;

(g) Co-ordinate and support vocational and commercial training provided by other agencies; and organize, at a later stage, management training for industry;

(h) Undertake technical analysis of raw materials;

(i) Maintain a technical library.

UNDP/SF allocated $663,900, of which $443,200 covers 192 man-months of expert services; $47,600 for 84 man-months of fellowships; $75,000 for equipment; and the balance of $98,100 for miscellaneous and overhead expenses. The government contribution is equivalent to $898,000, consisting of land, buildings, salaries of personnel and miscellaneous expenses.

2. Greece: Establishment of an industrial area and industrial estate near Salonika

This project was approved by UNDP/SF in June 1969, with UNIDO designated as executing agency. The duration of the project is three years.

The purpose of the project is to assist the Government in planning, setting up and operating an industrial area and industrial estate and a free customs zone near Salonika in order to:

(a) Foster regional development by decentralizing industrial production facilities now mainly concentrated in the Athens area;

(b) Contribute towards the reduction of considerable disparities in production, employment, income and living standards between the Athens area and the rest of the country;

(c) Gain experience in implementing projects of this kind with the view to establishing other industrial estates in Volos, Patras, Kavalla and Heraklion.

The Hellenic Industrial Development Bank (the government agency for investment in Greece) will in the course of time acquire and develop 310 hectares of land near Salonika as an industrial zone. Within this zone, about 200 hectares will be developed as an industrial area offering sites with the necessary infrastructure, such as power, water, roads, railway sidings and so on, as an inducement for the establishment of large-scale, medium-sized and small-scale industries. About 50 hectares will be developed as an industrial estate for small-scale industries, with standard factory buildings of different types and sizes, common service facilities, an industrial extension centre, and other promotional and assistance facilities and amenities. About 40 hectares will be developed as a customs-free zone for export industries.

During the three-year period of the project, 32 factories of different types will be constructed for small-scale industries in the industrial estate. Common service facilities will consist of toolroom, mechanical workshop, heat-treatment shop and testing and quality-control laboratory, and an information centre with a library on technical and economic subjects, audio-visual aids etc.

A quality-certification scheme will be developed, especially for export-promotion purposes.

UNDP/SF will provide 198 man-months of service of experts, including the project manager, an industrial engineer, a civil engineer, a tool-and-die expert, a chemical engineer, a marketing and export-promotion expert, an industrial free-zone expert and short-term consultants at a total cost of $435,600. Provision has been made for 27 man-months of fellowships at a cost of $19,800 and $168,000 for the equipment of common facility workshops. The total SF allocation amounts

to $722,300. The government contribution is equivalent to $2,404,000, consisting of land, buildings, salaries of personnel and locally available equipment.

3. Iran: Establishment of an industrial estate, Ahwaz development of small-scale industries

This project was the first of its type assisted by UNDP/SF. It was approved in June 1963 for a period of five years. The United Nations originally served as executing agency and later UNIDO took over the assignment. UNDP/SF allocated $637,500, and the counterpart contribution in kind by the Iranian Government was $3,112,100.

The purpose of the project was to encourage and facilitate the development of small-scale and medium-sized industries by assisting the Government in establishing an industrial estate authority and in planning, constructing and operating in the early stages a demonstration estate at Ahwaz; by organizing in-service training and providing fellowships; by carrying out surveys of industries suitable for location on the estate and provision of advisory services and common facilities to prospective occupants.

UNDP/SF provided for a total of 240 man-months of expert services, including a chief adviser, a technical engineer, a chemical engineer, an industrial economist, a foundry metallurgical engineer and short-term consultants; equipment for common service facilities, including a machine-tool and sheet-metal workshop, a foundry, a forge and heat-treatment workshop, a pattern-making workshop and a metallurgical and foundry-moulding laboratory.

Late in 1968, the Government of Iran established an organization for small-scale industries and industrial estates, which became the counterpart organization for this project.

The Government of Iran requested further assistance from UNDP to enlarge the scope of the project. Since 1 January 1969, this assistance is being used for the development of small-scale industries and industrial estates throughout the country. It will last until 1971.

During this period, the small industry organization will not only complete the industrial estate project at Ahwaz and plan new industrial estates, but it will also provide industrial extension services, economic and technical information to small entrepreneurs; advise the Government on policy and programming, tax and tariff concessions, credit facilities, promotion of subcontracting between large and small industries, marketing assistance to small industries, including special programmes of purchases by the Government and other measures of development.

The second phase of the project provides for an additional allocation of $427,900 on the part of UNDP/SF with the provision of 165 additional man-months of expert services. These include the continuation of the post of chief of project, chemical engineer, foundry technologist, among the expert staff of phase 1. In addition, four new experts are included—cost accountant, marketing expert, tool-and-fixture designer and industrial designer. Twelve man-months of short-term consultants in the shoe and leather and food fields are also envisaged.

4. Senegal: National Society for Industrial Studies and Promotion (Société nationale d'études et de promotion industrielle) (SONEPI)

The project for assistance to the National Society for Industrial Studies and Promotion (SONEPI) was approved by the Governing Council of UNDP in January 1970. The duration of the project is three years. The assistance to be provided

by UNDP/SF will enable SONEPI to work towards the implementation of the following functions:

(a) Centralize and disseminate information on the industrialization of the country; this will include the collection of relevant statistical data and other information of value to potential investors, its presentation in a form best suited to facilitate investment decisions and the establishment of an effective distribution system;

(b) Undertake feasibility studies on industrial projects, including production cost calculations, market studies, possibilities of financing etc.;

(c) Study and foster the establishment of industrial estates for small-scale and medium-sized enterprises;

(d) Establish training and extension services for the Senegalese industry, including advice on organization and methods of work, quality control, financing, common ventures between foreign "know-how" and domestic capital, and deepening the knowledge of Senegalese industrialists through courses, seminars, fellowships and study tours.

The total contribution of UNDP/SF will amount to $470,300. The total counterpart contribution of the Government will be 120,750,000 francs CFA;[1] in addition, the Government will pay an amount estimated at the equivalent of $53,100, representing 15 per cent of the estimated gross cost for the experts as a cash contribution towards the local operating costs of the project.

5. Turkey: Small industries development programme

This project was approved by UNDP/SF in January 1968 for a period of five years. UNIDO in association with ILO was designated as executing agency.

The purpose of the project is to assist the Government of Turkey in establishing a small industry development centre and in planning and constructing a demonstration industrial estate at Gaziantep.

The functions of the Small Industry Development Centre will be to:

(a) Conduct economic research and prepare feasibility studies;

(b) Prepare planning and development studies on industrial estates;

(c) Provide technical and management consulting, organize short-term training programmes, and set up an information service on production, financing and marketing problems;

(d) Organize the activities of sales and marketing, including arrangements for co-operation between large and small industries, through subcontracting and government purchase programmes;

(e) Provide advice on research leading to prototype production and product diversification and development.

The primary task of the centre will be to plan and establish the demonstration industrial estate and a pilot programme of small industry development at Gaziantep. International experts will supervise this operation and assist the Government in the initial management and operation of the programme. The Government will acquire the land for the industrial estate and construct the administrative building and common facility workshops. A co-operative of small entrepreneurs, with financial assistance provided from the industrial estate loan fund of the Government, will construct the factory buildings and the necessary infrastructure.

[1] One dollar = 278 francs CFA.

The total SF allocation is $962,800 and includes a total of 288 man-months of expert services, fellowships at an estimated cost of $39,800, equipment and supplies worth $220,000 and $34,600 for miscellaneous local operating costs. The Government's contribution is equivalent to $1,240,000, consisting of land, buildings, salaries of personnel and miscellaneous expenses.

6. Uganda: Small industries development programme and establishment of an industrial estate, Kampala

This project was approved by UNDP/SF in January 1966 with UNIDO as executing agency.

The purpose of the project is to strengthen and expand the Industrial Division of the Ministry of Industry and Commerce to enable it to implement a small industry programme. Assistance will also be given in planning a demonstration industrial estate at Kampala.

The programme will be organized to incorporate the following services:

(a) Stimulation of indigenous entrepreneurship:

(i) By carrying out surveys on prospective industrial development, taking into consideration such factors as the availability of raw materials, power, capital and labour, and the requirements of the country's over-all industrial development plans; and drawing up a list of feasible and desirable industries for each locality;

(ii) By preparing model schemes describing the capital, plant and equipment, materials and other necessities required for these new industries;

(iii) By carrying out feasibility and market studies at the request of prospective and established entrepreneurs;

(iv) By assisting such entrepreneurs to formulate bankable projects for financing by commercial or public credit institutions.

(b) Assistance to indigenous entrepreneurs in setting up new small-scale industries covering every aspect from planning and construction to operation and management. Advice will be given on plant layout and factory planning, equipment, procurement of materials, processes, accounting, quality control etc. Ultimately, industrial extension and information centres will be set up in different localities to encourage prospective entrepreneurs to undertake new industrial enterprises.

(c) Construction and management of industrial estates.

(d) Provision of advice to the Government, through appropriate channels, on policies and programmes for the promotion, development and modernization of small-scale industries, including such questions as customs relief, credit schemes, protection programmes and other incentives.

(e) Research in the field of small-scale industries and dissemination of economic and technical information.

These services will be provided by an autonomous agency that will have a number of functional units covering industrial estates, industrial extension services, industrial research and information.

UNDP/SF allocated $746,400, and the Government's contribution is $1,129,000.

The SF earmarkings consist of the provision, over a five-year period, of 25 man-years of service of experts, including a project manager, industrial economist, industrial, mechanical and chemical engineers and short-term consultants. Seven fellowships of six months each will be made available to enable certain of the

[illegible] counterpart staff to study abroad. Imported equipment for a testing laboratory [illegible] will also be provided.

This project will be developed in close co-operation with the UNDP/SF-assisted Management Training and Advisory Centre for which ILO serves as executing agency. To facilitate co-operation and co-ordination between the two projects, the Management Training and Advisory Centre will be located within the premises of the demonstration industrial estate.

Besides providing industrial advisory services and general services, such as power, water, transport, communication facilities, the demonstration estate will also provide common service facilities, which will include initially a testing laboratory and a mechanical workshop, toolroom, library and information centre.

The government contribution includes provision of counterparts, junior technical staff and technical operatives for the workshop and the laboratory and construction of the Kampala industrial estate. UNDP/SF is providing, besides the equipment for the laboratory, the mechanical workshops, the toolroom, the library and the information centre, fellowships for a workshop superintendent and a laboratory superintendent. Some of the technical service facilities will be organized for common use by the UNIDO and ILO projects.

7. Zambia: Development of small-scale industries

This project was approved by UNDP/SF in June 1969 and is being undertaken with UNIDO as executing agency. The duration of the project is three years.

The purpose of the project is to assist the Industrial Development Corporation of Zambia (INDECO) in the development of Zambian small-scale enterprises. It is expected that the project will create a substantial number of small enterprises, owned and managed by Zambians and will provide a base for the continued expansion of small-scale industries and services under indigenous entrepreneurship and management.

INDECO, a government-owned corporation, is an autonomous body entrusted with the responsibility for industrial development and promotion. As a result of the economic reforms carried out in 1968, INDECO became a majority shareholder in 25 companies and was given the over-all responsibility for management of the state-owned enterprises. Its two subsidiaries (wholly owned by INDECO), Zambia Steel and Building Supplies, Ltd. (ZSBS Ltd.) and RU-COM Ltd., will be strengthened under the project and will become the main instruments for channelling investments and for assisting in the development of new indigenous enterprises. An essential part of the project will be the training of national staff members of the two subsidiary companies who will work as counterparts of the international staff.

UNDP/SF will provide 216 man-months of expert services at a cost of $440,200. In addition to the project manager, the experts will include two senior building specialists, three building estimators, four building accounts and book-keeping trainers, five woodworking specialists, six food technicians, seven metalworking/mechanical experts and eight short-term advisers.

A provision of 54 man-months of fellowships has been made at a cost of $31,600 and $30,000 for equipment in addition to $58,100 as overhead cost and $26,300 for miscellaneous expenses. The total UNDP contribution amounts to $608,400. The government contribution is equivalent to $294,000, consisting of salaries of personnel and other miscellaneous expenses.

APPENDIX 2

UNDP/SF PROJECTS RELATING TO SMALL-SCALE INDUSTRY, MANAGEMENT DEVELOPMENT, TRAINING, PRODUCTIVITY, MAINTENANCE AND REPAIR, INDUSTRIAL STUDIES AND DEVELOPMENT CENTRES, AND INDUSTRIAL RESEARCH[1]

(as of 31 January 1970)

Project by country		*Executing agency*	*Approved by UNDP Governing Council*	*Project duration (years)*
1 Small-scale industry, including industrial extension services and industrial estates				
1 *Brazil*	Industrial Development Centre—Feira de Santana, Bahia	UNIDO	January 1970	2½
2 *Cameroon*	Centre of Assistance to Small Industries, Douala	ILO	January 1969	2
3 *Chile*	Department of Small Industries	ILO	January 1966	5
4 *Greece*	Small Industry Development Service	ILO	January 1967	5
5 *Greece*	Industrial Area and Industrial Estate near Salonika	UNIDO	June 1969	3
6 *India*	Training and Advisory Service in Tool, Die and Mould Making for the Plastics and Other Industries, Guindy, Madras	ILO	January 1966	5
7 *Iran*	Establishment of an Industrial Estate, Ahwaz			
	Development of Small-Scale Industries	UNIDO	June 1963	7
8 *Israel*	Small Industry Advisory Service, Tel Aviv	ILO	June 1965	4

[1] This list does not include projects in the fields of forestry, fisheries, animal husbandry, development of cotton, tobacco, technical higher education, occupational safety, pre-investment studies for industry etc. Although these projects have a bearing on industrial development, they have only a remote relationship to technical services and facilities for small-scale industries, which is the subject of this paper.

UNDP SF PROJECTS *(cont'd)*

Project by country		*Executing agency*	*Approved by UNDP Governing Council*	[illegible]
9 *Korea (Republic of)*	Extension Service Department in the Medium Industry Bank, Seoul	ILO	June 1966	4
10 *Panama*	National Service for Crafts and Small Industries (SENAPI), Chitre	ILO	June 1966	4
11 *Senegal*	National Society of Industrial Studies and Promotion (SONEPI)	UNIDO	January 1970	3
12 *Thailand*	Small Industries Service Institute, Bangkok	ILO	January 1965	5
13 *Turkey*	Small Industries Development Programme	UNIDO	January 1968	5
14 *Uganda*	Small Industry Development Programme and Establishment of an Industrial Estate, Kampala	UNIDO	January 1966	5
15 *Zambia*	Development of Small Industries	UNIDO	June 1969	3

II Management development, training and productivity centres, maintenance and repair

1 *Algeria*	Technical Service and Instructor Training Centre for Adult Vocational Training, Algiers	ILO	June 1964	5
2 *Algeria*	National Institute of Productivity and Industrial Development, Algiers	ILO	June 1966	5
3 *Brazil*	National Centre for Vocational Training	ILO	January 1970	4
4 *Bulgaria*	Management Training Centre for Engineers and Economists, Sofia	ILO	June 1966	4
5 *Cambodia*	Industrial Management and Productivity	ILO	January 1970	3
6 *Cameroon*	Pilot Programme in Maintenance and Repair	UNIDO	January 1970	2

UNDP/SF PROJECTS *(cont'd)*

	Project by country		*Executing agency*	*Approved by UNDP Governing Council*	*Project duration (years)*
7	*Ceylon*	Management Development and Productivity Centre, Colombo	ILO	January 1967	5
8	*Ceylon*	National Vocational Training Scheme	ILO	January 1970	2½
9	*Chile*	Establishment of an In-plant Training Scheme	ILO	January 1969	5
10	*China*	National Vocational Training Service for Industry	ILO	January 1967	4
11	*Colombia*	In-plant Training Programme	ILO	January 1967	4
12	*Congo (Dem. Rep. of)*	National Institute of Vocational Training	ILO	June 1964	5
13	*Congo (Dem. Rep. of)*	Central Services for Maintenance and Repair of Industrial Equipment	UNIDO	January 1970	1½
14	*Costa Rica*	National Institute of Apprenticeship (INA), San José	ILO	January 1967	5
15	*Cyprus*	Vocational Training and Management Development, Nicosia	ILO	June 1963	6½
16	*Ecuador*	Industrial Vocational Training Programme	ILO	January 1969	3
17	*Ethiopia*	Management and Entrepreneurship Training and Advisory Centre, Addis Ababa	ILO	June 1967	5
18	*Ethiopia*	National Industrial Vocational Training Scheme	ILO	June 1968	5
19	*Ghana*	Management Development and Productivity Institute, Accra	ILO	January 1967	5
20	*Ghana*	National Industrial Vocational Training Programme	ILO	June 1968	4
21	*Ghana*	Assistance to the Ghana Industrial Holding Corporation	UNIDO	January 1969	4
22	*Greece*	Training of Technical Teachers for Vocational Industrial Schools	UNESCO	January 1963	4

UNDP/SF PROJECTS (cont'd)

Project by country			[illegible]	[illegible]	[illegible]
23	Guinea	National Centre for Management, Development and Training, Conakry	ILO	June 196[illegible]	[illegible]
24	Hungary	Management Training Centre, Budapest	ILO	June 196[illegible]	3
25	India	National Institute for Training in Industrial Engineering, Bombay	ILO	January 196[illegible]	[illegible]
26	India	Advanced Vocational Training Institute, Madras	ILO	June 196[illegible]	[illegible]
27	India	National Apprenticeship Scheme	ILO	June 196[illegible]	[illegible]
28	Iran	Management Development and Supervisory Training in Provincial Centres	ILO	January 1969	[illegible]
29	Iraq	Management Development and Supervisory Training Centre, Baghdad (Phase II)	ILO	June 1966	2
30	Iraq	National Industrial Vocational Training Programme	ILO	January 1969	2
31	Iraq	National Institute of Management Services and Development, Baghdad	ILO	January 1970	5
32	Jamaica	Productivity Centre, Kingston	ILO	June 1966	5
33	Jamaica	National Industrial Vocational Training Programme	ILO	January 1969	3
34	Kenya	Management Training and Advisory Centre, Nairobi	ILO	June 1965	5
35	Kenya	National Industrial Vocational Training Scheme	ILO	June 1967	4
36	Korea (Republic of)	Central Vocational Training Institute	ILO	June 1968	5
37	Kuwait	Shuwaikh Industrial Training Centre	ILO	January 1970	4
38	Libya	Industrial Vocational Training Scheme	ILO	January 1966	5

UNDP/SF projects (cont'd)

Project/country			Executing agency	Approval by UNDP Governing Council	Duration (years)
39	*Madagascar*	National Vocational Training Programme	ILO	June 1969	[illegible]
40	*Malaysia*	Industrial and Trade Instructor Training Programme	ILO	January 1969	4
41	*Mali*	Assistance to State-Owned Enterprises	ILO	January 1969	3
42	*Mauritius*	National System of Vocational and Technical Education	ILO	January 1966	5
43	*Mexico*	National Service of Rapid Training for Industrial Manpower	ILO	January 1964	5
44	*Mexico*	Regional Centre for Industrial-Technical Training, Guadalajara	UNESCO	June 1967	6
45	*Mongolia*	National Industrial Vocational Training Scheme	ILO	January 1968	4
46	*New Caledonia (France)*	Training of Mechanics for Marine Diesel Engines and other Related Equipment	ILO	January 1969	3
47	*Nigeria*	Hides and Skins Demonstration and Training Project in the Northern Region	FAO	June 1963	$6\frac{1}{2}$
48	*Pakistan*	Management Development and Industrial Training in West Pakistan	ILO	May 1962	4
49	*Pakistan*	Automotive Training Centre, Chittagong	ILO	June 1967	4
50	*Panama*	National Vocational Training Programme	ILO	June 1969	2
51	*Peru*	National Vocational Training Service for Industry (SENATI)	ILO	January 1966	4
52	*Peru*	Management of Small Enterprises	ILO	June 1969	$1\frac{1}{4}$
53	*Peru*	Assistance to Food Industry Development Sector of the Institute for Agro-Industrial Research (IIA)	FAO	January 1967	5

UNDP(SF) projects (*cont'd*)

54	*Paraguay*	National Industrial Vocational Training Programme	ILO	January 1969	5
55	*Romania*	Management Development Centre, Bucharest	ILO	January 1967	5
56	*Rwanda*	Hides, Skins and Leather Demonstration and Training Centre, Kigali	FAO	June 1967	5
57	*Senegal*	Rural Vocational Training Programme	ILO	January 1968	4
58	*Singapore*	National Productivity Centre	ILO	January 1970	3
59	*Somalia*	Training Centre for Hides, Skins, and Leather Development, Mogadiscio	FAO	January 1967	5
60	*Sudan*	Management Development and Productivity Centre, Khartoum	ILO	June 1964	5
61	*Sudan*	National Vocational Training Scheme	ILO	June 1966	5
62	*Syria*	Management Development and Productivity Centre, Damascus	ILO	June 1963	6
63	*Thailand*	Management Consultancy Training, Bangkok	ILO	January 1968	3
64	*Thailand*	National Service for Technical Skill Promotion and Technical Entry Training for Industry	ILO	January 1969	5
65	*Trinidad and Tobago*	Management Development and Productivity Centre, Port of Spain	ILO	June 1964	5
66	*Tunisia*	National Vocational Training Institute, Radès	ILO	January 1966	3
67	*Tunisia*	National Productivity Institute, Tunis	ILO	January 1966	3½
68	*Turkey*	Establishment of the Turkish Management Development Centre	ILO	January 1966	5
69	*Turkey*	In-plant Training Centre for Engineers, Kirikkale	UNIDO	January 1968	5
70	*Uganda*	Management Training and Advisory Centre, Kampala	ILO	January 1965	5

UNDP/SF PROJECTS *(cont'd)*

	Project by country		*Executing agency*	*Approved by UNDP Governing Council*	*Project duration (years)*
71	*United Arab Republic*	Vocational Training for the Egyptian Railways	ILO	June 1964	5
72	*United Republic of Tanzania*	National Institute for Productivity, Dar-es-Salaam	ILO	June 1965	5
73	*United Republic of Tanzania*	National Industrial Apprenticeship Scheme	ILO	June 1967	5
74	*Uruguay*	Productivity Centre	ILO	January 1969	2½
75	*Venezuela*	Venezuelan Institute of Productivity, Caracas	ILO	January 1965	5
76	*Zambia*	National Industrial Vocational Training Scheme	ILO	January 1968	5
77	*Interregional*	Advanced Industrial Training for the Electrical and Electronic Industries	UNIDO	January 1970	3
78	*Interregional*	Higher Training for Textile Industries	UNIDO	January 1970	3

III. Industrial studies and development centres

1	*Algeria*	Centre for Industrial and Technological Studies	UNIDO	January 1968	3
2	*Iran*	Research Centre for Industrial and Trade Development	UNIDO	January 1967	5
3	*Ivory Coast*	Centre for Industrial Studies and Promotion	UNIDO	June 1968	3
4	*Jordan*	Centre for Industrial Development, Amman	UNIDO	January 1967	4
5	*Kenya*	Industrial Survey and Promotion Centre, Nairobi	UNIDO	January 1970	2
6	*Libya*	Centre for Industrial Development and Research, Tripoli	UNIDO	June 1969	4
7	*Saudi Arabia*	Industrial Studies and Development Centre, Riyadh	UNIDO	June 1965	3
8	*Syria*	Establishment of the Bureau of Industrial Project Evaluation and Feasibility Studies	UNIDO	January 1970	3½

UNDP/SF PROJECTS *(cont'd)*

	Project by country		*Executing agency*	*Approved by UNDP Governing Council*	*Project duration (years)*
9	*Tunisia*	National Centre for Industrial Studies, Tunis	UNIDO	June 1966	5
10	*United Republic of Tanzania*	Industrial Studies and Development Centre, Dar-es-Salaam	UNIDO	January 1965	5[1]
11	*Yugoslavia*	Centre for Industrial Organization and Development	UNIDO	January 1970	3
12	*Africa, Regional*	Centre of Industrial Studies for the Maghreb	UNIDO	January 1966	5
		IV. Industrial research institutes			
1	***Bolivia***	Centre for Petroleum Development, Santa Cruz	UN	June 1965	4
2	***Bolivia***	Experimental Production Plant for Asbestos Processing, Cochabamba	UNIDO	January 1968	2
3	***Brazil***	Tropical Centre of Food Research and Technology, Campinas	FAO	June 1963	5
4	*Chile*	Institute of Food Science and Technology, Santiago	FAO	June 1963	3
5	*Chile*	Metalworking Industry Testing Centre, Santiago	UNIDO	January 1969	3[1]
6	*China*	Food-Processing Institute, Hsinchu	FAO	January 1966	4
7	*Colombia*	Institute for Technological Research, Bogotá (Phase II)	UNIDO	January 1968	4
8	***India***	Refining and Petrochemical Division, Indian Institute of Petroleum, Dehra Dun	UNESCO	June 1964	4
9	***India***	National Institute of Foundry and Forge Technology at Ranchi, Bihar	UNESCO	June 1965	4
10	***India***	Central Institute for Tool Design, Hyderabad	ILO	June 1967	5
11	***India***	Mechanical Engineering Research and Development Organization, Durapur	UNESCO	January 1967	5

UNDP/SI PROJECTS *(cont'd)*

	Project by country		*Executing agency*	*Approved by UNDP Governing Council*	*Project duration (years)*
12	*India*	Design Centre for Electrical Measuring Instruments	UNIDO	January 1968	5
13	*Iran*	Hides, Skins and Leather Development	FAO	January 1965	4
14	*Iran*	Management Development and Supervisory Training in Provincial Centres	ILO	January 1969	5
15	*Iran*	Institute of Standards and Industrial Research, Karaj	UNIDO	June 1969	5
16	*Iraq*	Petroleum Research Institute, Baghdad	UNESCO	January 1946	5
17	*Israel*	Industrial Research Centre	UNIDO	January 1964	5
18	*Korea (Republic of)*	Fine Instruments Centre, Seoul	UNESCO	January 1965	5
19	*Malaysia*	Food Technology Research and Development Centre	FAO	January 1966	5
20	*Malaysia*	National Institute for Scientific and Industrial Research	UNIDO	January 1970	2
21	*Mongolia*	Applied Research and Experimental Centre for Leather and Leather Goods Industry, Ulan Bator	UNIDO	January 1970	3
22	*Morocco*	National Leather and Textile Institute, Fez (Phase II)	ILO	January 1968	3
23	*Pakistan*	Centre for the Organization and Development of the Jute Industry, Dacca	UNIDO	January 1969	3
24	*Paraguay*	Technical Standards National Institute	UNIDO	May 1962	5
25	*Peru*	Assistance to Food Industry Development Sector of the Institute for Agro-Industrial Research (IIA)	FAO	January 1967	5
26	*Philippines*	Metal Industry Development Centre, Manila	UNIDO	June 1969	3

UNDP SF PROJECTS (cont'd)

	Project by country		Executing agency	Approved by UNDP Governing Council	Project duration (years)
27	*Rwanda*	Pilot Plant for Industrialization and Pyrethrum Production, Mucingo	UNIDO	January 1966	5
28	*Senegal*	Institute of Food Technology, Dakar	FAO	June 1964	5
29	*Singapore*	Metal Industries Development Centre	ILO	June 1967	4
30	*Spain*	Electrical Industry Testing and Experimentation Centre	UNIDO	January 1970	2
31	*Sudan*	Industrial Research Institute, Khartoum	UNIDO	June 1963	5
32	*Sudan*	Food-Processing Research Centre	FAO	June 1963	5
33	*Sudan*	Demonstration and Marketing Research for Improved Hides, Skins and Leather Production	FAO	January 1967	3
34	*Sudan*	Industrial Research Institute, Khartoum (Phase II)	UNIDO	January 1970	4
35	*Syria*	Industrial Testing and Research Centre, Damascus	UNESCO	January 1964	5
36	*Thailand*	Rubber Development	FAO	January 1964	5
37	*Thailand*	Rubber Development Project (Phase II)	FAO	January 1970	5
38	*Thailand*	Technological Research Institute, Bangkok	UNIDO	January 1964	5
39	*Thailand*	Thailand Industrial Standards Institute	UNIDO	January 1970	2
40	*Trinidad and Tobago*	Caribbean Industrial Research Institute, Port of Spain	UNIDO	January 1969	5
41	*Tunisia*	Centre for the Development of Prototype Tools, Sousse	UNIDO	January 1969	4
42	*Turkey*	Central Research and Training Institute for Hides, Skins and Leather, Istanbul	FAO	June 1969	5
43	*United Arab Republic*	National Physical Laboratory for Metrology, Cairo	UNESCO	May 1961	6¼

UNDP/SF PROJECTS *(cont'd)*

	Project by country		*Executing agency*	*Approved by UNDP Governing Council*	*Project duration (years)*
44	*United Arab Republic*	Engineering and Industrial Design Development Centre, Old Cairo, Cairo	UNIDO	January 1967	5
45	*United Arab Republic*	Textile Quality Control Centre, Alexandria	UNIDO	June 1969	4

Annex

A SUMMARY LIST OF TECHNICAL SERVICES AND FACILITIES FOR SMALL-SCALE INDUSTRIES AND RELATED INSTITUTIONS

This report contains summary information on the main types of technical services and facilities for small-scale industries and on some of the common types of institutions providing such services and facilities. The information, presented in the form of a list, focuses on the needs of the smaller industrial enterprises, though some of the services described, for instance, techno-economic surveys of prospects of industrial development in a given region or area, are also required by industries of all sizes. The functions of certain institutions included in the list may encompass some or all of those described in this report under the heading of other institutions, some of which, in turn, may be departments of agencies of broader scope. The list of services and facilities follows the order of presentation of the topics in the provisional agenda of the Interregional Symposium on Technical Services and Facilities for Small-Scale Industries.

Services and facilities

Promotion of entrepreneurship and assistance at the pre-investment stage, including facilitation of financing

Basic studies

(a) Area surveys to determine the industrial potential of a given area, which may be the country as a whole, a region, province, district or town. The area survey provides the basis for a planned programme of industrial development, pinpointing short-term and long-term industrial possibilities and necessary measures of promotion and assistance.

(b) Industry feasibility studies to determine the economic prospects of establishing or expanding a particular industry or manufacturing a specific product or group of products. The studies make recommendations on: number and size of enterprises to be encouraged and their location; production, marketing and financing data; investment requirements; cost of production and profitability; and policies and measures for establishing or expanding industries.

(c) Market surveys to provide information on the outlets for given products that are open to existing and potential entrepreneurs. The purpose of these surveys is not only to improve distribution and to expand sales but also to assess the feasibility of candidate industries. The market survey also provides information on the potential size of the market, the long-run effect of substitute products and the elasticity of demand.

These studies are essential for formulating and carrying out any programme of industrial development. Drawing up lists of industries whose establishment is feasible and desirable in a given location, taking into account the availability of capital, labour, raw materials, domestic and foreign demand, the possibility of import substitution etc., as well as the objectives, priorities and requirements of a country's over-all industrial development plan, is essential in order to encourage entrepreneurs to diversify their production and to orient potential entrepreneurs. It is also a prerequisite for planning industrial estates and common service facilities for small-scale industries.

d) Model schemes or industry fact sheets for industries with good prospects. These are short pamphlets containing basic information for establishing and operating an industry and manufacturing a product: size of plant, type of equipment, production processes, prospective markets, requirements in fixed and working capital, estimates of income, expenditure and profitability.

Measures of assistance to prospective entrepreneurs

(a) Seeking out prospective entrepreneurs.

(b) Advising on plant feasibility and plant location, recruitment and training of personnel, availability and prices of raw materials, quality and standards of raw materials and finished products, marketing channels etc.

(c) Preparing detailed feasibility and pre-investment studies (bankable projects) and assisting in formulating applications for credit.

(d) Advising on incorporation, partnership, co-operative association and other organizational matters.

(e) Advising on selection of land, designing and constructing a factory, plant layout, selecting and ordering machinery and equipment.

(f) Advising on obtaining building licences, import licences, foreign exchange authorizations and carrying out other formalities and steps leading to the establishment, modernization, diversification or expansion of an industrial enterprise.

(g) Assisting entrepreneurs to obtain supporting facilities and benefits from various sources, including fiscal and tariff concessions, admission to industrial estates, hire purchase of machinery, government purchase schemes and other benefits.

(h) Carrying out "intensive promotion campaigns", as a co-operative effort of extension workers, bank officers, government officials etc., to stimulate and facilitate entrepreneurship in new industrial undertakings. During the campaigns, all or most of the above action may be taken.

Technical counselling

(a) Advising on utilization of materials, machinery and auxiliary equipment, requirements for new machinery, plant layout, techniques and methods of production, production planning and control, quality control (raw materials, semi-finished and finished products), maintenance and repair etc.

(b) Advising on inventory control, cost reduction, recording and control of machine performance etc.

(c) Advising on general housekeeping, working conditions (lighting, heating, protection from heating and radiation), accident prevention and other improvements.

Technical counselling may be provided through consultations, visits to the factories, demonstrations in the plant or in common facility centres, round-table discussions and seminars, technical bulletins, training courses for supervisory personnel, by correspondence etc.

Technical counselling is also provided in connexion with financial assistance, advice and assistance being given to both the borrower and the lender.

Common service facilities

Common service facilities are provided in areas of concentration of small-scale industries, in particular on industrial estates. The most common technical facilities are:

(a) Toolrooms for the manufacturing of tools and auxiliary equipment such as dies, jigs and fixtures for press work, forging, casting and moulding; and for manufacturing processes in the production of plastic, leather and rubber goods. Toolrooms may also serve as maintenance and repair workshops.

(b) Testing and quality-control laboratories for mechanical, chemical and or physical testing of raw materials, semi-finished and finished products. The laboratory may also serve as a quality-certification centre.

(c) Workshops for heat treatment, electroplating and finishing, forging, die casting; foundries with moulding, pattern-making and sand-testing equipment supplying ferrous and/or non-ferrous castings; woodworking shops performing operations on specialized machinery and seasoning and testing of timber; dyeing, bleaching and finishing workshops for the textile industry; tool sharpening for woodworking or metalworking industries; and other workshops performing specialized processes for various industries.

(d) Leasing of machinery and equipment, including renting out of expensive portable tools; leasing of hauling and installation equipment.

A variety of other services and facilities may be set up to serve the needs of industries, for instance, warehousing, showrooms, legal advice, auditing, advertising and publicity, and common procurement of raw materials. All technical facilities are aimed at improving productivity and quality and reducing costs. Common facilities and amenities, such as canteens, clinics (other than first-aid), fire protection or banking, are beyond the scope of the present survey.

Improvement of design, quality and standards

(a) Studies for the improvement of design in order to increase productivity, adapt designs to suit resources and levels of skills, type and grade of equipment and of raw materials etc.

(b) Studies for improvement in design to meet customer requirements and tastes (existing and potential customers, including export).

(c) Production equipment design to meet special engineering requirements and features.

(d) Determination of appropriate quality standards and specifications, quality control and quality certification.

Management assistance

(a) Over-all management advice: diagnosis of the operational and financial position of the enterprise; organizational structure; delegation of authority; management succession.

(*b*) Personnel management advice: recruitment, selection, appointment of personnel, labour-management relations, labour legislation; wage systems, including incentives and fringe benefits etc.

(*c*) Financial management and control: information on sources of financing, assistance in preparing credit applications; advice on book-keeping, cost accounting and control, budgeting, information on taxes and tariff regulations etc.

(*d*) Management training through general or specialized courses.

Marketing assistance

(*a*) Market study and research (domestic and foreign).

(*b*) Advice on development of sales channels; submission of specifications and sales conditions; assistance in making contacts with dealers and negotiating contracts; information on legislation and procedures.

(*c*) Advice on distribution methods, packaging, advertising, sales promotion and pricing.

(*d*) Facilitation of contracts with public authorities under government purchasing schemes.

(*e*) Facilitation of co-operative marketing schemes, establishment of trade associations etc.

(*f*) Organization of sales emporia, domestic and foreign exhibitions, sales offices etc.; use of mobile exhibition vans.

(*g*) Selection and training of salesmen.

Industrial research and demonstration

Assistance in the field of industrial research given to individual small industries includes:

(*a*) Testing raw materials and products.

(*b*) Investigating use of local raw materials, waste materials or by-products.

(*c*) Undertaking research on problems of processing.

(*d*) Carrying out in-plant investigations of problems of equipment, processing etc.

The above functions may be discharged through consultations (visits and correspondence), laboratory work, pilot plants, experimental and demonstration projects. According to the structure of the institutes, research work may be general or specialized.

(*e*) Providing laboratory standards of measurement and calibration services.

(*f*) Applying standards, quality specifications and assisting in establishing and maintaining quality-control procedures.

(*g*) Disseminating technical and scientific information of interest to small-scale industries, in particular, through question and answer service, bulletins etc.; organizing training, discussion groups etc.

(*h*) In many cases, providing economic, technical and managerial extension services to small entrepreneurs.

Promotion of subcontracting between small and large industries

In addition to technical and managerial assistance to small enterprises for production planning and control, improving and maintaining quality, cost accounting and pricing etc., the promotion of subcontracting involves:

(a) Collection of information on prospective demand for parts, components and/or processing and finishing operations from prime contractors.
(b) Collection of information on type of operations that potential subcontractors are in a position to perform, specification of production capacity (available and potential) etc.
(c) Bringing together "supply and demand", acting as intermediary between subcontractors and prime contractors.
(d) Assisting the small subcontractor (e.g. through financing, supply of machines and raw materials) to ensure quality and conformity of production as well as delivery according to schedule.
(e) Advising public authorities on measures for the protection of subcontractors.

Collection and dissemination of technical, economical and legal information

(a) Collection of information as a supporting activity of counselling, research and training.
(b) Collection of information on specific requests of small industrialists, e.g. for an inquiry and answer service.
(c) Dissemination of information of general interest to small-scale industry, e.g. through information bulletins.

Institutions providing technical services and facilities

Small industry service institutes

Small industry service institutes are multi-purpose agencies promoting and servicing small-scale industries of different types and advising the Central Government or local governments in the implementation of complementary programmes. They are usually government-sponsored autonomous or semi-autonomous agencies, sometimes departments of Ministries of Industry or of Economy, and, less frequently, departments of industrial banks, corporations or other credit institutions.

Their functions include most of those described in the first part of this list: economic, technical, managerial, marketing and financial counselling and assistance, operation of common service facilities, training, liaison with other assistance programmes etc.

Industrial extension centres

In most countries, industrial extension centres are synonymous with small industry service institutes. In some countries, extension centres have the same functions as the institutes, but their services are confined to certain industries—textiles, leather or metalworking industries etc.

Management development centres

The main purpose of management development centres is to develop and upgrade managerial ability through training and through assistance at the plant level in solving problems of management, including marketing and accounting. Many management development centres also serve as industrial extension agencies and stimulate entrepreneurship, provide technical assistance, carry out feasibility studies etc. The workshops and laboratories of some centres serve not only for training but also as common service facilities for small-scale industries.

Productivity centres

The main function of productivity centres is to improve productivity, principally in industry, through integrated in-plant study, productivity measurement, work study, cost reduction, labour-management relations etc. Group training and seminars are usually the principal means of carrying out these functions, but many productivity centres also provide technical and managerial counselling to small enterprises, carry out economic research and other developmental work.

As a rule, productivity centres serve industry irrespective of type and size.

Production-and-training centres

In production-and-training centres, production and training are combined to reproduce, as closely as possible, the actual conditions of industrial operation. In some countries, they are set up in semi-urban or rural areas. Most centres specialize in such trades as carpentry, pottery, leather, shoemaking or metalworking.

Prototype production and training centres

Prototype production and training centres have been set up in India in recent years with the objective of developing and producing prototype machinery and training the operative staff of small industries to produce such machinery on commercial lines. The Rajkot Centre specializes in training for production of machinery for foundry, woodworking and sheet-metal manufacturing; the Okhla Centre, in training for production of prototype machine tools; and the Howrah Centre, in training for the production of special machines suitable for small industries such as extrusion machines for plastics industries and electrical instruments for switchboards.

Industrial research institutes

The main purpose of an industrial research institute or a technological research institute in a developing country is to undertake — mainly at the request of public or private bodies or industrial enterprises, but also upon its own initiative — investigation, research, analysis and testing, and to provide other technical assistance to industry. Some institutes are general-purpose; others specialize in certain industrial fields. Most are national bodies; a few are regional or subregional. Some of them carry out the functions of industrial extension centres for small-scale industries.

Quality-marking and quality-certification centres

Quality-marking and quality-certification centres issue quality certificates or marks for certain products destined for the local market and/or export. A certification mark is a third-party assurance to the purchaser that goods have been inspected, tested and certified by, or under the supervision of, a competent agency.

Small industry marketing centres

Specialized marketing centres have been set up in a few countries to carry out market research, promotional campaigns, product design and product pricing studies, bulk purchase of raw materials, contracting of large orders to be distributed among small industries, product inspection etc. "Marketing clinics" inspecting and advising on design, goods, quality, packaging etc. are sometimes held by industrial extension agencies, either in their premises or by visits to producing centres.

Export-promotion centres or councils

Export promotion centres or councils assist small-scale industries in producing and marketing for export, through technical assistance; quality inspection and control, sometimes associated with certification marking; surveys and canvassing of foreign markets; participation in foreign trade fairs, exhibitions and advertising abroad; facilitation of export credit; and dissemination of information. Export promotion centres frequently specialize in certain industries.

Industrial studies and development units

Industrial studies and development centres have been established recently in a number of countries, one of them on a subregional basis. Their functions are to formulate, study and evaluate industrial projects of all types; to assist in their implementation; and to advise Governments on all matters relating to the industrial development of the country or countries they serve. Some of them have specific functions in the field of small-scale industry, including not only feasibility studies and formulation of promotion measures but also technical assistance to small-scale industry and assistance and advice on establishment of industrial estates.

Subcontracting exchanges

A new type of facility has been recently established in several European countries the subcontracting exchange aimed at bringing together demand and supply for industrial subcontracting work. The exchanges provide information on requirements of large industries and on the available capacity and specialization of small enterprises. Some exchanges are able to provide extension services to small-scale industries.

Supporting activities in the field of technical services and facilities for small-scale industries

A number of projects relating to technical services and facilities for small-scale industries are included in UNIDO's Work Programme for 1969 to 1971. These are briefly described below.[1]

Two training workshops on extension services for small-scale industries are being organized by UNIDO, in co-operation with the Economic Commission for Africa (ECA), for the West African and the East African subregions, respectively. The former will be held in Dakar, Senegal, in May 1970, and the latter in Kampala, Uganda, in June 1970. Both workshops will bring together senior government officials responsible for the organization of industrial extension services. Similar programmes will take place in 1971 for the Central African subregion and for North African (and some Mediterranean) countries.

A number of studies have been prepared especially for the West and East African workshops, including: "Services for Small-Scale Industry in West Africa", and "Problems and Possibilities of Small-Scale Industry Extension and Development Finance with Special Reference to the Situation in East Africa", each prepared by a consultant; these two studies are concerned with the relationship between industrial extension and financing of small-scale industries in each subregion. Another study

[1] For more details, see UNIDO, Industrial Development Board, "Programme of Work for 1971 including Report of Activities for 1969 and Updating of 1970 Programme", ID/B/64/Add. 11.

also prepared by a consultant, discusses "The Role of Industrial Estates in the Development of Small-Scale Industry in African Countries"; the study reviews industrial estate plans and projects in these countries as of February 1970 and presents a tentative analysis of current developments.

Consideration is also being given to organizing, in 1971 and 1972, group training programmes on industrial extension services for small-scale industries for industrial extension officers. These programmes will be of longer duration than those mentioned in the preceding paragraphs. The first will be organized for Spanish-speaking participants from Latin America, and the second for French-speaking participants from Africa. They will include courses, round-table discussions, visits to industrial estates and other facilities, and in-plant training.

Apart from assisting in the establishment of industrial extension centres under technical co-operation programmes, UNIDO has endeavoured to create, in co-operation with ECA, a centre for training and development of small industries in a West African country. The centre will receive machinery and equipment for training, demonstration and common servicing from another developing country, where the machinery is manufactured.

UNIDO intends to organize campaigns for the modernization of equipment and production in selected areas of a few developing countries. The campaigns would be organized, at the request of Governments, in countries where UNIDO operates technical assistance projects relating, in particular, to industrial extension, financing and the establishment of industrial estates. Such campaigns are jointly undertaken by extension officers and officials of financial institutions to diagnose shortcomings in equipment and operation of enterprises, to propose remedial action and, whenever possible, to process on-the-spot credit applications for the modernization of equipment.

Among the research studies on common service facilities for small-scale industries recently completed by UNIDO is a report on the toolroom, to be published in 1971. Currently, a number of studies are in preparation on common facilities for the woodworking, leather and rubber products, and on electroplating facilities. Similar studies on common facilities for the ceramics and textile industries will be undertaken in 1971.

Studies on techno-economic aspects of small industry development include: *Bicycles—A Case Study of Indian Experience* (Sales No.: E.69.II.B.30), which relates principally to the manufacture of parts and components of bicycles by small industries under subcontracting arrangements with large industries; and a similar study on sewing machines, to be published at a later date. Another study deals with quality in small-scale manufacturing; it will serve as a guide for industrial extension officers in developing countries.

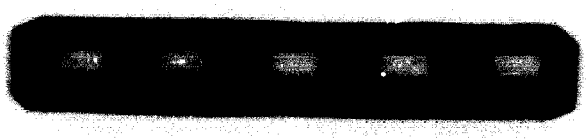
Subcontracting was the subject of an Expert Group Meeting held in Paris in October 1969, in co-operation with OECD. An important documentation was prepared for this meeting, some of which discussed the role of industrial extension centres in the promotion of subcontracting in the developing countries.[2]

Other studies relate to specialized industrial estates (such as estates for co-operatives engaged in joint production programmes, estates for subcontractors, single-trade estates, and free zone industrial estates), to financing of small-scale industry and to domestic marketing of small industry products.

[2] The "General Conclusions" of the Expert Group and selected documents submitted to the meeting will be published in 1971.

A Group Training Programme on the Planning, Establishment and Management of Industrial Estates organized by UNIDO took place in January–March 1969. It was held at the Small Industries Extension Training Institute of Hyderabad, India.

The studies on financing will be submitted to seminars to be held in 1970 (for Latin America) and 1971 (for Asia and the Far East), while the studies on marketing will be presented to a seminar to be held in 1972. These studies discuss, among other things, the role of industrial extension services in facilitating financing and marketing



Printed in Austria

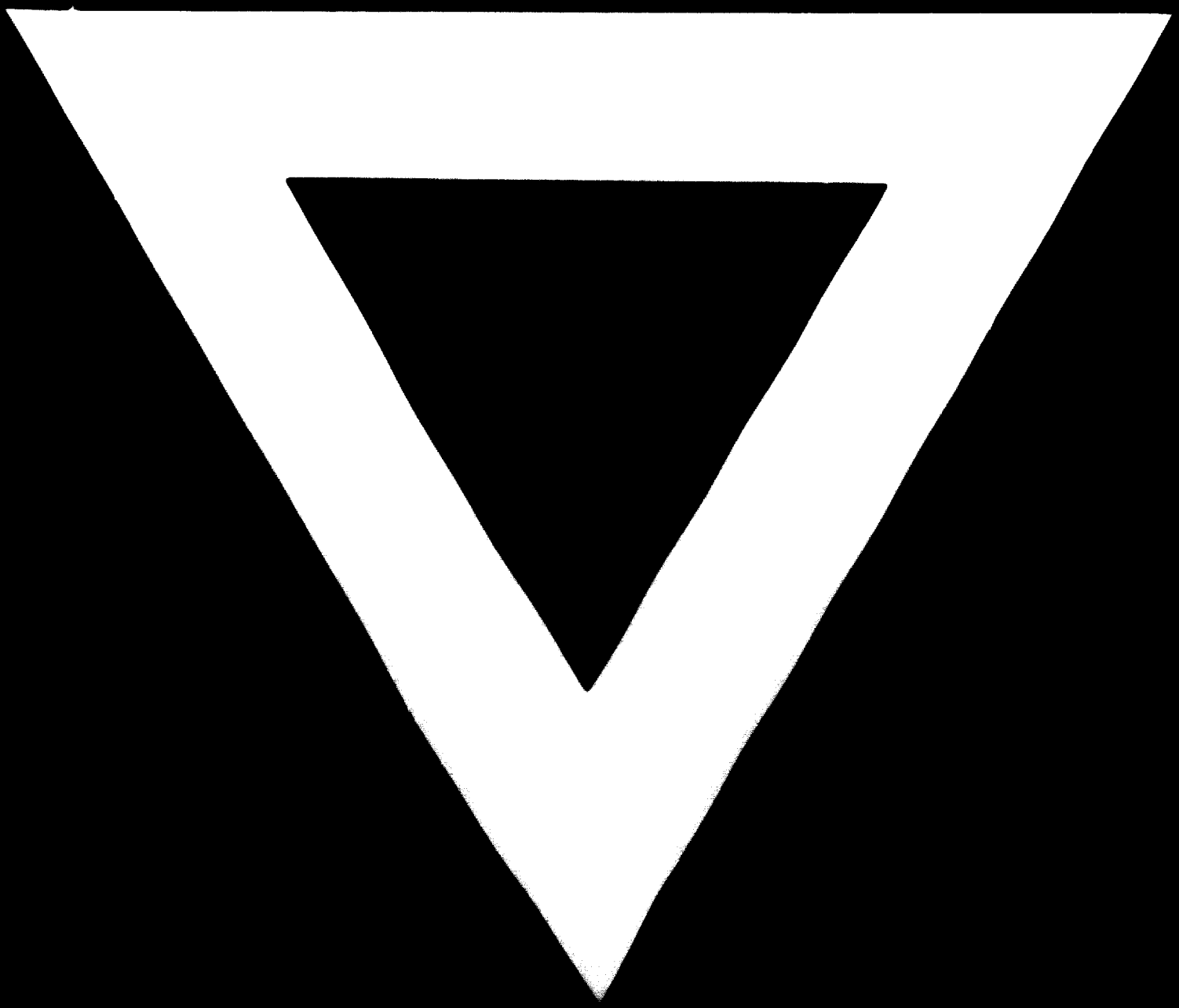
Price: $U.S. 3.00
(or equivalent in other currencies)

United Nations publication

69-305—February 1971—4,000

Sales No.: E. 70. II. B 19

ID/20



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