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9. ABSTRACT

This series of 13 guidelines is intended for use as a supplement to management and technical assistance efforts in the field and as training course background materials. Additional guidelines will be produced as new needs are perceived, but the current compilation includes the following titles:

- An Approach to Furnishing Industrial Extension Services to Small-Scale Industry
- The Generation and Evaluation of Venture Ideas
- Selection of Appropriate Technology
- Resource and Technical Analysis
- Advising the Prospective Entrepreneur on Going into Business
- A Systematic Appreach to Small-Scale Industry Growth
- The Presentation of Investment Proposals
- Factors in Plant Layout
- A Simplified Cost and Control System for Small Industrial Concerns
- Inventory Control for Small-Scale Manufacturing
- Production Planning and Control for Small-Scale Manufacturing
- How to Use a Private Management Consultant
- Selected Bibliography

These guidelines address themselves to the most prevalent and most frequently recurring problems that appear to be characteristic of small and medium-size industries regardless of their geographical location. They are generalized to be broadly applicable to companies in developing countries, although it is recognized that they may not be equally applicable to all country situations.

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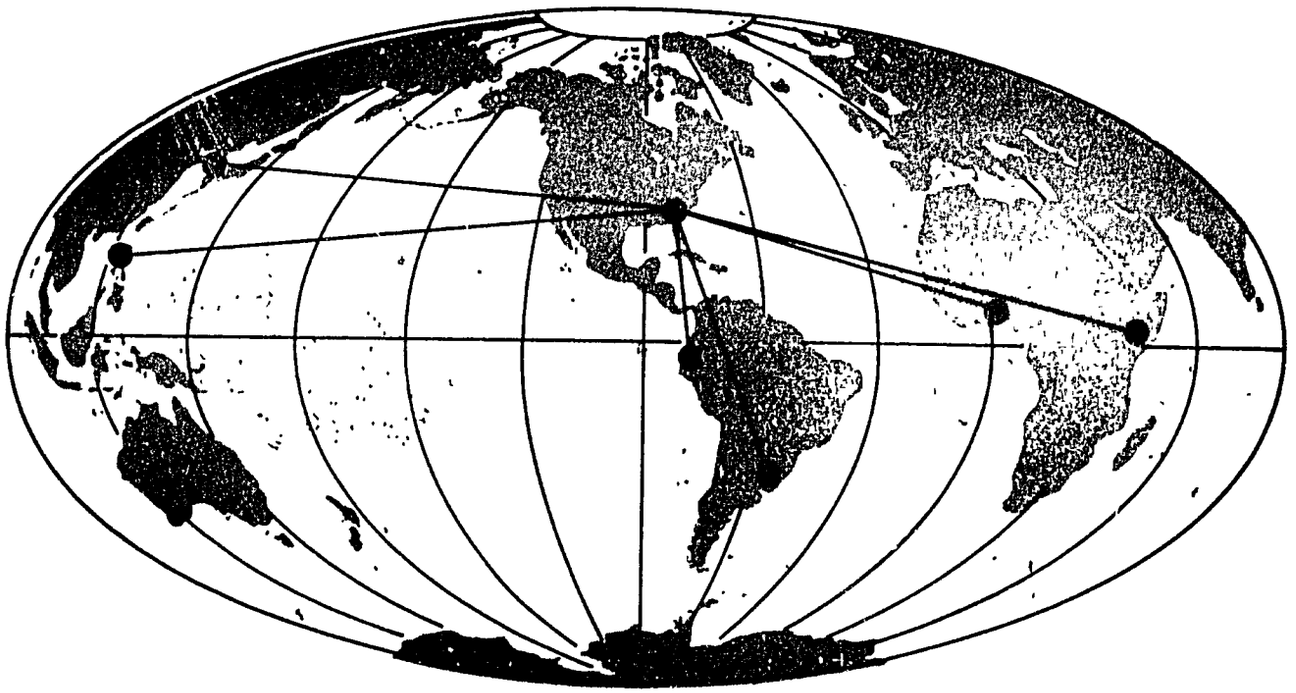

GUIDELINES FOR INDUSTRIAL EXTENSION PERSONNEL

GEORGIA INSTITUTE OF TECHNOLOGY
ATLANTA, GEORGIA

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GUIDELINES FOR INDUSTRIAL EXTENSION PERSONNEL

by
INDUSTRIAL DEVELOPMENT DIVISION STAFF
Robert E. Collier, Editor

Industrial Development Division
ENGINEERING EXPERIMENT STATION
Georgia Institute of Technology
November 1974

INTRODUCTION

The Industrial Development Division has a long history of providing practical industrial extension assistance to more than 3,500 existing and new companies which had problems of various kinds. As a result of this interaction with both domestic and international companies, the staff has developed much insight into and experience with typical industry problems.

The staff recognized early that some types of problems recurred frequently and appeared to be characteristic of small and medium industries regardless of their geographical location. Beginning in the mid-sixties, the Division staff began producing a series of generalized counseling notes related to the recurring cases encountered. These original counseling notes were subsequently added to as new needs were perceived, resulting in a series of 1 "Management and Technical Assistance Counseling Notes." Originally these were used on a selective basis with U. S. companies which sought assistance.

The series of guidelines included in this binder have been generalized to be more broadly applicable to companies in developing countries, while recognizing that the counseling notes may not be equally applicable to all country situations.

However, these guidelines do encompass some tested and successful approaches to business and industry planning and operations. They cover separate subject areas and are intended to be used in part, as appropriate, as a supplement to management and technical assistance efforts in the field and as training course background materials.

As with all Industrial Development Division reports, we welcome suggestions and comments which can be utilized in revising and expanding the contents of these guidelines.

Ross W. Hammond, Chief
Industrial Development Division
ENGINEERING EXPERIMENT STATION
Georgia Institute of Technology

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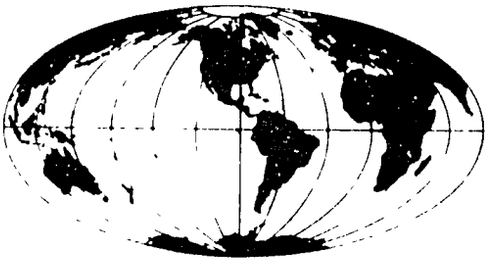
A Guideline for Industrial Extension Personnel



No. 1

November 1974

Published by the Industrial Development Division, Engineering Experiment Station, Georgia Institute of Technology and Funded by the United States Agency for International Development

AN APPROACH TO FURNISHING INDUSTRIAL EXTENSION SERVICES TO SMALL-SCALE INDUSTRY

Introduction

The purpose of this guideline is to describe the concept, structure, approach, and operation of an industrial extension service program that has been in operation in the state of Georgia for the past 14 years. This statewide program of management and technical assistance is conducted by the Industrial Development Division (IDD) of the Engineering Experiment Station (EES) at the Georgia Institute of Technology (Georgia Tech). While the IDD program involves assistance to city and county governments and local, area, and state economic development groups as well as technical services to business and industry, the emphasis in this guideline is on those aspects of the total program that relate to technology transfer and the provision of management and technical assistance to small-scale industrial firms.

A Concept for Technology Transfer

Technology "transfer" is much more complex than the mere transporting of an idea solution or piece of hardware from one place to another. The Georgia Tech industrial extension program is based on a fundamental principle: Technology cannot be force fed; the demand for it must be created and nurtured. Once this basic principle is accepted, technology transfer falls into place and some criteria for program development and management emerge, such as:

- Much technology now exists; the problem is how to apply it.
- In order to create a demand for and motivate institutions to apply technology, management must be convinced that technology will serve its economic needs.

- o Technology must address the needs of business, industry, and government.
- o These needs must be communicated to the research and development community at the state and local level, and the research and development community should try to sensitize itself to these needs.

Availability of Management and Technical Assistance Services

The staff of the Industrial Development Division has had a wide range of practical experience in consulting, administrative, and operational work with a variety of industries. Personnel of the Division are skilled as market analysts, plant location specialists, industrial economists, statisticians, research librarians, and engineers in at least six disciplines. In addition, the facilities and personnel of other divisions of the Engineering Experiment Station and of Georgia Tech's academic departments and library are available for consultative work on special projects. Laboratory and shop facilities can also be made available on highly specialized technical problems.

IDD's management and technical assistance services include but are not limited to the following:

Organizational analysis. . .determination of manpower requirements for a new manufacturing venture. . .assistance in improving a personnel selection and training program. . .investigation of possible sources of capital. . .analysis of financial statements. . .development of principles of cost recognition and control. . .assistance in modifying production equipment. . .verification of cost estimates for equipment modification. . .plant layouts. . .determination of feasibility of constructing a new plant. . .evaluation of equipment to support a loan application. . .investigation of the development of a new manufacturing process. . .development of market data. . .investigation of export opportunities. . .assistance in locating suppliers of special equipment and services.

Field Operations of the Industrial Extension Service

Seven area offices have been established throughout Georgia to serve as an extension of the Industrial Development Division activities and to provide resident assistance to meet the increasing need for research and professional guidance in the economic development of the state.

As an extension of the basic Industrial Development Division program, many of the service functions of the Engineering Experiment Station are also carried out through area offices. Therefore, many areas of commonality are found between the activities of the area offices and other branches of the Industrial Development Division, as well as other divisions of the Engineering Experiment Station.

IDD's extension service activities may be divided into two broad categories:

- o Technical assistance to business and industry
- o Technical assistance to local, area, and state economic development organizations

While all area offices have activities of similar nature, the principal difference in programs is that of emphasis. Each individual office stresses programs geared to the needs of its particular areas.

Technical support to local development groups may take many forms but, for the most part, involves development organization establishment, guidance, and support; economic research; industrial site identification, evaluation, documentation, and development; and prospect servicing.

Technical assistance to area development groups includes participation in land-use studies, zoning recommendations, industrial site or park development, data on worker commuter patterns, area potentials for industrial growth, industrial transportation requirements, prospect handling, economic research, assistance in the preparation of proposals for federal grants and loans, and staff training.

Technical assistance to statewide economic development agencies includes servicing of prospect inquiries, industrial site location, economic research, liaison between statewide agencies and local or area development groups, and the supply of basic data used to promote and sell the state and its communities.

Another function equally important in creating jobs and upgrading a community's economy is to improve existing business and industry through technical assistance. One method of strengthening existing industry is to provide technical services and information to companies that do not have the advantage of large technical staffs or up-to-date technical and management libraries. To implement this method of industrial improvement, the industrial extension service of IDD participates in a program to keep business and industry informed of

the latest advances in management and technology and to assist in the application of this information. Industrial extension field service professionals, operating from the seven area offices, visit industries in their areas to determine how Georgia Tech can best assist them.

Method of Approach

During the initial visit to a company, the field service man explains the various programs carried out by the Industrial Development Division and obtains as much information about the company as he can. This information is noted on a confidential manufacturer's data sheet prepared during the interview. It covers areas of production equipment and capabilities, raw materials and waste (which also include air pollutants and water pollutants), sales and marketing, plant facilities and possible expansion plans, and what the company's technical information and assistance needs might be.

Usually during this initial plant visit, the field service representative will have an opportunity to tour all of the manufacturing facilities. In many instances during this tour, the field service representative is able to make on-the-spot recommendations for improvements. It is sometimes very difficult, however, to get the company officials to expound on all of the company's problems and information needs. Often, if the official identifies symptoms rather than problems, the field service representative is able to deduce, from observations and conversations, what the company's present and potential problems are.

As a result of this initial visit, a write-up of the interview, as well as a profile of the company and any possible requests for information or assistance, is sent to the field service headquarters in Atlanta. The information requests and technical needs are screened and then either assigned to a researcher in the Industrial Development Division or directed to specialists at the Engineering Experiment Station or on the academic faculty. Answers to these industrial questions can come from either reprints of pertinent articles, abstracts, and bibliographies or from the experience and knowledge of Georgia Tech specialists.

The key elements of successful technical assistance and technology transfer are perceptive problem identification, the practical adaptation of technological solutions to the specific needs and capacities of the client firm, and direct personal assistance in interpreting technical information and applying recommended solutions.

General Policy

As a matter of policy, no industrial service project is undertaken which is considered to be competitive with the services of private consulting firms. The purpose of the program is to complement, not duplicate, private sources of service.

A standard policy approach guides all technical assistance projects:

1. Efforts are initially directed toward assisting the firm in solving its problem by itself. This is essentially a matter of assisting company representatives in identifying the true nature of a problem, then guiding them toward a series of steps by which they can correct the problem.

2. If it is impractical for a firm to resolve a problem situation with its own personnel, actual assistance is provided in attacking those aspects of the problem which IDD can competently approach on a short-term basis.

3. If a problem situation requires an inordinate amount of time or if IDD or other Georgia Tech personnel are not available or qualified to attack the problem, the firm is advised of its need for competent consulting specialists. (Certain longer term projects can be undertaken under government grant programs, and under exceptional circumstances where private consulting services are not available, either IDD or another division of the Engineering Experiment Station may undertake special contract assignments.)

Personnel Qualifications

The key to any successful industrial extension service operation is the selection and training of field service representatives.

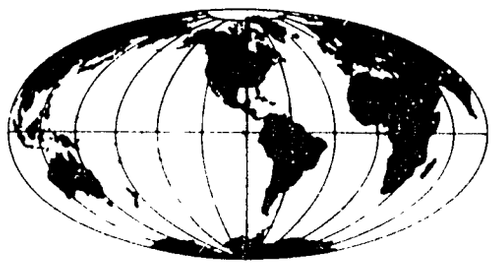
In recruiting these individuals, the following broad qualifications are used as guidelines for selection:

- o Engineering, science, or industrial management education
- o Work experience in business or industry, with a plus for actual entrepreneurial experience
- o Work philosophy that of "generalist" rather than "specialist"

- o Evidence of practical rather than theoretical approach to industrial problem-solving
- o Proven record of ability to work independently with very little supervision

After the selection has been made, a period of indoctrination and training is undertaken. Indoctrination is very informal and consists primarily of providing the new employee with printed material for self-study. This material includes administrative procedures, organization regulations, case study reports of technical assistance and technology transfer efforts, etc. The actual training process begins with the assignment of the new employee to an experienced field service representative. Using on-the-job training experience, the new employee gradually progresses from the passive role of "observer" through the phase of "contributor" and into the active role of working independently on company problems.

A Guideline for Industrial Extension Personnel



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Published by the Industrial Development Division, Engineering Experiment Station, Georgia Institute of Technology and Funded by the United States Agency for International Development

THE GENERATION AND EVALUATION OF VENTURE IDEAS

Idea Identification: A Proper Function for a Development Organization

It is a necessary and important function of a development organization to identify fields that offer potentially sound opportunities for the establishment of new industrial enterprises and/or the expansion and diversification of existing ones. In a very real way, this gives a sense of direction to the development of a geographical area and/or an industrial sector and actually constitutes a major responsibility for a development organization.

In essence, since new ventures frequently originate in the form of an idea that some person has, it is important that the professional in the development field be able to perceive through certain happenings in his community, or through conversation with other people, or through his own thought process the existence of ideas for study which harbor the potential for economic growth. That is to say that the developer must train himself to be aware of such opportunities when he comes across them. In one sense, this involves becoming generally knowledgeable about the broad economic circumstances of his area. In another sense, this involves gaining experience in his professional field. In total, however, what is involved is more than either of these. It is the discipline of the developer's mental faculties so that he is sensitive to what he sees and hears as it relates to his pursuits of the industrial and economic development of his area.

In addition to this frame of reference from which the developer must operate, there are more formal and detailed methods of turning up sources of ideas for study that are available to the development organization. The following strategies represent ways in which data may be used to turn up ideas for further development.

Strategies for the Generation and Selection of Venture Ideas

There is no one best way of generating ideas for new ventures or for determining the need for the expansion or diversification of existing industrial operations. There are, however, several general approaches that may be used in exploring new approaches. Some of the strategies that may be used are outlined below.

- o Upgrade and expand existing industry opportunities
  - Identify opportunities in growth industries
  - Select industries which have potential for upgrading and expansion
  - Analyze markets for development by selected industries
  - Identify appropriate technology which will assist in expansion or upgrading
  - Perform product description to include marketing strategy, labor force availability, risk analysis, facilities location, and environmental enhancement
  - Define enterprise alternatives
- o Create totally new industrial opportunities
  - Gather information on new products, services, processes, and production from all available sources
  - Identify those items which are applicable to the region
  - Select products, etc., with the greatest income potential
  - Identify appropriate technologies
  - Define enterprise alternatives
- o Attract extra-regional growth industry opportunities
  - Identify major growth industry opportunities outside region or LDC (developing country)
  - Obtain location criteria used by companies
  - Correlate location criteria with regional and LDC resources and facilities
  - Define enterprise alternatives
- o Identify market opportunities for regional and LDC resources and products
  - Identify existing regional and LDC resources for external and internal marketing

- For external marketing, determine products with the highest potential for developing markets outside the region and LDC
- For internal markets, determine those resources which will contribute most significantly to internal income generation
- Apply to enterprise alternatives

o Identify investment/venture capital resources relative to enterprise alternatives
- Develop current information on availability of venture capital
  . Data on major investment bankers in the nation
  . Data on all sources of capital in the region
- Determine policies of regional and LDC investors
- Apply to enterprise alternatives

o Identify relevant skills to technologies for each productive enterprise
- Estimate skill requirements based on production processes
- Estimate skills availability based on current employment and resources development
- Determine current and projected labor availability
- Determine training required to produce required number of skills
- Apply to enterprise alternatives

o Determine impact of existing local and regional conditions on enterprise alternatives
- Housing
- Health care
- Water and sewer facilities
- Public education
- Public agency involvement with community industrial development
- Apply to enterprise alternatives

Approaches to Idea Identification by the Development Organization

o Inquiries. Requests for information on specific industries often prove useful in determining development possibilities. Such inquiries indicating interest in a given industry many times indicate a need or desirability for the industry as well. The use of this approach is especially meaningful if the requests begin to fit a pattern -- a strong indication that further analysis is needed. In addition, if the interest is in an industry that might promote the

need for related industries, such as job shop services, then further analysis often is warranted.

o Satellite Industry. It is sometimes desirable to investigate the possibility of developing satellite industries which will tie in with the existing industrial complex. Possibilities fall into two groups -- those satellite industries which will supply raw materials, components, and services to the existing complex, and those which can further process the products or by-products of the existing complex.

o Investigate the Resources of an Area. Investigation of the resources of a defined area can lead to identification of specific economic development opportunities. Mineral, forest, agricultural, tourist, and recreational resources can be analyzed based on both published information and interviews, and opportunities showing particular promise for commercial development can be identified for further development. When this approach is applied to industrial resources, it is the same as the satellite approach described earlier.

o External Evaluation. External evaluation identifies opportunities for development primarily through analysis of published material and regional data on a broad range of specific industries. Analysis can search for growth industries, industries which tend to serve regional markets, industries which prefer small cities or towns to large metropolitan areas, and industries which are sensitive to freight costs, labor costs, utility costs, and other factors. Through this method, opportunities which are most appropriate for the development of a given area can be identified.

Although statistical standards can be developed for many of the factors considered in the analysis program, judgment and experience are necessary both for measurement of some factors and for overall evaluation of the relative importance of all the factors. Refer to check list for use in connection with adequate statistical information.

o Developing a Particular Industry Group. Development organizations sometimes choose to encourage the growth of a particular kind of industry -- sophisticated, space oriented, metalworking, etc. -- usually because they feel that the particular industry will have an important or desirable impact on the total economy. Such a policy decision would call for evaluating the many segments of the selected industry group in order to determine which segments the organization

can hope to successfully develop first or which segments, if developed, will lead to the most rapid development of the total industry group.

Idea Identification by the Small-Scale Entrepreneur

The basic objective of the entrepreneur is to select an economically successful venture. That is one that has a high likelihood of giving him a good return on his investment. The following are areas of investigation that may be suitable for the small-scale entrepreneur. It is noted that some of the areas that must be investigated may require the assistance of industrial extension personnel.

- o Investigate Local Materials - Minerals, agricultural products, forests wastes, clay for ceramic tile, ocean.
- o Study Available Labor and Management - What skills, handicrafts, or special arts are involved?
- o Existing Markets - Existing markets which you can satisfy at an advantage because of proximity and have low transportation costs or because competition lacks capacity.
- o Existing Industry - Existing industries for expansion or diversification, lack of competition, inefficiencies which can be corrected, too high prices, etc.
- o Imports - Consider along with domestic production. These do not have to be imports from foreign countries. They can be imports from any distance which presents an opportunity for transportation cost advantage.
- o Tax Situation - Governmental policy offering special advantages by way of low taxes or other concessions.
- o Inter-Industry Relationships - Growth in one industry almost always creates opportunities. Analyze input needs of existing firms to determine if you have a cost advantage for any of this, e.g., egg cartons.
- o Regional and Country Growth Trends - Evaluate development plans and population growth and trends. Make projections. Observe experience elsewhere.

- o Service Industries - Study the service and support needs of existing industry or the public (e.g., maintenance, information service). Here again analyze all inputs to existing industry.
- o Identify Major National Growth Industries - Is capacity needed in your area? You may be able to compete locally with a firm which has to ship its product in.

Evaluating the Feasibility of New Ventures

These guidelines are suggested as a basic check list for use in evaluating the feasibility of new ventures.

- o Market Potential
  - Define the market for the product:
    - . local?
    - . regional?
    - . national?
  - How is this market documented?
    - . letters of intent from prospective customers?
    - . personal word-of-mouth "survey" by the applicant?
    - . firm orders on an "as, if, and when" basis?
    - . a market survey carried out by a recognized, disinterested professional?
    - . a recognized shortage of the product in relation to demand?
  - Is the market for this product apt to be long term or is it:
    - . a flash-in-the-pan, a novelty item?
    - . a product liable to rapid technological obsolescence?
    - . a staple item with only small growth potential?
  - What kind of competition does this product face?
    - . is it strong nationally but relatively minor locally or regionally?
    - . is it oriented to price or quality?
    - . has it strength in technology or merchandising ability?
    - . is it long-established (e.g., well-known brand) or relatively new to the marketplace (e.g., electric toothbrushes)?

- Is there the possibility of industry "overcapacity"?
  . locally, regionally, or nationally?

Financing

- Is enough money available from all sources to finance the project?
  . community money?
  . bank or other private financing?
  . applicant's equity?
  . working capital?
- Has provision been made for:
  . construction delays?
  . start-up expenses?
  . initial sales and merchandising costs to break into the established market?
  . product modification (possibly involving equipment modification) in response to customer demands?
- Has the availability of private financing, applicant's equity, and working capital been documented adequately?

Management Capabilities

- Will the project have adequate management to handle competently:
  . selection of site, building, machinery, and equipment?
  . operation of the plant?
  . sales and merchandising?
  . cost controls?
  . accounting?
  . employee relations?
- What is the business experience of those who will actively manage the project?
- Do they show a pattern of success in:
  . identical or similar ventures?
  . closely allied ventures?
  . unrelated businesses?
- Do they have interests outside the project which will detract from their attention to the project?
- Do they have other sources of income which will lessen their dependence on the success of the project?

- To what extent are their own resources committed to the project?
- Do they have business connections which might threaten a potential conflict of interest with respect to the project's welfare?

o Technological Capabilities

- What special technical knowledge and skills will be required to make the project a success?
- What is the technical background and experience of those who will be actually associated with the project?
- Is the project in a field experiencing rapid changes in technology?
- Has provision been made to meet the problems engendered by technological changes?

o Materials and Supplies

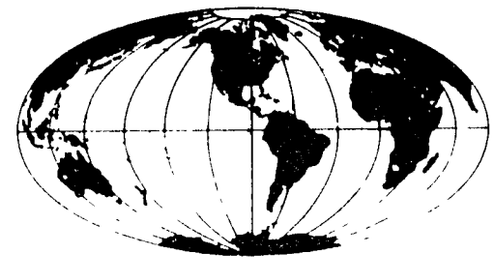
- Raw materials:
  . are they available?
  . in sufficient quantity?
  . at acceptable delivery costs?
  . of such quality or grade as to minimize in-plant upgrading?
- Supplies: (e.g., tools and dies, spare parts for machinery, repair facilities)
  . are they available?
  . promptly?
  . at reasonable cost?
  . is there a choice of sources or substitutes?
- State source of information on above items.

o Machinery and Equipment

- Production equipment:
  . will it perform the job for which it is intended?
  . will it do so efficiently and at an acceptable cost?
  . is it standard equipment available from several sources?
  . are spare parts or service readily obtainable?
  . if special purpose or of special design, has performance been proven under normal operating conditions?
- Auxiliary equipment
  . will it perform the job intended?

  - . the same questions as above? PLUS . . .
  - . is it immediately necessary to the functioning of the operation or is it too elaborate?
- State source of information on above items.

A Guideline for Industrial Extension Personnel



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SELECTION OF APPROPRIATE TECHNOLOGY

For the purposes of this guideline, "appropriate technology" is defined as "that level of applied technology which is best suited to the specific cultural, economic, social, and political climates found in the various countries of the world," and which, consequently, may vary from country to country.

The aim of this guideline is to provide a rationale for appropriate technology and to show, in various settings, specific examples of alternative technology levels in order to provide some guidance to development personnel confronted with the need to make level-of-technology decisions.

Why "Appropriate" Technology?

There are a host of unsuccessful examples of transfers of specific technologies from a developed society to the developing countries. The reasons for the failure of these transfers are many and include:

- o Technology which is too advanced for or not adapted to the country.
- o Ignoring of differences in the labor vs. capital factors found in developing and developed economies.
- o Inadequate infrastructure, insufficient trained manpower, inadequate markets, or other social, cultural, or economic barriers to high technology transfer.
- o Technology not in keeping with national development goals.

One of the important considerations in selection of appropriate technology is the question of labor vs. capital. In a country where labor costs are high, it is generally feasible to think in terms of mechanization and automated equipment (capital intensive). In countries where labor costs are relatively low (and where unemployment usually is high), it is frequently more desirable to manufacture products using more hand labor and less mechanization (labor intensive).

It is possible to manufacture many products by means of a high proportion of labor and little machinery or a high proportion of machinery and little labor, as well as many other in-between combinations of labor and equipment. It is the selection of the appropriate use of man and machines, based on their relative cost, which determines in many cases the appropriate level of technology to use.

Another major determinant in many countries of the world is government policy. If there is a well defined government plan for economic development, it will probably include special incentive programs and focus on selected industries which the government wishes to develop. This tends to focus the technology on that associated with the key industries which are to be developed. If the government has a major concern of reducing unemployment or underemployment, then the creation of labor-intensive industry becomes very important, usually with a lower level of technology. Again, if foreign exchange (for the purchase of equipment) is in short supply, this too will affect the labor vs. capital relationship and hence the technology utilized. Other factors affect this relationship as well.

Criteria of Appropriate Technology

There are certain basic criteria to be considered in the selection of appropriate technology:

1. Technology is seldom directly transferable. More often than not it must be adapted to different environmental conditions (dry-land rice harvesting machinery will not work well in a wet-land rice growing country).
2. The various cultural, political, economic, and infrastructure conditions must be considered in suggesting the appropriate technology. For example, a high electric power-using technology would be inappropriate for an area devoid of reliable electric power.
3. To the maximum extent possible, local materials and natural, manpower, and man-made resources should be utilized (foreign imports usually are high in cost and foreign exchange in short supply).
4. Appropriate technology should encourage and foster indigenous initiative and innovation. It is not sufficient to buy technology and know-how and transfer and install it without encouraging in

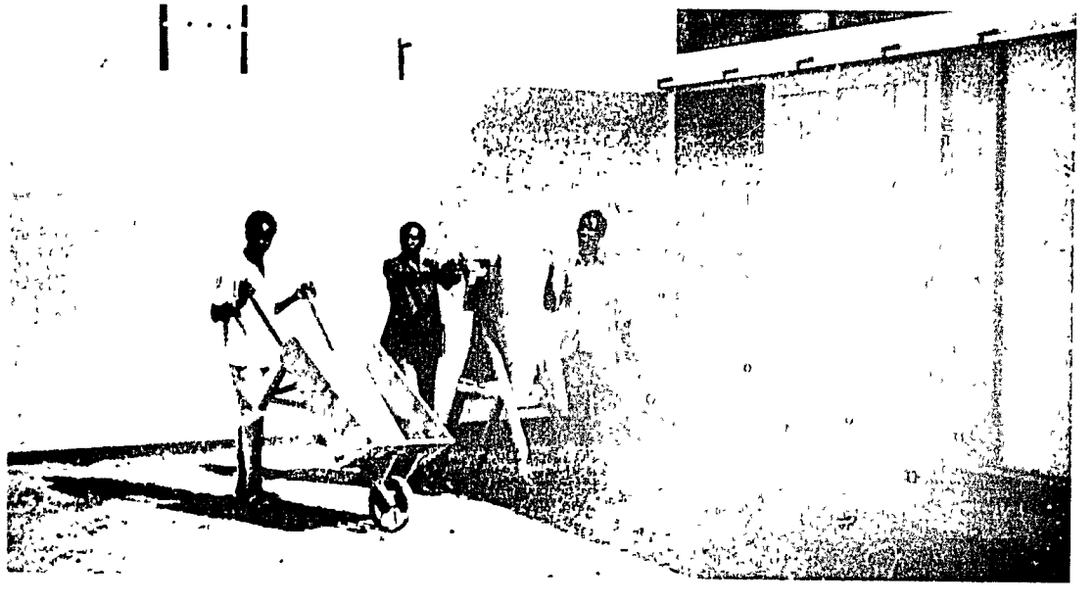
the productive system flexibility and a willingness to change with changing markets and other factors.

5. Appropriate technologies must have or develop logistical support systems, such as maintenance services and spare parts availability.

Some Specific Examples of Appropriate Technology

In order to demonstrate some of the factors which interact in the selection of appropriate technology, the following examples are cited:

1. Appropriate Technology for Rural Kenya. Photograph No. 1 was taken at the Machakos Rural Industrial Development Center. It shows two products designed and produced for use in a rural part of Kenya.



Photograph 1

MANUALLY OPERATED CORN SHELLER

The wooden wheelbarrow is made from local resources, obviating the need to import steel wheelbarrows from abroad and reducing the need for foreign exchange. The introduction of the wheelbarrow in a rural subculture which is accustomed to transporting material on the heads of individuals involves a cultural change which takes time to implement, but is an appropriate materials handling technology.

The second object in photograph No. 1 is a manually operated corn sheller for use in areas where electric power is nonexistent. The ears of corn are

rotated manually at the top of the device and the kernels are abraded off on turned-over nails which have been driven into planks. The corn kernels and cobs fall into a container at the bottom and the cobs are manually separated and discarded. This rudimentary but effective device is an appropriate approach where the mechanization infrastructure is not developed.

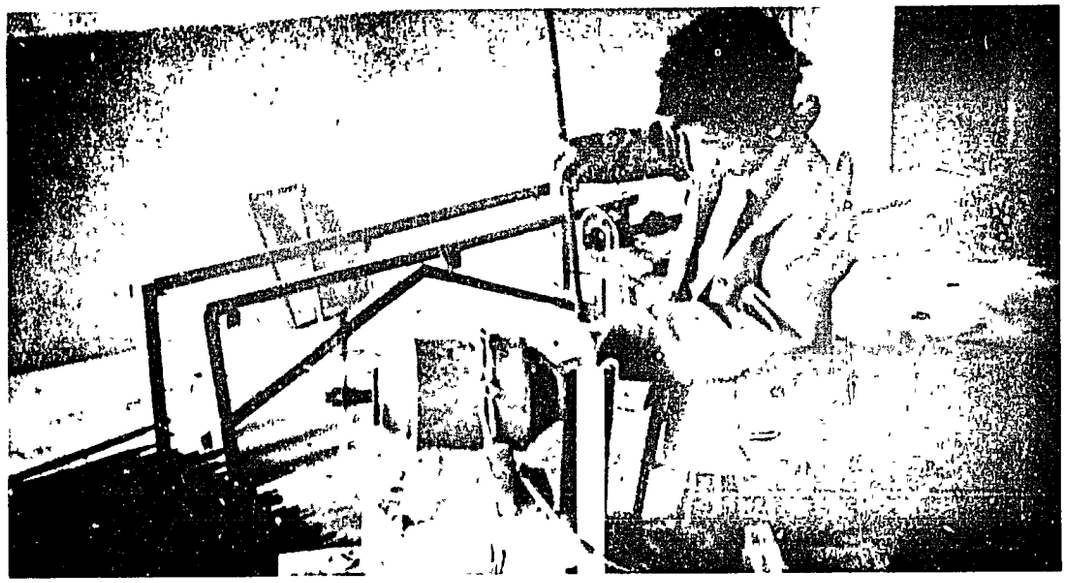
2. Appropriate Technology in Rural Korea. The government of Korea has established a rural development program called "New Village Movement (Sae Maul)," which has as one of its aspects the decentralization or development of industries in rural communities. Photographs Nos. 2, 3, and 4 show scenes at one such rural industry, a fishing pole factory, employing some 50 people in a labor-intensive activity.

Photograph No. 2 shows the raw material, bamboo, stacked to dry in an open area and the preliminary cutting and matching of the bamboo into tapered sections for the fish pole production. The individual bamboo sections are heated in the ovens shown in photograph No. 3 and straightened by hand, using a simple hand-held wooden jig. The sections are then bored and sized (photograph No. 4) so they will form a multi-section fishing pole. The section ends are then wrapped with thread and painted, and all sections are finished and packed for shipment. Monthly production is approximately 10,000 poles.

Photograph 2
RURAL INDUSTRY IN KOREA

Photograph 3

RURAL INDUSTRY IN KOREA



Photograph 4

RURAL INDUSTRY IN KOREA

Almost all of the jobs are relatively unskilled and manual in nature, which is appropriate to a rural environment where labor costs approximate $1.00 per day. There are frequently great opportunities in labor-intensive activities like this to materially increase productivity through improvements in layouts, methods, and the use of simple tools and jigs, without sacrificing employment.

3. Traditional or Modern Technology. The interior of a Nigerian bakery employing about 20 persons is shown in photograph No. 5. The bread can be seen on the floor in the containers in which it was baked, in the traditional wood-fired earthen oven shown in the left foreground.

Photograph 5

NIGERIAN BAKERY

Interestingly, in the left background is a modern electric oven which was not being utilized at the time this photograph was taken.

Was this a case where the entrepreneur had an opportunity to compare the traditional and modern technology side by side in the bakery and decided the traditional wood-fired oven was superior? Or was the modern technology not competitive in cost with the traditional method of baking bread due to the cost of electricity and other factors?

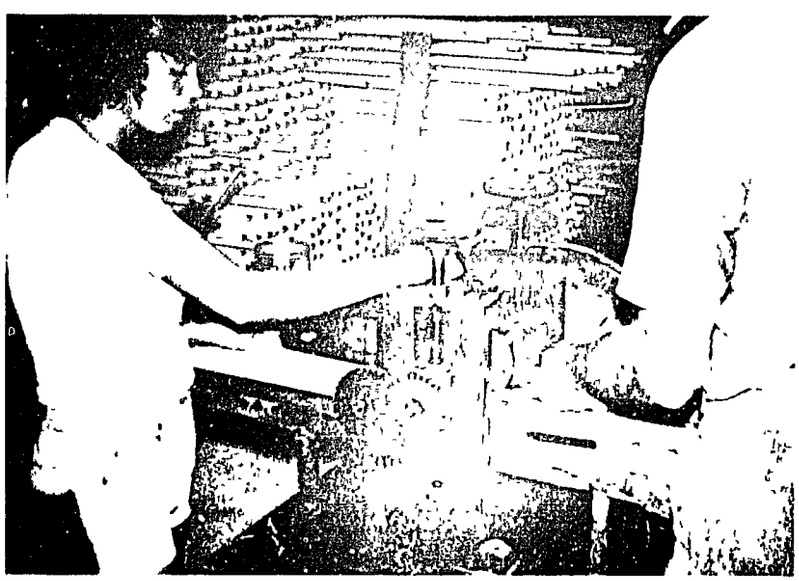
These and other conjectures occurred to the technicians gathering information about the operations of this enterprise. Further investigation revealed that the reason that the electric oven was not being used was due to a breakdown of the equipment and the unavailability of replacement parts to make the oven operational again.

This highlighted one of the major problems in technology transfer the world over. All too often technology is transferred without adaptation and without establishing adequate maintenance and spare parts services.

4. Adaptability Is an Important Aspect of Appropriate Technology. Small industries in developing countries often have shown a capability to adapt existing technology to suit the country conditions and the availability of component parts.

The work of the International Rice Research Institute (while not a small industry) in the Philippines is a case in point. There, a number of low-cost rice related machines (seeder, thresher, dryer, pumps, etc.) have been designed and produced. One of the features of the designs is the flexibility to utilize motors, materials, and component parts which are readily available locally, indicating that a good deal of adaptability in production of these machines is needed.

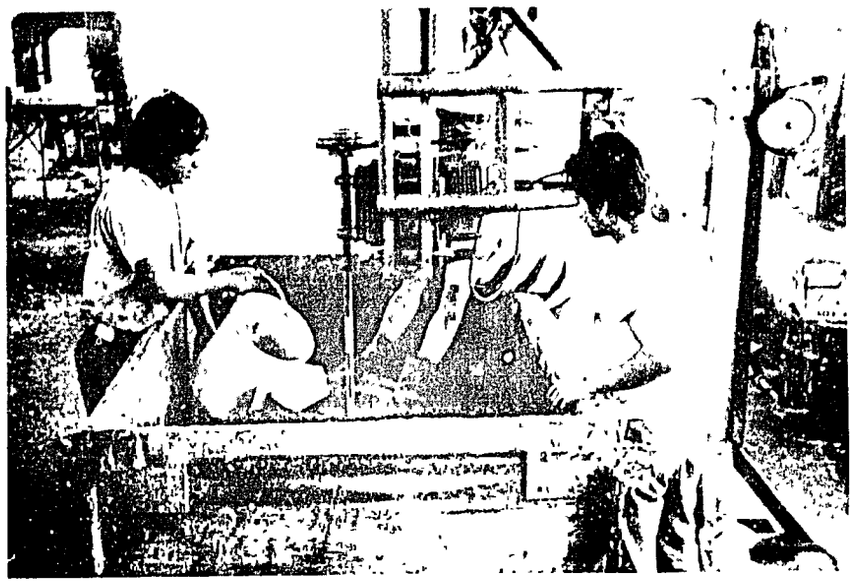
Photograph No. 6 shows one process (embossing a design) in a picture frame plant in southeast Brazil. Here an olive green agricultural paste is fed into the machine manually from the right hand side of the embossing machine. As the white picture frame is drawn through the device, the paste is embossed in a repetitive design or the wood and after hardening becomes an artistic and decorative addition to the picture frame. This machine, as well as others in the plant, was designed and fabricated locally.



Photograph 6

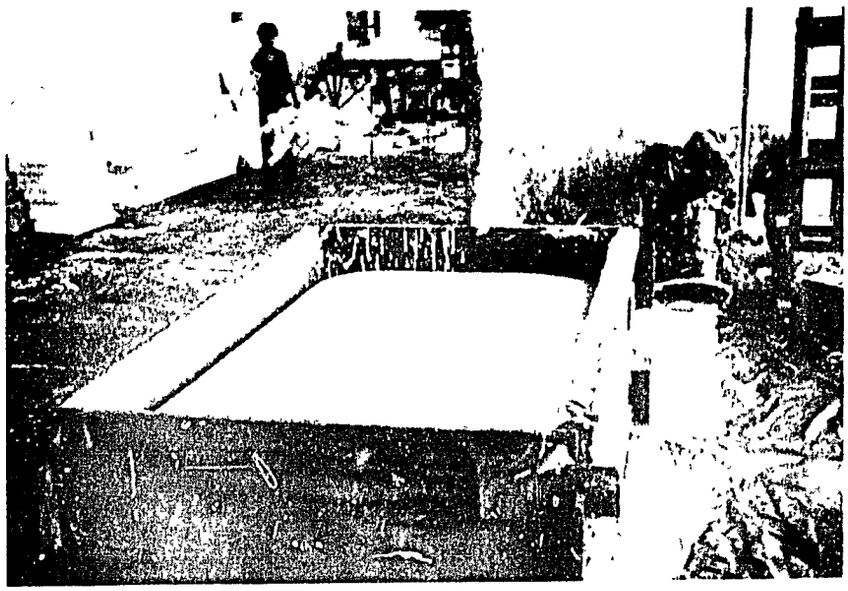
PICTURE FRAME PLANT IN BRAZIL

Various stages of producing polyurethane foam mattresses in Ecuador are shown in photographs Nos. 7, 8, and 9. In photograph No. 7, two of the necessary ingredients are being mixed in the forms used to produce the polyurethane foam. The materials expand about 30 times during the process (shown partly expanded in photograph No. 8). The po_yurethane foam blocks are then cut to size for the mattresses, as shown in photograph No. 9.



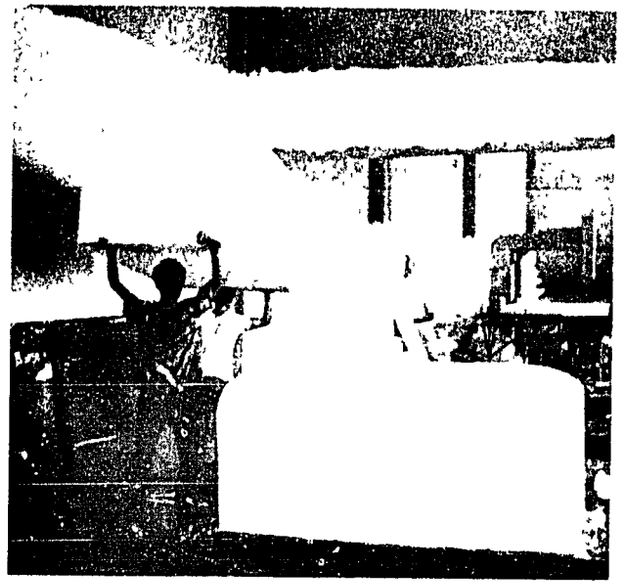
Photograph 7

MATTRESS PRODUCTION IN ECUADOR



Photograph 8

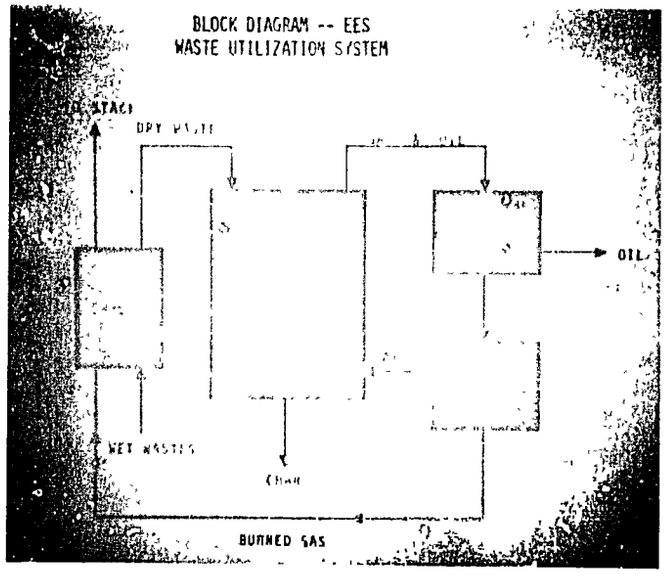
MATTRESS PRODUCTION IN ECUADOR



Photograph 9
MATTRESS PRODUCTION IN ECUADOR

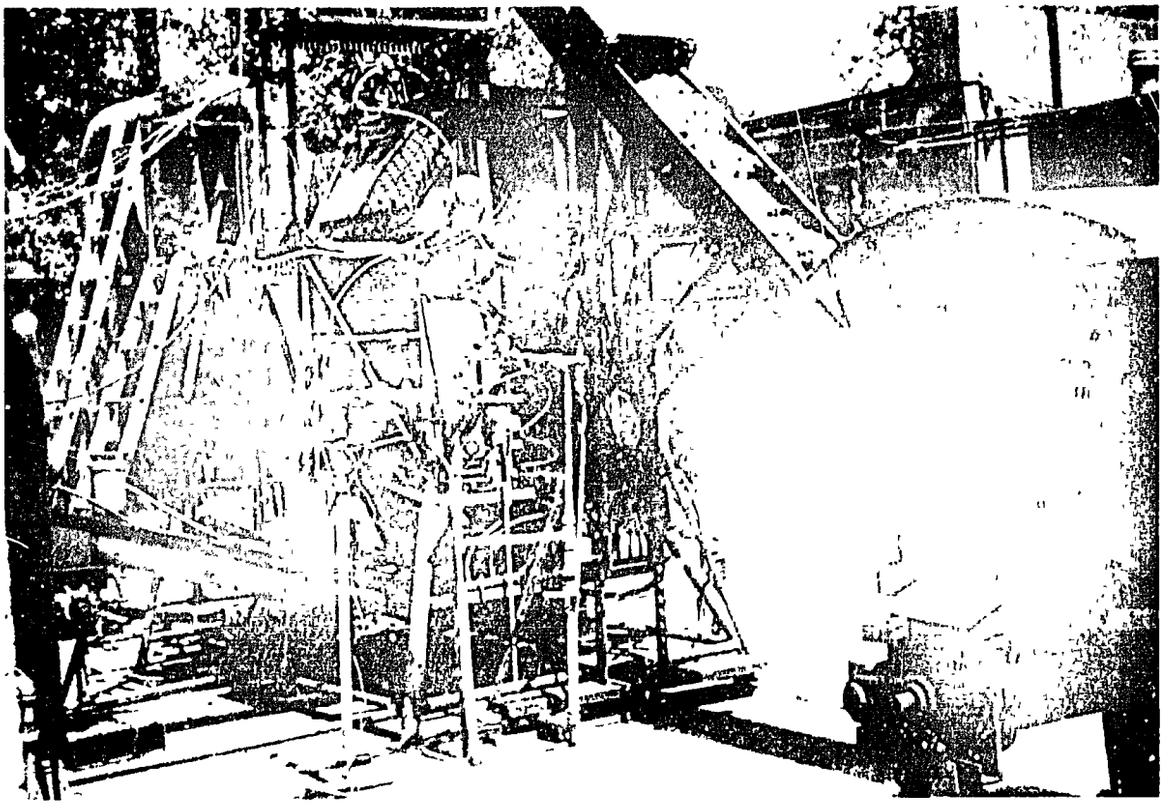
All of the equipment used in this plant (except the motors) were built locally for this plant and adapted to the specific needs of the plant, showing a technology usage appropriate to the needs of the Ecuadoran environment.

5. Conversion of Agricultural Waste Products. Photograph No. 10 shows a block diagram for a system to convert agricultural wastes (peanut hulls, coconut shells, cotton gin waste, coffee bean hulls, etc.) into useful products (char, hydrocarbon oils, gases, etc.). It is done by pyrolytic conversion (burning under controlled conditions) and can be done very simply (old oil drums are used in Jamaica, for example) or with fairly complex equipment as shown in photograph No. 11.



Photograph 10
WASTE CONVERSION SYSTEM

If one were to consider the use of the equipment shown in photograph No. 11 in many of the developing countries, rather significant adaptations might be needed to make the equipment suitable for the conditions in those countries.



Photograph 11

SIMPLE WASTE CONVERSION EQUIPMENT

For example, the need to make the equipment more labor intensive might dictate hand feeding waste material into the equipment rather than using the automated conveyor shown in the photograph. It might also be desirable to put the installation on a truck to make it possible to visit the various decentralized locations where agricultural wastes are generated, since agricultural wastes may not be available in one centralized location. Any number of other changes might be instituted depending on the specific country circumstances, the stage of development, etc.

Steps in the Selection of Appropriate Technology

With the above as background information, the following steps are suggested as a methodology to employ when selecting appropriate levels of technology to

utilize in industrialization processes.

1. Review national goals relating to industrialization.

   - o Is there a national thrust to develop small and medium industry?
   - o What kind of government incentive programs exist?
   - o Is the need for employment generation demonstrated in the government's national plan?
   - o What other public or private information is available which can help in the selection of appropriate technology?

2. Verify the feasibility of the proposed industrial activity.

   - o Is there a market for the product? What is the nature of the market -- local, national, international, etc.?
   - o Is the infrastructure (electricity, gas, oil, water, roads, etc.) available in the proposed industrial location?
   - o What are the raw materials needed and are they available?
   - o Is the transportation system adequate to permit the proper distribution of products within the market area?

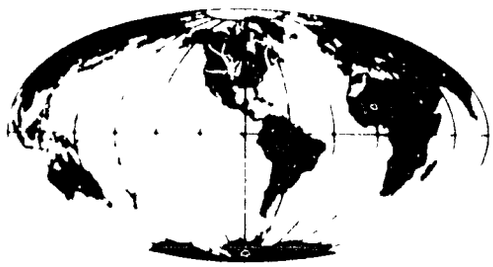
3. Investigate the social, cultural, and political climate as it affects industrial activity.

4. Consider the elements of the proposed enterprise:

   - o Organization
   - o Entrepreneurial resources and management capability
   - o Technological levels possible in the activity
   - o Relative cost of labor and machinery (labor vs. capital)
   - o Financial and other restraints
   - o Production processes
   - o The range of technological alternatives
   - o Sales and distribution plans
   - o Verification of maintenance and service sources for the level of technology

5. Based on the above, recommend selection of the appropriate technology.

A Guideline for Industrial Extension Personnel



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RESOURCE AND TECHNICAL ANALYSIS

Introduction

It is becoming more and more evident that one of the most important contributing factors to the failure of newly created small industries in developing countries is the inadequate analysis of technical alternatives prior to equipment purchasing commitments. This type of failure usually is found in those situations where the small industrialist does not have technical assistance available during the critical stages of equipment selection. Unfortunately, however, small industry failures also take place even when "expert advice" goes into the planning of the production system to be selected. The causes of this phenomenon are many and varied. An examination of causes is beyond the scope of this guideline, but the implications of what appears to be the most common one can be mentioned here.

Many developing programs are staffed with specialists whose backgrounds are heavily oriented towards the social sciences and weak on technical exposure or curiosity. If members of a development team are not multidisciplinary, they, like the small industrialist that acts on his own, tend to rely heavily on the word and advice of equipment salesmen. When equipment representatives are not available locally, decisions to purchase machines often are made solely on the basis of information in catalogs or brochures. In this type of situation, the probability of failure can be minimized if a careful, detailed analysis is made of the raw materials to be processed (resource analysis) and the available production technologies (technical analysis).

Resource Analysis

Resource or raw materials analysis is particularly important when foreign technology and equipment is being purchased. Many times raw materials with identical names and appearance can be quite different in composition and internal characteristics in different countries. When seeking foreign equipment sources, therefore, a development analyst can not afford to assume that the raw materials characteristics in another country are the same as the raw materials characteristics in his native environment. An analyst should learn as much as possible about the physical and mechanical characteristics as well as the chemical properties of the raw materials to be processed by the industry he is assisting. Oftentimes such information is already available in the technical libraries or is known by research organizations within his country. If information is not available or is scarce and incomplete, he should encourage the interested parties to have the materials analyzed or tested in national laboratories.

If none of these alternatives are feasible, the development analyst should recommend the shipping of sample lots of the indigenous material to the equipment supplier so that it can be tested on the supplier's equipment to see if the equipment ratings, performance, and yields are the same as those assumed for this type of material. If technical information is available, he should send it to the equipment supplier and ask about the adaptability and performance of the equipment if the raw materials are significantly different from those that the equipment was designed to process.

Selecting the Appropriate Technological "Package"

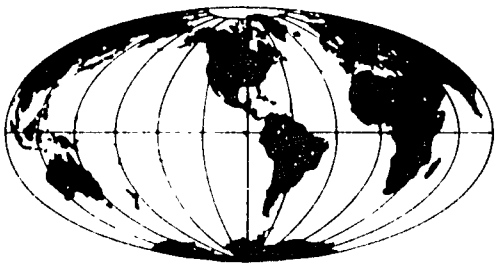
Once a thorough resource analysis has been performed, and even before equipment sources are contacted, the analyst should research the alternative productions methods available, if any, that produce relatively similar results. If different technologies are available, this often becomes a very critical stage in his analysis, particularly when dealing with small industry. This is so because the small businessman has to derive a trade-off system of analysis that will help him identify, evaluate, and select that production method (technology) that is best suited to the reality of the environment in which the business firm will operate. He will have to balance the trade-off elements such as:

1. An expensive system vs. a less reliable cheaper production method
2. Capital intensive vs. labor intensive
3. High technology vs. lower technology
4. Type of energy to be consumed, e.g., electricity vs. fuel oil
5. The availability of spare parts in the future, e.g., local vs. foreign sources
6. Foreign vs. national equipment
7. New vs. used equipment
8. Type and size of market to be served, e.g., domestic vs. export

These are no quick rules for balancing this set of trade-offs. A close observation of the problem indicates that the decision on the individual trade-off is a function of the financial, managerial, and technical potential of the investors (1, 3, 7). It is also a function of the developmental policies of the native country (2, 5, 6, 8), as well as the economic development stage of the country (1, 3, 4, 8).

Once a technological package has been selected, the analyst should try to obtain at least three different price quotations. Each quotation should be analyzed in detail and pieces of equipment that are not vital or that can be economically replaced by labor should be eliminated. Prior to making his final recommendations, the analyst should, if possible, visit the equipment supplier's manufacturing plant and should discuss the merits of the equipment with previous clients of the supplier.

A Guideline for Industrial Extension Personnel



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ADVISING THE PROSPECTIVE ENTREPRENEUR ON GOING INTO BUSINESS

Individuals who are ready and willing to think and act independently, to take risks intelligently, and to live in such a risk-taking environment are usually the type of people who seriously consider starting their own businesses.

The objective of industrial extension personnel is not to disillusion the prospective businessman, but rather to encourage him to make a critical analysis so that he may see the factors that breed success. Intelligent personal risk-taking can be stimulated by encouraging the prospective businessman to gain insight into some of the characteristics which make for the success of a new enterprise. The prospective businessman must look at the total picture as objectively as possible. He should examine the pitfalls as well as the possibilities.

The prospective businessman should develop a skill in assessing new enterprise opportunities. He must be able to reach a conclusion as to whether the new enterprise will fill a need, either known or created. A hard look at the industry, the market, competition, sources of financial support, and similar external influencing conditions is essential. No business can succeed unless it finds some means of gaining a competitive advantage over others. Thus, the need and the competitive advantage determine the potential and possibilities.

A new small business is characterized by several conditions:

1. The spirit of innovation. A new idea or a new way of doing something is usually the spark that sets off a chain reaction leading to the establishment of a new business. This new and untried element creates a challenge and risks beyond those normally faced in established companies. It is this innovative spirit that frequently points the way to creating a need and developing the competitive advantage so essential to the small business.

2. A "key-man" operation. Usually one man or at most a few men must bear the full responsibility for the total operation of the enterprise. Decisions must be made which are based on limited experience, little time, and restricted financial support. These decisions will at times be critical ones; frequently, they must be made rapidly without elaborate investigation.

3. Financial uncertainty. The small businessman is faced with the problems of determining financial requirements, obtaining the funds necessary for the establishment of the business, and maintaining the enterprise in a sound financial condition. Invariably, uncertainties will exist in a new enterprise; often these uncertainties must be faced by persons without organizational experience.

4. Total management. The sum total of the small business' management problems fall on one person or at most a few individuals. This individual or small group must handle the full gamut of management functions: organizing, planning, leading, coordinating, and controlling. While these functions in the small concern may not be as extensive as in the larger companies, the questions of planning, timing, and human relationships are nonetheless critical to the continued operation of the business.

5. Survival and growth. A legitimate business is established as a "going concern"; certainly it is not established for the express purpose of going out of business. The conception and birth of a new enterprise is a traumatic experience for its sponsor. This experience involves a rapid change in the way of life for the businessman and, in a sense, forecasts the dynamic nature of the environment in which he will operate in the future, for the business environment is essentially one of change. While the means the businessman initially uses to achieve a competitive advantage may be a correct one, this initial advantage may be lost in a short time because of changing conditions.

One of the greatest advantages that the small business enjoys over a large business is the possibility of adapting more quickly to changing situations. Less rigidly bound by policy and structure, small businesses generally are capable of moving directly and swiftly in meeting problems and needs. This natural advantage often is lost, however, because a small business operator is either unwilling or unable to take advantage of the asset of flexibility. Unless the small business owner grows into the small business manager, problems in all areas of the operation are likely to develop and multiply.

When an individual considers starting his own business, he should look beyond the moment of formal establishment to the problems he may face in the future. In a study of small manufacturers conducted by the Industrial Development Division, it was found that many of the problems and needs of such businesses resulted from a failure to observe certain basic principles of small business operation and management. It was concluded that the fundamental problems, or most common mistakes, of small manufacturers (and the ones that new manufacturers should attempt to avoid from the beginning) are these:

o The small business operator fails to limit his field of competition to an area in which he is capable of competing successfully. He attempts to compete in a field that is dominated by larger businesses without offering unique or special products or services, without taking advantage of his size by providing personalized service and close customer relations, or without having the resources and resourcefulness to grow with an industry and compete for a general market on equal terms with larger companies.

o The operator of a small firm does not possess or fails to acquire a high degree of management skill and an intimate knowledge of the manufacturing field in which he operates. He may enter a field that appears to be lucrative rather than one in which he has knowledge and experience. If he is familiar with the field in which he operates, he may fail to recognize the need for self-improvement and growth in knowledge and skill. He may fail to take proper advantage of the knowledge and skill that can be acquired by hiring qualified assistants or by utilizing outside assistance as particular problems or needs arise.

o The principal of a small firm fails to plan for the organizational needs of his company and fails to take full advantage of the abilities of his subordinates. He does not plan for the day when operational and management requirements of his company will exceed his span of knowledge and skill. He is reluctant to delegate authority, and he attempts to make all of the decisions and do most of the work himself, even after his company has grown to a size where it is neither physically nor economically feasible for him to do so.

o The small business operator fails to recognize the fact that manpower resources are no less valuable because a business is small. Although he pays competitive prices for raw materials, supplies, equipment, and other resources, he somehow expects to attract qualified manpower at cut-rate prices because he

is "small and cannot afford to pay more." In an effort to get cheap labor, he succeeds only in getting the most expensive kind -- the untrained, unreliable worker whose aptitudes are limited.

o The small business operator fails to maintain complete and accurate records and therefore fails to base his operating decisions on known facts. He may rely on his memory or observation to keep informed of operating results, or his records may be too incomplete or too complex to be useful. He fails to recognize the fact that only through the development and maintenance of adequate and proper records can he know and retain the facts necessary to make sound and effective operating decisions.

o The small manufacturer fails to take advantage of the flexibility that his size affords, and he does not apply an aggressive ingenuity in overcoming problems and meeting changing needs. He either is unwilling or unable to adapt, or lacks or does not exercise the aggressiveness and ingenuity required to capitalize on the asset of flexibility.

Although the foregoing conclusions were based on a study of small manufacturing concerns, evidence from the study clearly indicates that most of the basic problems of small business growth and survival are closely identified with management capabilities and characteristics. The most encouraging feature of this conclusion is the fact that these problems are not inherent parts of small business itself, but are capable of being resolved through proper education, counseling, and assistance.

A person who has not previously owned his own business but is now considering going into business should ask himself two basic questions: "Do I really want the kind of life that small business ownership will entail? Do I now have the needed management and technical capabilities?"

It should be recognized that small business ownership is marked by a lack of financial security, long hours and reduced family life until the business is successful, a sense of personal loneliness, and the necessity of working with the grubby details and endless minutiae which are inherent characteristics of small business. In contrast, a successful business may produce worthwhile monetary rewards and a great sense of personal achievement.

Objective self-analysis and appraisal is required in seeking an answer to the question concerning management and technical capabilities. The appended

list of questions provides a starting point for a self-analysis by the prospective entrepreneur.

QUESTIONS TO CONSIDER

Are You the Type?

1. Have you rated your personal traits, such as leadership, organizing ability, perserverance, and physical energy?
2. Have you had some friends rate you on them?
3. Have you considered getting an associate whose strong points will compensate for your weak traits?

What Are Your Chances for Success?

4. Have you had any actual business experience?
5. Do you have special technical skills, such as those needed by a plumber, electrician, mechanic, or radio repairman?
6. Have you obtained some basic management experience working for someone else?
7. Have you analyzed the recent trend of business conditions (good and bad)?
8. Have you analyzed business conditions in the city and neighborhood where you want to locate?
9. Have you analyzed conditions in the line of business you are planning?
10. Have you determined what size business you plan to establish (dollar sales per year)?
11. Have you built up a detailed set of figures on how much capital you will need to launch the business?
12. Have you figured how much time you will need until the business income equals the expenses?
13. Have you planned what net profit you believe you should make?
14. Will the net profit divided by the investment result in a rate of return which compares favorably with the rate you can obtain from other investment opportunities?

How Much Capital Will You Need?

15. Have you worked out what income from sales or service you can reasonably expect in the first six months? The first year? The second year?
16. Do you know what net profit you can expect on these volumes?
17. Have you made a conservative forecast of expenses, including a regular salary for yourself?
18. Have you compared this income with what you could make working for someone else?
19. Are you willing to risk uncertain or irregular income for the next year? Two years?
20. Have you counted up how much actual money you have to invest in your business?
21. Do you have other sources from which you could borrow money?

22. Have you other assets which you could sell or on which you could borrow?

23. Have you talked to a banker?

24. Is he favorably impressed with your plan?

25. Do you have a financial reserve for unexpected needs?

26. Does your total capital, from all sources, cover your best estimates of the capital you will need?

Should You Share Ownership with Others?

27. Do you lack needed technical or management skills which can be most satisfactorily supplied by one or more partners?

28. Do you need the financial assistance of one or more partners?

29. Have you checked the features of each form of organization (individual proprietorship, partnership, corporation) to see which will best fit your situation?

Where Should You Locate?

30. Do you know how much space you will need?

31. Do you know what type of building you will need?

32. Do you know of any special features you require in lighting, heating, ventilating, air conditioning, or parking facilities?

33. Have you listed the tools and equipment you need room for?

34. Have you considered all critical locational factors at they relate to your customers, employees, suppliers, etc.?

35. If the proposed location does not meet nearly all your requirements, is there a sound reason why you should not wait and continue seeking a more ideal location?

Should You Buy a Going Business?

36. Have you considered the advantages and disadvantages of buying a going business?

37. Have you compared what it would take to equip and stock a new business with the price asked for the business you are considering?

38. Have you learned why the present owner wants to sell?

39. Have you checked the owner's claims about the business with reports from an independent accountant's analysis of the figures?

40. Have you checked with the company's suppliers to obtain their ideas of the value of the business?

41. Do the suppliers think well of the proposition?

42. Is the stock of merchandise a questionable buy? (Would a large proportion of it have to be disposed of at a loss? Is any of it out-of-date, unsalable, or not usable?)

43. Are the physical facilities old or in poor condition and, hence, overvalued?

44. Are you sure the accounts receivable are worth the asking price?

45. Is the present company's goodwill fairly valued?

46. Are you prepared to assume the liabilities, and are the creditors agreeable?

47. Has your lawyer checked to see if the title is good and if there is any lien against the assets?

48. Are there any back taxes to pay?

49. Have the sales been temporarily increased by conditions which are not likely to continue?

Are You Qualified to Supervise Buying and Selling?

50. Have you estimated your total stock requirements?

51. Do you know in what quantities users buy your product or service?

52. Do you know how often users buy your product or service?

53. Have you made a sales analysis to determine major lines to be carried?

54. Have you decided what characteristics you will require in your goods?

55. Have you set up a model stock assortment to follow in your buying?

56. Have you investigated whether it will be cheaper to buy large quantities infrequently or small quantities frequently?

57. Have you weighed price differentials for large orders against capital and space tied up?

58. Have you decided what merchandise to buy direct from manufacturers?

59. Will you make your account more valuable to your suppliers by concentrating your buying with a few of them?

60. Have you worked out control plans to insure stocking the right quantities?

How Will You Price Your Products and Services?

61. Have you determined what prices you will have to charge to cover your costs and obtain profit?

62. Do these prices compare favorably with prices of competitors?

What Selling Method Will You Use?

63. Have you studied the sales promotional methods used by competitors?

64. Have you outlined your own sales promotion policy?

65. Have you studied why customers buy your product (service, price, quality, distinctive styling, other)?

66. Will you do outside selling?

67. Will you advertise in the newspapers?

68. Will you do direct mail advertising?

69. Will you use posters and handbills?

70. Will you use radio and television advertising?

How Will You Manage Personnel?

71. Will you be able to hire satisfactory employees locally to supply skills you lack?
72. Do you know what skills are necessary?
73. Have you checked the prevailing wage scales?
74. Have you a clear-cut idea of what you plan to pay?
75. Have you considered hiring someone now employed by a competitor?
76. Have you checked on the pros and cons of doing so?
77. Have you planned your training procedures?

What Records Will You Keep?

78. Have you a suitable bookkeeping system ready to operate?
79. Have you planned a merchandise control system?
80. Have you obtained standard operating ratios for your type of business to use as guides?
81. Have you provided for additional records as necessary?
82. Have you a system to use in keeping a check on costs?
83. Do you need any special forms?
84. Have you made adequate provision for having your record keeping done?

What Laws Will Affect You?

85. Have you investigated what, if any, licenses to do business are necessary?
86. Have you checked the health regulations?
87. Are your operations subject to interstate commerce regulations?
88. Have you seen your lawyer for advice on how to meet your legal responsibilities?

What Other Problems Will You Face?

89. Have you worked out a system for handling your tax requirements?
90. Have you arranged for adequate insurance coverage?
91. Have you worked out a way of building a management team?
92. Does your family (if any) agree that your proposed venture is sound?
93. Do you have enough capital to carry accounts receivable?
94. Will you sell for credit?
95. Have you worked out a definite returned goods policy?
96. Have you considered other management policies which must be established?
97. Have you planned how you will organize and assign the work?
98. Have you made a work plan for yourself?

Will You Keep Up-to-date?

99. Have you a plan for keeping up with new developments in your line of business?

100. Have you a small group of qualified advisors from whom you can get help in solving new problems?

A Guideline for Industrial Extension Personnel

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A SYSTEMATIC APPROACH TO SMALL-SCALE INDUSTRY GROWTH

Basic Problems of Small-Scale Industry

The most persistent problems of small business -- and those that most often lead to business failure -- may be properly classified as "management problems." This fact of small business life has been substantiated over and over again by detailed analyses of business failures and by case study investigations of the problems of small business establishment, growth, and survival.

A detailed study of the problems of growth and survival of small retail and service firms found that "success or failure could not be attributed to single causes but was generally the result of a complex interplay of various factors." These factors, stated positively and grouped in order of importance, include:

1. Adequate capital, managerial competence, and favorable personality.
2. Motivation, hard work, persistence, and flexibility.
3. Favorable location, good record keeping, good housekeeping, and advance planning for operating and developing the business.

Since all of these factors are within the control of the small business owner or manager, they may be broadly classified as management factors. Specifically, these factors can be translated into the following array of problems:

1. Recruitment of non-management personnel
2. Training of non-management personnel
3. Training of management personnel
4. Sales promotion
5. Recruitment of management personnel
6. Distribution channels
7. Cost control

The individual areas of operation in which managerial and technical assistance has been found to be most helpful to small manufacturers by the Industrial Development Division are as follows:

1. Cost control
2. Sales promotion
3. Training employees
4. Production methods
5. Maintaining stable work force
6. Diversification
7. Quality control

Based on the experiences of providing industrial extension services to companies, it has been found that many of these problems and needs result from a failure to observe certain basic principles of small business organization and management. It has been concluded that the underlying causes of many of the problems of the small manufacturer were these:

1. Failure to limit his field of competition to that in which he was capable of competing successfully.
2. Lack of management skill and less than adequate knowledge of the manufacturing field in which he operates.
3. Failure to plan for the organizational needs of his company and failure to take full advantage of the abilities of his subordinates.
4. Failure to recognize the fact that manpower resources are no less valuable because a business is small.
5. Failure to maintain complete and accurate records, with the resulting failure to base his operating decisions on known facts.
6. Failure to take advantage of the flexibility that his size affords and to apply an aggressive ingenuity in overcoming problems and meeting changing needs.

Experience clearly indicates that most of the basic problems of small business growth and survival are closely identified with management capabilities and characteristics. The most encouraging feature of this conclusion is the fact that these problems are not inherent parts of small business itself -- but are capable of being resolved through proper education, counseling, and assistance.

Basic Guidelines

- Expansion or diversification should be planned in the light of the company's capabilities and its long-range objectives.

- No one management function should control the pattern of growth; a realistic decision can be made only after all influencing elements (financial, sales, production, and personnel capabilities) have been considered.

Steps Toward Systematic Growth

- Determine the Soundness of the Base for Growth

  Evaluate the company's existing resources and capabilities in the fields of finance, manufacturing systems, sales programs, research and development facilities, and management personnel capacities.

- Evaluate the Overall Potential within the Industry

  Analyze the growth trends within the company's industry group, the projected expansion of the industry, and the product lines which appear to have the most potential in the light of market demand, technical development, and competitive forces.

- Evaluate the Potential of Related Industries

  Investigate the potential of related industries to identify and evaluate possible product lines which have significant growth potential and which fall within the present and potential capabilities of the company.

  a. Products which can be made with little or no additional investment.
  b. Products which can be sold with present distribution system.

- Determine Management's Long-Range Objectives

  After consideration of the company's available resources and capabilities and the general potential of broad product categories, establish specific and realistic objectives for the company in terms of broadening its financial resources, manufacturing capabilities, and marketing program. Specify what additional resources and capabilities must be developed to achieve these objectives.

- Search for the Optimum Growth Pattern

  Working within the framework of the broad product categories which appear to have the most potential, make use of industry associations,

trade contracts, consultants, and specialized development organizations to identify:

a. The most appropriate avenue of expansion within the existing product line.

b. Specific new product possibilities for diversification.

o Measure Alternatives in the Light of Company Objectives

Consider the alternatives of expanding production in the existing product line as opposed to diversification into a new product group. What are the relative advantages and disadvantages? What does each alternative contribute to achievement of the company's long-term objectives? For each alternative, evaluate:

a. Any basic limitations.

   (1) The patent and legal considerations involved for the particular item.

   (2) The impact of the action on the company's existing product line.

b. Salability.

   (1) The particular market potential of the product involved -- to be determined through analyses of existing and potential market demand.

   (2) The nature and extent of existing and probable competition.

c. Costs.

   (1) The availability and costs of raw material.

   (2) The manufacturing costs and related capital expenditures required for putting the product into production.

   (3) The availability and costs of production, management, and sales personnel required to support the new product line.

   (4) The additional sales and distribution costs and marketing effort required for the new product.

d. Profit potential -- the income potential to be achieved, based on projected cash flow estimates for the new product.

o Organize for Action

a. Determine the most appropriate time to enter the market with an expanded or diversified product line.

b. Plan and execute product design and engineering phases.

c. Secure necessary financial reserves as indicated by the projected cash flow.

d. Establish control schedules for the purchase and installation of necessary equipment and inventory.

e. Establish related schedules for the employment and training of additional personnel.

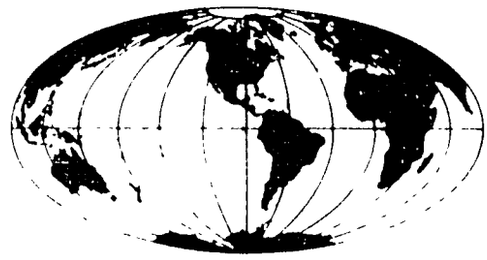
f. Plan advertising, sales promotion, and field marketing programs.

g. Establish and maintain sound quality control procedures to insure product quality during the critical start-up period.

o Monitor Market Reaction

Follow closely the initial market reaction. Be prepared to act quickly in altering sales strategy to meet unanticipated reactions. Monitor actual operating costs and sales receipts for comparison against initial projections, and make necessary adjustments required in scheduling additional disbursements.

A Guideline for Industrial Extension Personnel



No. 7 November 1974

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THE PRESENTATION OF INVESTMENT PROPOSALS

In order to attract capital for a new business, the developer should present a complete outline of the proposed business. In the promotion of a new product or process, he should be able to demonstrate its realistic potential in terms of:

1. the market potential,
2. manufacturing requirements,
3. financing requirements, and
4. general management requirements.

The market should be investigated as carefully as possible to determine if the potential is sufficient to attract investment capital. The market should be defined in detail: Is it specialized or broad? Is it regional or national? Is it characterized by many competitors or only a few? How successful have competing products been in the market? What unique appeal does the new product or process have? How is the market likely to react to the new product or process?

The problem of distribution is one that is usually discussed in detail after investment interests have begun their preliminary discussions. However, the developer should be familiar with distribution methods for his type of product, and he should be able to discuss the advantages and disadvantages of several possible methods.

Manufacturing requirements are a major consideration in any presentation of a new product. The developer should be able to present an estimate of production facilities required for a given number of units. This estimate should include data related to major items of production equipment and probable manpower requirements.

Financing requirements cannot be determined with complete accuracy, but the developer should estimate the probable cost for the preliminary work in refining the product for manufacture (including any research and development work required), in securing suitable manufacturing space, in the purchase of equipment, and in meeting necessary payrolls.

As a matter of basic interest to a prospective investor, and as a working guide for the developer himself, the preparation of a cash flow projection is highly desirable. Figures 1, 2, and 3 illustrate a useful format for this purpose. These forms require the developer to determine specific production, personnel, and financial requirements. The preparation of the cash flow projection and the pro forma profit and loss statement will indicate very clearly specific operating capital requirements. The data will also serve as a basis for determing what costs are most significant and require the most careful control.

General management requirements will be determined by the background of the developer himself and his feelings as to his role in the production and distribution of the product. In addition, the role of the investment group will shape the general management of a new enterprise. This is a time for careful reflection on the part of the originator of the proposal: on one hand, he may feel that he should control the company since the product is his idea; on the other hand, he must face the realistic problem of evaluating his own management capabilities. Many new enterprises lack management skills sufficiently well rounded to cope with all the problems that develop in an operating situation.

One of the major obstacles to be overcome by the developer of a new product or process involves the method of presenting his idea to prospective investors. It sometimes happens that an individual becomes so familiar with his idea that he fails to present it in meaningful and concise terms. For this reason, a very basic sort of background document has been developed by the technical assistance staff for use in describing the background, potential, and requirements of the new product or process. This form calls for the following information:

1. Descriptive title of product or process.
2. Names and addresses of developers.

3. Bakground of the developers.
4. Background of the product or process.
5. Description of the product or process.
6. Advantages of the product or process over similar products or processes.
7. Market for the product or process.
8. Estimated selling price and proposed method of distribution.
9. Consumer or industry reaction.
10. Patent status.
11. Availability of blueprints or working model.
12. Estimated capital investment and operating capital requirements, preferably including a cash flow projection and pro forma profit and loss statement.
13. Additional information.

This form is not intended to be used to describe in detail all of the features of the new product or process. The form serves two very useful functions, however. It requires the developer to reduce his idea to its basic elements and to determine if he needs to secure additional information before proceeding.

Figure 1

CASH FLOW PROJECTION

	Months												
	1	2	3	4	5	6	7	8	9	10	11	12	Total
1. Gross Sales													
2. Less: Returns, Allowances, and Discounts													
3. Net Sales													
Cash Receipts From:													
4. Accounts Receivable and Notes Receivable (on Books)													
5. Collection of Sales (Line 3)													
6. Other Income													
7. TOTAL CASH RECEIPTS													
(Prepare information called for in lines 27, 28, and 29 before proceeding further)													
8. Accounts Payable (on Books)													
9. Accounts Payable (New Purchases) (See line 28)													
10. Direct Labor													
11. Manufacturing Expense (Exclude Depreciation and Salaries)													
12. Sales Expense (Exclude Depreciation and Salaries)													
13. General and Administrative Expense (Exclude Depreciation and Salaries)													
14. All Salaries													
15. Research and Development Expense													
16. Income Taxes													
17. Notes Payable (Banks)													
18. Notes Payable (Other)													
19. Mortgage Payments													
20 Interest													
21 Other													
22 TOTAL CASH REQUIREMENTS													
23. Cash Receipts													
24. Cash Requirements													
25. Excess (Deficit)													
26. Month End Balance (Cash at beginning_____)													
27 Production Scheduled													
28. Material Purchases													
29. Purchase Payments (Transfer to line 9)													

Figure 2

INSTRUCTIONS FOR PREPARATION OF CASH FLOW PROJECTION

Line

1. Show management estimates of sales to be expected during forecast period (one year).
2. Deduct estimated returns, allowances, and discounts. (If established company, use prior experience.)
3. Line 1 minus line 2.
4. Estimated collection of existing receivables on basis of actual experience. Example:

   $\frac{\text{Average Outstanding Receivables}}{\text{Annual Net Sales}} \times 360 = \_\_\_\_\_$ days to collect after shipping date.

5. Same procedure as above to be applied to receivables created from new sales (line 3). (If new company, assume collection on due date of invoices.)
6. Rent, discounts taken, contemplated borrowings.
7. Summary of lines 4, 5, and 6.
8. Include all past due trade payable in first month, spread balance by discount date.
9. Purchase payments. (See line 28 for method of calculation.)
10. Direct labor cost.
11. Exclude depreciation and salaries
12. Exclude depreciation and salaries
13. Exclude depreciation and salaries

    } If an existing company, compute these factors as a percentage of Net Sales during a prior period which you consider to be typical. If a new company, use estimates which can be supported. Apply percentages of figures on line 27.

14. All salaries (spread on level basis throughout year).
15. Research and Development costs payable in forecast period.
16. Income Taxes to be paid during forecast period.
17. Notes Payable presently on books or projected.
18. Notes Payable presently on books or projected (new machinery purchases, etc.).
19. Mortgages payable on books or projected.
20. Interest on existing proposed debt.
21. Other cash expenses or payments: Itemize substantial costs peculiar to your type of operation.
22. Summary of lines 8-21.
23. Copy line 7.

24. Copy line 22.

25. Line 23 minus line 24.

26. Start with cash position immediately preceding start of forecast period and carry forward cumulative total by month.

27. Insert the sales dollar value of production necessary to support projected sales and any related inventory build-up, taking into consideration the time required for manufacturing and delivery. All percentages used in lines 9, 10, 11, 12, and 13 of the Cash Flow Chart apply to this figure.

28. List planned purchases by month.

29. Spread purchase payments into the months in which they fall due.

Figure 3

STATEMENT OF INCOME

(Period Covered)

	Actual	Per Cent of Net Sales	Projected	Per Cent of Net Sales
Gross Sales				
Less: Returns, Allowances, and Discounts				
Net Sales		100%		100%
Raw Material Used				
Direct Labor				
Manufacturing Expenses				
Other				
Inventory Adjustment				
Cost of Sales				
Gross Profit				
Selling Expenses				
Administrative and General Expenses				
Total Expenses				
Operating Profit				
Other Income				
Other Charges				
Profit Before Taxes				
Reserve for Taxes				
Net Profit				

Note: Total amount of depreciation and amortization included in above figures.

A Guideline for Industrial Extension Personnel

No. 8 November 1974

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FACTORS IN PLANT LAYOUT

The primary purpose of plant layout design is to integrate the basic factors of men, material, and equipment in order to move material through the production sequence at optimum efficiency. Many developments in a business may dictate the need for a revised plant layout: production expansion, new methods, new products, new facilities, and cost-cutting programs. Each of these factors requires a forward look in planning a plant layout. To ensure a well-planned layout, which is essential in meeting competition, the thinking of all facets of the organization should be included.

The various objectives of plant layout include increased production, reduction of operating expenses, improvements in working conditions, greater safety in the plant, improved materials handling, reduction of goods in process, elimination of confusion, reduction of indirect labor, utilization of space, and provision for future expansion. The central objective or objectives should be decided prior to layout design. This decision establishes the requirements of and general operating practices desired in the new plant. The next step is to survey present facilities and determine the type of production required. In general, this can be divided into two categories for the purpose of plant layout -- process-type and product-type.

The process-type (see Figure 1), which groups similar operations in the same area, is particularly suited to job-lot manufacture because of its flexibility in producing a variety of products with the same equipment. Process-type layout has these advantages:

1. Flexibility. (The layout can be adapted to produce a number of different products at the same time, using the same machinery.)
2. Greater utilization of machinery.

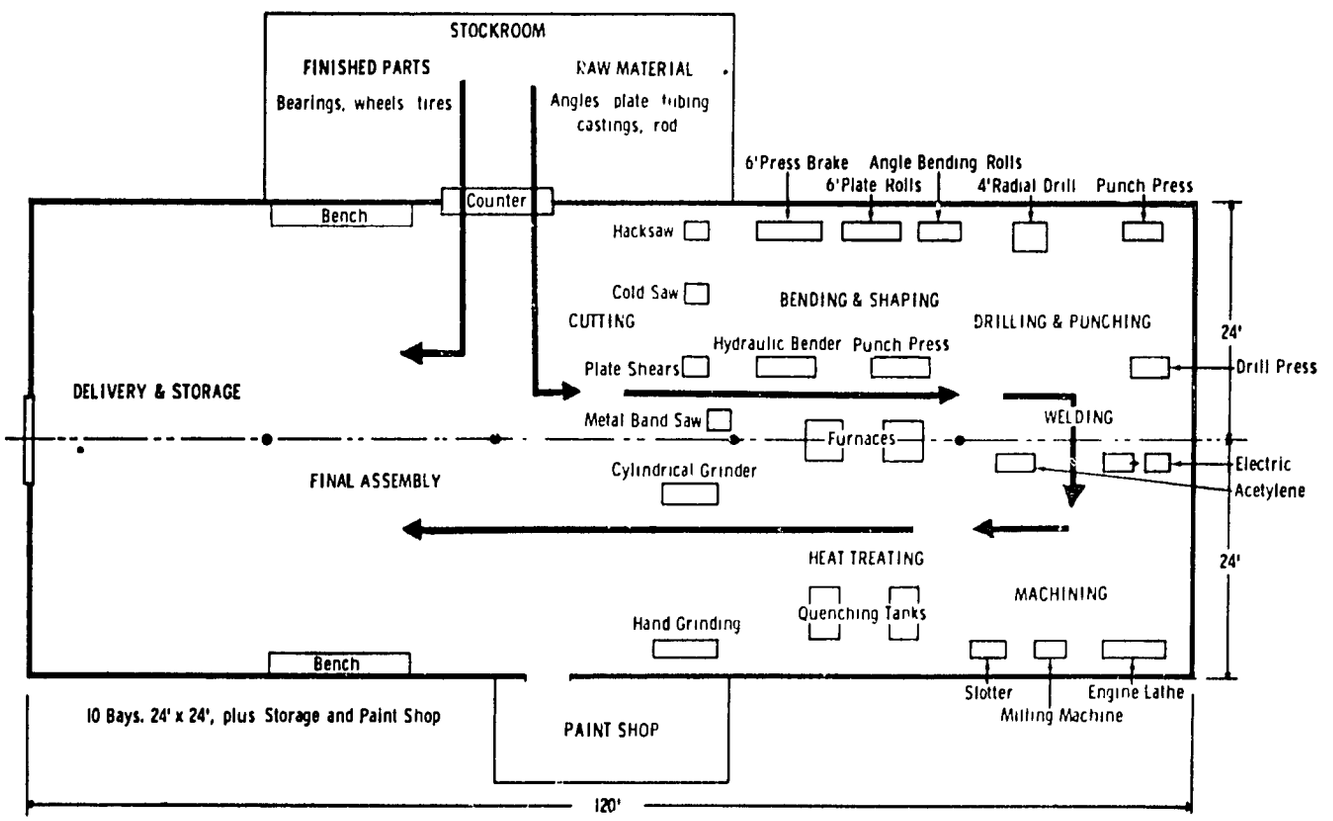
3. More consistent operation. Work may be routed to other machines in the event of breakdowns.
4. Lower capital investment on equipment because of less duplication of equipment.
5. More efficient supervision of intricate processes.
6. Production stimulation (greater incentive for individual workers to raise level of production).
7. Lower unit cost (suited to small volumes of work).

The process-type layout has several disadvantages, among them:

1. Problems in routing and scheduling in order to obtain full utilization of machines.
2. High materials-handling costs and extra space requirements for storage of goods in process.
3. Difficulties in cost control.

Figure 1

PROCESS-TYPE LAYOUT



The product-type layout (see Figure 2) is used most often in small plants where operations are arranged in straight-line production. Where a limited variety of items is produced and the same processes are required on all of them, it is best that operations be arranged in sequence. In this manner, material is moved from one machine to the next and successive operations are performed in sequence.

To meet competition, manufacturers are turning to straight-line production, where in most cases the end result is relatively high output. This type of layout reaches its peak in automation. Among the advantages are the following:

1. Lower materials-handling costs.
2. Lower total production time.
3. Less work in process.
4. Less floor space required for goods in process; less floor space needed per unit produced.
5. Simplified controls and reduced cost accounting problems.
6. More efficient labor utilization and greater group incentive.
7. Smoother flow of materials.

Some of the disadvantages of product-type layout are:

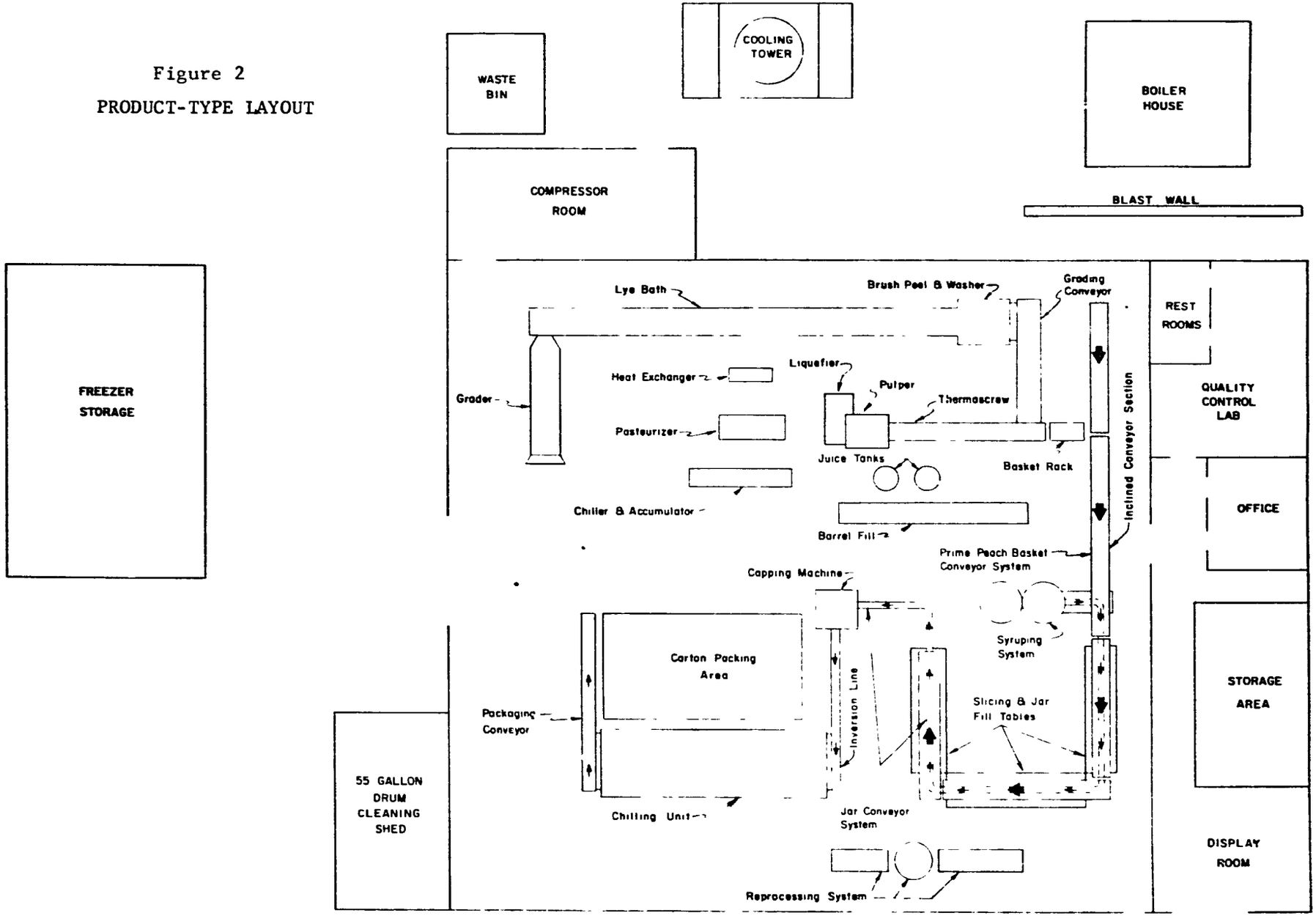
1. Higher investment costs for machines and equipment.
2. A need for a steady high rate of production in order to remain above the break-even point.
3. Increased pressure to keep sales abreast of high production volume.
4. A need for close supervision.
5. Difficulty in adding new products if they require additional production lines.

The type of layout to be employed depends upon the conditions to be met. It is not always necessary for only one of these types to be used; often manufacturers find it advantageous to combine both types in attaining the desired production goals. The objective of good plant layout is to minimize cost of production by adopting that method which most readily attains this goal.

Perhaps the best way to approach the actual layout design is through a method which employs a flow or process chart (Figure 3). A process chart is a graphic representation of the sequence of all operations, transportations, inspections, and storages occurring during a process or procedure. It may

Figure 2

PRODUCT-TYPE LAYOUT



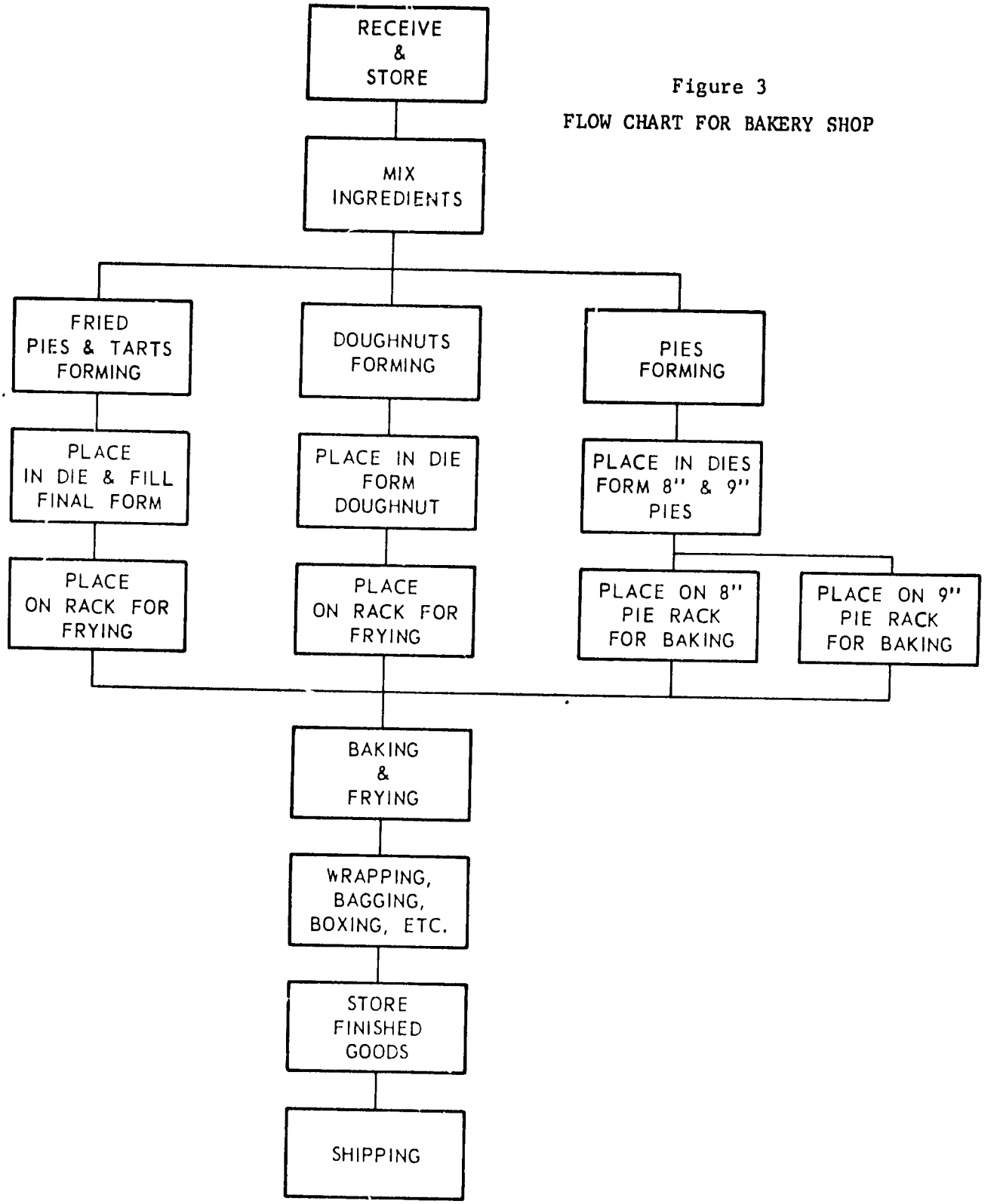


Figure 3

FLOW CHART FOR BAKERY SHOP

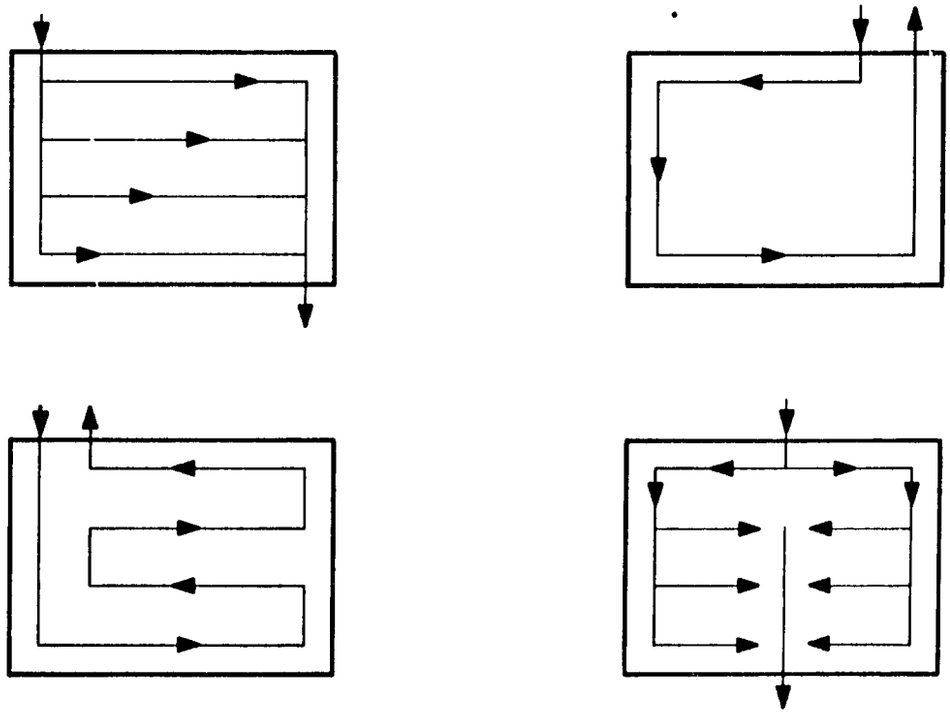
also include information considered useful in layout analysis, such as time required and distance moved.

A flow chart is useful in illustrating the sequence of operations performed in the production process. It is a visual representation of the flow of materials from the moment they are received until, as finished goods, they are shipped out. Since a flow chart shows all the interrelationships between work area, it is extremely useful in the initial stages of layout. It shows the relationships between operations without regard to the distance or space actually involved. It is an effective means of simplifying the presentation and showing just those factors pertinent to the particular problem.

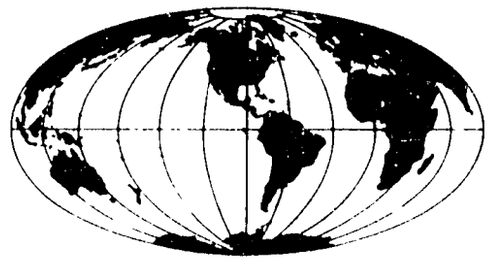
The over-a_ purpose of the flow pattern is to plan the movement of the raw materials in as direct a path as possible through the plant. The beginning and ending points of the flow are dependent, to a certain extent, on the location of external transportation facilities, such as highways, railroad sidings, and docks or piers on navigable waterways. Figure 4, below, shows four examples of different types of flow patterns that could be adapted to the same area.

Figure 4

MATERIAL FLOW PATTERNS



A Guideline for Industrial Extension Personnel



No. 9 November 1974

Published by the Industrial Development Division, Engineering Experiment Station, Georgia Institute of Technology and Funded by the United States Agency for International Development

A SIMPLIFIED COST AND CONTROL SYSTEM FOR THE SMALL INDUSTRIAL CONCERN

Two major areas in which tighter controls are indicated in order to protect and improve the profit picture of the company are manufacturing costs and inventory. A simplified yet adequate system of control in both fields has been devised that requires a minimum of paperwork and personnel effort.

If the company is of modest size it may appear that cost accounting is unnecessary. However, production and overhead cost can be deceptive, and until these costs are accurately determined, management cannot control as effectively as it should.

In determining true manufacturing costs, three items are needed: total direct labor cost, total material cost, and allocated overhead burden. These costs can be determined in the following manner:

Direct Labor Cost. A form (sample A attached) is provided on which each employee enters by job number the number of hours worked on each job each day. At the end of each week these forms go to the bookkeeper, who determines direct service hour costs and enters them on the Job Cost Summary sheet (sample form C attached).

Total Material Cost. A Bill of Materials form (sample B attached) is used for entering all materials used on the specific job. This form can be the responsibility of the stockroom or the foreman, or it can follow the job as a part of the work order. When costed, these material costs can be entered on the Job Cost Summary sheet weekly or, if more convenient, kept until the job is completed for pricing.

Allocated Overhead Burden. There are several methods of determining this figure, but the most widely used is to divide the estimated overhead (all costs

of operation other than direct labor and materials) as established in the annual budget by an estimate of what the total direct labor hours for the current year will be. This resulting overhead burden figure when multiplied by the direct labor hours charged to the job will yield an Allocated Overhead cost.

If the company does not have a formal annual budget for operations, it will be necessary to review costs for the past year item by item and adjust them in the light of anticipated operations. If the firm already keeps monthly records of direct labor hours and can therefore estimate direct labor hours for the coming year with accuracy, the overhead burden per direct labor hour will be correspondingly accurate. However, a monthly comparison of direct labor hours with the figure of the corresponding month of the year past will disclose quickly any significant variation which will make a revision of the overhead burden figure necessary.

These three cost figures are entered at the bottom of the Job Cost Summary. When subtracted from the sale price, they will reveal the profit or loss on the specific job. After these figures are transferred to the Master Job Cost Record (sample form D), the Job Cost Summary is filed with the job record file. The Master Job Cost Record is retained by management so that it can have at a glance a current and up-to-date record of all costs of all jobs completed.

The Master Job Cost Summary can be extremely valuable to management. It can state with accuracy where the money is going, how much is coming in, and what percent is being retained. It can indicate when labor or materials or overhead are getting out of line. It can show which jobs are profitable and should be pushed in the sales effort. It can also show which jobs are marginal or actually unprofitable and indicate the necessity for re-pricing.

Thus with a minimum of paperwork and a modest investment in bookkeeping time, management will get the current answers that can mean normal and adequate profit on its investment in time, money, and equipment.

The second area of control indicated is that of inventory. The attached sample form E has been designed for inventory usage. Although the design of the form is for production materials, it can also be used as a control for such items as drill bits and welding rods. Although its use for such items is marginal in value, the fact that such an inventory is kept may significantly reduce the pocket-loss of such items. The primary value of this Basic Stock

Contol Record is that it permits management to maintain an adequate planned balance on hand in an orderly manner and to signal when reordering is necessary.

The first three columns on sample form E list the item, the lead time necessary for delivery, and the balance on hand at the start of the control system. Each of the following three columns under the headings "Month" is for the use of the purchasing agent. If an item has been ordered for delivery during the month, the quantity is entered in the column "Scheduled for Delivery." At the end of the month the quantity used, which is taken from the Bills of Material (sample form B), is entered under "Usage" and subtracted from the total of "Starting Balance" and "Scheduled for Delivery." This results in a "Balance on Hand" quantity which must agree with the physical inventory; if not, an internal problem is indicated. From now on the "Starting Balance" figure is no longer necessary since the monthly Balance on Hand is the current total. If the Lead Time for Delivery (column 2) is kept in mind, the figure under Balance on Hand will signal when reordering is necessary.

Sample Form A

Date:_____

EMPLOYEE'S DAILY JOB REPORT

Employee Name:

Monday	Job No.	Regular Hours	O-T Hours	Total Hours	Office Use
Time In_____					
Time Out_____					
Time In_____					
Time Out_____					
Tuesday					
Time In_____					
Time Out_____					
Time In_____					
Time Out_____					
Wednesday					
Time In_____					
Time Out_____					
Time In_____					
Time Out_____					
Thursday					
Time In_____					
Time Out_____					
Time In_____					
Time Out_____					
Friday					
Time In_____					
Time Out_____					
Time In_____					
Time Out_____					

Sample Form B

BILL OF MATERIALS FOR ORDER NUMBER_____

Description of Order:

Order Quantity :

Drawing No.:

Starting Date_____

Scheduled Delivery Date_____

Description of Parts/Materials/ Supplies	Amount Required Per Unit	Amount Issued	Note: Shortage/ Breakage/Scrap

Sample Form C

JOB COST SUMMARY

Job Number_____ Date Ordered_____

Customer_____ Date Shipped_____

LABOR			MATERIALS	
Date	Hours	Cost	Item	Cost

Total Direct Labor _____

Total Materials _____

Allocated Overhead _____

Total Cost _____

Sale Price _____

PROFIT (OR LOSS) $

Sample Form D

MASTER JOB COST RECORD

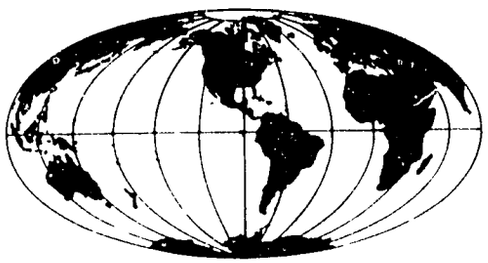
Job #	Direct Labor	Materials	Allocated Overhead	Total	Sale Price	Profit (or loss)

Sample Form E

BASIC STOCK CONTROL RECORD

Item	Lead Time for Delivery	Starting Balance	Month: Sched. for Delivery	Usage	Bal. on Hand	Month: Sched. for Delivery	Usage	Bal. on Hand	Month: Sched. for Delivery	Usage	Bal. on Hand

A Guideline for Industrial Extension Personnel



No. 10 November 1974

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INVENTORY CONTROL FOR SMALL-SCALE MANUFACTURING

Since materials account for a substantial part of production costs in most manufacturing operations, the need for an effective inventory control system is obvious. The degree of success attained in controlling inventory has a direct bearing on the company's profit and working capital position. The complexity of an inventory control system will be dependent upon the type of manufacturing concern.

It behooves the small-scale manufacturer to have the most economically effective inventory control system possible. This guideline is intended to aid industrial extension personnel in evaluating current systems for possible improvements, as well as to assist the new producer in establishing an effective system.

Primary emphasis will be given here to discussing step-by-step techniques that should be considered in establishing a materials control system. The scope of this discussion will not include work-in-process or finished-goods inventory because these areas normally will receive much attention under a well-administered production planning and control system. The importance of an effective production planning and control system and its interrelation with inventory control cannot be emphasized too strongly. Much attention should be given to establishing accurate short- and long-range plans -- especially running plans and forecasts for the next 12 months. Close attention should be given to relating actual production with the forecasts in these plans and adjusting these forecasts as indicated. Effort in this area will result in keeping the inventory of finished products in line with marketing conditions and helping to maintain a stable work force, as well as forming a workable budget for materials inventory control.

Setting Inventory Control Policies and Standards

To have an effective inventory control system it is necessary to establish policies and standards peculiar to the individual manufacturer. Policies should be set down relating to the following points:

1. What will be the company's policy as to delivery time to customers?
2. Will warehouse space be available for volume purchasing?
3. To what extent will volume purchasing be permitted?
4. What specific basis will be used in estimating rate of material consumption?

To set such policies, management must consider such things as competition's policies and practices, location of plant with respect to suppliers, production volume of plant, financial position of company, segment of market that company seeks to serve, and market forecast and establishment of production plans.

After all of these variables are thoroughly evaluated and general policies are formulated, inventory control standards can be established. These standards include a short-range inventory budget and anticipated inventory turnover rates. These standards will serve as indices or benchmarks to help control future planning and budgeting.

Developing Order Rules

With the aid of established policies and standards, order rules on each inventory item should be written. An order rule is a statement of when to replenish an inventory item, in what quantity and mix, and how frequently to review the item to determine whether it should be reordered.

A prerequisite for writing accurate order rules is an economic review of each inventory item. This will necessitate a reliable method of forecasting future usage, the determination of the amount of time required to replenish each item, the establishment of the most economical quantity to order, a practical estimate of the minimum inventory level to maintain for safety against stockout, and the segregation of the items into classes as to their relative importance.

In determining the economic order quantity (EOQ) for the inventory items, only a few items will warrant thorough study. The ones that should be carefully evaluated are those with substantial price differentials for quantity purchases, items of high unit cost, or items of high inventory-carrying costs. The mathematical formulas are as follows:

$$T = \frac{Q}{2} I C + \frac{S}{Q} A \text{ or}$$

$$EOQ = \sqrt{2 \frac{AS}{IC}}$$

for items without price differentials, and

$$T = \frac{Q}{2} I C + S C$$

for items with price differentials, where:

T = total annual cost, dollars

Q = order quantity, units

I = Iventory-carrying cost as a decimal fraction

C = unit cost of the item, dollars

S = expected annual usage, units

A = out-of-pocket setup and ordering cost, dollars.

The latter formula gives the total cost separately for each price, relative to the minimum order quantity for that price. The EOQ would be that quantity corresponding to the lowest T evaluated for each price.

The EOQ for many items will be obvious without going through an elaborate evaluation. This will depend on such things as location of suppliers, service of suppliers, and price differentials. For example, if a manufacturer's upholstered furniture supplier is within a one-day truck service zone, if the only price break is for truckload quantities, and if the supplier offers short lead-time service, then the manufacturer usually will order once each week and maintain minimum inventory levels. Other EOQ considerations involving upholstered furniture are style options and high inventorying carrying cost because of bulk and damage risk.

After evaluation, inventory items can be segregated into classes for inventory control. This method advocates giving more attention to the more important items. Items that are relatively expensive, or that could prove costly in the event of a stockout, or which require long lead time usually warrant close scrutiny. These are class A items, and special care is used to maintain accurate perpetual-inventory records for them.

Class B items have average importance and warrant the normal amount of attention. This group includes items that are neither class A nor class C.

The class C items are relatively unimportant. This category includes a large number of items but accounts for only a small part of the inventory investment. Generally the cost of maintaining liberal quantities of these items in stock is less than keeping them under close inventory control. Examples of these items are fasteners, electrical connectors, and glue. No perpetual-inventory records are kept, and they are usually controlled under a "two-bin" method. For instance, two bins are maintained for a certain type fastener. Usage is from one of the bins while the other is sealed. When the opened bin is emptied and the seal is broken on the full bin, the fasteners are reordered. Upon receipt of shipment, the empty bin is filled and sealed.

Maintaining Inventory Records

A perpetual-inventory control system brings together all the planning and study previously discussed in the form of perpetual-inventory cards. Information recorded on these cards include: part number and description; order rule information, such as reorder point, order quantity, minimum quantity, or danger point; cumulative usage information, such as recepts and disbursements, with dates; and supplier information, such as name, lead time, and unit price. (See Exhibit A.) The card will carry much more information, depending on the individual needs of the manufacturer. The perpetual-inventory system facilitates physical control of inventories and also provides valuable information to be used for future planning and control.

Most manufacturing operations do not use a stock requisition system, but are set up on a standard cost system. Therefore, the materials are not received into stock and reissued to production on a stock requisition form as such. Rather, the stock foreman approves the receipt of materials and sends the receipt copy to inventory control for posting to perpetual-inventory records. Periodically, the completed production orders are channeled to inventory control, and by comparison with standard bills-of-material for that unit, the disbursement from stock can be recorded on the perpetual-inventory cards.

Physical Inventory Verification

Physical inventory verification must be made periodically to insure the accuracy of inventory records. Depending on the class of inventory, this check can be by actual count, sight estimate, etc. Experience and the class of inventory item will dictate how often verification is necessary. Some manufacturers

take physical inventories on special items each week, while other manufacturers find it necessary only once per quarter. It is recommended that in most manufacturing concerns, physical inventories be taken on a continuous schedule, with the more important items checked on a periodic cycle throughout the year. It may be necessary once a year to take a more accurate and complete inventory of all items over a one- to two-day period.

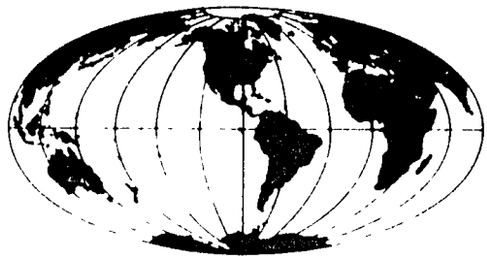
Feedback of the Inventory Control System

Feedback information, in the form of reports to management, is a valuable benefit of a good inventory control system. These reports, when properly analyzed, will aid in comparing the effectiveness of the system, help eliminate slow-moving or obsolete items, and provide valuable information to be used in future planning.

Management should receive a monthly running report of individual item inventory levels in units and dollars, with comparisons with previous periods. From this report, possible slow-moving or obsolete items can be pinpointed for investigation.

Management also should receive a monthly report of total inventory investment with turnover rates for comparison with standards for the industry. This can be in the form of a monthly financial balance sheet and will aid in future financial planning. Several months should be shown for comparison purposes.

A Guideline for Industrial Extension Personnel



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PRODUCTION PLANNING AND CONTROL FOR SMALL-SCALE MANUFACTURING

The primary purpose of this guideline is to outline the general factors involved in production planning and control and the steps needed to implement a system for a particular operation. The purpose is not to advocate a specific system for implementation because each manufacturing plant or organization has different characteristics and, therefore, different needs; rather, it is to outline general considerations involved in establishing a production planning and control system.

The task of managing production and inventories can be broken into three major functional areas: production planning, production control, and material control. Only the first two areas are discussed in detail here; however, it is recognized that production control and material control are interrelated. The prerequisites for a production planning and control system are outlined first, followed by discussions of production planning for general manufacturing operations, aspects of a production control system, and some benefits to be expected from such a system.

Preliminary Analysis, Standardization, and Preparation

Several important steps must be taken before a production planning and control system can be implemented. All of these steps should be given thorough consideration no matter how large or small the organization. Those firms which have already given attention to some of these steps should carefully review their work to make sure it is accurate and reflects the latest information available and then establish the missing links. Listed below are the phases that must be considered:

1. Product analysis
2. Methods analysis
3. Time standards
4. Plant layout analysis
5. Preparation of design information
6. Analysis of present production control system

A person in the organization should be selected to take the lead in completing this phase of the work. This person should be selected for his ability to work with people, his ability for analytical thinking, and knowledge of production and management goals in the organization. He could be the production superintendent, plant engineer, or assistant to the general manager. Whoever is selected should be given full support of top management and should work very closely with the general manager.

Product Analysis. The first step is to take a thorough look at the products that are manufactured or will be manufactured. The number of models or type of product should be kept to the minimum that is possible without adversely affecting sales. Effort should be made to standardize materials, component parts, and subassemblies.

Methods Analysis. Each operation should be studied for possible improvements as to method. From this analysis, more efficient use of tools, machinery, and materials will become evident. After these new ideas are incorporated, where justified, the new method should be specifically set down as the production method for that operation. This production method should be as well-defined as possible and should include a workplace layout for the operation.

Time Standards. After the product has been analyzed for possible improvements as to design, materials, and standardization and the methods have been studied and improved where possible, time standards should be established for each operation. Time standards are helpful in many areas of plant operations, such as cost accounting, production scheduling, comparison of new methods and improvements, and wage incentive systems.

It is very important to establish consistent time standards for all operations. Some companies may want to contract for the services of an experienced time study engineer for establishing these standards. A second alternative is to train someone in the organization in the art of time study and setting

standards. It is definitely not recommended that an inexperienced person be allowed to establish standards.

Time study and methods study are closely related and are interdependent. Results of a time study often indicate a new method, and the new method will have a different time standard. The method and time study are combined on page 1 of the time study sheet (Exhibit A). Page 2 of the time study sheet (Exhibit B) is the work sheet for performing the time study. Since it is essential that page 1 and page 2 of the time study sheet be kept together, they should be printed on the opposite sides of the same sheet.

These time study sheets for each plant operation should be safeguarded and filed for reference. They are the standards for production. The standard times developed from these sheets are usually listed on a standards data sheet which is issued to the various departments that use standard time data.

Plant Layout Analysis. Equipped with method and time standards for each operation, the analyst should scrutinize the plant layout for possible improvements. A helpful tool for pinpointing areas needing improvement is the material flow-process chart. (See Exhibit C.) Where justified, the improvements should be incorporated into a new layout that will integrate the workplace layouts developed under the methods study into the most efficient overall plant layout.

Preparation of Design Information. Before a production planning and control system can be implemented, it is necessary to have all needed information in a usable form. A complete bill-of-materials for each major product is necessary. It should be broken down for each department in the plant. Each item must have an identification number and name, and other specifications should be as complete as possible.

Engineering drawings may be required for major items of production. These should include drawings of each subassembly (structural drawings, electrical, plumbing, etc.). Applicable portions of the bill-of-materials should be shown on these drawings. The engineering drawings pertinent to each department should be prepared and issued to the department along with the bill-of-materials.

Copies of the standards data sheet, discussed previously, are necessary for the production scheduling and cost accounting departments and the production manager. A copy of the complete materials flow-process chart developed while analyzing the plant layout is necessary for the production scheduler.

Analysis of Present Production Control Systems. The present production control system should be understood thoroughly. The system should be analyzed to determine "why" and "for what purpose" each phase is performed; then a decision should be made as to what features of the old system will be retained and what changes are indicated.

Production Planning

In major manufacturing operations, there is a need for both long-range planning and current planning. Long-range planning is usually done by top management with assistance from the sales, engineering, production, and materials control departments. Current planning is usually done by the general manager of each individual division or plant, who naturally draws on the information, knowledge, and assistance of his department managers.

Long-range planning can be broken down further into long-term plans and short-term plans. Long-term plans usually cover a period of from three to five years ahead of the current date. Plans of this nature are fixed, project-type plans. They will include consideration of such areas as new plants, major expansions of existing plants, and possible diversification. Factors considered in long-term planning include the general economic picture, market trends of the industry, company sales trends, and current demands.

Short-term plans cover the next one to three years. Usually these are moving plans which are adjusted quarterly for the first future year and annually for the second and third future years. Again, the sales forecast is based on the general economic picture, market studies, sales trends, and current demands. Attention is focused on the most profitable models and customer acceptance trends for new models. Consideration is given to inventory levels and decisions on acquiring additional machinery and plant facilities. Of particular importance is the balancing of sales and production plans with the financial requirements for inventory, machinery, and plant facilities.

Planning for product diversification is an important aspect of long-range planning. Management should be continuously investigating the profitability of introducing a new product, and these ideas should be incorporated in long-range planning.

Current plans are those made for a period of one year. For most manufacturing, it appears more advantageous for these to be moving plans. With this type planning, plans are made for a 12-month period, but every three months the plan is revised and extended. The current plan is more detailed than the long-term or short-term plans; by using sales forecasts, it takes into account inventory levels, plant capacities, and the level of manpower needed for the required production. While the general manager of a plant is responsible for establishing the most efficient current plan and adhering to it, top management must provide certain policy guidelines for the plan. Top management must dictate policies in such areas as inventory levels to be maintained, manpower levels to be maintained, and lead time for meeting dealers' orders. By comparison of actual production with the current plans, manpower requirements can be leveled, inventory levels can be held in check, and other production control is possible.

Production Control

Production control in general manufacturing includes analyzing the sales orders, scheduling the production orders, dispatching production orders to production, and following up to make sure production schedules are met.

In general manufacturing, the sales orders are usually scheduled in batches. Once every two weeks a scheduling meeting should be held. The accumulation of sales orders is studied and scheduled for two weeks' production to begin two weeks from the meeting date. The materials manager is furnished a copy of the schedule to make necessary purchases. This scheduling system will necessitate a four weeks' lead time for the dealer. Management will have to decide whether the dealers can live with this. If competition dictates a shorter lead time, bigger materials inventories are necessary -- this is costly. If a shorter dealer lead time is necessary, it may be beneficial for the materials manager to review the sales orders immediately upon receipt. This will enable him to make earlier purchases for the items requiring longer lead time.

The production controller is aided in preparing the schedule by the material flow-process charts mentioned earlier. These charts must include standard times for each operation. With this information, decisions can be made as to the amount of lead time necessary for each subassembly and the production line can be balanced for the most efficient operation. For quick reference, an assembly line balancing sheet can be prepared on each product.

One technique in scheduling that will be beneficial in some plants is that of scheduling some units to be manufactured for stock. This will allow the substitution of a rush order in place of a scheduled stock order. Experience will indicate the number of units to schedule for stock.

Production orders should be prepared weekly from the production schedule. Before they are issued, the purchasing manager should check on the inventory of necessary materials. Production orders should be issued on Friday morning for the following work week, thus allowing a department that gets ahead of the current schedule to begin working on the following production order. Production orders should be issued to the production manager who, in turn, dispatches copies to foremen in each department.

The flow of forms in the production control system is important. The 12-month current plan is kept in the general manager's office. A copy also is kept by the production controller, production manager, sales manager, cost accountant, and materials manager. The two-week production schedule is kept in the production control office. It may be a large board prominently displayed for quick reference. The production orders can be copies of the sales orders. They should give a complete description of what is required by each department. Copies of these or equally descriptive production forms are given to each foreman, who distributes them to his department. (See Exhibit D.) At the end of each day, the completed work orders are returned to the production control department, which passes them along to purchasing, cost accounting, sales, and the general manager. Actual production is posted each day so that progress may be ascertained for control purposes.

After the system begins operating, the work has only begun. The production control function is to watch for weaknesses in the system, analyze them, and take corrective action. The methods and time studies should be reviewed continuously for possible improvements. The forms and reports used in the system also should be checked constantly. If they are not necessary, they should be eliminated, and if better forms and reports are needed, they should be installed. Forms should contain only information necessary for the intended purpose. Nonessential information is confusing.

The control provided by the system should be analyzed. Reports as to percent plant efficiency can be prepared periodically and submitted to management. Also, comparison of changes in direct labor hours per unit of production

before and after the installation of the system is a good evaluation technique. The effect of the new system on material shortages and surpluses and capital investment is easy to determine.

Some Expected Benefits

Some benefits to be expected from a production planning and control system of this nature are listed below:

1. More efficient plant operation is possible. With the standard times, each operation can be scheduled more precisely, thereby eliminating delays. Standards are especially useful in balancing the assembly line in that each operation can be balanced as to time. If some operations are necessarily longer, the faster production workers can be assigned to the task, and for necessarily short operations, new, inexperienced workers can be broken in on the job.
2. Standards and methods set down in print give reference points for future improvements. A new piece of equipment or new method can be better evaluated by comparison with existing standards and methods.
3. Better control is immediately available. Also, when the operation grows and becomes more complex, the system will prove even more valuable.
4. Better cost control is afforded because of standards.
5. A more stable work force is possible because of the coordination of sales forecasts with production.
6. The system can be easily adapted for computerized operation.
7. Better quality control can be achieved.

EXHIBIT A - PAGE 1 OF TIME STUDY SHOWING WORKPLACE LAYOUT, METHOD, AND STANDARD TIMES.

TIME STUDY SHEET

Operator Name John Martin Operation Fabricating Roof Trusses

Operator No. 2012 Subassembly No. T-3841 Drawing No. 4108

Component Parts Spruce Top Member (TT14), Spruce Bottom Member (TT15), Plywood Gussets (TT1, TT2, TT3) Machine No. and Description MC410 - Truss Jig (2 position) Table (mechanically operated)

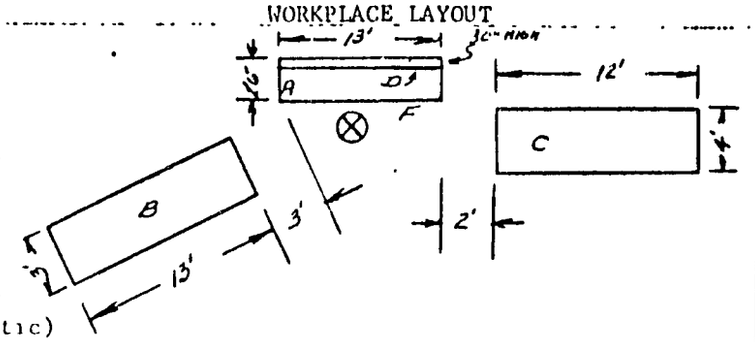
Time Began Study 10:35 Study By Howard Clark

Time Ended Study 10:54 Approved By Jim Phillips Date 1/21/70

Work place symbols

- A Truss jib table
- B Dolly with TT14 & TT15 components
- C Rack for finished trusses
- D Shelf for plywood gussets and glue
- E Rack for stapler & nailer (pneumatic)
- F Lever (under table)
- X Operator (Standing)

WORKPLACE LAYOUT



Elem. No.	ELEMENT DESCRIPTION	No. Obs.	Std. Time (min.)
1	Walk to B - place 2-TT14 and 2-TT15 components in jig (A) - reach for glue brush on D - Grasp Glue Brush.	8	0.28
2	Apply glue to ends of spruce members - place brush back into container - Release Brush.	8	0.46
3	Reach and grasp lever under jig table - pull lever bringing spruce components together at glued ends - Release Lever.	7	0.13
4	Apply glue to plywood, gussets - place gussets - get stapler from E and staple gussets - place stapler back at E - Release lever.	7	0.95
5	Turn trusses over - apply glue to gussets and place - staple - put stapler back to E - Release Stapler.	8	0.52
6	Set trusses upright - get nailer from E - nail from top at ends - put nailer back at E - Release Nailer.	8	0.33
7	Place both finished trusses in Rack C - Release Last Truss.	8	0.23
	STANDARD TIME FOR 2 TRUSSES		2.90
	(Min.) Total Standard Time Per Piece		1.45

Production At Standard 41 Trusses Per Hour

Production During Study 52 Trusses Per Hour

ELEMENTS		CYCLES															
		1		2		3		4		5		6		7		8	
No.	TERMINAL POINT	R	T	R	T	R	T	R	T	R	T	R	T	R	T	R	T
1	Grasp Glue Brush	.20	.20	2.45	.27	4.85	.22	7.10	.25	9.29	.19	11.67	.21	13.96	.20	16.22	.23
2	Release Brush	.57	.37	2.79	.34	5.76	.31	7.49	.39	9.65	.36	11.99	.32	14.34	.38	16.59	.37
3	Release Lever	.64	.07	M	/	5.25	.09	7.63	.14	9.77	.12	12.07	.08	14.45	.11	16.68	.09
4	Release Lever	1.39	.75	3.70	/	5.94	.69	8.28	.65	10.58	.81	12.92	.85	15.17	.72	17.44	.76
5	Release Stapler	1.80	.41	4.15	.45	6.36	.42	8.69	.39	11.00	.42	13.36	.44	15.58	.41	17.84	.40
6	Release Nailer	2.03	.23	4.43	.28	6.63	.27	8.92	.25	11.30	.30	13.59	.23	15.84	.26	18.08	.24
7	Release Last Truss	2.18	.15	4.63	.20	6.85	.22	9.10	.18	11.46	.16	13.76	.17	15.99	.15	18.26	.18
8																	
9																	
10																	
11																	
12																	

RECAPITULATION

ELEMENTS	1	2	3	4	5	6	7	8	9	10	11	12
Total Time in Mins.	1.77	2.84	0.70	5.23	3.34	2.06	1.41					
Number of Obs.	8	8	7	7	8	8	8					
Pre-Rate Divisor	-	-	-	-	-	-	-					
Average Per Cycle	0.22	0.36	0.10	0.75	0.41	0.26	0.18					
Leveling Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10					
Leveled Time	0.24	0.40	0.11	0.83	0.45	0.29	0.20					
Allowance Factor	1.15	1.15	1.15	1.15	1.15	1.15	1.15					
Standard Time	0.28	0.46	0.13	0.95	0.52	0.33	0.23					

RATING	1.00
SKILL	EFFORT
-	0.10
TOTAL	1.10
ALLOWANCES	1.00
Personal	.05
Fatigue	.00
Delays	.10
Total	1.15

Symbols Used: M - Missed Reading

EXHIBIT B - PAGE 2 OF TIME STUDY

EXHIBIT C

FLOW PROCESS CHART

NO FPC-16

PAGE 1 OF 2

SUMMARY

	PRESENT NO	PRESENT TIME	PROPOSED NO	PROPOSED TIME	DIFFERENCE NO	DIFFERENCE TIME
○ OPERATIONS	3	1015				
⇨ TRANSPORTATIONS	3					
□ INSPECTION	0					
D DELAYS	2	123				
▽ STORAGES	0					
DISTANCE TRAVELED	102 FT.					

JOB Ripping, cutting, dadoing No. SW 12 studs and delivering to sidewall station

☐ MAN OR ☒ MATERIAL Spruce Lumber Studs

CHART BEGINS At Rip Saw

CHART ENDS At Sidewall Station

CHARTED BY H. Clark DATE 3/10/70

STEP NO.	DETAILS OF METHOD ☒ PRESENT ☐ PROPOSED	SYMBOLS ○ ⇨ □ D ▽	DISTANCE TRAVELED (FEET)	QUANTITY	TIME	APPROVED	NOTES	SAVINGS MINUTES
1	Rip 2" x 12" into 2" x 2" studs (2 men)	○⇨□D▽		50	48			
2	Deliver to cut-off saw on dolly	○⇨□D▽	25	140				
3	Awaiting cut-off operation	○⇨□D▽			85		Congestion at station	
4	Cut to 7½ ft. lengths (2 men)	○⇨□D▽		140	78		Purch. auto. saw. Comb. with dado oper.	
5	Deliver to dado saw	○⇨□D▽	17					
6	Awaiting dado operation	○⇨□D▽			38		Congestion - need better scheduling	
7	Dado studs (2 men)	○⇨□D▽		260	138		Purch. auto. dado saw Comb. with oper. 4	
8	Deliver to sidewall station	○⇨□D▽	120				Move mill oper. closer to sidewall st.	
		○⇨□D▽						
		○⇨□D▽						
		○⇨□D▽						
		○⇨□D▽						
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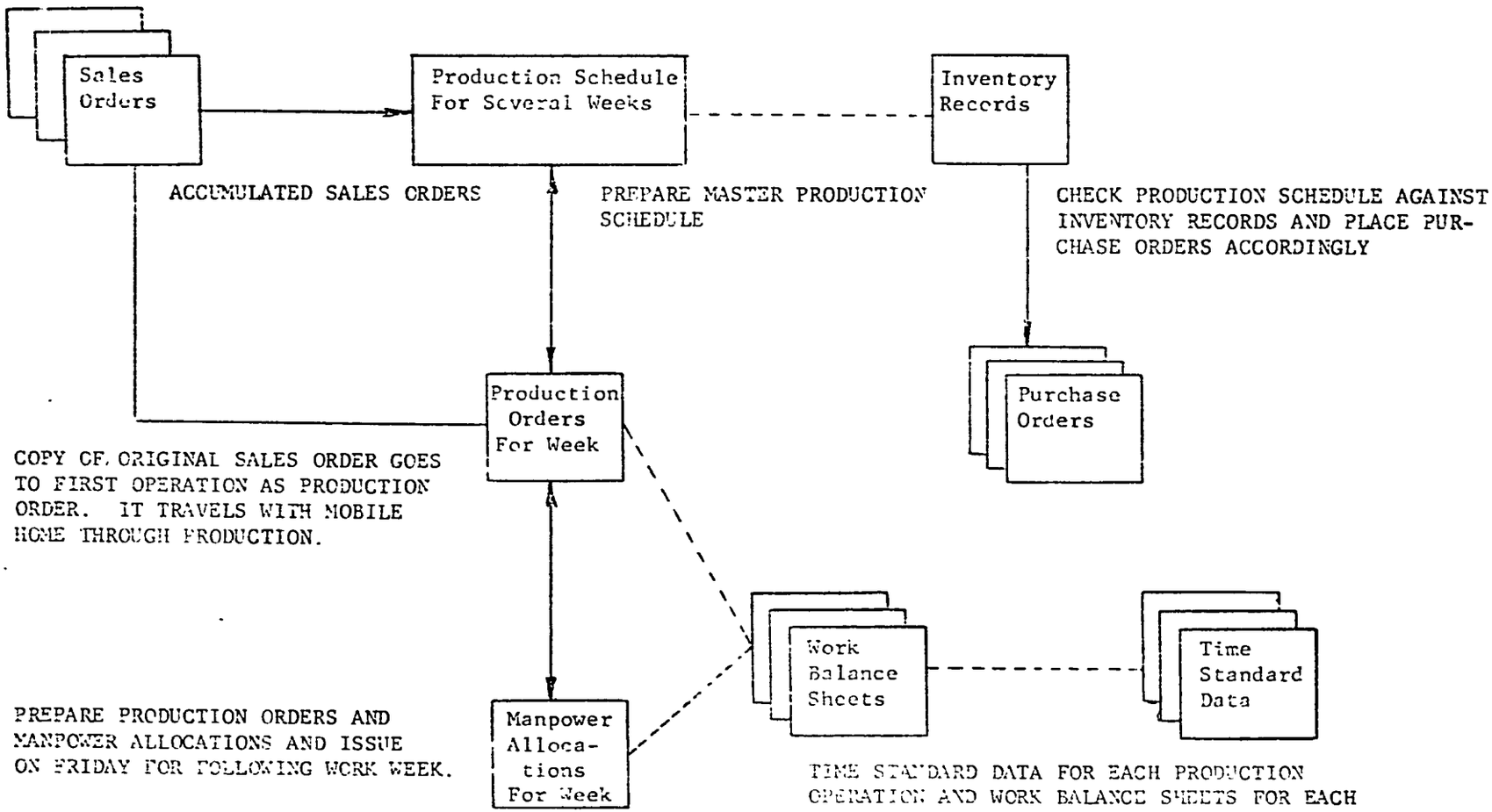
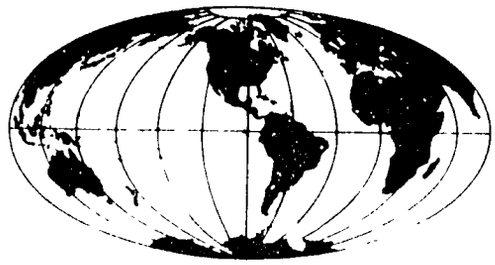


NOTE: EACH DAY COMPLETED PRODUCTION ORDERS ARE RETURNED TO PRODUCTION CONTROL. COMPLETED SALES ORDERS ARE SENT TO COST ACCOUNTING, MATERIALS CONTROL, SALES, AND THE GENERAL MANAGER.

SCHEMATIC OF PRODUCTION CONTROL SYSTEM

EXHIBIT D

A Guideline for Industrial Extension Personnel



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HOW TO USE A PRIVATE MANAGEMENT CONSULTANT

Development Organization Role

It is a necessary and important function of a development organization to provide management and technical assistance to small-scale industry. This support may be furnished through the organization's industrial extention personnel and/or private consultants. As a developing country becomes more industrialized, the possibility exists that private individuals will become involved in furnishing advice and assistance to enterprises. The development organization should be in a position to advise small-scale management on matters relating to the employment of private consultants and should provide guidance to individuals who are preparing themselves to enter the private consulting field.

Why Use a Private Consultant

Regardless of a company's size, problems often arise which cannot be resolved within the company. Perhaps the pressure of day-to-day operations leaves management with insufficient time to analyze and study the problems properly. Perhaps specialized knowledge and skill is needed which management does not possess and cannot afford to hire permanently. Or perhaps only symptoms of problems are evident -- and an independent and fresh approach is needed to identify basic causes.

In situations such as these, business organizations are relying more and more on the professional advice and assistance of management consultants. It is no longer considered a sign of weakness for a company to seek help in the field of management -- no more so than it is to seek legal advice from a lawyer or financial advice from a banker. Outside management assistance is often the best answer not only when specific problems are encountered, but also when the

need arises for the installation of specialized systems or the development of special information required in the formulation of management decisions.

The following outline of criteria, admittedly sketchy, can serve as a guide to the businessman considering the use of consultants. The businessman should ask himself the following questions:

1. How do I determine the need for consulting assistance?
2. How do I select a specific firm?
3. How should I use the consultant?
4. What should I do with the results?

Determining the Need

First it should be realized that a consultant is a diagnostician. His strong suits must be analytical ability, objectivity, knowledge and experience in his area, and time to devote necessary attention to definition and solution of the problem. Knowing what a consultant is, determining the need for a consultant becomes a matter of recognizing certain signs, such as

-- high turnover of personnel,
-- declining sales or unsatisfactory growth rate,
-- rapid increases in costs,
-- unaccountable shifts in product mix,
-- loss of major accounts,
-- declining market share on major products,
-- lack of realistic corporate objectives,
-- desire to diversify product line,
-- need to survey for new product potential,
-- customer reaction survey,
-- need for personnel selection program,
-- requirement to recruit key personnel,
-- audit of present or proposed manufacturing plans or marketing programs,
-- need to establish or revise compensation plans to meet changing conditions and objectives,
-- declining or unsatisfactory growth of net profits, or
-- need to acquire or merge with another company.

Selecting a Consultant

Next comes the matter of selecting the consultant. And the connotation of "consultant" is just as important, if not more so, than "consulting firm." The work accomplished will be no better than the men who are assigned to the project. The cost of the project must be analyzed in terms of what it is worth to you to have the problem solved. Just as in corporate business, but more so, a consultant is paid what he is worth and his firm must charge accordingly. Per diem rates and productivity of consultants varies little among the major consulting firms.

To select the consultant:

1. Define the field in which the problem lies. If it is a legal question, then a law firm may be your best choice. If the problem is oriented to accounting, data processing, systems, or procedures, a public accounting firm or perhaps a general management consultant may offer the best answer. If the problem is general management, marketing, personnel, production, or engineering, then a general management consulting firm or a specialty firm is usually the best choice.
2. Select two or three firms in the general class you have chosen by
   -- talking with friends and fellow businessmen who have used consultants successfully,
   -- checking with present service groups such as your accounting firm, advertising agency, or bank, or
   -- asking your college or university industrial development of business management leaders.
3. Interview the principals of the selected firms with respect to their
   -- knowledge of your problem,
   -- capability and that of their staff members in your business,
   -- approach to doing business, and
   -- clients and amount of repeat business.
4. Request each firm, if interested, to submit a written proposal of the assignment for you. Give the firms no more than two to three weeks to do so and then make your own decision equally as fast. The proposals you receive should contain

-- a definition of the purpose and scope of the assignment,

-- a description of how the work is to be performed,

-- an estimate of the elapsed time to complete the assignment and its cost, and

-- background on the firm and biographical data on the men who will work on the assignment.

Do not overly concern yourself with price differences. Instead analyze price differences in terms of the firm's experience, the caliber of the men on the assignment, the time that firm's principals will devote to it, and your own needs for differing levels of qualification.

5. Ask for a few references from the firm you have tentatively selected or from the two you are trying to decide between when all other factors are equal. Check these references in person or by telephone and probe the reference on the firm's performance in terms of

   -- successful implementation of recommendations,

   -- failure to upset "applecarts,"

   -- attention of principals to assignment, and

   -- capability and attitudes of staff personnel assigned.

6. Make your selection and then put your trust and confidence in the firm. However, your work is not ended. There is the matter of starting the assignment.

How to Use a Consultant

You and the members of the consulting firm most directly concerned with the assignment should meet to

-- review the proposal letter, clarify its intent, and make any changes necessary,

-- familiarize your key personnel with the consultants,

-- introduce the study to affected members of your staff, if this has not already been done,

-- develop a plan of action and timetable of activity,

-- establish periodic checkpoints, and

-- supply or arrange for supplying needed data, documents, and other records to the consultant.

Then the consultant is on his own. A good one will keep you abreast of where he stands on his schedules, but he will not feed you exceptionally preliminary conclusions or confidential information from your personnel or specific customers. Do not embarrass him by asking for such information; his code of ethics should prohibit such actions.

He will probably want to discuss his preliminary findings and conclusions with you near the completion of the work, but before the final report is delivered. This is not unusual, and it can be beneficial to the assignment because he has the chance to play back findings and get another side of the story. Also he can gauge your reaction and know how much he will have to document certain points where management understanding may be removed from actions required by the findings.

What to Do with Results

Nothing is so disappointing to a consultant as to see his work "cubbyholed" at the conclusion of an assignment. Use the work, implement it, and gain from it. In some cases it is advisable to use the consultant on the implementation of the recommendations. But be careful not to lean too heavily on him because over the long run, you must build the experience in your organization.

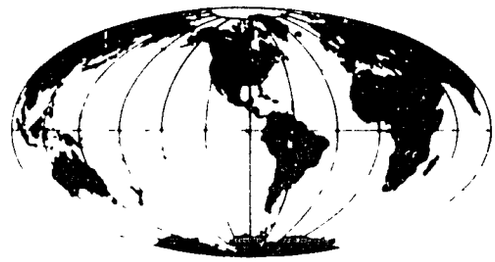
Conclusion

Once you have established a consulting relationship, you will find it easier and easier to use the consultants to assist on other specific problem-solving assignments. You usually will find it unnecessary to go through the selection procedure again, but you should always demand and have a written proposal letter for each assignment no matter how good the relationship.

If the relationship did not work out as well as you thought it would, the consulting firm may be at fault, but remember you selected it. Also, much of the fault for poor performance may lie within your organization.

Do not let a bad experience stop you, though. Try to learn from it and do a better job next time, because in every business there is a time and an event when an outside consultant is the most economical and effective way to turn a problem into an opportunity.

A Guideline for Industrial Extension Personnel



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SELECTED BIBLIOGRAPHY

The following publications are suggestions for further information on topics presented in GUIDELINES FOR INDUSTRIAL EXTENSION PERSONNEL. All items are held by the International Development Data Center, Georgia Institute of Technology.

GENERAL APPROACHES TO FURNISHING INDUSTRIAL EXTENSION SERVICES TO SMALL-SCALE INDUSTRY

51027 Asian Productivity Organization. Managerial and Technological Guidance for Small Business in Japan. Translation Series, No. 8. Tokyo, 1968.

50788 International Labour Organisation. Services for Small Scale Industry. Geneva, 1961.

50108 Organization for Economic Corporation and Development. Methods of Industrial Development. Paris, 1962.

50118 Organization for Economic Cooperation and Development. Technical Assistance and the Needs of Developing Countries. Paris, 1968.

50185 United Nations Industrial Development Organization. Industrialization of Developing Countries: Problems and Prospects; Administrative Machinery. New York, 1969.

50851 United Nations Industrial Development Organization. Industry and the Developing Countries. New York, 1973.

51034 United Nations Industrial Development Organization. Manual on Investment-Promotion Centres. New York, 1969.

50187 United Nations Industrial Development Organization. Regional Cooperation in Industry. New York, 1969.

GENERATION AND EVALUATION OF VENTURE IDEAS

51073 Asian Productivity Group. Outline of Policy for Smaller Enterprises -- Japanese Experience. Tokyo, 1969.

50670 Harvard University Center for International Affairs. The Process of Industrialization, by Hollis B. Chenery. Economic Development Report, No. 146. Boston, 1969.

50297 International Bank for Reconstruction and Development. Development Strategies in Semi-Industrial Countries. Economic Department Working Paper, No. 34. Washington, D. C., 1969.

50013 The National Industrial Conference Board. Obstacles and Incentives to Private Foreign Investment 1967-68. Studies in Business Policy, No. 130. New York, 1969.

50376 Organization for Economic Cooperation and Development. Creation of an Industrial Promotion Service, by Claudio Alhaique. Problems of Development Series. Paris, 1972.

50093 Organization for Economic Cooperation and Development. Investing in Developing Countries: Facilities for the Promotion of Foreign Private Investment in Developing Countries. Paris, 1970.

50503 United Nations Industrial Development Organization. Industrialization in Countries at the Earliest Stages of Development, by Frank L. Turner. Vienna, 1971.

50188 United Nations Industrial Development Organization. Industrialization of Developing Countries: Problems and Prospects; General Issues of Industrial Policy. New York, 1969.

50344 United Nations Industrial Development Organization. Industrial Location and Regional Development. Vol. I. Revised Edition. New York, 1972.

50491 United Nations Development Organization. Report of the Expert Group on Industrialization in Countries at Early Stages of Development, with Special Reference to Small Scale Industry, Vienna 6-10, December 1971. Vienna, 1971.

50983 United Nations Industrial Development Organization. Measures to Facilitate Foreign Investment. Issue Paper, No. 9. New York, 1969.

TRANSFER OF APPROPRIATE TECHNOLOGY

50089 German Foundation for Developing Countries. Seminar Center for Economic and Social Development. Development and Dissemination of Appropriate Technologies in Rural Areas. International Workshop, July 17-28, 1972, Kumasi, Ghana. Berlin, 1972.

50993 Hammond, Ross W. Technology Transfer Systems for Small Industries. Seminar on the Role of Small Scale Industries in Transfer of Technology, Schloss Hernstein, Austria, July 5-8, 1973. Atlanta: Industrial Development Division, 1973.

50074 Jackson, Sarah. A Consideration of Appropriate Technologies for Developing Countries. Washington, D. C.: Overseas Development Council, 1971.

51018 Korea Institute of Science and Technology. Proceedings of the International Seminar on Dissemination of Technology, Held in Seoul (Korea) November 20-22, 1972. Seoul, 1972.

50081 Organization for Economic Cooperation and Development. Development Centre. Transfer of Technology and Appropriate Techniques: A Bibliography. Paris, 1972.

51009 United Nations Industrial Development Organization. Guidelines for Acquisition of Foreign Technology in Developing Countries (with special reference to technology license agreements). New York, 1973.

50466 United Nations Industrial Development Organization. Industrial Extension Service, by Hamid Akhavan. Meeting of Promotion of Small Industries in the RCD Countries, Tehran, Iran, April 11-17, 1971. Vienna, 1971.

51035 United Nations Industrial Development Organization. Planning for Advanced Skills and Technologies. Industrial Planning and Programming Series, No. 3. New York, 1969

RESOURCES AND TECHNICAL ANALYSIS OF PROJECT ALTERNATIVES

51036 Asian Productivity Organization. Product Planning of a Major Textile Yarn Maker -- The Case of Teijin Limited of Japan. Tokyo, 1970.

50113 Organization for Economic Cooperation and Development. Methods of Selecting Industries for Depressed Areas: An Introduction to Feasibility Studies, by Leo K. Klaasen. Developing Job Opportunities, No. 2. Paris, 1967.

50119 Organization for Economic Cooperation and Development. Development Centre. Manual of Industrial Project Analysis in Developing Countries. Vol. II. Paris, 1968.

50349 United Nations Industrial Development Organization. Extracts of Industrial Feasibility Studies. Vol. I. Industrial Planning and Programming Series, No. 7. New York, 1973.

50811 Yale University. Economic Growth Center. Industrialization, Employment and the Choice of Alternative Vintage Equipment in Less Developed Countries, by Howard Pack and Michael Todaro. Center Discussion Paper, No. 95. New Haven, Connecticut, 1970.

ADVISING THE PROSPECTIVE ENTREPRENEUR ON GOING INTO BUSINESS

51024 Center for Venture Management. The Entrepreneur and New Enterprise Formation: A Resource Guide. Milwaukee, Wisconsin, 1973.

50018 The East-West Center. The Development of Small Industrial Entrepreneurs as a Tool of Economic Growth, by Robert B. Buchele. Honolulu, 1972.

50076 The East-West Center. Entrepreneurship Workshop II, January 8-26, 1973, Honolulu, Hawaii. Honolulu, 1973.

50668 Harvard University. The Center for International Affairs. The Industrial Entrepreneurs -- Education, Occupational Background and Finance, by Gustav F. Papanek. Economic Development Report, No. 128. Boston, 1969.

51015 United Nations Department of Economic and Social Affairs. The Role of Patents in the Transfer of Technology to Developing Countries. New York, 1964.

50267 United Nations Department of Economic and Social Affairs. Center for Industrial Development. Technical Cooperation for the Development of Small Scale Industries. New York, 1966.

50616 United Nations Industrial Development Organization. Training for Small Manufacturing Enterprises in Developing Countries. Vienna, 1967.

T2535 United States Agency for International Development. Technical Bulletin. Washington, D. C., (various dates).

013 The Supervisory Six.
014 New Foreman Training Plan.
023 Effective Job Organization.
025 Fundamentals of Management.
056 Public Relations Training.
057 Industrial Training Methods.

T7680 United States Agency for International Development. Training Manual. Washington, D. C., (various dates).

081 Purchasing.
083 Manufacturing and Manufacturing Engineer.
094 Personnel Administration.
135 Performance Discussions.

51039 Watanabe, Susumu. "Entrepreneurship in Small Enterprises in Japanese Manufacturing," International Labour Review, CII (December 1970), 531-576.

50114 Wedderburn, Dorothy. Enterprise Planning for Change. Paris: Organization for Economic Cooperation and Development, 1969.

THE BASIC PROBLEMS OF SMALL BUSINESS SURVIVAL AND GROWTH

51028 Asian Productivity Organization. Approaches to Successful Specialization by Small Businesses. Translation Series, No. 14. Tokyo, 1969.

50799 International Labour Organisation. Services for Small Scale Business. Geneva, 1961.

50110 Organization for Economic Cooperation and Development. Problems and Policies Relating to Small and Medium-Sized Businesses. Paris, 1971.

50098 Organization for Economic Cooperation and Development. Productivity and Economic Planning. Paris, 1970.

50012 Organization for Economic Cooperation and Development. Development Centre. Promotion of Small and Medium-Sized Firms in Developing Countries Through Collective Action. Paris, 1969.

51040 Takizawa, Kikutaro. A Comparative Study on the Problems of Small Business in the United Kingdom, The United States and Japan. I. Nagoya, Japan: Nagoya University, 1974.

50344 United Nations Industrial Development Organization. Industrial Location and Regional Development. Vol. I and Vol. II. New York, 1971, 1972.

50546 United Nations Industrial Development Organization. Problems and Possibilities of Small Scale Industry Extension and Development Finance with Special Reference to the Situation in East Africa, by Franz C. Helm. Vienna, 1970.

50619 United Nations Industrial Development Organization. Services and Facilities for Small Scale Industries in Industrial Estates, by A. D. Bohra. Vienna, 1967.

THE PRESENTATION OF INVESTMENT PROPOSALS

FACTORS IN PLANT LAYOUT

A SIMPLIFIED COST AND CONTROL SYSTEM FOR SMALL SCALE INDUSTRIAL CONCERN

INVENTORY CONTROL FOR SMALL SCALE INDUSTRIAL CONCERNS

PRODUCTION PLANNING AND CONTROL FOR SMALL SCALE INDUSTRIAL CONCERNS

51020 East Pakistan Small Industries Corporation. Small Industry Advisory Service. Investment Brief of Cold Storage and Ice Plant. Sponsored by U. S. Agency for International Development. Dacca, 1966.

51021 Hibben Ziesing and Associates. Investment Survey: Extraction of Castor Oil from Castor Beans in Thailand. Sponsored by U. S. Agency for International Development. Washington, D. C., 1964.

51025 The Industry Institute. Report on the Feasibility Study of a Ceramic Whiteware Industry -- Wall Tile, Sanitary Ware and Dinnerware -- in Jordan to the Development Board of the Hashemite Kingdom of Jordan. Sponsored by U. S. Agency for International Development. Beirut, Lebanon, 1961.

51023 The Industry Institute. Report on the Potential Profitability of a Glass Containers Plant in Jordan. Sponsored by U. S. Agency for International Development. Beirut, Lebanon, 1961.

50102 Organization for Economic Cooperation and Development. Quantitative Models as an Aid to Development Assistance Policy. Paris, 1967.

50122 The Rockefeller Brothers Fund. Investigation of the Feasibility of Establishing a Gravel Washing-Crushing-Grading Industry in Nigeria. Sponsored by U. S. Agency for International Development. Washington, D. C., 1963.

50783 Small Industry Extension Training Institute. Location of Small Industry: A Research Study. Hyderabad, 1973.

50106 Thomas, George D. Cost Reduction. Progress Through Modern Processes and Tools. Vol. II. Washington, D. C.: U. S. Agency for International Development, 1970.

50707 Thomas, George D. Organizing for the Effective Control of Quality and Production. Progress Through Modern Processes and Tools. Vol. I. Washington, D. C.: U. S. Agency for International Development, 1970.

50481 United Nations Industrial Development Organization. The Concepts of Quality and Quality Control and Criteria for Their Definition, by Agnes H. Zaludova. Vienna, 1967.

50918 United Nations Industrial Development Organization. Guidelines for Project Evaluation. New York, 1972.

50194 United Nations Industrial Development Organization. Incentive Policies for Industrial Development. Report and Proceedings of the Interregional Seminar Held in Vienna, March 10-21, 1969. New York, 1970.

50344 United Nations Industrial Development Organization. Industrial Location and Regional Development. Vol. I. Revised Edition. New York, 1972.

50367 United Nations Industrial Development Organization. A Guide to Industrial Purchasing. New York, 1972.

50607 United Nations Industrial Development Organization. Improving Product Quality in Small Industries in Developing Countries, by David J. Desmond. Vienna, 1972.

50372 United Nations Industrial Development Organization. Information Sources on Industrial Quality Control. Guides to Information Sources, No. 6. New York, 1973.

50485 United Nations Industrial Development Organization. Inspection, Sampling and Testing, by Leslaw Wasilewski. Vienna, 1971.

51030 United Nations Industrial Development Organization. Planning and Programming of the Metalworking Industries with a Special View to Exports. New York, 1972.

50338 United Nations Industrial Development Organization. Programming and Control of Implementation of Industrial Projects in Developing Countries. New York, 1970.

50487 United Nations Industrial Development Organization. Quality and Standardization, by V. Koukhar. Vienna, 1971.

50482 United Nations Industrial Development Organization. Quality, Quality Motivation, Reliability and the Consumer, by Lennart Sandholm. Vienna, 1971.

50486 United Nations Industrial Development Organization. Quality Training, by Leslaw Wasilewski. Vienna, 1971.

50574 United Nations Industrial Development Organization. The Role of Quality and Quality Control in Industrial Development, by Agnes H. Zaludova. Vienna, 1972.

51019 United Nations Department of Economic and Social Affairs. Industrial Standardization in Developing Countries. New York, 1964.

T7680 United States Agency for International Development. Training Manual. Washington, D. C., n.d.

097 Production and Management.

50966 Williams College. Center for Development and Economics. Size of Firm Efficiency in Colombian Manufacturing, by John E. Todd. Research Memorandum, No. 41. Williamstown, Massachusetts, 1971.

HOW TO USE A PRIVATE MANAGEMENT CONSULTANT IN SMALL SCALE INDUSTRY

50788 International Labour Organisation. Services for Small Scale Industry. Geneva, 1961.

51014 National Academy of Sciences. Research Management and Technical Entrepreneurship: A United States Policy in Improving Skills in Developing Countries. Washington, D. C., 1973.

50116 Organization for Economic Cooperation and Development. The Evaluation of Technical Assistance. Paris, 1969.

50115 Organization for Economic Cooperation and Development. Development Centre. Foreign Skills and Technical Assistance in Economic Development. Paris, 1968.

51034 United Nations Industrial Development Organization. Manual on the Use of Consultants in Developing Countries. New York, 1972.