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The purpose of this study is twofold; first, to describe and analyze the most significant problems encountered by managers of manufacturing plants in developing countries. American managerial techniques are taken as basis of comparison. Second, to suggest approaches and points of view which can be useful to managers and students having managerial interests in developing countries.

This work discusses the most important influences of the environment on management techniques. It also studies the relationships which exist between culture and the management of the work force, the selection of production processes, the acquisition of equipment and technology, and the influence that governments have in these processes.

A model to help visualize the relationships between the characteristics of the environment and the efficiency of managerial techniques is presented. Based on this model, the most prominent managerial

methods and procedures are discussed in relation to their adaptation to the conditions encountered in developing countries.

From the discussion, it can be concluded that some aspects of management are universal and can be generally applied, while there are others that lack universality, mainly in the area of interpersonal relationships. Nevertheless, there is a great amount of wisdom and experience in American management that can be successfully applied in developing countries. It seems, furthermore, that the development of management and technology due to its complexity cannot be attained wholly by individual efforts; governmental action appears as a necessary force behind the changes, especially creating a more adequate environment for any private initiative. The direct participation of consulting agencies, both public and private, can be considerably helpful in the implementation of these new techniques on industrial enterprises.

Industrial Adjustments in American Managerial
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TO MY PARENTS

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INDUSTRIAL ADJUSTMENTS IN AMERICAN MANAGERIAL TECHNIQUES FOR DEVELOPING COUNTRIES

I. INTRODUCTION

This study was undertaken to show how American managerial techniques can be applied to increase the potential of developing countries. The implementation of the various techniques and the transference of know-how from one country to another is where the problem lies and is the area where attention must be focused. The main objective of this paper is to develop some insights into the industrial management problems existing in developing countries, and to emphasize the influence that environment and culture have on how management processes are implemented.

Production environments in developing countries are characterized by a limited range of industrial capabilities, small-scale production and shortages of managerial and technical know-how. Many industrially developed countries, especially the United States, have earnestly tried to assist underdeveloped countries with managerial and technical expertise. Though the problem of technology has not been completely solved, a lot of progress has been made. However, the transference and adaptation of advanced managerial know-how has lagged. This may be partly explained by the lack of agreement among management scholars concerning the feasibility of such a transference

to different socio-cultural environments, and the lack of appropriate conceptual schemes by which such transferability and adaptability can be obtained.

Management problems in developing countries have attracted little attention in the past. Much research has been directed to international corporations, mainly in the areas of marketing, corporate policy, and financing overseas investments. The existing studies of international companies point out some of the problems of management in developing countries, showing the difficulties that multinational businesses find in different political and cultural environments for the application of management techniques. A great deal of study has been devoted to economic development, international trade, labor movements and power structures in developing areas. Anthropologists have analyzed the values, assumptions and beliefs inherent in many of the world's cultures, but relatively little research has been done concerning the peculiar problems of management and manufacturing in developing nations.

The present study is based to a considerable degree on Latin America, and in particular in the Andean Countries*, but also applies to some extent to other parts of the world.

It appears that there are dominant behavior patterns of

*The Andean Countries are: Bolivia, Chile, Colombia, Ecuador, Peru, and Venezuela.

managers and of enterprises in different developing countries which can be depicted through the analysis of some critical elements of the management processes. In this study, the primary interest is in such dominant patterns and trends rather than exceptions. The number of management problems in developing countries is vast, and only the more outstanding and influential are discussed. This approach is obviously subject to considerable overgeneralization since many exceptions to dominant patterns may be found in different countries, and there may be some significant differences in the management processes of different branches of industry. However, from these generalizations specific applications to management in developing countries can be derived and readily applied.

This work is organized as follows: Chapter II offers an outline of the conditions encountered by managers in developing countries. It begins by defining economic development and showing the role of industrialization in the process of general development and some of the attitudes encountered in Latin America. In addition, it introduces the concept of the need to adapt products and production techniques to the particular environment. It illustrates the compromises that have to be reached between quality and cost in the design of a production system.

Management philosophy must be compatible with the environment in order to be successfully applied, and it is important to know

specifically the extent to which enterprise management in developing areas resembles management in recent or earlier phases of American management. Chapter III reviews some of the opinions that exist in the literature in relation to the universal application of managerial techniques, presents a model that helps to visualize the relationships between the characteristics of the environment and managerial techniques, and lists the ways of evaluating the efficiency of these techniques. The model also serves as an introduction for the following chapters.

Chapter IV discusses some of the management operating policies needed in developing countries to cope with the environment. Among these are consideration of production organization, location of suppliers, procurement of parts and materials, financial policies, ownership, accounting procedures, wages and incentives, supervision, work satisfaction, relationships with the community and the government, relations with unions, and work force education.

Chapter V is concerned with special characteristics of management processes and operations in developing nations: production planning and forecasting, procurement of materials, inventory control, quality control, information systems and use of electronic data processing, maintenance of equipment, personnel selection and training, labor supervision, and management staffing.

Chapter VI deals with the problem of transference of technology to developing countries. It considers the cost of technology and its commercialization, the mechanisms of transference, and the role of the government in the process of developing the technology of a country.

Chapter VII presents a brief summary of the main points suggested previously and recommends subjects for future study.

II. BACKGROUND

The Meaning of Development and the Role of Industrialization in Developing Nations

Development can be defined as the "upward movement of the entire social system" (19).

This can be interpreted as a coordinated system of measures taken in order to raise the productivity, knowledge and education of the people, improve the conditions of life, improve institutions and attitudes, and avoid or remove the undesirable conditions in the social system. Development means growth plus change (5, 7). There are many dimensions in the development process that may be absent in a simple economic expansion.

Such general development focuses on the nation-state as the unit of development and encompasses economic as well as social, political, legal and administrative development. The interrelationships among these various types of development are very important, and inter-disciplinary study is needed to determine how economic and other forces interact in the general development of a nation.

Economic development is not equivalent to "economic independence" or "industrialization," but these two factors are extremely important in economic development. Economic independence is viewed as the goal in many developing countries, especially when they

need to create a feeling of nationalism, an often politically important force which may delay economic development. Industrialization alone does not represent economic development, because the concentration of the production in other factors, like agriculture or mining, may be highly contributory. Industrialization is not the "solution" to all economic problems. Any progress in the industrial sector is highly dependent on the input of numerous national resources.

Rapid economic growth, reflected in a perceptible improvement of the average standard of living, has been associated during the nineteenth and twentieth centuries with radical changes in productivity, technology and management. This movement started in England during the Industrial Revolution, and continued in other European nations, the United States, Canada, Japan, and other countries. In these places, economic growth has been achieved in the course of a generally slow and socially painful process of economic change.

The result of economic growth has been an increase in the differences in world incomes; different regions of the world are growing at various rates and rising from markedly dissimilar original levels. These levels depend on many variables, but basically on the aims which motivated the enterprises and on the type of international relationships that they maintained during succeeding historical eras (23).

Many theories attempt to explain the cause of the varying levels of development, none of which is entirely convincing or generally accepted. Some theories regard underdevelopment as the natural state of the world and seek to explain why a few areas have escaped from it. Others try to explain underdevelopment in terms of climate, historical cycles, innate physical or intellectual ability, disease and malnutrition, colonial exploitation, missing factors, etc. (18).

Latin America may be used as an example of how historical and environmental factors can significantly contribute to underdevelopment.

When Latin America broke politically free of Europe, the region fragmented into independent political entities, coinciding in general with what the colonial powers had previously created for their own administrative and economic convenience. The colonial environment and a century of laissez-faire economics after independence created problems which persistently blocked development of the region.

The most important factors in any country are its natural and human resources. Although natural resources are in satisfactory supply in Latin America, they are not available in a favorable combination. Large tracts of land are not suitable for agriculture; the mountains, rich in minerals and potential water power, divide Latin America and hinder transportation, eliminating the larger rivers and

forests from utilization. The available iron ore is generally located where there is no coal. Similar inequities abound. The quality and potential of the human elements are closely related to racial and cultural composition. The main problem in this respect is the prevalence of mixed but not blended groups of people who differ in their ways of living, technical abilities and fundamental attitudes. The diversity of human characteristics, though not a problem of racial discrimination, has become a problem of cultural background discrimination based on social and economic status. A complete contrast in attitudes and objectives between the aboriginal Indians and the Spanish conquerors still persists today. The Indians live usually in rural communities of a more or less tribal type, and employ ancient methods of land cultivation that yield a very low productivity. In general, they lack ambition and drive for improving their economic condition. They have hardly any "time perspective," rarely perceiving the need for saving or storing goods against a future contingency. In this sense, the Indians exist outside the national markets, and lack any concept of business or management in the North American or even Latin American urban sense.

The rapid rate of growth and the almost frantic effort to industrialize is one of the main characteristics of modern Latin America; and almost as important is the urgency to develop the economy as part of a general development program in each country.

Lately, many institutions, national and international, have been created in order to speed industrialization. One of the characteristics of the management has been the lack of specialization in a particular industry or field of business and the family type of ownership. The same person or family group frequently administers a wide variety of enterprises. Although a number of firms with widely dispersed stock ownership exist, such organizations are still the exception rather than the rule. In recent years, trends to wider distribution of shares have emerged in an increasing number of areas and are, in many cases, family-owned enterprises employing high-level executives hired from outside the family circle.

In their basic thinking concerning the conduct of business, national development needs, and life values, managers in Latin America tend to differ from their counterparts in more developed areas of the world.

In many developing countries, business has a special orientation towards the short-range view, neglecting long-range considerations. Investments are not considered good if they do not have the prospect of immediate high profits and complete amortization in a very short time. Some reasons for such limited aims are the past instability of governments and political forces, the shortage of capital and the danger of inflation. The short-range approach has not created the spirit of profit maximization that would be expected, because of the

presence of certain cultural and status factors.

By cultural tradition, many Iberians (Spanish and Portuguese) and Indians have a "not to be rushed" attitude toward life in general and economic activities in particular. This does not mean that financial incentives are ineffective, but they have to be applied in a different way.

All Latin American countries have a substantial amount of foreign management. Native and foreign-owned companies usually employ foreign managers and technicians. The selection and promotion of professionally trained management based on objective criteria is relatively new, but is increasing rapidly.

Developing countries in other areas of the world face different problems--social and historical barriers to development--but at the same time they have many conditions in common with Latin America. This fact permits the application of similar theories and practices in most developing countries.

In most places the pressure to establish domestic industrial enterprises is strong, because they create employment, permit a better utilization of resources, and help to maintain an adequate balance of international trade.

In order to increase industrialization, the governments usually protect new industries, especially the ones included in governmental development plans. Some of these policies have created an

environment of imperfect markets, which permit the existence of high-cost and low-quality industries that are not able to compete in international open markets. These policies have also contributed to a widening of the technological gap between developing and more advanced countries. Technological difficulties in industrialization result from the fact that the products and techniques applied in industrialized nations in most cases are not suited to the capacity of developing economies.

Both products and production techniques usually need some degree of adaptation to the local conditions of usage, ethical values, and cultural preferences when transferred from one country to others.

The Adjustment from the Engineer's Point of View

Product Design

In a free enterprise system, success in business over the long-run depends on continually offering the best value for the price asked. Best value is determined by two considerations: performance and cost. It has been generally recognized that an acceptable product must serve the customer's needs and wishes to the degree that he expects (performance capability); and the cost of producing must be

such that the customer can buy the product at competitive prices (value concept).

Technical knowledge is the intellectual conception of possibilities for combining inputs of factors in order to achieve an output of products defined in terms of quality and quantity (16). Know-how, the capacity to use technical knowledge, is a combination of knowledge and skills. Both technical knowledge and skill have to be adjusted to the needs and conditions encountered in developing nations.

Such an adjustment must take into consideration the product itself, the conditions of its use, the size of the markets, the availability of suppliers and skilled labor, the competence of management, the application of government policies of industrialization and trade, and the gap existing between the transmitting and the recipient economies. The industrial technology and know-how to be transplanted consists of product design, production techniques, and managerial systems to plan, organize and carry out a production function (3).

In underdeveloped areas, a more efficient use of products and equipment calls for a gearing down in design to the lower volume of demand, the scarcity of initial capital funds, and the inadequate maintenance and other support facilities and skills. Increase in net return must exceed product redesign and related production conversion costs.

In redesigning, as in developing new products, there is a cycle

that involves at least three stages: research and development, growth, and maturity (17).

In the first stage, research and development, new or additional functions are created or existing functions are adapted to the new environment and conditions of work. The problem in developing areas is that much of the advantage of modern techniques may be lost by trying to accommodate the techniques to the scale of demand, the conditions of use, and the high costs of adaptation. Some compromise must be made between the variety of individualized needs and the costs.

During the growth period, the product having proved that it fills the need, gains in demand. At this stage, the product must be produced at lower cost in order to be competitive. Thus, research and development no longer makes a large contribution to efficiency in the function of the product.

In a mature industrial economy there is commercial incentive to research "backward" to reduce production costs or to research "forward" to extend markets (4). In developing nations, companies usually lack incentive for research and development due to the inelastic supply, the small size of the markets, and the high costs involved. Research poses yet greater problems in developing countries, whose present state can be described as "too much of too many things to do in too short a time." Scientific and technological development on a broad basis involves the education and training of a large number of

scientists and technologists. Not only is the number of available outstanding scientists limited, but there is the "brain drain" of qualified men to advanced countries. Another serious problem is the scarcity of funds allocated to research. Probably these are the main forces that motivate nations to participate in the formation of common markets in developing areas, where competition, a larger demand, and bigger markets may create the incentive for research and innovation. Additional problems encountered by engineers designing products for developing areas are the following:

- (1) Frequently costs are lacking;
- (2) There is pressure directed at designing for the machines already owned, usually low-specialized and non-automatic;
- (3) Some applicable methods of manufacturing are unknown to the particular manufacturing and engineering people;
- (4) Certain materials do not exist or are thought to be unsuitable for a particular use;
- (5) There is lack of specialized suppliers;
- (6) There is no easy access to new materials or technologies.

Production Techniques

Production techniques are a second element of the technological transplant.

An extensive collection of technical knowledge and manufacturing

know-how is often required to manufacture a single product. The volume of technical knowledge that has to be transmitted in the form of process sheets, blue prints, and manufacturing specifications depends on the complexity of the transplant and the amount of accommodation to production scale, existing machinery, technical and managerial skills, etc. In addition, hundreds of small details involving manufacturing problems have to be worked out. These include machine speeds and tolerances, material specifications, and minimum standards.

A measure of a product's technological suitability for a developing country can be the cost and time involved in transmission and adaptation. For example, given the present stage of development in most Latin American countries, it appears that in the immediate and intermediate future, advantages will be found most frequently in the primary and light industry sectors instead of in heavy or sophisticated types of industry (i. e., primarily in the production of consumer goods rather than in capital goods).

Usually governments make decisions in the choice of industrial and technological priorities, but each industry has to establish its own priorities when deciding the type of machinery and techniques to be used in the production, especially in relation to the intensity of labor. The decision depends chiefly on the type of product. Manufacturing industries with a large proportion of assembly work, food

processing, construction, etc. are good examples of industries that lend themselves to more extensive utilization of labor. Because most developing countries have an abundance of low-cost labor, and in general, are short of capital, they should try to use their cheap and abundant labor and economize on capital. One means of economizing is to use non-automatic machinery, which in advanced countries may have become outmoded because of the high cost of labor in those countries. Moreover, using this machinery can give considerable flexibility, making it possible to shift to new or different types of equipment sooner than is possible with more expensive machines. Capital-intensive processes are usually identified with progress and have a prestige appeal, but at the same time, they require sophisticated skills, specialized maintenance, and quality materials. In addition, they tend to over-produce for small markets.

There is not any one straightforward answer to the problem of the correct combination of the factors of production in any particular industry. The right balance can be determined only in each individual case, after a detailed consideration of costs and local circumstances.

In general, universal-type, single-station equipment is more adaptable to smaller production volumes. Simple and durable equipment is needed, because operational skills are usually low, and maintenance and repair facilities tend to be of low quality.

Indirect costs in firms that use abundant factors (i. e., labor

over machinery) are excessive in many cases due to price distortions (i. e., labor without skills is cheap and abundant, but has at the same time very low productivity). In other cases the attitudes of the working force create difficulties. Rural labor has difficulty in adjusting to continuous work under supervision. Artisan type labor interferes with the practices of factory work, quality control and standardization.

In making technological adjustments and designing for a developing economy, engineers are largely concerned with adapting production facilities to adverse conditions. In general, minimum changes are made in product or parts design, since the low volume of demand cannot support the additional costs involved in redesign. The function of production engineering is to design the most economical means of production--given the existing environmental conditions and the availability and costs of materials, equipment and labor.

The product designer and the production engineer have to arrive at a sensible balance between functional utility and production costs. In an industrially advanced country, it is possible to separate the functions in engineering. This is rarely the case in underdeveloped areas, where the full range of industrial capabilities is lacking. Engineering solutions to production environments are essentially compromises between product quality and production costs. Other cost-quality considerations involve such decisions as whether to make, buy or import and what material standards to use.

Reconciling the viewpoints of engineering and economics is a fundamental problem of efficiency in the overall development. The complete picture, from design of the product to commercialization and marketing, has to be considered as a whole. The systems approach can be very useful in accomplishing this total process.

III. MANAGEMENT - THE APPLICABILITY OF AMERICAN MANAGEMENT IN DIFFERENT CULTURES: A MODEL

Universality of Management Principles

There are elements of numerous philosophies within the structure of American management, but, as a whole, these philosophies embody a system of attitudes, approaches, principles and values that give the reference framework to the solution of problems.

American managers have this framework in common because they are, to a greater or lesser extent, products of a common social, cultural, and economic structure.

A study of the management-theory jungle (14) reveals that all the theories approach the problem by taking into account only the internal factors and considering the external environment as a constant. Most studies in management look at production processes as a block diagram or black-box, without much concern for the environment, but this representation does not portray the constraints and varying objectives of the management function (22).

An analysis that considers only a fixed environment is useful for the individual firm in order to achieve higher efficiency, but because it does not consider the problem of relative efficacies between firms in different environments, especially when the changes are major, as in the case of different countries, it would not be universally applicable.

There are two main currents among management theorists concerning the universality of management principles. The one accepts the idea of universality (13), but the second challenges this idea, asserting that management philosophy is culture-bound, and denying the universal applicability of American management theories (11, 20).

Many management principles have proved to be universal (i. e., division of labor, centralization, standardization, etc.). However, it must be realized that there are at least two factors, in addition to the principles of management, that help a manager to achieve success. One of these is the managerial philosophy which encompasses the sense of values, customs, and assumptions concerning the environment, and the other is the knowledge of that environment.

The management philosophy must be compatible with the environment; therefore, a given manager in a given company in a given country will be successful only if he knows and is able to apply the principles of management, and if his personal philosophy is compatible with the environment in which he is operating.

Coping with the environment is a challenge to management even in the United States. Management occurs within an economic, cultural, political, psychological, and social context. These factors make it necessary for the "science" of management to be modified by the "art" of management.

Many businessmen in Latin America consider management

strictly as an art that can be learned only through experience.

Decision-making is based primarily on intuition, and, in many cases, on emotion and impulse.

In developing nations, there are relatively few opportunities for people to gain management experience, resulting in less applicability of the general management principles. On the other hand, knowledge of such principles does not automatically produce management efficiency (11). At least two vital ingredients need to be added: experience and proper attitude.

A Model of Management

The following external constraints are cited (8) as the more important ones in the applicability of management:

- (1) Educational characteristics
- (2) Sociological characteristics
- (3) Political and legal characteristics
- (4) Economic characteristics

These factors have been proposed also as indicators of the relative effectiveness of managers in different countries.

At the same time there are internal factors that define the effectiveness of management and these are (21):

- (1) Management processes
- (2) Management policy or philosophy

These variables, introduced in a model, may help to indicate their interrelationship and the way in which they affect the applicability of management in developing nations.

It is true that the external environment affects the performance of management, but at the same time, there is evidence that the techniques applied by American managers in different environments and cultures have been successful. The authors who argue that American management is a unique philosophy, limited in applicability to economies and cultures comparable to that of the United States, admit that "American management is highly respected abroad. . ." and ". . .had yielded great dividends for the host country" (11).

The conclusion is that management, "the science," is universal and can be transferred to developing nations, and be used there with full efficacy. At the same time, a significant part of the contemporary American management philosophy lacks universality. That aspect of management that lacks universality involves interpersonal relationships, including the ones between management and workers, management and suppliers, management and the customer, the community, the government, etc.

The relationship that exists between these interpersonal aspects of management and the actual solution of business problems forces changes in some of the scientific parts of management, not in the basic concepts but in the way that they are applied.

Sometimes, it becomes difficult to apply certain techniques that require such tools as statistics or sophisticated computers, but these aspects are only transitory and depend on the circumstances of each specific case.

The Model

Efficacy or effectiveness in a given industry depends on the way in which the manager carries out the basic functions of planning, analysis, and control (i. e., in general the processes and operations of management). The management processes are dictated by both the environment and the management policy concerning the consumers, the community, government, labor, etc.

In this model (Figures 1, 2, 3, and 4), the concern in management policy, process, and operations is in those concepts which can be transferred to developing nations.

There are many elements of management policy that are a product of the culture and socio-economic and political environment of a particular country, whereas others are more general and can be applied everywhere. The distinction between and identification of the general policies is important because such policies can be transferred from one culture to another without problems and with usually good results.

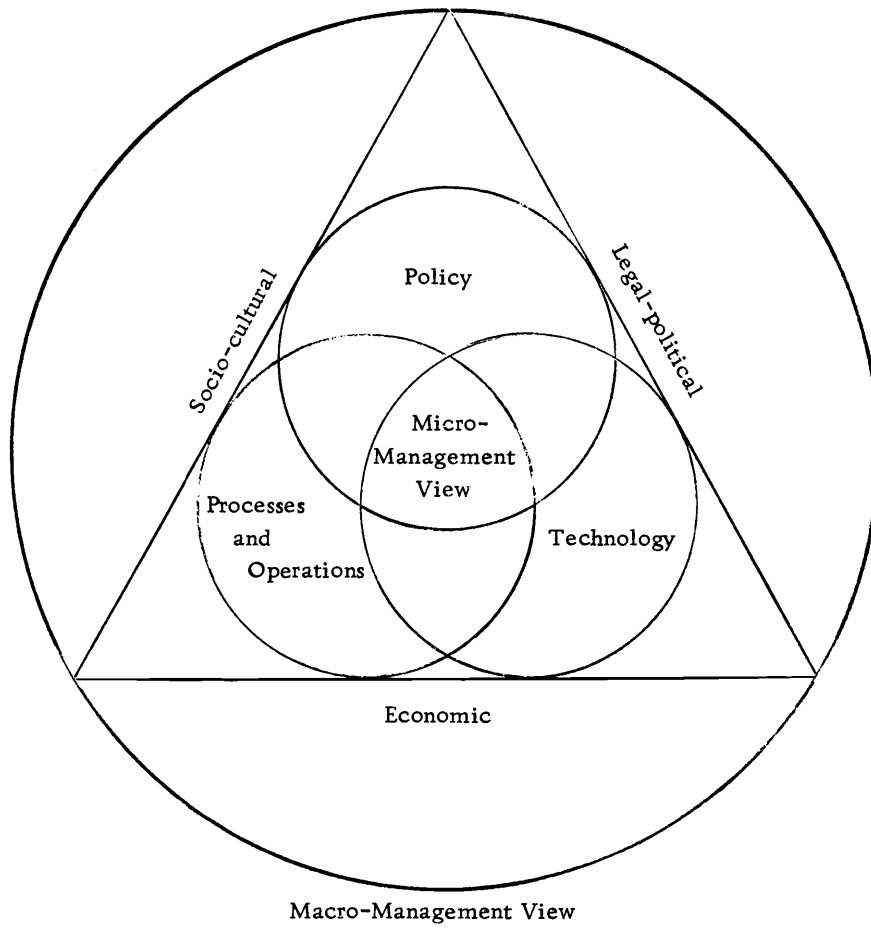


Figure 1. American Management Applied in Developing Countries.

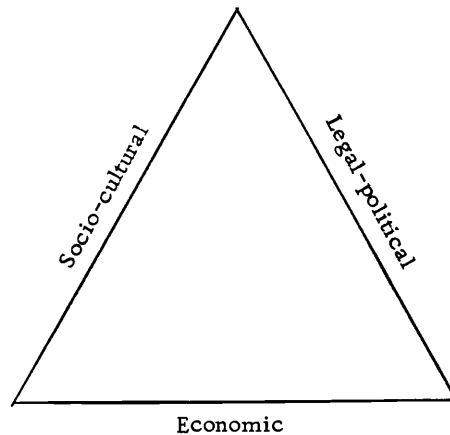


Figure 2. The Environmental Factors that Affect Management in Developing Nations.

Factors of the Model (Figure 1):

Environmental factors:

- 1) **Socio-cultural characteristics:**
 - Education: literacy; specialized labor; technical education; attitudes
 - Culture and idiosyncrasy: the individual; the group; the organization; the society
 - View of scientific methods, wealth, goals in life, etc.
 - View of decision-making and risk-taking
 - Class flexibility, other social characteristics
- 2) **Legal - political characteristics:**
 - Legal structure that defines the rules of the game; legal changes
 - Political organization, the role of governments, degree of centralization, government stability
 - Foreign policies, trading restrictions, tariffs, free trade areas
 - Development policies
- 3) **Economic characteristics:**
 - General economic framework of the society
 - Banking system, fiscal policy
 - Economic stability
 - Capital markets
 - Markets, size, purchasing power, economic class differences
 - Economic integration

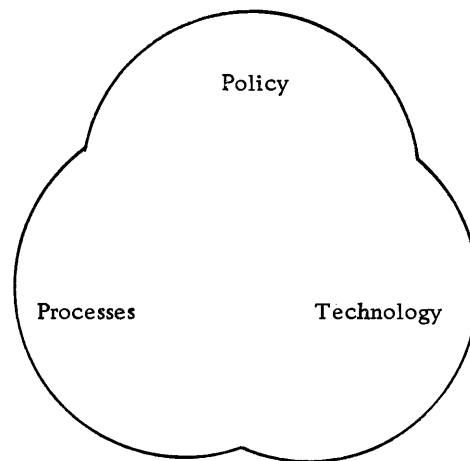


Figure 3. Factors of Management Structure.

Micro-managerial structure

Management policy:

- Consumer
- Labor
- Suppliers
- Distributors
- Government and society

Management processes and operations

(Set up the organization, develop resources, and guide execution of plans):

- Planning
- Analysis
- Control

Management of industrial technology:

- Production
- Transference
- Adaptation

Management efficacy:

(Over all the concepts)

- Profits
- Growth
- Company's image
- Stock prices
- Employee turnover
- Relations with society, government, etc.

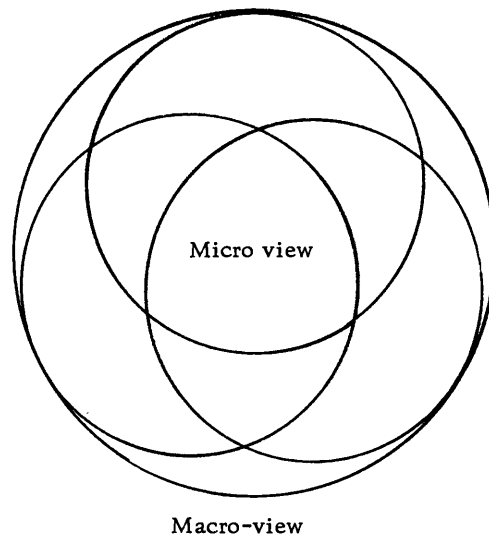


Figure 4. American Management Applied in the U.S. : the environmental factors are considered as a constant.

In the United States, the triangle representing the environment is given as fixed, known, and more or less constant, and because of that the two points of view, exterior and interior, take into account only the management policy and the management process in relation of efficacy.

The assumptions for the model are:

- (1) That management efficacy depends on the way in which the management process and operations are carried out.
- (2) In turn, the management processes and operations themselves depend on both the environment and the management policy.

Because of these assumptions, in order to determine the impact of the environment on management processes, it is necessary to determine its influence on management policy and on environmental policy interrelationships.

Evaluation of Management Efficiency

Societies of every nationality want to become more efficient in expanding usable outputs over available inputs. To achieve this, each one of the productive enterprises in the society must also become efficient.

The measurement of the efficacy of management and management techniques at international level has particular problems, some of which are the following:

- (1) Diversity of inputs and outputs. A solution to this problem is the use of a common measuring rod such as money, but even the value of money changes from place to place.
- (2) Lack of information. It is difficult to know the point of maximum

utilization of goods or services. One of the major blocks in the way of managerial efficiency in developing nations is the absence of comprehensive, reliable, and current information. For example, given an equivalent decision-making situation in the U.S. and in a developing nation, a very poor manager in the U.S. may stumble onto a correct decision because he has at hand the appropriate body of information or people from whom he can get it. His opposite number in a developing area needs to be of first-class caliber, thoroughly and personally aware of all aspects of the business and the industry, and possessed of a sixth sense which tells him which aspects are important in order to come up with the proper decision. This lack of information makes managers in developing areas more conservative than those in the U.S.

- (3) Confusion concerning goals: The question of "efficiency toward what" is difficult to answer due to the multiple types of goals of different enterprises. A common assumption is that the maximization of profits can be considered as a general goal, but the question still remains as to whether the profits should be obtained in the short or long run.
- (4) Subsystem optimization: The goals of one private company, or the manner of obtaining those goals, may conflict with the

overall goals of the country, and this conflict usually results in some type of government action which does not permit comparisons.

Evaluation of Firm Efficiency

Most of the concepts of firm efficacy are based on economic results. The major reason for economic concern for efficiency comes from welfare economics which deals with the question of whether or not the economic system yields results which are desirable in respect to general economic goals.

Exploring the internal operation of a firm, economists usually consider management as the black box in which, given a set of inputs, the best combination is sought in order to get the best outputs.

General measures of firm efficacy are the following:

- (A) Profitability. The rate of return on net worth serves as a basis of comparison, but has the following shortcomings:
- (1) The imperfection of the markets permits monopolies, etc.
 - (2) The choice of long or short term profitability varies among managers.
 - (3) Potentially very profitable firms may be subject to government controls.
 - (4) Some firms may be subsidized by governments, in order to achieve some non-economic goals.

- (5) Variations in risk and uncertainty may cause profits to vary sharply.
- (B) Exports. If a manufacturing firm is a monopoly at home, a measure of its effectiveness may be how well it competes in the international markets. Here there is also the possibility of the intervention of governments that subsidize such exports.
- (C) Usable output per man. Output can be valued in monetary terms. International comparisons are difficult because the wage-capital costs vary widely.
- (D) Plant utilization rates. Production depends on plant capacity.
- (E) Prices relative to foreign firms. For goods or services that are exported, comparisons to the prices charged by foreign firms if similar national conditions exist.
- (F) Long-run effectiveness. This measurement is based on the concept that effectiveness in the short run does not affect the long-run efficacy. However, short-run distortions may invalidate this presumption.

In general, it can be seen that there is no precise way to obtain the efficiencies, or even define the measures of efficacy.

IV. OPERATING POLICIES OF INDUSTRY IN DEVELOPING NATIONS

As mentioned earlier, management is, by and large, a product of culture, and of the social, economic, political and legal environments of a country. But at the same time many elements of management philosophy are man-made, and can and have been exported from one culture to another.

It appears that virtually everywhere management operates in accordance with a common framework of basic objectives. However, the ways in which the functions tend to be performed in different countries vary markedly in many cases.

The elements of management philosophy which are less cultural-bound are considered in the model as more or less constant. The more variable ones are related to a firm's attitude toward and relationships with some of its internal and external agents, such as employees, unions, consumers, the community, the government, etc.

Aspects related to people tend to change more than do other cultural aspects in different countries.

Production Organization

The available markets in developing nations are fewer and smaller than those in the U.S. The limitation in size and number of markets is set by the size of the population in most countries, but

more significant for manufactured products is the low living standards and low economic conditions of a large percentage of the population. The problem is complicated by the number of companies which compete for the same markets.

This limited sales volume sets limits on various aspects of market programs, making it difficult to support such activities as the maintenance of a qualified sales staff, advertising, and customer services.

In order to meet this problem, companies typically have to lower the rate of production by using general purpose machinery, and changing tools for the different operations, instead of using specialized or automatic machinery. From the management view, the situation requires more than just adjustment of physical methods. There is less need for the highly trained specialist and more for the ingenious "jack of all trades."

Adjustments in production techniques are generally feasible, but lead to an unsatisfactory situation in that they result in the loss of potential economies of scale. In many cases, this produces government regulations that limit the number of companies allowed to manufacture a given product, or encourage consolidations of companies.

Even if the government does not act, it is common that more than one company share the output of a single producing unit. There

is a relatively tolerant attitude on the part of governments toward agreements among competitive companies which facilitate cooperation.

Supplying of Materials

Obtaining suppliers in developing nations is usually more expensive and troublesome than in the U.S.

Most companies find that the only way to obtain some materials and parts is by importing them from more industrialized countries. In this case the costs of transportation have to be specially considered. Sometimes the cost of imported supplies is made exorbitant by import duties. Furthermore, reliance on imports is risky because there is always the danger that this supply of goods may be interrupted by foreign exchange or political problems.

These pressures encourage reliance on local sources of supply, and in many cases companies have to create the suppliers by helping local suppliers with know-how and economic aid. Dealings with local suppliers are often unsatisfactory because quality and delivery schedules are far below minimum expectations. This condition tends to force changes in inventory policies to set inventory levels high enough so that operations can continue even when shipments are delayed or must be rejected. For similar reasons, policies in quality control have to be geared down from international standards.

Where competing suppliers are available, pressure can be

exerted to improve their standards, but this practice is not generally effective; it forces the companies to manufacture more of their own supplies, or to take a more active part in improving the operations of suppliers. This is generally a difficult process but is often more satisfactory in the long run than integrated manufacturing.

Similar and related problems occur in the supplying of other facilities such as electricity and transportation. Usually governments give substantial attention to supplying this type of facility.

The Role of Government Policies in Relation to Company Policies

Of the variety of actions by which a government can affect the operations of a company, the most important is the power to exclude external competition by import restrictions or tariffs. Such restrictions permit prices within a country to be maintained above the international prices.

Beyond this, all important areas of government policy influence the general economic conditions in many ways: tax policies, financial aid to private companies, helping or hindering the importation of supplies, encouraging or discouraging demands of labor unions, etc. The possibilities are as numerous as the potential operating problems of a company. The stability of the government is very important in this respect because the government policies usually have the same stability as the government itself.

When a country enters a program of economic integration with free trade zones or a common market, common government policy is equally applicable to all the countries involved. Consequently, although many companies thus may lose the protection of their own government, the common policies usually are rendered more stable.

Essential to the planned economic development of a country is the concept that the government has the right to steer the growth and operating practices of private companies, and it is assumed that private enterprises are in large measure instruments of the public so that their basic plans of action must conform to the general development plans.

The variations among countries and companies in these areas are so great that general conclusions are impossible.

Financial Policies

In broad terms, the governmental financial policies that differ most from those in the U. S. are the ones involving inflation, foreign exchange shortages, differences in capital conditions, and tax laws. Such policies directly affect the financial policies of the countries' industries.

In most countries the maintenance of price stability has a lower priority than other objectives, such as the increase of national income through the expansion of industrial production, or the increase

of the level of life in the country. In order to enhance the general welfare, governments are often forced to make heavy investments to encourage the expansion of production, mainly because private capital is insufficient to accomplish the desired goals. This usually produces inflationary pressures. Too often, however, the political instability of the governments does not permit them to take anti-inflationary measures without the danger of political defeat. In some countries all these pressures on industry have been reinforced by fiscal deficits, wage increases, and currency devaluations.

In private companies, the main methods of reducing devaluation risks are to depend less on imports, minimize the obligations in dollars and maximize the obligations in domestic currencies, or borrow money at a fixed rate of exchange, paying an insurance or premium for this privilege.

Foreign exchange is a pressing problem for all countries in the world. In developing nations, the trade disequilibrium that causes problems in the money exchange has two basic causes: forced economic growth and inflation. In order to correct the trade disequilibrium, governments usually control the exchange rates, and create systems of priorities for the utilization of foreign currencies, giving quotas for imports, etc.

Each country is unique in its patterns of ownership of capital, supply of capital, and methods by which capital is made available,

distributed, and controlled. There is a notable difference in the public and private sectors in respect to distribution of new investment capital. In general, all the development programs, national and international, are made through the government, giving it a major portion of the distribution function. Private capital tends to be concentrated on a relatively small number of individuals, and the middle classes are scarcely significant as a source of funds.

When a company needs external financing, it may look to government or private (national) sources, and to private international banking corporations. Private national sources are preferred when possible because, regardless of the form in which foreign funds are obtained, their use means payment of high rates of return and restrictions in management freedom, in addition to the exchange and inflationary risks involved.

The sale of common stock to the public is not a usual way of obtaining capital. Ownership of securities is largely limited to a very small segment of the population, and the trade is correspondingly small.

Individual family fortunes are a common financial source, but not in the form of public stock. The owners usually find it more convenient from the control point of view to put their capital in their own enterprises.

Accounting

Each country has its own laws and regulations applicable to the accounting function--chiefly for tax purposes. Usually the companies need to have their own set of accounts primarily for internal cost control. When inflation or devaluation exist, the valuation of inventories becomes unrealistic. The government usually requires a policy of last-in first-out, under which materials are charged out of inventories at current prices, resulting in the value of the remaining inventories becoming unreal because they are not being used at their acquisition cost. Some companies use the first-in first-out method where materials are used in the order and cost of acquisition, so that the residue of the inventories reflect current costs that are more realistic. This last method is desirable from the control and planning points of view.

No accounting problems occur in salaries, wages, and selling prices since they are always current.

Depreciation is usually computed as a percentage of the original cost of plant and equipment. Here also there are variations from one country to another. The problem is that the operating statements contain items of varying historical status which in combination are not realistic when inflation is significant.

All of the preceding variations cause every company to need a realistic system of accounts which reflects the actual values and costs

of all the items affected. This is necessary as a guide to financial status and for planning purposes.

Labor

In return for their work, laborers have different expectations concerning their monetary compensation and work satisfaction. In developing nations, wages are low compared to those in the U.S., but in some cases low salaries are compensated for by higher non-wage payments, such as insurance, family allowances, paid vacations and participation in business profits.

The effectiveness of direct wages as an inducement to work is reduced in many cases by social conditions. Workers, especially at lower levels, usually lack high ambition and wish to earn only enough to meet their basic needs. If the wages are increased, they simply work for a shorter period of time. Thus management has to look for other forms of incentives.

Some companies have tried methods of payment by supplying goods directly to the worker, but usually government laws prevent this method of payment. Providing food, medical service, and other similar direct benefits usually give good results. Protection from dismissal is an important worker incentive in developing countries, and laws usually provide high severance payments and other restrictions which discourage the discharge of employees, especially after

they have worked for a determined number of years. Dismissal policy varies in different companies.

In most developing areas, workers are recent immigrants from rural areas and lack a thorough grasp of the nature of their work, the processes of which they are a part, and the basic attitudes required by industrial work. Policies of setting strict work standards and holding the men to them by a combination of incentives, disciplinary measures and close supervision have to be established and administered in such a way that they will increase the commitment of workers to industrial life and help them to increase their living standards. Most of the problems of work satisfaction are related to the standardized routine processes of mass production and line assemblies. In Latin America, for example, many workers find labor satisfactory only if they can show individual creativity and express themselves freely through their work. Thus, standardization and quality of the products usually suffer. When possible, it seems advisable to make working conditions more flexible, like shifting the men from job to job on an assembly line in order to give variety to the work. Since workers like to put initiative into their effort, direct orders of how to do a job sometimes are not accepted. An indirect way of selling ideas and giving the worker the credit for initiative seems to give good results.

In other instances, work may be subdivided slightly less than in the U.S., thereby giving workers the satisfaction of completing a

determined part or subassembly, letting them see where it goes, and what part it plays in the finished product.

Relations With the Community and Government

One of the important factors in the management of any enterprise is the determination of the role to play in relation to the community in which it operates.

Most of the interactions between companies and community are established through the government. The only direct influence in the community is the building of a general favorable image of the enterprise. The most important aspects are the role of the company in the economic and social development of the country, and ideally the people's feelings of nationalism and pride in the company's national products. Public relation policies may also involve communication and participation in the institutions of the community in such fields as health and education.

The establishment of the political position of the company requires considerable diplomacy, especially in countries where almost everyone is actively involved in politics. A neutral position seems to be the most advisable, but this is not always possible or convenient.

In its relationship with the government, there are two broad areas. One concerns the national interests of the country and the government policies as a whole, and the second, the everyday, person to person contacts with government officials.

In the first instance, the company policies have to agree with the governmental policies, in many cases being fixed by the government, which usually plays a stronger role than in the U. S.

It is important for the manager to understand the basis of the government's position upon which is established the policies and proper attitudes of the enterprise. In many cases substantial differences exist between the proclaimed position and the real actions of the government. The strength of the acting forces in any particular situation is the major determinant of whether or not the government adheres to its stated intention.

In personal negotiations with officials, the situation varies greatly from country to country, but generally in a given situation the level of the official dealt with is higher than that in the U. S.; negotiations are longer and usually require more documentation. The chief reason for these differences stems from the importance that industry has in the economic development of the country. It is usually necessary for the company to build a complete management mechanism to deal with government officials at different levels, and to use different strategies at each level.

Cultural Influences

Knowledge of the culture of a country is vital for management, and influences policy-making.

Sociological and cultural factors correspond to dominant human attitudes, values, and beliefs in a given society, and they influence the motivations, behavior, and performance of individuals working in an enterprise.

A major problem is that socio-cultural constraints which apparently have a significant bearing on managerial performance are difficult to measure and quantify. Since there have been relatively few studies of these variables, any analysis has to be suggestive rather than conclusive.

Different areas exhibit marked differences in the way individuals, groups, organizations and society as a whole act. Taking an example of the common Latin American cultural ways of behavior, it can be found that individuality is a very strong feeling in the sense that each person feels that he is unique. This feeling has nothing to do with the social position of the individuals, and makes other spheres, such as groups and general organizations, less important.

Policies must consider the person as a unit of analysis, emphasizing the total person, not just the part of the individual that performs a specific job in the organization. This emphasis on persons creates a relevance of particularism; the particular instance and individual is frequently more relevant than the abstraction and the organization.

Such individualism usually causes groups or committees to be

ineffective in Latin America. It seems that the family is the only group in which the individuality of a person is not threatened and his uniqueness is not compromised. Hence, businesses tend to be owned by family groups.

There is no sharp distinction between the company and the person who owns or runs it. This explains why the organization area is not considered as important, why any type of charismatic leadership becomes important, why organizations tend to become dominated by individual personalities, and why informal rather than formal organizations are commonly used.

Among other cultural characteristics, differences in values must be considered by management, mostly those traits which are classed as moral standards or codes of conduct, and the ones involving attitudes toward work and material success. A system of values is an integral part of a group's whole cultural system, and serves its role in keeping the society functioning effectively. Here also there are differences among countries.

Organized Labor

Labor unions are constituted similarly in different countries. The members belong to local units which are pulled together into a small number of national federations. However, they differ in their ideology, the role they play, and their strength in different localities.

In Latin America, for example, although labor has become more sophisticated in the ways of collective bargaining, it is still generally true that the unions are more important politically than economically, and that management relations with organized labor are not simple matters that deal with the company's internal workforce. Unions are closely tied to community issues, national politics, and international affairs.

A notable characteristic of union leadership is the prevalence of outsiders to the work force. The local officers come from the workers, but presidents and other key officials are commonly intellectuals or politicians, usually sympathetic to the cause of labor but without a complete understanding of labor problems. There are cases where labor leaders do not in reality intend to serve the needs of the workers, but rather their own political interests.

Theoretically all union leaders are elected but the concept of democracy varies greatly among countries at the union's level. In most places, unless unions at the local level are supported by the government, they tend to be ineffective. For the most part, government activities take two forms: extensive labor legislation, and participation in labor management negotiations. Labor laws usually cover many aspects of employment which are left to individual negotiation in the U.S. The role of government here is significant to management in two respects: it limits the scope of management

initiative and determines the government relations and interventions in labor problems. Some general policies that may be useful to unions in developing nations are a more cooperative management-union relationship, acceptance by management of negotiations with outsiders, and especially the encouragement of maturity in local union leaders by a management which, however, avoids actions like taking direct charge of a union, etc.

Education

The quality, efficiency, and structure of an enterprise depends upon the overall quality of the persons in the organization. Hence, the nature and quality of the education within a country is a critical determinant of the level of managerial efficacy. The problem of education involves both quality and quantity.

Literacy is important in the quality of the work force, not only in the productive sense but also in the general social sense. Literacy level implies the ability to read and write with reasonable accuracy. In developing countries, the enterprise is forced to work with barely literate personnel inside and outside of the company.

If a firm has a large proportion of illiterate personnel, usually it is necessary to build the organization around a relatively few competent, literate people. This means that the educational qualifications of the workers take precedence over other factors in

organizational activities. In such a low-literacy situation, a high degree of decentralization is almost impossible. Besides, literacy has an immediate effect on the span of control. The most common type of organization in an illiterate environment is a rather horizontal one, with a large amount of oral communication. It is extremely difficult to make use of written policies, procedures or methods, and planning becomes a difficult task.

The level of education in a given country affects other areas of management, such as control, supervision, personnel training and staffing, marketing and sales. Typical modern management control requires a system of written reports, paperwork, and the immediate need is to find people who can produce such documents. The control problem is compounded by the fact that in developing nations extensive control is required. Thus, in those countries, more time has to be spent in the training of personnel. Usually the training has to start from the very beginning with a basic literacy program. A shortage of qualified human resources occurs not only among workers and skilled laborers but also among the supervisors at the lower levels of management, particularly foremen. Firms unable to find the proper candidates for existing or new positions must usually either fill them with less capable persons or leave the positions unfilled. The staffing function tends to be exceedingly time consuming and expensive. In other areas such as advertising, literacy is important. In illiterate

societies firms are forced to make oral or pictorial contacts with their clients (and even the instructions for the use of the products need special designs). Likewise, salesmen must employ personal contact with clients and customers.

It can be seen that policy making in developing countries requires a complete knowledge of each of the particular problems and existing conditions in the many different areas of management. Therefore, except for the recognition of the marked effect of cultural and social influences, it is difficult to generalize concerning policy-making in the industries of developing countries.

V. MANAGEMENT PROCESSES AND OPERATIONS IN DEVELOPING NATIONS

Production Planning and Forecasting

The actual problem of planning involves obtaining the desired goals through the mobilization and allocation of resources in the best manner that time and circumstances permit.

Tentative quantitative goals always have their roots in the economy of the country in which the company is located. As long as the economy is relatively stable, the tentative goals will probably need to be changed only when performance within the company fails to meet long-run objectives. On the other hand, if the economy of the country is not stable, planning must usually be short-range, and objectives require frequent reexamination.

A potentially unstable political situation makes planning difficult. One job of the planner is always to appraise the possibility of political change, forecast the direction of that change and make plans which reflect adequate reaction to the anticipated situation. Careful planners usually have to make more than one assumption, and establish more than one goal in their plans, each to be effective when certain anticipated events take place. Such planning that represents successive decisions based on conditional alternatives, makes the use of decision trees very useful, with emphasis on defining ways of action

rather than on the probabilities of each event. At the same time, such a method may permit optimization at each level of decisions.

In developing nations there are so many imponderables that a good plan must allow for adaptive processes to take place, ideally building them into the plan itself. It also means that long-range planning is seen essentially as a sequence of short-range decisions, each as effective as possible, and each allowing only for as much of the future as is presently evident. Practically speaking, although planning should be adaptable, managers must be careful that this flexibility does not lead them to work without plans.

Subject to the conditions of fast change, lack of sufficient statistical data, and instability of some aspects of the environment, many of the classic tools of planning can be successfully applied, however, the applicability of mathematical models in decision making is limited by the lack of information available and the complexity the models required due to the number of uncertainties.

Market Forecasting

When sufficient statistical background information is available, market forecasting can be useful in projecting a probable trend, but the existing statistics usually cannot be taken too seriously without careful study of the underlying details. If no statistical data exist, or if the available information is not considered trustworthy, other means

must be employed by the planner to give some indication of what will probably occur in the future. One such method is judgment, based on the planner's experience and intuition.

Before any detailed study of a project is undertaken, it is essential for the planner to have a clear idea of the size and other characteristics of the market, including consumers, suppliers, competitors, and all kinds of technical, legal, and political restrictions. Markets in developing countries show a number of characteristics that determine the lines of investigation, some of which are the following:

- (1) When there is a large demand for the importation of a particular commodity, customs officials generally can supply statistics to determine the size of the market.
- (2) Since many markets are relatively small, the reduced number of firms in each field makes forecasting the potential market easier.
- (3) Geographical barriers, difficulties in transportation, and economic and cultural differences in the population cause markets to be very segmented.
- (4) Production techniques and a limited market may cause many existing firms to have plant overcapacity in relation to existing needs. This condition may be difficult to determine without access to internal information from the firms themselves.

- (5) In many cases there is not free competition, and other imperfections in the market may exist due to governmental actions.
- (6) Except for statistics from customs officials, there are very few data available to forecast consumption, and the existing statistics frequently require some type of verification before acceptance.
- (7) Many nations have the possibility of, or are already included in, some type of regional integration of markets.

The basic sources of information for statistical data are the regular publications of governments, trade groups, certain private enterprises, and some international institutions. The data published are usually demographic, economic, fiscal and commercial statistics.

Future Demand Forecasting

There are many possible methods for estimating future demand. Some of the methods which require statistical data are the following:

- (1) Projection of the trend, which is based on the assumption that the factors that determine the growth rate of production and consumption will continue. In general, due to the low stability that characterizes developing economies, this method is used for preliminary estimates only.

- (2) Technical coefficients, which are used in the forecast of future demand of intermediate goods, when the future demand of those goods is known (i. e., the demand of cement based on the number and kind of government contracts).
- (3) The level of imports, for items which it is anticipated may be locally produced rather than imported (import substitution).
- (4) Econometric simulation models which are based on past experience can forecast the future trend through simulation in a mathematical model containing all the variables and possible relationships. This method usually cannot be employed without a large computer.
- (5) International comparisons can be valuable if the countries selected for comparison are chosen with care. The type of data needed depends on the product and the main variables that can influence demand: prices, income, and competition.

When statistics do not exist, other methods of forecasting have to be used. The most common are:

- (1) Forecasting by sector of use, considering each category of potential users and defining the development prospects for each one of them.

- (2) Forecasting by national development targets, which usually are established well before current demand. In such cases, knowledge of public policies is crucial.

Purchasing

Purchasing is the function related with the acquisition of all the items associated with the industrial activity, and is carried on within a framework of six essential factors:

- (1) Type of material desired
- (2) Quantity needed
- (3) Quality expected
- (4) Delivery at specified location
- (5) Delivery at designated time
- (6) Purchase at the best price (10)

Whether a firm limits the purchasing activity to its local market or scans the international horizon for the best deals is very largely determined by local shortages, its capabilities of production, the restraints imposed by company agreements, and especially the restrictions imposed by the government in each country. Generally, the procurement of suppliers, reliable deliveries, reasonable costs, and adequate quality for parts and materials constitutes the most difficult problem that confronts management in developing countries,

and influences many other operations and processes. The problems of importing are different from those of local purchasing and require different solutions.

Problems of Importing

The acquisition of foreign exchange is one of the most common difficulties affecting developing economies. When the balance of trade in a country is negative, the government has to limit imports by requiring licenses and fixing import quotas for every firm and product. There is very little that a company can do to change this situation, other than obtain its import quotas and use them in the best way possible. This creates in each enterprise the need of an administrative section dedicated to dealing only with voluminous form filling and follow-up. Mistakes made in the application for import permits are very difficult to correct because new import permits have to be applied for each time a correction needs to be made.

Another source of difficulty is the long lead times in international procurement that, added to the time spent in obtaining import licenses, force companies to reorder at least six months in advance of needs to avoid stockouts. Still other delays result from a large variety of unpredictable factors not under the control of management. Consequently, and in spite of the difficulties, as accurate a forecast

of the market as possible is needed. At the same time, high safety factors in inventories are necessary.

In the area of maintenance, planning the requirements in tools and parts, and forecasting possible failures in advance calls for special care and training of the persons in charge.

Problems in the use and correct understanding of the terms involved in specifications are innumerable. Specifications are subject to considerable misinterpretation, and with the barriers of language, distance, and different systems of weights and measures, the possibility of receiving parts or materials which are not satisfactory is high. The supply of certain materials and parts becomes difficult in some places due to the climate, altitude, humidity and other similar variables. In many circumstances the variations are not considered or known by the manufacturers or buyers at the moment of placing an order (i. e., sealed insulated glass, used in some types of showcase freezers, explodes when transported over the Andes Mountains; pumps and engines do not work properly under certain conditions of temperature and elevation). In many cases special research and investigation to correct the variations is needed, but the suppliers, being far removed from the buyer, are not able to do anything practical to solve the problems. Buying at long distances produces such problems as missing parts, wrong dimensions, credit and payment controversies, long lead times and missed delivery dates.

Problems of Local Purchasing

Usually it is not possible to avoid procurement in the local markets. The costs of being self-sufficient are too high, and there are pressures from the governments that restrain imports and force local manufacturing. This makes local procurement unavoidable for most companies.

The problems in local purchasing are more numerous than those in foreign acquisition of materials, but there is the advantage of the supplier being physically closer, permitting a more direct action and control by management. Due to the lack of complete directories and catalogs, a difficult task in a developing country is identifying possible sources of supply (24). Although some manufacturing plants have the physical capacity to produce parts or materials for other firms, they often are not aware of their capabilities, and have to be alerted by the interested purchasing agent. A useful and often necessary means of locating vendors is for the purchasing executive to travel the area and then follow up the clues obtained.

A second problem in local purchasing is the one related to quality, understanding of standards, and capability of reading blueprints. In many cases local manufacturers are not able to provide good quality products due to inadequate equipment and lack of technological or management ability. In this case, good results can be

obtained by helping the vendors to implement programs of quality control in their plants. Similar causes and solutions exist in a related problem: delivery times. A variation in attitude toward the value of time is sometimes involved, but in most cases the delays are caused by the inability of the suppliers to schedule and control their production. Methods of scheduling and control such as Gantt Charts and PERT are very useful in this area and can be relatively easily implemented in the supplier's production.

Inventory Control

The problems encountered in the procurement of materials, both through imports and local purchasing, have notable influence in inventory policies. A general tendency in developing countries is to create a large safety stock that may give protection from stockouts, and buffer the effects of uncertainty in the acquisition of materials and parts.

The basic methods of control and use of inventories and the cost analyses involved are rarely well formulated in developing nations, and often do not seem to be understood. Generally the emphasis is on safety, and concern about costs is subordinate to concern for shortages. This creates a tendency to control the inventories by gross rules, rather than to concentrate the attention on the items that might produce difficulties. Large safety stocks have advantages but always

high costs as well, resulting from the expense of capital, storage, insurance, handling, obsolescence and deterioration.

Some of the most relevant factors that affect the control of inventories in developing economies are the following:

- (1) Governments fix import quotas on the basis of the previous year's production and the plans of expansion of each company. The quotas usually are valid only for a determined period of time.
- (2) Import permits are required for every order and have to be included in the previously fixed quota.
- (3) There is uncertainty about the quality of the products imported. This refers to the quality standards, as well as completeness of subassemblies, matching parts, and many other details.
- (4) There is uncertainty in the delivery times due to a wide variety of factors, many of which are completely unpredictable and uncontrollable.
- (5) The quality of local supplies is not constant, usually forcing a hundred percent inspection of those items, and frequent rejection of complete lots.
- (6) There is a lack of internal markets where substitutes may be bought.

- (7) There are other internal problems of control, especially in the area of security from thievery, mishandling, and deterioration.

Based on these and other restrictions, it is possible to establish models that may permit the study of the effects of different policies which will help to minimize the costs.

Other factors have to be considered, besides the cost of materials, when defining the priorities for control. Some of these are the following:

- (1) Possibility of acquiring substitutes in the local market.
- (2) Possibility of local production, even with higher costs and lower quality.
- (3) Possibility of buying in foreign countries without the need of production orders.
- (4) Possibility of use of air transport (depending on weight and volume of materials).

Usually those factors can be evaluated in monetary terms in order to use the concept of dollar usage in an ABC analysis.

Quality Control

Though it is usually difficult to maintain American standards of quality control in developing countries, and often it is unnecessary and uneconomical to do so, the products have to be manufactured

according to some standards. In spite of the fact that the standards may differ, it is usually possible and desirable to adopt quality control methods similar to the ones used in the U. S.

In the development of a program of quality control, the differences in specifications of materials and in supplier capability are problems of major concern. Difficulties also exist in labor, supervision, and management, but these have relatively easier solutions.

The basic requirements for establishing an effective quality control system are the following:

- (1) Adequate information must be assembled concerning the origin, performance, price, and availability of substitutes of local and imported materials.
- (2) Information should be established about local suppliers and their degree of conformance to stated standards.
- (3) The tolerance and variation range of particular equipment and for particular parts should be determined and inspection procedures adjusted accordingly.
- (4) The field performance of similar products made abroad should be studied in order to determine the changes in design, quality standards, and maintenance procedures needed in order to meet different environmental and customer requirements.

The adaptation of specifications to low production volumes and

local skills constitutes a formidable task and requires a high degree of technical skills. As a consequence, manufacturing firms are forced to use technical standards imported from other companies. This in turn creates new problems: the standards are unnecessarily rigid and designed to fulfill different needs, their application becomes unreal, and the feeling of unreality destroys faith in management techniques of quality control.

An intermediate solution seems to be more acceptable: importing the specifications and lowering them a certain proportion. The problem then is to determine the necessary amount of change or the amount of tolerance permitted in the standard. In any company there are at least three basic areas where principles of standardization can be applied: design, manufacturing and quality control. An important consideration for a developing country is that there is a lag in time between the development of technology and its appearance in standardization. For this period, the standards used have to be borrowed and applied permitting a larger degree of tolerance which changes according to each product or part. In the initial steps of production, for example, more attention is given to the quality of functional parts than to appearance. Lowering the standards also means a reduction in the variety of standards used, and simplification through the elimination of minor differences on parts, materials, products, and procedures. The most common sources of standards that can be used

in developing countries are the following:

International standards

Standards from foreign countries

National standards, if they exist

Industrial or customer standards

In the execution of the daily quality control activities, most of the problems involve people; education of the workers, work habits, capability of the supervisors, and stringency of control. These internal problems can, in general, be solved by adequate education and training of the work force and managers involved.

The quality of the procured materials and components is usually the most difficult aspect of quality control. Tight systems of receiving inspection and higher levels of reserve inventories are required.

Managers sometimes show lack of interest or understanding of systematic controls of quality when profit margins and product acceptance are satisfactory. Managers do not feel the need to reduce rejects to lower the cost of obtaining good quality. Total quality control of an entire process seems to be a concept that is not fully understood at most plants in developing countries. Quality control is much more apt to be seen merely as good inspection, and the function is organized at the lower levels of management, diminishing the organizational stature of quality control.

In recent years, quality control in developing economies has

markedly improved because of the enlarged markets and increased competition which motivates management to improve the quality and diminish the costs.

Operations Research

The basic research needed in developing countries is to find useful things for people to do, and efficient ways of doing them.

For many problems, Operations Research investigators will not be able to find solutions, but they can both broaden the range of the alternatives considered and reduce the number of alternatives from which policy makers can make a choice. They can also provide a better, even if incomplete, basis for choice.

Operations Research has to operate in developing countries with less and poorer quality data than is available in more advanced countries. But even gross approximations can often yield dramatic improvements in decision making. Many countries and industries in developing nations have a growing interest in Operations Research.

Similarly the idea of multi-discipline teams can be very useful in decision making, especially at the government development planning level.

Use of Electronic Data Processing

Decision makers in developing countries are plagued by

inadequate information at every level, resulting mainly from a lack in sophistication in management control techniques, or from a poor flow of information. Hence, there is a great need for better management information systems designed to improve the amount and quality of information that is available. A computerized information system can be seen as a good solution in many particular cases; however, cost and other technical and operational problems make it difficult to implement successfully such a system.

Usually there is availability of computer time in developing countries, and hardware is not a problem. At the same time, it seems that there is not any unusual demand of software that has not been met and implemented somewhere. Operational feasibility, on the other hand, presents problems of a different sort: The degree of computer acceptance by managers that are not familiar with the use of EDP systems, the availability of human resources capable of undertaking the design and maintenance of such a system and especially the cost involved.

The total cost of an EDP system in developing countries is in general prohibitive, but it may be conjectured that conditions will change in the future.

Sharing a computer seems to be the most convenient solution for industrial enterprises in developing countries, because it can provide

hardware and software, technicians, large memories, and many other conveniences, mainly the reduction in costs of operation.

Sharing a computer however entails other problems such as communication costs, or the possibility of one user affecting the files of others.

A gradual evolution may be foreseen in the use of EDP in developing countries, beginning with certain areas of control, and evolving to more sophisticated areas like large scale simulations, and strategic planning.

Maintenance and Durability, Secondhand Equipment

Although capital is relatively scarce and labor relatively abundant in many developing nations, the cost of skilled labor services of maintenance is usually high. Maintenance outlays are an important variable in the choice of appropriate labor-capital proportions in production, and in turn, the cost of maintenance can be affected by capital outlays in education of personnel.

Different management attitudes exist in relation to maintenance and its costs. In Latin America, for example, many enterprises use equipment for a longer time than it would have been used in a high-wage, capital abundant economy, but the emphasis is on repair, not on preventive maintenance. Decisions to repair or replace are usually made in each particular machine, and not in terms of any general

policy toward greater durability of equipment. Good preventive maintenance is hard to supervise and reward, but the pressures to spend money elsewhere also plays its part where there is shortage of capital, and the interest rates are high. Postponing maintenance is part of the general heavy discounting of the future that is almost a way of life.

The amount of longevity that is worth the expense of more durability in the equipment, or more maintenance, depends on the scarcity of capital and the existence and costs of maintenance skills. An initial outlay for greater durability--equipment of better quality in the sense of resistance against wear, tear, and corrosion--usually means that spending for replacement in the future can be postponed. An analysis of the costs of maintenance compared with the interest rates on the capital employed, shows that since interest rates are high in capital-scarce developing nations, and maintenance costs are relatively low because they are likely to be labor-intensive, there is less insistence on durability (6).

The same analysis can lead to another conclusion: the possibility of using secondhand equipment. If it pays to maintain equipment longer in low-wage economies, then importing equipment that industrialized countries are replacing must also pay. In developed countries wages are high and always rising, technology is displacing labor from certain jobs. Thus, maintenance and repair are least

advantageous. For this and other reasons, machinery in industrialized countries is put out of work earlier and in relatively good conditions for future use.

These considerations show that for most industries in developing countries, used machines can be a better buy, if the prices are determined mainly by demand in developed countries, permitting the investment of the saved capital at a higher rate of return. Nevertheless, experience shows that only a very small amount of used machinery is bought by developing countries. The main reasons for this are the following:

- (1) Credit and finance are difficult to obtain for used equipment, mainly because the firms that buy used equipment are small and without much credit. Preference for secondhand machines is associated with small scale businesses.
- (2) Need of technical assistance that usually is obtainable when buying new machinery from machinery makers does not exist in used equipment. In this case, scarcity of knowledge takes precedence over capital scarcity.
- (3) There are delays in obtaining parts from other countries. In this case the preference for new equipment is influenced by the distance from machinery producing areas, and problems of import licenses.

- (4) Reduced channels of trade and lack of information exist in the used machinery market. This creates uncertainty both in buyers and sellers in many different aspects of negotiation, credit, availability of spare parts, and accessories.
- (5) Prejudice exists concerning used equipment due to previous bad experiences, and especially the decreased glamour of using secondhand equipment.

Labor Relations

Labor relations in developing countries seem to pass through different phases, depending on the degree of development of the general environment. Many countries in Asia (19) and Latin America are examples of agricultural societies in which the population moves toward the cities where the establishment of industrial production is in its beginnings. Work legislation is usually existent and effective at early stages of their industrialization. Governments establish the framework and draw up regulations to ensure safety, good conditions of work, minimum wages, etc. Legislation in many cases is inspired by the current laws of highly industrialized countries, and provide forms of social security, medical care, and other social benefits.

In the first stages, workers must make adjustments to the life in an industrial environment. At this point, where the values of

traditional society still persist, the employer is usually forced into a paternalistic relationship with his workers, whether he desires it or not. This stage is characterized by social immobility and low levels of innovation and technical skill.

The transition to a more stable situation requires an avoidance of paternalistic practices through externalization of the functions not directly related to the business, and fulfilling the requirements of the workers indirectly through local governments.

Gradually attitudes become more like those in industrialized countries--over a period of time workers become more dependent on their jobs in industry. They show more concern for security and there is an increased cohesion in the labor unions. From country to country, legally imposed conditions vary substantially regarding procedures for determination of wages, structural relationships, labor representation in management of the company, employee participation in profits, etc.

Selection and Training of Personnel

Careful employee selection is important because it influences productivity and work relations. In the selection of laborers in developing nations, interviewing appears to be most important because the selection has to be based mostly on intuition. Since usually there is underemployment, it is relatively easy to recruit workers. But at

the same time, there is scarcity of workmen with the required skills and education. Here, the concept is valid that laborers are not born but have to be created. Two different policies are used in personnel selection: (1) Hiring and training men who have relatively low skills but show promise, avoiding workers that have some skills but possibly bad work habits, or (2) hiring only highly trained people. The second alternative is the ideal, of course, but becomes difficult to accomplish in the face of the scarcity of qualified labor.

The quality of the workers is not only a consequence of their initial skills, but even more of their potential for development. Education, literacy in particular, is the basic element that should be considered. At the same time attitudes and personality traits are critical. The ability of a person to adjust to the disciplined routine that is part of normal industrial life is probably the most important characteristic to be considered.

Extensive training operations are typically carried out in order to provide the workers with the necessary fundamental knowledge and skills, but adjustment of the men to new social environments requires more than training. Many basic concepts have to be modified in the employees. The more important changes involve the concept of time, acceptance of authority, development of self-discipline, mutual cooperation and teamwork, and commitment to the job.

Training of Work Force

Usually workers have the ability to learn the required skills fast and easily. Studies in international operations (9) show that this is the concensus of American companies operating in developing nations. However, the training of a work force does pose problems.

It is necessary to distinguish between training for knowledge or specific skills and training for judgment. Knowledge and skills can be instilled rapidly, but the development of judgment is more troublesome. Judgment is a necessity for the worker if he has to operate independently--be resourceful in overcoming work stoppages and changes in design, or recognize problems for the maintenance of machinery. As competition increases and fewer imported parts are permitted, the companies need to progress to more complex operations, and workers must improve their skills. Thus, it is important that training not be merely for particular jobs but for industry and industrial life.

In order to overcome the problems of training in the factory that may represent heavy losses and costs, some countries in Latin America have created cooperative systems between government and private industry to establish training centers that provide instruction both in skills and adaptation to industrial life.*

*Colombia is a good example of this practice. Its national vocational training system, SENA, gives one to three years training courses, in more than 150 different skills.

Supervision

The functions of planning and control extend to motivating subordinates to proper performance, and to securing and maintaining those conditions in which this proper performance is reasonable and possible.

Supervisors are the links between the workers and higher managers. Their function has long-range effects on productivity and labor relations. First-line supervision is usually a weak link in developing countries. Communication problems exist either with the higher managers or with the workers, and in most cases it is difficult to find supervisors capable of coping with the conflict they feel between loyalty to their superiors and to their subordinates. As a result, many high-level managers tend to deal directly with the workers, dividing jobs into more specialized functions so that they require less supervision. Labor supervision is often handled at higher levels, even though high individual worker productivity is thus usually lessened.

Supervisors are promoted in most instances from within on the basis of their ability, but they have to face the problem of a lack of cooperation of the workers who resent the idea of having internally promoted supervisors. The other alternative--obtaining supervisors from outside--is better accepted by workers but usually causes

subsequent problems because the new supervisors do not know the operation as well as the workers themselves.

A careful analysis and evaluation of the skills, attitudes, and customs prevailing in a particular plant and their effects on the supervisors' performance is fundamental. Based on the results of this evaluation, programs should be designed that may help to overcome weaknesses through adequate training, improved personnel practices, and better salaries.

Direct Labor Productivity

Low productivity of direct labor seems to be generally accepted (25). Lack of information about labor productivity and lack of standards are the main causes of poor controls. If there is no rational analysis to provide some standards of work, actual performance cannot be realistically evaluated.

The transplanting of work standards from one country to another generally creates resistance in the workers. Likewise, top management is skeptical because the difference in conditions of work and machinery used. However, even transplanted standards cannot be strictly applied, job definition and methods and industrial engineering approaches are useful.

There are no time studies or IE departments in factories of developing countries, and the notion of time study is generally

considered to be too sophisticated, considering the stage of development of the other functions of management. A partial explanation of the low interest in time studies is that direct labor is viewed as cheap and fixed, and that in many cases low direct labor productivity can be attributed to poor supervision rather than to lack of standards.

Management Staffing

Finding, developing and compensating managers is a challenge for every company, and yet there are no absolute or complete guidelines to accomplish this important function. There are two basic requisites for management in developing countries: an effective understanding of the environment, and an equally effective understanding of the needs and methods of each particular enterprise.

For many companies in Latin America, locating management personnel is more a matter of taking advantage of opportunities presented by chance than a systematic search for talent.

Usually companies recruit and train managers belonging to three major categories: technical personnel, sales officers, and financial executives.

In their attitudes toward the selection and promotion of managers, many executives still believe that practical experience, or at least training within the company, is the only kind of background that counts. However, there is growing support for the idea of systematic training

for management and emphasis on personal traits, such as the ability to work with a team and to get along with people.

Most managers consider the combination of academic and practical training ideal. The availability and quality of managers varies widely from one country to another. Latin America, for example, does not have the trained management pools that can be found in developed countries, where locally hired executives as a rule need only an intensive steeping in the particular methods of the company that hires them. On the other hand, there is not a complete lack of managerial talent.

Considerations of seniority differ from country to country according to differences in culture and historical background. Due to existing environmental conditions, training emphasis on attitude, rather than on aptitude and technical skill, is considered in many cases most important. The question of training abroad receives mixed reactions (75), mainly because of concern for the differences in the developing nations' technical and human aspects of management. However, it seems to be generally accepted that technical training in developed countries is very valuable and, unless it is excessively specialized, it can be readily applied anywhere.

VI. TRANSFERENCE AND DIFFUSION OF TECHNOLOGY IN DEVELOPING COUNTRIES

Transfer of technology is the planned and purposeful diffusion of technology. The intent manifests itself by conscious, predetermined effort and a commitment of resources to transplant technology from one country to another, or from one use to another.

The transfer of technology is a process that integrates a large number of highly complementary elements. Thus if one element is missing, the other elements will be useless, or their effectiveness will be highly reduced. These basic elements can be divided into three broad categories:

- (1) Social systems, institutions, and human attitudes
- (2) Knowledge and human skills
- (3) The physical elements in which modern technology is embodied

The speed of change in each one of these elements tends to be slow and irregular, creating bottlenecks in the process of transference. The location of the main bottlenecks, which differs among cases, should decide the strategy and type of development. In some cases equipment is not available; in others, equipment exists but human attitudes and social systems offer resistance to change. In still other situations there is no scarcity of people with an adequate technological education. Even the necessary capital equipment may

be available, but the managerial skills may be missing. All this creates the need for a coordinated program that encompasses all the variables influencing the process of technological development.

The Process of Technological Development in Developing Countries

Management's objectives should include not only the capacity to obtain maximum productivity and efficiency, but to make adequate use of the technology, given the particular circumstances of each industry. The development and successful application of any specific innovation in a given economy depends essentially on the existence of men with new ideas and with the capacity to forge these ideas into concrete realities. Thus, technical development is a continuous process that includes the creation of the knowledge (investigation), the diffusion (transference of technology), and the application of the knowledge (technical innovation).

There must be a continuous chain of inter-connections between the creation, the transference and the utilization of knowledge in order to convert the results of the investigation in technical innovation. It is not useful to create new knowledge if it is not incorporated into the production process. At the same time it can be harmful to give attention only to the utilization and not to the creation of new knowledge.

The concept of technical development permits comparison with an economic process of the production, distribution, and consumption of an intangible good, "knowledge." The three stages of technical development are governed by the laws of supply and demand and other conditions of the market of technology.

It is difficult to set a price on technical knowledge because it can be "capital-embodied" (incorporated in machinery and intermediate goods); "human-embodied," (incorporated in the knowledge and experience of technicians); and "disembodied," (incorporated in documents, manuals, specifications for products and processes, and patents) (12). In its "disembodied" and "capital embodied" aspects, technical knowledge can be treated like a tangible good or a merchandise, but in its "human embodied" aspect, it becomes difficult to establish its value.

This analogy between the transference of technology and the marketing process clarifies the problems of the commercialization of technology in developing nations: the consumption of technology is small, with a small demand, and with a limited capacity of production. This creates a supply of low quality and high cost, which in turn reduces the size of the market and the demand, forming a vicious circle. The problem is compounded by the fact that because the demand for goods is often satisfied by imports, the pressure for internal technology is diminished. Usually the only way of breaking

the vicious cycle is through government intervention to control the imports of goods and to subsidize research and development, increasing and promoting in this way the internal capacity of production.

Two additional components have to be considered in the transference of technology:

- (1) It is not an exterior element to the general development of a nation, since the degree of development affects all the elements of the transference.
- (2) The importing of technology requires a capacity for absorption that can be reached only if there exists a good scientific and technical base in each industry and in the country as a whole.

When the transference of technology is not controlled by the government, the knowledge to be transferred "by-passes" the national systems of technology, eliminating the recipient country from participation in the process of transference. Because of this, the technology is not adapted to local conditions or properly diffused. Students of economic development have been troubled by the phenomenon, which they speak of as "economic or technical dualism."

It might be said to be the co-existence of islands of technology embodied in industrial enterprises in the midst of relatively primitive economics of oceanic proportions (7). These industrial "islands" have usually been financed by interests outside of the developing countries, and have been built and continuously operated by the initial

persons. In some cases, the industrial enterprises have become largely indigenous but still remain "islands." In short, technology--mainly the capital-embodied--will work almost everywhere, but it will affect the lives of only those who are in direct contact with it, without contributing to the general technological development of the country.

The Cost of Technology

In the process of commercialization of technology, sellers and buyers have different considerations of marginal costs. For the seller or owner of the technology, the process of selling a technology does not include any extra cost for that technology, and his marginal cost is equal to zero or is very small. On the other hand, for the buyer the marginal cost for the development of a technology by his own means could mean very high costs. Frequently, the receptor is not able to develop that technology by himself, and in this sense his costs become infinite.

The prices of technology are determined mainly on the basis of the relative capacity and power of negotiation of the buyers, given the possibilities of the market. Here, one of the imperfections of the market of technology is evident: the recipients' lack of information or knowledge about the technology that is to be purchased. But if such complete information concerning the technology were furnished to the

buyer by the seller, the necessity of the purchase would be automatically nullified. Hence, arrangements are ideally handled through specialized government agencies of the negotiating nations, though such governmental intervention usually slows down the transaction.

The following considerations are cited as the most relevant in negotiations for technology (27):

- (1) The receiving nation (company) negotiates from the weak side, and usually makes excessive concessions in the initial agreement.
- (2) There is no knowledge of similar contracts that can serve as examples.
- (3) The negotiating capacity of the buyers is generally low.
- (4) There is not sufficient strength in local or international law to force fair negotiations.
- (5) In many cases, and in the long-run, the vendor has to compensate the buyer because of pressures that follow the initial agreement.
- (6) The vendor frequently forces tying contracts, which require the buyer to purchase parts or raw materials as a condition of getting the technology.

Given these considerations, the explicit cost of the technology paid through royalties is only a part of the total cost, and additional hidden costs may exist.

Other factors that can be included as a cost are the right of the vendor (explicit or not) to intervene in the decision-making processes of the buyer, imposing restrictions on export, fixing the structure and level of production, fixing the sale prices of the products, and forcing the utilization of technical personnel in certain areas of production.

Relationship of Industrial Development and Technology

The technological needs of industry can be filled by the internal (national) system of science and technology, or by external sources. In industrialized countries it seems to be a balance between the two sources, but developing countries show an evident disproportion between the national creation and the imports of technology.

The existence of imports of technology is not negative by itself in developing countries, but it creates dependence on foreign knowledge, a situation where technical progress becomes extremely expensive, and where there is no freedom of choice for entrepreneurs. A reduction of technological dependence means incrementation of the freedom of choice between the national production of technology and the different international alternatives of buying it, and requires:

- (1) To have the capacity of processing imported technologies (selection, adaptation, and improvement).

(2) To have capacity for creating national technologies.

In this respect there is also an analogy between technical and economical development: reducing the technological dependence does not mean a reduction in the imports of technology in the same manner that a diminishing economic dependence does not force a reduction in the imports of goods. On the contrary, when a nation has technological progress, the foreign trade of technology usually advances simultaneously. Japan constitutes a very good example of this fact.

The Mechanisms of Transference of Technology

The most used mechanisms of transference of technology are foreign investment, contract licenses for production, and the transference of non-commercial technical information.

The degree of relative utilization of these mechanisms depends on a number of different factors, but mostly on the policies of both the receiving countries and the strategies followed by the exporting firms.

Multinational enterprises seem to prefer the direct investment through the establishment of subsidiaries that are totally owned and consequently may avoid license contracts. On the other hand, developing countries prefer to import technology and buy licenses and know-how, over joint ventures, and finally prefer these to the direct investment through subsidiaries of multinational companies.

The central point to all these different tendencies is the control of the enterprises. Multinational companies prefer direct control because they want an efficient administration which requires centralization and coordination of decision-making. On the other hand, the general strategies of multinational business with the idea of total optimization forces them to adopt policies that in numerous cases run against the particular interests of a particular subsidiary, other local business, or the national plans of development of the country. This fact usually creates fear in developing countries and explains their preference for direct acquisition of know-how.

Innovations in technical knowledge are to a large extent created in the course of productive operations. Progress in science as an academic study, makes a fundamental contribution to the technical knowledge applied in production. However, many innovations of technical knowledge are also created by people trying to solve operational problems within producing units. Such innovations of technical knowledge are made at all levels of operations by management, marketing, and engineering personnel, and by workers at their machines.

The extent to which technical knowledge flows from the field of industrial operations into a common fund of technology depends upon the functioning of the communication system that theoretically connects industry with the common technical knowledge pool.

Technical assistance in the industrial field provided by international and government organizations has been restricted mainly to surveys, advice, and general information. Only in exceptional cases do experts from such organizations participate in the establishment of new industrial units. The necessary know-how is usually found in industrial firms or in consulting firms specialized in the transference of know-how. It would be natural and probably more effective if the technical assistance programs would be made with the direct involvement of such firms, even in cases in which the method of direct investment is not used.

The activities of public technical assistance organizations should be coordinated with the activities of private firms in this field. Consulting firms are only exceptionally organized to transfer know-how by participation in industrial operations covering complete industrial units. Their activities seem to be restricted mainly to surveys, advice, and information of similar types. They often cover only one special part of industrial operations, for example, certain management aspects. It seems that there would be a large market for the services of consulting firms that went one step further and extended their activities into temporary participation in operations covering complete industrial units.

On the other side, the capacity of a country to absorb the technology depends on it possessing a trained corps of technicians.

Only fully-trained and competent professional working in a team are capable of assessing the merits of the technologies developed abroad, and make wise choices on which technologies to import. Japan is a country that demonstrates this view (2). Much of Japan's successful growth has been due to her systematic purchase of "appropriate technologies" from abroad. The choice of technologies was aided by the fact that Japan possessed a body of competent scientists and engineers who for the most part were employed by the government and worked in government laboratories.

The technological services of private or government agencies should include on-the-ground assistance in technical and market feasibility studies, pre-project planning and costing, applied scientific research and development (mainly to improve products and by-products, cost reduction, use of local materials, or adaptation to local production conditions), plant location, efficient factory layout, materials handling, standardization and quality control, technical trouble-shooting, emergency improvisation, modern cost accounting, and the full spectrum of production engineering and technical management counsel.

The intervention of government in technological development is specially advantageous and necessary in the case of small industries. Even though large factories are a characteristic feature of a modern industrial economy, they are not the whole of it. Despite the well

known "economies of scale," manufacturing is not always and everywhere more economical in large than in small establishments. This is true even in highly industrialized countries, and more in developing countries where markets are smaller, and there is less experience with large-scale organizations.

In most of the industrial development programs, too little attention has been paid to the benefits to be gained by helping existent small industry to modernize, and by stimulating the growth of new, modern small industry. Small industry means manufacturing carried on in relatively small establishments that have some characteristics which distinguish them:

- (1) The small manufacturing firm usually depends on "one-man management"
- (2) It does not have bargaining strength in buying or selling
- (3) It usually lacks access to capital and credit
- (4) Often it is relatively integrated in the community through ownership and management

The following checklist can be useful to select what types of practical development aids should be considered in designing a positive program to improve the efficiency and promote the growth of small and medium industry:

- (1) Industrial advisory or counseling services in economic, business management problems, and technical production problems.

- (2) Aid in procurement of materials and equipment, and promotion of bulk-purchasing through cooperatives or government agencies.
- (3) Industrial training services in management techniques, supervisors, foremen, and skilled workers.
- (4) Industrial research services, in order to adopt the best available technology.
- (5) Financial aid through counseling and appropriate institutional devices.
- (6) Formation of industrial parks, that provide utilities, transportation, etc., not available in other places.
- (7) Marketing aids, basically information, market surveys, trade directories, and contact with larger firms (26).

Each country requires a set of measures adapted to its own situation and valuable ideas can be obtained by studying the experiences from other countries; i. e., the United States has an active "Small Business Administration," the Scandinavian countries, other European countries, India, Japan, Mexico, Brazil, Colombia, Indonesia, Burma, Pakistan, The Philippines and others, are using various techniques of small industry promotion.

In general, it can be seen that the management of technology cannot be pursued at the individual level without the danger of serious losses, and that any program of technological development has to be established at national levels. What private managers or

entrepreneurs do depends essentially on the national situation and the international established means of acquiring the needed know-how for the particular industry.

VII. CONCLUSIONS AND RECOMMENDATIONS

The purpose of this work has been (1) to describe and analyze the most significant problems encountered by managers of manufacturing plants in developing countries, taking as a basis of comparison the American managerial techniques, and (2) to suggest approaches and points of view that can be useful to managers and students of management that have an interest in developing countries. This final chapter focuses on broad fundamental conclusions derived from the discussion in the previous chapters.

Industrialization plays an important role in the general development of a country and is affected by many environmental variables. In order to establish managerial pathways in developing countries, the complete picture, which involves all the environmental and human variables, has to be considered as a whole.

With respect to the applicability of American managerial techniques in developing nations, it can be concluded that the scientific aspect of management is universal and can be transferred to a developing area to be used there with full efficacy. At the same time, there is another part of American management that lacks universality, interpersonal relationships. This lack of universality necessitates changes in the way in which the scientific or technical aspects of management are applied.

There is a great amount of wisdom and know-how concerning American management that can be employed in developing nations in dealing with the workers both individually and collectively. This knowledge is in the form of attitudes and practices conducive to effective human relationships. It must be recognized too that labor relations develop in a step-wise chronological order through a series of transitory stages which are similar from country to country. This fact may be very useful in order to predict future developments or moderate the inevitable stresses in labor relations by using the past experience of more industrialized countries.

Policy making and production organization have to be adapted to the existing environmental conditions such as size of the markets, productivity of the work force, literacy and education, and stability of the economic and political conditions. Lack of organization is a common problem in developing countries and a vicious cycle may develop in which poor organization and planning result in less planning and infrequent reappraisal of the existing structure. This results in relative inflexibility of the organization which in turn leads to less planning and inadequate balance among the various management functions.

Managers in developing countries have many more contacts with, and consequently more dependence on, relationships with the government which require skills not usually associated with

manufacturing in the U. S. In developing nations the governments usually have a higher degree of involvement in industrial activity and in the general planning of the economy. It is important for management to understand the basis of government actions in order to establish adequate policies and proper attitudes.

Knowledge of sociological and cultural factors, attitudes, values, and beliefs of people, and the relationship between motivations and performance of individuals and groups is very important in order to select the appropriate managerial techniques to be applied and the form of application. These factors usually differ from one culture to another and require different approaches.

Industrialized control of workers' productivity is thought to be unnecessarily and excessively sophisticated by developing countries. In many cases the emphasis on control is less than it might be because of the low cost of direct labor. In the long run this creates bad precedents regarding normal productivity which are difficult to break. Work standards have to be established in relation to the local working conditions. Relatively little know-how about industrial engineering is available in developing countries and the industrial engineering point of view is too infrequently employed. This is precisely the gap that should be filled: development of processes and methods to fit the environment. Industrial engineering education is

an area that is essential to developing countries and should be emphasized.

Productivity control is hampered by a shortage of trained middle management, and this usually forces decision making to the top levels, decreasing the importance of middle management, creating information gaps and controls which are loose and not well identified. The development of middle management to effectively achieve better controls and the recognition that there is a fruitful payoff in doing a better job in this area will bring about improvements over a period of time.

Quality control encounters problems of definition of standards and specifications for materials and parts, of insufficient supplier capabilities, and inadequate discipline of the work force. More information in this area of management is a common need.

Inventory controls are notably influenced by the difficulties encountered in the procurement of materials. Here the emphasis is usually on safety, leading to large protection stocks and correspondingly higher costs of inventories. A better analysis of the factors involved is required in order to establish models that may lead to better solutions.

The selection of equipment and processes is directly influenced by the environment and the firm's objectives in relation to the use of technology. To be effective and viable, a production system must be

congruent with the environment. The respective governments usually play an important role in the national level of technology, and in the way technology is imported and adapted. An important decision area involves the selection between capital-intensive and labor-intensive processes. There is a wide diversity of opinions about this subject. In general, it seems that a better use of capital and labor can be obtained through the utilization of secondhand equipment that can be purchased in more industrialized countries. Decisions concerning the utilization of equipment, both original or for replacement, and equipment maintenance are usually considered to be rather technical and specialized, but equipment and process selection is more a matter of technological strategy than a mere technical evaluation.

The cost of technology can be excessively high if the purchasing negotiations are not conducted through the proper channels. For small and medium size firms, direct negotiations are difficult to accomplish and governmental intervention is needed. Governmental actions usually take the form of surveys, advice, and general information. However, it seems that both public and private consulting organizations can perform a better service if they have temporarily a direct participation in the operations of a firm involving all industrial processes.

The capacity of a developing country to assimilate advanced technology requires the capacity to recognize the feasibility of transference of a given technology, the physical capacity to adapt the

technology to the environment, and the capacity to restructure the context of operations to provide a more hospitable environment for the new technology. All these requirements usually can be met only through planned governmental actions, and are very difficult to accomplish through individual efforts.

Government action can create a more hospitable environment for industrial development, not only creating a more stable economic and political situation, but through the improvement of the technological facilities and technical agencies to serve private industry, education of the work force, with better use of the management talent through programs of cooperation. The utilization of the available management talent through government agencies can prevent at the same time the "brain-drain," that is a characteristic of many developing countries. Emphasis should be put in the development of industrial engineering education, and in the propagation of management techniques among managers of developing countries. All development plans should include technology and management as one of the essential elements.

Many areas in relation to management and technology in developing countries require further study. Some of these are related with the implementation of particular techniques for determined countries, other more general, can include such areas as the selection and procurement of secondhand equipment, development of programs and

models for the different areas of management such as quality and inventory controls, work and quality standards, programs of work and structure of technical consulting firms, development of an education plan for Industrial Engineering in developing countries.

The following table may be useful in visualizing the effects of the environment on production operations. This type of analysis may be useful in setting guidelines for achieving congruency of a firm's production system with its environment.

Table 1. Resumé of the effects of the environment on production operations.

Environment Variables	Which Generate (primarily effects)	Leading to Differences in (with reference to the U. S.)	Which Require Firms to Change (in relation to American Management)	
			Policies	Processes
Cultural	Personality Characteristics (Individualism)	<u>Values</u> (Time, money, material goods)	Organization	Information Systems
	Attitudes toward Business (General development, nationalism)	<u>Family Business</u>	Interpersonal Relations	Management Staffing
	Low Output per Man (Overpopulation, Cheap Labor)	<u>Traditionalism</u>	Size of Firms	
	Technical Level (Low, low mechanization, know-how)	<u>Productivity</u>	Wage System	Hiring Practices
Education	Skill of Labor (Low training)	<u>Institutional Paternalism</u>		
	Managers (By birth, familiar loyalty)	<u>Selection - Training</u> <u>Capital vs. Labor Intensity</u>	Education	Training Supervision
	Engineers (Broader knowledge, no specialists)	<u>Technology - Independence</u>	Staffing Middle Manag Organization	Scheduling
	Illiteracy (High percentage)	<u>Transference of Technology</u>	Technology - Strategy	Work Design
	Urban/Agrarian Societies (New Industrial Environment)	<u>Controls</u> (span, type)	Standards	Performance - Standards Supervision
	Social Barriers (Of different types)	<u>Incentives</u> <u>Specifications - Standards</u>	Choice of Equipment Relations with Community	Quality Control
	Population Mobility	<u>Plant Location</u>		Planning Forecasting
	Position of Minorities	<u>Supervision</u>		
Sociological	Population (Size, composition, rate of growth)		Automation	Maintenance
			Marketing	Important Adapt Technology

(Continued on next page)

Table 1. (Continued)

Environment Variables	Which Generate (primarily effects)	Leading to Differences in (with reference to the U. S.)	Which Require Firms to Change (in relation to American Management)	
			Policies	Processes
Economic	Drive for catch-up (Industrialization, fast changes)	<u>Type of Equipment</u>	Products	
	Markets (and Common Markets) (Size, composition, suppliers, materials, free competition)	<u>Inventory</u>		
		<u>Procurement Organization</u>	Supply Organization	Purchasing Inventory Control
	Availability of: foreign exchange capitals (cost)	<u>Dependence on Foreign Problems</u>	Investment - Expansion Credit	Sales
	Foreign Inversion (Security)	<u>Plant Utilization</u>		
	Utilities (Electricity, water, etc.)	<u>Investment</u>	Accounting Procedures	Plant Location
		<u>Ability to Borrow</u> <u>Taxes</u>	Information - Systems	
	Transportation (National, International)	<u>Operating Margins</u>		Lead Times Schedules
	Price Stability (Inflation, devaluation)	<u>Purchasing Power</u>	Ownership	Government Liaison
	Legal - Political	Institutions (Democracy, Bureaucracy)		Vulnerability (Political, economic)
Import Restrictions (Permits, Licenses)		<u>Control from Government</u>		
Legal & Political Stability (Short-run is important)		<u>Ability to Import</u> <u>Low Risk-taking</u>	Relations with Government	
Growth			Political Involvement	

BIBLIOGRAPHY

1. Ayres, Clarence Edwin. *The theory of economic progress*. New York, Schoecker Books, 1962. 317 p.
2. Ballon, Robert J. *Joint ventures and Japan*. Tokyo, Japan, Sophia University Press, 1967. 138 p.
3. Baranson, Jack. "Un Programa de Tecnologia Creativa para Ayudar al Desarrollo Economico de los Paises menos Desarrollados." *El Trimestre Economico* XXX, No. 17, January-March. 1963. p. 33.
4. _____ *Manufacturing problems in India. The Cummings diesel experience*. Syracuse, New York, Syracuse University Press, 1967. 146 p.
5. Bhattasali, B. N. *Productivity and economic development*. Tokyo, Japan, Asian Productivity Organization, 1971. 173 p.
6. Blitz, R. "Capital Longevity and economic development." *American Economic Review*, June, 1968. p. 313.
7. Clower, Robert W. *Growth without development*. Evanston, Illinois, Northwestern University Press, 1966. 385 p.
8. Farmer, Richard and Richman, B. "A model of research in comparative management." *California Management Review*, Winter, 1964. p. 55.
9. Fayerweather, John. *Management of international operations*. New York, McGraw-Hill, 1960. 604 p.
10. Glasser, Joseph. *Fundamentals of applied industrial management*. Dubuque, Iowa, W. M. C. Brown, 1962. 575 p.
11. Gonzales, Richard and McMillan, C. "The universality of management philosophy." *Journal of the Academy of Management*, Vol. 4, No. 1, April, 1961. p. 33.
12. Halty, Maximo. *Produccion, Transferencia y Adaptacion de Tecnologia Industrial. Seminar on Industrial Development and Integration in the Andean Countries*. Paperback. Bogota, Colombia, 1971.

13. Harbinson, H. and Myers, Ch. Management in the industrial world. New York, McGraw-Hill, 1959. 413 p.
14. Koontz, Harold. "The management theory jungle." Journal of the Academy of Management, Dec. 1961. p. 174.
15. Lauterback, Albert T. Enterprise in Latin America. Ithaca, New York, Cornell University Press, 1966. 207 p.
16. Meier, Gerald M. Leading issues in economic development. Stanford, Oxford University Press, 1970. 758 p.
17. Miles, Lawrence D. Techniques of value analysis and engineering. New York, McGraw-Hill, 1961. 267 p.
18. Moyes, A. and Hayter, T. World III. A handbook of developing countries. London, England, Pergamon Press, 1964. 152 p.
19. Myrdal, Gunnar. Asian drama. New York, The Twentieth Century Fund, 1968. 3 volumes. 2284 p.
20. Oberg, W. "Cross cultural perspectives on management principles." Journal of the Academy of Management, Vol. 6, No. 2, June, 1963. p. 129.
21. Prasad, S. Benjamin and Negandhi, Anant R. Managerialism for economic development. The Hague, Gunter Beyer and Martinus Nijhoff, 1968. 170 p.
22. Riggs, James L. Production systems: Planning, analysis and control. New York, Wiley, 1970. 604 p.
23. Robinson, Richard D. International business policy. New York, Holt, Rinehart and Winston, 1964. 252 p.
24. Skinner, W. "Procurement for international manufacturing plants in developing economies." Journal of Purchasing, February, 1967. Vol. 3, No. 1. p. 5.
25. Skinner, Wickham. American industry in developing economies. New York, Wiley, 1968. 278 p.
26. United States Papers prepared for the United Nations Conference on the Application of Science and Technology for the Benefit of Less Developed Areas. Science, Technology and Development. 12 volumes. Washington, D. C., U. S. Government Printing Office, 1963.

27. Vaitzos, C. V. *Estrategia y la Comercializacion de Tecnologia: El Punto de Vista de los Paises en Desarrollo*. Paperback. Bogota, Colombia, 1970. 36 p.

Additional References

1. Baranson, Jack. "Transfer of technical knowledge by international corporations to developing economies." *American Economic Review* LVI, May, 1966. p. 259-267.
2. Banco Interamericano de Desarrollo. *Las Inversiones Multinacionales en El Desarrollo y la Integracion de America Latina*. BID, Bogota, Colombia, 1968. 401 p.
3. Banco Interamericano de Desarrollo. *El Proceso de Industrializacion en America Latina*. BID, Guatemala, 1969. 332 p.
4. Branner, T. R. and Hodgson. *Overseas management*. New York, McGraw-Hill, 1965. 238 p.
5. Chenery, H. B. "The application of investment criteria." *Quarterly Journal of Economics* LXVII, Feb. 1953. p. 76-79.
6. Farmer, Richard and Richman, B. *Comparative management and economic progress*. Homewood, Illinois, Richard D. Irwin, 1965. 436 p.
7. Fenn, Dan Huntington. *Management in rapidly changing economy*. New York, McGraw-Hill, 1958. 339 p.
8. Hirschman, Albert O. *The strategy of economic development*. New Haven, Connecticut, Yale University Press. 217 p.
9. Neuman, W. H. and Logan, J. P. *Business policies and central management*. Cincinnati, Ohio, Southwestern, 1965. 948 p.
10. Prasad, Benjamin S. *Management in international perspective*. New York, Appleton-Century-Crofts, 1967. 282 p.
11. Stonehill, Arthur I. *Readings in international financial management*. Pacific Palisades, California, Goodyear, 1970. 263 p.
12. Tannenbaum, Frank. *Ten keys to Latin America*. New York, Vintage Books, 1962. 237 p.