Productivity in Underdeveloped Countries

by

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Some of the less industrially developed countries, in their efforts to achieve rapid economic progress, are devoting much thought to programmes for raising productivity in all sectors of the economy. In such programmes there is sometimes a tendency to emphasise one item—capital investment—at the expense of others. The following article stresses the importance of other items, such as the improved utilisation of manpower, equipment and material and the expansion of industrial engineering methods, and suggests that there should be in each of these countries, as part of the productivity programme, a number of specialised centres to give information on these subjects and to provide training.

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IN the numerous studies dealing with the economic expansion of underdeveloped areas the problem of productivity is usually discussed as an aspect of the broad economic issues related to the problem of industrial expansion or in terms of a detailed account of what has been accomplished in a specific community or enterprise. That is not the intention in this article. No recommendations will be made concerning the economic prerequisites for a productivity programme nor will specific instances of increased efficiency in particular plants be quoted. Instead, an attempt will be made to describe the organisations required, somewhere within the national framework, if expanding industries are to receive the guidance and assistance that are necessary to their early development.

The generalised recommendations contained here are based on two years of observation in a rapidly developing country—Israel. Many of the organisations listed have already been established there, and are making a significant contribution to the increases in productivity that have been observed. However, several of the organisations do not yet exist in that country, and their absence may be readily discerned.

The problem of increasing the productivity of a particular undertaking is essentially the problem of increasing the degree of application of various techniques at all levels of the organisational hierarchy. In Israel experience seems to indicate that the most effective means of furthering the use of new techniques is a broad programme of education in their use. Consequently it is primarily educational activities that will be emphasised.

The Concept of Productivity

It is unfortunate that in so many of the treatises on productivity the term is interpreted as output per man-hour. While for purposes of statistical measurement and for certain other purposes it may be necessary or convenient to relate output to the input of a single factor only, and while special interest may attach, for various reasons, to the productivity of labour, the choice of only one concept of the general term " productivity " is unfortunate, since it seems to imply that an increase in productivity necessarily means an increase in production per man-hour—and therefore either more production (with possibly concomitant distribution problems) or less labour (with possibly serious technological unemployment). Productivity is by no means limited to this interpretation alone, despite the fact that output per man-hour is a convenient index when making economic comparisons.

In this article the concept of productivity is understood as the ratio of output to input in a more general sense. The significance of this general concept is not merely that we may wish to measure the productivity of other resources besides labour, for measurement of productivity is only the first step. What is really important is the improvement of productivity and; if we insist on always using productivity in the sense of labour productivity, we shall be led by our definition to concentrate primarily on labour-saving techniques.

Actually, there are many equally valid definitions of productivity. Thus, for a factory, output may be defined as money volume of sales, added value, number of units produced, or even net profit. Likewise input may be defined as labour hours, quantity of raw material, capital invested, machine capacity, foreign

currency required, etc. Any combination of these factors may be chosen, or all of them. In Israel, for example, it is quite common to judge the success of an industrial unit by taking added value as output and foreign currency requirements as input.

There are many different kinds of productivity. In selecting the specific interpretation or interpretations to be used, the following two criteria should be used as a guide : *(a)* the usefulness of the ratio selected as a basis for decision ; *(b)* the possibility of measurement with the definitions chosen.

The Measurement of Productivity

Regardless of the definition of productivity that is of primary interest, the basis of productivity measurement remains the same—an adequate system of cost and financial accounting within each enterprise, with all the subsidiary internal records that this implies. Unless a factory has such a system, it is impossible either to assess its present level of productivity (except by the most subjective estimate), or to arrive at any logical conclusions concerning the methods to be used to improve the existing situation.

The first step in the attempt to improve the productivity of an undertaking, therefore, is the introduction of an adequate accounting system. However, if it is an industry (or an entire economy) that we are concerned with, it is necessary not only to record the performance of individual enterprises but also to accumulate this information from each of the other units in the industry concerned, and to calculate some type of over-all index. From the point of view of general planning, such data are extremely significant, since they permit *(a)* a comparison between enterprises within an industry; *(b)* a comparison with comparable industries in other countries ; and *(c)* an estimate of the degree to which progress is being made over the entire industry.

In an underdeveloped area the introduction of such a system represents an enormous task. It implies—

(a) convincing a large number of managers of the need for recording and supplying such data ;

(b) training a large number of cost accountants to develop the internal data ;

(c) establishing a central statistical office for the industry or industries concerned ;

(d) training the required number of statisticians ;

(e) training auxiliary clerical staff in methods of accumulation and presentation of such data.

Fortunately it is not necessary to wait until such a long-range programme is completed before attempting to improve productivity. It is quite possible—indeed, in underdeveloped areas vitally necessary—to do a great deal towards improving productivity even before either the present level of development or the precise effect of the action taken can be determined accurately.

Techniques for the Improvement of Productivity

In discussing the definition of productivity, a question of ends was considered. However, no matter what interpretation of the end to be achieved is decided upon, there remain a wide variety of techniques that may be used for improvement. These techniques may be divided into four broad categories according to whether they are used to obtain improved utilisation of (1) manpower resources ; (2) equipment resources ; (3) raw materials ; or (4) any or all of the above.

Each of these sets of techniques will be discussed in relation to factors that are within the control of the individual enterprise —for example personnel, improved methods or factory layout— as opposed to external factors, such as marketing, purchasing and factory legislation. It must be admitted that in practice the manager or consultant very quickly realises that any problem must be considered from both its internal and external aspects if a proper solution is to be found. For example, the problem of human relations in a factory is governed at least as much by the sociological environment in which the factory exists as by the personal relationships between the members of the labour force during working hours. Or, to take another illustration, the problem of marketing is influenced as much by the scope and intensity of market research or the economy within which the factory operates as by the design and production of the item made.

In the broadest sense it may be claimed that almost any aspect of national life has some influence on productivity. However, in order to limit the scope of this study, only the techniques that are most closely related to the internal problem of productivity are considered.

It is important to note that the maximum increase in productivity is to be achieved only by making the fullest use of all four of the above groups of techniques. However, it is quite impractical to attempt to introduce all these techniques into an enterprise simultaneously, and some may be much more expedient than others. For example, while many considerations may rule against the immediate introduction of some of the techniques for improving the utilisation of manpower resources, a considerable contribution

to the economy of an underdeveloped area may be made (usually without encountering adverse reaction, if the experience of Israel may be considered typical) by the introduction of techniques to achieve fuller utilisation of equipment or material resources. A more extended discussion of this point will follow, after each set of techniques has been discussed more fully and its institutional requirements enumerated.

Improved Utilisation of Manpower

Among the techniques for improving the utilisation of manpower resources, the following are of greatest interest to the individual enterprise :

(1) selection procedures, or methods of finding the most suitable persons for the jobs available ; this requires a comprehensive programme of job analysis and description and the widespread use of modern testing techniques ;

(2) training, perhaps the most important of the techniques in this category, since most underdeveloped countries suffer from a critical lack of skilled workers ;

(3) motivation ; particularly in underdeveloped areas, the problem of employee motivation in an evolving industrial society is both acute and complex ;

(4) safety ; in an environment where machinery is often strange and unfamiliar, the loss of skilled manpower through preventable accidents represents a serious waste of a scarce resource.

Any enterprise may increase its productivity very considerably by the introduction of the techniques listed above. However, if it is to do so, it must first be convinced of the necessity, and then provided with the necessary skills and guidance. The national institutions required to achieve this will be discussed in the following paragraphs.

Job Analysis and Description

One of the first steps in the introduction of a rational personnel policy is the development of complete job descriptions of the positions in the enterprise. By this is meant the listing of all the duties and requirements for each of the jobs existing in the company and the attributes required to perform the job properly. Job descriptions are essential in any organisation. They form the basis not only for the proper selection of workers but also for the development of an organisational structure and the planning of a comprehensive training programme.

In order to obtain the widespread use of such descriptions it will be necessary to set up a central national agency to act as a clearing house for the exchange of information on job descriptions. Job descriptions are not only a basic part of personnel practices within a specific organisation but also a fundamental aspect of national labour policy. For example, the comprehensive planning of vocational training programmes, the operation of employment exchanges and the development of a national wage policy (where one exists) also benefit greatly from the existence of such descriptions.

It will also be necessary to train a sufficient number of job analysts to fill the needs of at least the larger local organisations. Some job descriptions will undoubtedly be standard for the whole country and will therefore not have to be dealt with separately in each organisation. However, most enterprises, particularly in the underdeveloped areas, evolve tasks peculiar to their own structure. They therefore require the services of their own job analyst—or group of analysts, according to the size of the enterprise—to observe and describe the duties of the jobs involved and to assist in the formulation of job specifications.

Selection

Once the requirements of a job are decided upon, the next step is to find an applicant who conforms to the requirements. The following methods are used in selection, usually jointly: *(a)* the gathering of information on application blanks (where literacy is not a problem); *(b)* interviewing; *(c)* testing.

The first two of these represent no particular problem, though there is considerable room for improvement in the present practice of many organisations. The third technique—testing—is becoming an instrument of increasing scope and complexity as more and more is discovered in the field of psychology, and as the area of application of this information widens. Today tests are increasingly used not only to determine present ability but—more important for underdeveloped areas—potential capacity to benefit from training. Consequently it is urgently necessary that underdeveloped countries should have a centre or centres for psychological testing.

Such centres exist in Israel, primarily for the use of the schools and the vocational guidance programme for children. However, their utilisation by industry as a means of assistance in the selection of employees is slowly increasing. An interesting use of such a centre was recently made, in co-operation with the I.L.O. productivity mission, to select candidates for training for the new vocation of productivity technician. While it was recognised that the

testing of the first groups would serve mainly to check the validity of the tests used, this procedure was very helpful in eliminating beforehand those obviously unsuitable for training.

In an underdeveloped country the need for people with new skills, either vocational, technical, or administrative, is usually acute. Consequently, one of the corollaries of industrial expansion or general economic growth is a pressing need for a wide variety of educational programmes, and to make the fullest use of these there must be proper selection of candidates. In this a testing centre can make a valuable contribution.

Training and Education

It has been pointed out above that economic growth requires a commensurate expansion in the educational activities of a country if development is to be maintained. Unfortunately the importance of skills and abilities at every level—from worker to manager—seems to be all too little realised. There seems to be a notion that a factory can be created by merely erecting a building, installing modern machinery, and hiring the required number of men. Nothing could be further from the truth. A successful factory is primarily a group of men who possess certain required skills and who, in addition, have found the necessary equipment to carry on production. If the abilities are there, the factory is an economic proposition. If not, an early failure is inevitable.

A comparison between the amounts spent on the acquisition of new equipment and those spent on the training of personnel by individual enterprises shows that this is not always realised. It is not at all unusual to find large organisations with much new machinery but without a training officer or any formal training programmes for their workers.

Types of Training.

The general areas of training most closely related to the maintenance of economic development may be classified in the following general groups : *(a)* vocational training in specific operations in the enterprise ; *(b)* supervisory training, not only in the technical aspects of the industry concerned but also in the attributes required for effective foremanship (human relations, job instruction, methods improvement, rudiments of costing, etc.) ; *(c)* specialist training in the professions closely related to the problem of productivity in the enterprise (accountants, industrial psychologists, engineers, statisticians, etc.) ; and *(d)* training in management methods for existing and potential managers.

Training of Workers.

No details of the institutional requirements for an effective programme of vocational training will be given here, in view of the scope and complexity of the problem, particularly in underdeveloped areas, where the numbers of people to be trained and the areas in which training is needed are so great in relation to existing facilities. However, it cannot be stressed too much that the degree of productivity possible depends on the skills and knowledge of the workers concerned, and that this in turn is a function of the effectiveness of the vocational training available. Consequently an urgent requirement for the success of a national productivity programme is the closest collaboration between the vocational schools and the institutions attempting to improve the productivity of specific areas of the economy. The institutional means of achieving such collaboration will be dealt with later.

Training of Supervisory Workers.

The importance of supervisory training was well summarised by the Meeting of Experts convened by the I.L.O. to discuss the problem of increasing productivity in manufacturing industries. In their recommendations on practical methods of increasing productivity in these industries [1] they stressed the importance of the supervisor in the organisational hierarchy:

> Foremen and supervisors can make specially important contributions to higher productivity. They constitute the principal link between higher management, scientists and engineers on the one hand and operatives on the other ....
>
> There is growing recognition of the cardinal importance of adequate training for foremen and supervisors not only in their technical and administrative duties but also, and perhaps especially, in the principles of human relations, since it is of the highest importance that there should be mutual confidence and friendly relations between supervisors and their personnel.

In order to enable supervisors to carry out their task, particularly in view of the increased responsibility they carry in underdeveloped areas, a vigorous programme of training is required in the following fields: the technology of their specific industry; techniques of supervision; company policy and information; and general studies.

Large organisations may not have difficulties in training supervisors in these subjects. If they are able to obtain the services of a competent training officer they will probably be able to develop

[1] See " Practical Methods of Increasing Productivity in Manufacturing Industries ", in *International Labour Review*, Vol. LXVII, No. 4, Apr. 1953.

their own internal programmes. Indeed, in the more developed areas, these internal programmes are excellent examples of sound training methods.

However, to encourage and assist local enterprises to undertake this vital work, a supervisory training centre is needed. Furthermore, such a centre could be extremely helpful in enabling smaller organisations to carry on jointly a programme of supervisory development that no one of them could afford by itself.

Among the functions of such a centre, would be—

(a) research into the function of the supervisor in small and large organisations ;

(b) action as a co-ordinating agency between existing educational institutions and industrial enterprises in the training of foremen ;

(c) the selection, training and supervision of supervisory trainers ;

(d) the development of training material for trainers and supervisors.

Training of Specialists.

In the more advanced areas there has been a striking increase in the use of specialists of all kinds. This has come about not so much by the increased size of many undertakings as by the rapid discovery of new information in a great variety of scientific fields and the ever-increasing rate of application of such information to the every-day problems of industrial life.

In underdeveloped areas the lack of competent specialists is an acute handicap to the improvement of productivity in a large number of firms. Unfortunately there is often a vicious circle, since many firms are unaware of the potential contribution that a specialist could make because no training centre exists in this field, while on the other hand no training centre exists because local firms have not demanded the services of such specialists. In order to break this pattern it is necessary to establish (or bolster up, where such activities have already made a beginning) training centres and research in the fields of cost accounting, design, industrial and applied psychology, industrial engineering, applied statistics and marketing.

Only the larger industrial organisations will be able to afford the services of a full-time specialist in each of these fields. However, the need in smaller organisations will be at least as acute. It is therefore necessary that such centres assume the responsibility for the training and guidance of small-company personnel, in view

of the importance of the small organisations, which usually represent the bulk of the economic effort.

Training of Management.

There is little doubt that the key people in a national productivity programme are the country's managers. As J. J. Spengler pointed out :

> Industrial progress is markedly dependent upon *(a)* the relative number of imaginative and energetic innovators and entrepreneurs present in the population, *(b)* the extent to which these qualified persons are empowered to make and execute relevant decisions, and *(c)* the degree to which these individuals are free of hampering legal and institutional arrangements.[1]

To these three points a fourth must be added in the case of underdeveloped areas : the degree to which facilities exist for the training of local managers in modern management methods. For it is clear that if managers in underdeveloped areas (or, for that matter, anywhere) are to conform to what is required of them in a national productivity programme, they must be taught both the necessity for doing so and the methods by which it can be done. In order to realise this objective, a management training centre is needed. The functions of such a training centre should be—

(a) the development of training materials for management education programmes ;

(b) the selection and training of trainers. This is of special importance, since the methods of training people of executive level are necessarily different from those used in supervisory or specialist training ;

(c) carrying out the management training ;

(d) acting as a centre for the local and international exchange of information related to management problems.

The rapid growth of such centres in the United States and Western Europe during the last decade is an interesting indication of the service that such units perform in the attempt to raise productivity.

Motivation

Vital as selection and training are to the productivity effort, they are of little avail if the workers lack the will to acquire the skills presented and to use them to their fullest capacity. Unless people want to go in the direction required by economic develop-

[1] As quoted by Ragnar NURKSE in *Problems of Capital Formation in Underdeveloped Countries* (Oxford, Basil Blackwell, 1953), p. 17.

ment, it is clear that such development will be very difficult to reconcile with personal satisfaction.

The problem of motivation may be divided into two subsidiary problems : how to induce willingness to devote one's energies to the existing methods of work and how to induce willingness to adapt to changing methods of working and living. The solution of both problems depends on a fundamental knowledge of group habits and values.

Unfortunately the general faith placed in financial inducements often tends to overlook deeper and more powerful appeals. In Israel, for example, the most striking diligence may be observed among the collective settlements, which are in most cases practically moneyless societies. In view of what has been known since the Hawthorne experiments[1], this should not be surprising. However, the principles discovered in these experiments have not been systematically applied in all underdeveloped areas.

Any attempt to raise productivity implies a change in the existing method of doing things, and change—as has been constantly reiterated by the social psychologists—represents a most jarring challenge to the existing order of personal relationships. It is very important for economic progress that this challenge be met successfully. In this case success would mean that the changes required in order to improve productivity are accepted as improvements by the workers involved and that the source of initiative for the change (the productivity centre or the industrial engineer) is accepted as generally beneficial.

To achieve these requirements, a considerable knowledge of group attitudes is required. This is especially important in underdeveloped areas, since there the existing group values may be quite different from those with which those instigating the changes are familiar, and the violation of these values may immediately destroy all hope of introducing programmes of even the soundest technical value.

For these reasons it is important that there should be a centre for social research to assist the productivity programme. The centre should have among its functions research into group habits and attitudes among all sectors of the working population and training in group dynamics and human relations for all persons concerned with the introduction of change in the working environment. This would include managers, supervisors, engineers, and especially the staff of a productivity centre.

[1] Experiments carried out by the Western Electric Company in the United States at its Hawthorne works in Chicago concerning the effect on output of various changes in working conditions. See F. J. ROETHLISBERGER and William J. DICKSON : *Management and the Worker* (Cambridge, Mass., Harvard University Press, 1939) and Elton MAYO : *The Human Problems of an Industrial Civilisation* (Second edition, Boston, Mass., 1946).

Safety

Measures to promote greater safety in industry may also make an important contribution to the more efficient utilisation of all types of resources. In underdeveloped areas the combination of new and unfamiliar working methods and equipment frequently results in an extremely high accident rate, death or injuries to personnel, damage to equipment and waste of materials.

One of the essentials of an accident prevention programme is undoubtedly adequate labour legislation and an inspectorate that ensures compliance with minimum standards. However, this is by no means the complete answer. If real safety is to be achieved, all workers must be trained in methods of locating and removing causes of accidents. For this a national safety organisation is required, with educational and advisory rather than coercive functions. Such organisations are admirably typified in the National Safety Council in the United States and the E.N.P.I.[1] in Italy.

The functions of a national safety organisation should be training those who will train the workers and also training management in the importance of safety, establishing standards for safe practices and equipment, acting as a central agency for the distribution of information on safety and drawing up public information programmes.

Improved Utilisation of Equipment

The most important techniques in this category of interest to individual enterprises are the selection or design of new equipment and maintenance.

Both of these techniques deserve special priority in the repertoire of productivity techniques to be applied in underdeveloped areas, since both have as their primary objective the conservation of investment capital. A poorly chosen machine or one that is allowed to wear out before its time represents a waste of capital—one of the scarcest resources of an underdeveloped area.

The Selection of New Equipment

In highly industrialised areas, the manager faced with the problem of selecting a new machine has a relatively straightforward problem. If the cost of the new machine justifies it, he will entrust to his cost accountant the task of making an analysis of several alternatives and to the chief engineer or equipment salesmen the task of making a technical comparison between the various types and models available. His own experience will, in the final analysis, prevent any serious mistakes when the choice is made.

[1] Ente Nazionale di Propaganda per la Prevenzione degli Infortuni.

In an underdeveloped area, none of these factors may be present. The frequent lack of competent specialists within the organisation makes it difficult to undertake the type of investigation required for a rational choice. The long distance from the suppliers may make it difficult to deal with a sales representative of the same calibre as is available in the home market. Furthermore, trade agreements or delivery considerations may make it essential to purchase from firms with whom the organisation has no experience at all. In view of these difficulties, which are especially acute for smaller firms, an equipment advisory centre is necessary in underdeveloped areas.

The function of such a centre is to accumulate detailed information concerning the characteristics and cost of equipment available in specific industries and to assist local enterprises to make a selection by undertaking studies of their needs and advising them on available equipment.

An interesting illustration of the potential contribution of such an organisation was provided by the Productivity Institute of Israel recently. To import equipment into Israel, an import licence is required. A review of the requests made for such licences and visits to the factories desiring them showed that neither in the factories concerned nor in the governmental agencies were there specialists available to undertake a detailed investigation. Engineers of the Institute were sent to enterprises making requests, in order to advise them on how the increased production could be obtained without the use of new equipment or to show how less costly equipment would be more suitable to the needs of the specific case. In some cases enterprises had underestimated their capital requirements but, by and large, the savings effected were quite impressive.

Maintenance

One of the most noticeable wastes of vital capital resources in an underdeveloped area arises from failure to maintain expensive equipment properly. The resulting rapid deterioration of machinery is particularly extravagant in view of the difficulty of recovering invested capital in such areas.

A necessary institution to help overcome this situation is a central agency to advise on the necessary procedure for proper maintenance. Such an agency will include among its responsibilities (1) the development of training courses in maintenance for all levels of operating personnel—not only the specialists who have to do the repairs but also the workers and supervisors who must carry out the procedure required to minimise breakdowns; (2) contact with suppliers and manufacturers of equipment to ensure

the availability of maintenance materials; (3) publicity programmes to ensure proper treatment of the equipment used.

Improved Utilisation of Materials

The effective utilisation of materials within the enterprise depends to a very great extent upon two groups of specialists—research personnel and designers.

From the long-range point of view, the contribution of research personnel to a programme for the better utilisation of material is probably the more important. The problem of finding substitute materials that can be produced locally, or at lower cost than those being used, is a fundamental one. However, the enormous problem of the relationship between the scientific facilities of a nation and its productivity programme deserves a far more extensive and detailed analysis than is possible here. Within the individual enterprise, the responsibility for material utilisation frequently falls upon the designer.

The designer is responsible for applying the scientific knowledge of materials to the specific problem of the product to be made. He must specify the kinds of material to be used, determine the amounts of materials necessary and indicate the form of the product, in order to integrate in the best way the properties of the materials chosen with the function to be fulfilled.

To do these successfully, the designer requires a vast knowledge of materials, processes and costs. It is impossible for an individual to build up this knowledge by means of personal experience. It is essential for him to have access to a centre that can accumulate and disseminate the data needed. Specifically, the functions of such a centre should include the provision of information concerning relative costs of material, new developments in design, and the standardisation of products and components.

Industrial Engineering

In recent years there has been a great development in a set of techniques that may be broadly grouped under the title of industrial engineering.

The techniques in this category differ from those previously listed in that they do not primarily refer to only one of the factors mentioned. Rather, they may be applied to the whole enterprise. They are techniques for describing, analysing and diagnosing. Therein lies their special contribution, for frequently one of the difficulties in attempting to raise productivity in an enterprise is to describe adequately the existing situation, and decide which

of the three factors (manpower, equipment, or materials) is the major source of trouble.

These techniques are as follows :

(a) methods improvement (finding a better way to do the job) ;

(b) work measurement (deciding how long the job should take) ;

(c) quality control (deciding how good the product should be and how good it is) ;

(d) factory layout (determining the best distribution of machinery and related equipment) ;

(e) production planning and control (deciding what, when and how production should take place, to what extent the programme is being adhered to and what action should be taken) ;

(f) organisation (determining the scope and inter-relationship of the jobs in the enterprise).

The application of all these techniques is a very powerful means of improving the productivity of the enterprise. If they are fully understood and used at all levels, they can bring about considerable savings. Consequently a centre for their promulgation is an important addition to the organisations previously listed. The functions of such a centre should be to educate all levels of the organisation in the use of these techniques, to act as a centre of documentation and exchange of information and to co-operate with existing institutions in order to foster the introduction of such subjects into their curricula.

Study of Markets

Not less important than the above is a careful study of markets, actual and prospective, so as to ensure that the firm's products are as well adapted as possible, in range and quality, to consumers' requirements. Blind faith rather than the facts of the market too often determine decisions to establish a factory or manufacture a new product. It is therefore convenient to have a marketing centre, which would have among its functions advice on methods of undertaking market surveys and the training of specialists in market research techniques.

Summary of Organisations Required

In accordance with the recommendations outlined above, the implementation of a national productivity programme in an underdeveloped area requires organisations that can handle, separately or in combination, the functions of—

(a) a central statistical office ;

(b) a centre for job analysis and description ;

(c) a psychological testing centre ;

(d) a supervisory training centre ;

(e) a specialist training centre for cost accounting, design, industrial and applied psychology, applied statistics and marketing;

(f) a management training centre ;

(g) a centre for research and education in the field of motivation ;

(h) a national safety institute ;

(i) a centre to advise in the selection of equipment ;

(j) a maintenance centre ;

(k) a centre for industrial engineering techniques.

This listing is not intended to imply that each of the organisations mentioned should be separate or that they should be established in addition to such as may already exist. Whether or not such centres should be completely independent of each other or how they should be grouped together is something to be solved by the local authorities, taking into account the personnel available. For example, an equipment selection advisory centre might very well be combined with a maintenance centre, a management training centre with a centre for industrial engineering techniques and with the specialist training centres mentioned under *(e)*.

Method of Establishing the Organisations Required

It will seldom be possible in an underdeveloped country to initiate or develop activities along all these lines simultaneously, and decisions regarding priorities will have to be taken, with due regard to local facilities as well as needs. In a country with few or no existing facilities on which to build, the first task may be a survey of needs, undertaken perhaps by a small technical assistance mission. This may be followed by the establishment of a single productivity centre with, at first, a relatively narrow range of activities, which could be gradually expanded to cover all or most of the various activities mentioned ; the establishment of more specialised centres may come later. In any event, in view of the wide range of activities to be initiated, the best method of ensuring integrated action is to establish first a nucleus under the leadership of a director of the highest standing and competence, perhaps of ministerial level. The nucleus may take the form of a national productivity centre or institute such as has been established in a number of European countries and in Egypt, India and Israel.

Experience has shown that it is desirable to associate representatives of employers and workers with the work of such a centre.

The potential activities of such a small but influential nerve centre are extremely important. Among them might be included the following :

1. A survey of existing facilities in each of the fields mentioned. In most countries a start has already been made in some, and it is both wasteful and damaging to the prospects of co-operative effort to overlook the possibility of using existing institutions. Universities, technical institutions and voluntary professional associations such as institutes of management are among the odies whose facilities it may be possible to expand and develop.

2. Where the local situation is found lacking, to encourage the establishment of new facilities. The success of the nucleus should be judged by the extent to which it is able to encourage other institutions to adapt their facilities to the requirements of the national productivity programme.

3. To act as a single, centralised source of information on facilities existing in the country. Very frequently existing facilities are not sufficiently utilised because they are not known to the persons requiring the service.

4. To act as a liaison between those concerned with economic planning and those concerned with productivity. The fullest application of productivity techniques to expanding industries can have only beneficial effects for all concerned. It is the industries at present suffering from overexpansion or underconsumption that present the truly difficult productivity problems. To select the industries or enterprises that are to have priority in the productivity programme requires close collaboration with economic planning. This is best achieved through such a centre.

5. To act as a means of co-ordinating local agencies in order to obtain effective action on selected problems. Once a specific industry or enterprise has been selected for priority treatment, the best results are achieved by the unified efforts of all types of centre. To achieve this co-ordination of effort a central policy, making nucleus is essential.

Conclusion

In his book on the problems of capital formation in underdeveloped countries, Professor Nurkse has written :

> Leaving aside the engineering aspect of capital formation, we shall proceed on the assumption—a quite realistic assumption for the less devel-

oped countries—that there is a great fund of technical knowledge in the world which could be advantageously applied to the productive process if only economic resources were available to make use of it.

Experience would appear to indicate that, even where such economic resources are available, the application of such technical knowledge is by no means automatic. This article has attempted to show the organisational framework necessary to facilitate the introduction of such technical knowledge into the field of productivity.