The Scope for Manpower Analysis in Planning Production in Certain African Countries

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REVOLUTIONARY CHANGES in many African countries have undermined the belief among their people that economic development depends mainly on foreign capital and entrepreneurship. Now it is widely accepted that the impetus derived from imports of capital and know-how cannot be sustained, nor can its benefits be generalised, without a continuing development of technical, managerial, and scientific skills by African manpower and the progressive transfer of redundant manpower to productive employment.

Acting on this belief, a number of governments have embarked on expanded programmes for education and vocational training and measures for the relief of unemployment. Subsequently, in some cases, difficulties have arisen because the prospective supply of manpower bears little relation to opportunities for employment. As a result there has been pressure to reorganise education and training, and revise employment policies, in order to bring them into conformity with requirements for the development of production.

This article suggests a different approach. The author argues that educational reform and the extension of measures to increase employment are likely to lead to further frustration unless they are supported by the reorganisation of industrial production at project level to take account of opportunities for manpower development in industry. A primary requirement is a change in the reflexes of project planners conditioned by past experience of dependence, stagnation, and a predominantly illiterate and unskilled labour force. Manpower analysis applied at various levels can contribute to such a change.

This argument is developed against a background of recent experience in a number of African countries intent on developing systems of national economic planning.

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Background

In the United Arab Republic it is widely believed that the development of human resources is the key to economic development. This was shown by the emphasis of the first five year plan and has been confirmed by strategies adopted by the Ministries of Planning, Education, and Labour.[1]

From the start the aim was universal education, according to aptitude shown, up to the highest level. This was supplemented by the purpose of increasing the supply of high-level scientific and technical manpower, and more recently by plans to make good deficiencies of lower-level technical and supervisory skills.[2]

Now efforts are being made to assist other African countries to profit from Arab experience in raising the level of competence of the workforce and redressing imbalance in supplies of different types of skills. At the same time, within the Republic, the basis for manpower development is being extended. The Institute of National Planning is doing pioneering work in extending knowledge of rural employment and unemployment, unemployment among the educated, and the effects of some measures for increasing employment.[3] The Aswan Development Project is an attempt to set up, as an example for all the provinces, a model of regional development within the framework of the national plan: its emphasis is also on manpower development.[4] In other regions (e.g. the province of Behera) local initiative has been responsible for some successful projects in which manpower development has been directly associated with the development of production.[5]

Even in this country, however, the application of manpower analysis in production planning has only just begun and its future potentialities

[1] National Planning Committee: *Perspectives 1960-1970*, and *Five year plan for economic and social development* (Cairo, 1959).

[2] Detailed information supplied by the Ministries, and from documents internal to the Institute of National Planning, Cairo. See also F. HARBISON and I. A. IBRAHIM: *Human resources for Egyptian enterprise* (New York, 1958); and Moufid ELIA: " Upgrading training of skilled workers in the U.A.R.", in *International Labour Review*, Vol. XC, No. 1, July 1964, pp. 35-44.

[3] M. HAMZA: *Rural employment and unemployment in the U.A.R.* (Cairo, Institute of National Planning, 1963) (outline of a plan for a joint research project undertaken by the Institute and I.L.O.).

[4] A proposal for setting up a human resources development board for the region was adopted by the Aswan Development Conference, March 1964; and recommendations of the conference for a regional census, a manpower survey, and a comprehensive research programme directed towards the provision of a broader basis for regional manpower planning, were accepted by provincial and central government authorities. (The author represented the I.L.O. at this conference.)

[5] The Governor of Behera has been the inspiration behind many of these projects, e.g. the training centre at Damanhour where over 2,000 illiterate girls and boys are learning trades and having some general education. This work is linked with the creation of employment opportunities throughout the province. (The author accompanied Dr. Hamza and his research committee on a visit to the province.)

can only be conjectured. The same might be said of Tunisia.[1] In some countries south of the Sahara, visited in the course of field work on which this study is based, very little has been done on these lines, although the Ashby Report in Nigeria, World Bank studies in East and Central Africa, and I.L.O. missions to Burundi and elsewhere have stimulated interest and activity.[2] In highly industrialised countries of Europe and America sophisticated techniques of manpower analysis are applied on a project basis by a number of large undertakings, but their application on a wider (industrial or regional) basis is not far developed.[3]

For these reasons, *and because development in African countries depends on African manpower*, the following study of some of the uses of manpower analysis in planning production has been undertaken.

The production project

It seems natural to apply manpower analysis first to the production project. This is generally done, in some form, whenever people start to think about the best way to do a new job or to increase output in an established production operation.

In the simplest case the first step is to derive manpower requirements from a preconceived production plan. For instance it may be the case of a construction project, where the nature of the product and the time available for its completion are determined (within limits set by known techniques of construction) by the demands of users of the product. There is an accepted way of performing each element of every phase of the production operation which, in this simplest of cases, is recognised as " best practice ". Therefore, with given specifications for the finished product and a construction plan based on these specifications, manpower analysis is applied in the first instance to assess the number of man-hours of every type required for the job.

Secondly the analysis would be applied to the definition of the time-pattern of manpower requirements over the construction period—to determine precisely when and where the services of different types of workers (in man-hours) will be needed. This time-pattern for the delivery of manpower services will correspond to schedules for the delivery of equipment, materials, and funds.

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[1] Based on evidence seen in the course of an I.L.O. mission to Tunisia in July 1963. See also the following official Tunisian Government publications: *Perspectives décennales de développement 1962-72*; *Plan triennal 1962-64*; *Plan triennal—Rapport sur la première année de l'exécution* (1963).

[2] *Investment in education* (the Ashby Report) (Lagos, 1960); I.B.R.D.: *The economic development of Tanganyika* (Johns Hopkins, 1961); I.L.O.: *Rapport au Gouvernement du Royaume de Burundi sur l'emploi et le chômage à Usumbura* (Geneva, 1964) (mimeographed).

[3] See, for instance, Pierre BAUCHET: *Economic planning—the French experience* (London, Heinemann, 1964), pp. 145-150 and 171-174, and *Rapport général de la Commission de la main-d'œuvre* (Paris, Imprimerie nationale, 1961), pp. 81-143.

Then would follow the application of the analysis to the organisation of production. There may be detailed study of skills and elements of skill required for particular production operations and sequences of operations, study of working conditions and environmental factors which determine how effectively skills are applied, and assessment of the availability of skilled and unskilled workers with different aptitudes. This would provide a basis for recruitment, instruction and in-work training, rate-setting, incentive payments, allocation of responsibilities, and the control of operations.[1]

The manpower plan for the job, set up in this manner, would then be the basis of a production programme which related all inputs to the pattern of output established by the specifications of the finished construction and the schedule for building. This type of approach would mean also that every step in manpower analysis would be focused on the provision of data required to give some foundation for management decisions that had to be made during the course of the operation.

Now one could go on to show, on the basis of this simplified case, how techniques of manpower analysis might contribute to effective production planning and management within the limits of the conditions assumed. Even within these restraints, techniques of work study, job evaluation, and modern programming techniques have their application.[2] Or, without the formal adoption of such procedures, the same basic ideas may be applied implicitly by people who improvise on the basis of past experience in similar undertakings. However, although a manpower approach to production engineering could be elaborated on such a basis, this case has already served its present purpose. What is proposed now (in effect) is to relax some of the restraints imposed by the model and use it to show how the application of economic analysis to problems of development can be extended by the adoption of a manpower approach.

Meanwhile, for present purposes, the main point which comes out of this instance of the use of manpower analysis in a simplified case of industrial engineering is this: where manpower analysis is used in this manner as a basis for the implementation of preconceived production plans, the pattern of employment is a residual effect of such plans.

Project development

Experience in the application of manpower analysis in production planning for the achievement of given production targets (as outlined

[1] See, for instance, J. TINBERGEN: *The design of development* (Johns Hopkins, 1958); and United Nations: *Management of industrial enterprises in underdeveloped countries* (New York, 1958).

[2] See Murray D. BRYCE: *Industrial development* (New York, 1960), especially pp. 148-173.

above) tends to bring about radical changes in the design of project planning. This can be demonstrated in terms of our model production project.

First of all, if we relax the conditions of (1) rigid specifications of the end-product and (2) a fixed time for construction, then we extend the scope for manpower analysis and the application of its results. Let us say, as before, that the original project specifications (including time for construction) are based on technical information and information about markets for products, but are open for revision. Then, let us say, manpower analysis shows that these specifications call for services of skills (managerial, technical, etc.) that are not available or are obtainable only at a very high cost. Therefore modifications of design, techniques or the time of construction may be undertaken to make the project feasible and to reduce cost or increase the efficiency of the finished product.

If we go a step further, manpower analysis may be introduced at the outset in conjunction with technical data and the results of market research. Whether the project is in land development or the construction of a factory, an oil refinery, a hydro-electric dam, or a school, whether its purpose is to fill a gap in an existing industrial or social complex, or to make a step in the direction of changing such a complex, manpower considerations enter into the determination of what is possible both in the construction phase and in the utilisation of the finished asset over its life. Crucial matters involved are:

(1) How changes in the pattern of manpower supplies, affecting either construction or subsequent utilisation, will proceed independently of any decisions made within the undertaking.

(2) How manpower factors within the control of the administration of the undertaking can be manipulated to raise the level of achievement in production.

Envisaged in this way manpower data, instead of being used simply to plan and organise the achievement of *given* production objectives, may be used in conjunction with technological and market information to determine those objectives. This is only logical: any decision about production is inadequately based unless manpower analysis, in some form, is applied in the process of finding out the extent of production possibilities. Otherwise some steps in the production programme may prove to be impossible as originally designed and some too costly, so that time-consuming and expensive modifications have to be made or hasty improvisations undertaken at a late stage. Even more important in the African context is the likelihood that ignorance of the availability of certain skills or the possibility of developing them will lead to failure to recognise the existence of important production possibilities.

This means, then, that the pattern of employment and manpower utilisation in the undertaking will no longer be merely the residual out-

come of preconceived production plans based on technological and market information. In this case, on the contrary, manpower data, including knowledge of possibilities of manpower development, will have a significant place in production planning from the initial stage of determining production aims up to the final stages where they are applied in the organisation and control of production operations.

Regional and national employment objectives

For the region or national economy manpower analysis has sometimes been applied in much the same manner—when it has been based on knowledge of actual and potential availability of services dependent on different skills and has been related to problems of decision-making at the operational level.

First come production objectives, generally based on technical and market information. Manpower studies may result in the modification of these objectives; but, whether or not they lead to such modification, they have been undertaken in the first place as a basis for decisions about the development and organisation of manpower services to execute *given* production plans. Of course this does not rule out the likelihood that some ideas about manpower availability have been implicit from the beginning in calculations which have led to the formation of production objectives. But it means, commonly, that the systematic assessment of actual and potential manpower availabilities and the formation of manpower development plans *follow* the elaboration of production plans.

Again this approach means the treatment of employment as a residual effect of production planning, and failure to recognise production possibilities which become apparent only in the light of manpower development prospects. This follows because levels of aggregate employment and the pattern of employment (by occupations and levels of skill, and by industries, sectors, and regions) are treated as the outcome of production plans which largely leave out of account both manpower developments in progress and possibilities of modifying these developments in order to bring within reach a higher level of achievement in production.

Experience in Tunisia illustrates this point very clearly. A massive programme for the development of general and vocational education is part of the first Ten Year Plan.[1] Its execution is changing the nature of production opportunities and extending their range. Meanwhile the production development programme embodied in the same plan is being pushed ahead vigorously. But even though the Tunisians have achieved a high degree of co-ordination among their agencies for development, their plans for manpower development and for the development of production have been largely independent of one another. Therefore, since

[1] See p. 382 above, footnote 1 and text.

production plans are forming the pattern of demand for manpower, while independent education and training plans are shaping the supply, little correspondence between the two is to be expected. Consequently deficiencies of some skills, which could have been foreseen and provided against, are expected to continue to limit production; and surpluses of other skills are expected to result in under-utilisation and probably some export of valuable middle-level and high-level technicians. However, towards the end of the first three-year phase of the perspective plan, the " brain trust " in the Ministry of Finance and Planning in Tunis was aware of these things and was intent on achieving a higher degree of co-ordination between manpower development and the development of production.[1]

Thus the Tunisian Government, like that of the United Arab Republic, is beginning to experience the effects of the first of two radical changes which tend to occur as a result of experience in manpower planning initiated on the basis described. These effects are—

(1) Manpower planning introduces a new dimension into the planning of production. First it reveals new production possibilities which would appear inaccessible or uneconomical if assessed on the basis of existing manpower availabilities and production costs. When mobilised in various forms of manpower development it can go a step further and *create* new production opportunities through changes in the composition of manpower supplies, through the development of new types of skills, and through consequent change in the efficiency with which available land and capital can be used both to supply current consumption needs and to increase the capital stock. (Obviously the efficiency with which passive factors of production are used depends on the nature of manpower, the active factor.) This radical change means that manpower analysis becomes a primary element in the determination of production plans; along with analysis of factors on the demand side and technological data, it enters into production planning from the first stages.

(2) A further radical change which may be made possible at the same time is the integration of production objectives with employment objectives. As long as the level and pattern of employment are a residual outcome of production plans based on experience characterised by unemployment and a predominantly unskilled population, employment objectives go by default. Or they may give rise to specific measures to relieve unemployment—by raising the level of aggregate demand, by encouraging the use of labour-intensive techniques, altering the wage

[1] Messrs. Sghal, Bahroun, Ben Amor, Limam, and other members of the Secretariat du Plan in Tunis, and Professor Samir Amin (now of the African Institute for Economic Development and Planning, Dakar) supplied personal and documentary information on these matters. See Samir AMIN: *La Tunisie 1953-71: Décolonisation et perspectives de développement*, IDEP/PR/II/19 (Dakar, 1964).

structure, limiting imports, and so on. Such measures, if geared to short-run exigencies and unrelated to long-run development aims, are more than likely to frustrate production plans based on the long perspective. On the other hand the alignment of the use of such policy measures with long-run aims is likely to be a vital matter for the maintenance of accelerated development.[1]

If employment aims are built into production plans from their inception it will be possible to give a calculated weight to the danger that measures designed to increase employment will involve some sacrifice of production. This means providing a measure of insurance against pressures to use policy instruments for purposes which cut across development aims. It also means taking account of costs involved in sectional or general unemployment, in retrogression and loss of skills of trained people in jobs in which their special skills have no use, and in failure to develop some aptitudes which remain latent unless they have a vocational application.

Production and employment

In the final analysis neither employment nor production, as commonly understood, is an end in itself.[2] Both are means of achieving desired social and individual objectives which will generally be served by development that results in sustained increase in income measured at constant prices. This is an imperfect measure of the development aims of African communities; but, subject to some safeguards, the highest maintainable rate of increase of income measured in these terms will *ordinarily* [3] serve other development aims.

[1] Here the question arises whether there is a *necessary* conflict between short-run and long-run employment objectives. Such a conflict can arise if short-run exigencies dictate a change in the level or the pattern of employment. The authorities may then divert manpower to forms of employment which promise a high short-run marginal return, or from employment which appears to offer a negative short-run marginal return, in terms of values which reflect their current preferences. Put in a long perspective, or even in the context of a three-year plan, the marginal returns offering for these different forms of employment or for particular changes in aggregate employment may bear the opposite relation to one another. Effectively planned development would be designed to forestall such a conflict of aims or, where this was not possible, provide a basis for well-informed choice between conflicting alternatives.

[2] On the other hand they might be considered as ends in themselves (and practically identical ends) if employment were considered " the productive use of manpower ", production as " the creation of real income ", and real income as " what people want ". See J. de V. GRAAFF: *Theoretical welfare economics* (Cambridge, 1963), for some discussion bearing on these matters of definition and related problems of analysis and questions of fact.

[3] There is hardly space here to go into the complexities behind this apparently simple statement, but two points must be mentioned: (i) in a planned economy current market values may diverge from the planning authority's system of values, so that " shadow prices " may be used in evaluating changes in production; (ii) with or without such an adjustment of market values, and whether they are assessing past experience in the development of production or estimating possible future development, the people concerned tend in effect to put themselves in the place of their predecessors or their successors. This means they tend to use *current values* for weighting purposes.

Increased production implies increased income and, other things being the same, it also implies increased employment. But other things do not remain the same in a developing economy. The pattern of final demand, manpower structure and techniques of production tend to change rapidly. Consequently measures designed to yield a general and continuing increase in production according to a pattern aligned with *existing* costs and demands may have little effect—or even a negative effect—on the level of employment. This means not only that the employment objective goes by default, but also that the realised rate of increase in production is lower than the maximum which could be achieved with the available resources.

Among the conditions required for the avoidance of this danger is the integration of production plans with manpower development plans. From the point of view of the individual investment project, this is no more than a matter of increasing the adequacy of the information on which the investment plan is effectively based. For the industry and region it means also looking to the interaction of different production projects and taking a longer view of the future than the management of the individual project can generally afford to take. For the national economy it implies a long view of the future and regard for the linkages between different developments and aspects of development.

" All this is very well " the sceptic might say " but why the fuss about manpower analysis and manpower development? Similar generalisations might be made with reference to forecasting the future pattern of consumer demand, and the future course of technological change, and planning accordingly. In Africa capital is scarce and labour redundant. Scarce capital resources have to be allocated efficiently with regard for trends in demands for products, the possibilities of technological innovation, and the interaction of different investment projects among which they are shared. The availability of labour is one thing that can be taken for granted; and if the creation of employment is pursued for its own sake then not only will capital be diverted from more productive to less productive uses, but also there will be a tendency for increased consumption to make inroads into the resources which would otherwise be channelled into investment."

The answer is that (i) the employment policies implied by the development aims of African governments require the creation of *productive* employment, and the creation of productive employment is one and the same thing as the development of production; (ii) the limited supplies of capital are indeed obstacles to accelerated development, but the principal means available for increasing the supply of capital resources is the use of unemployed and relatively unproductively employed manpower for capital creation; (iii) technological innovation requires the support of innovation in management, marketing, and other fields, and all these forms of innovation depend largely on manpower skills: indeed,

in present-day African societies which have access to the most modern technologies, manpower development is a primary means towards extending capacity to absorb new techniques already available; (iv) the logical use of manpower analysis for the integration of production objectives and employment objectives does not imply any idea of the creation of (unproductive) employment for its own sake.[1]

It is also true (as implied by the development programme of the United Arab Republic) that the development of human resources is of basic importance at each level where interdependent decisions about employment and production have to be made. In this case, and also in each of the other African countries visited in the course of experience on which this study is based [2], accelerated development requires the progressive transfer of unemployed and under-utilised resources to productive employment. Existing factor reserves which could possibly be activated in this way consist mainly of unskilled labour and under-utilised natural resources; but there is also considerable industrial and social capital being used far below its capacity because of manpower deficiencies. In these conditions the transfer of idle resources to employment in any particular avenue of production will tend to run into diminishing returns as rising production approaches a " bottleneck "—whether the cause is the limited supply of capital in general, lack of particular types of capital or land, or lack of any type of skill (e.g. technical or managerial).

Capital development and innovation associated with, and indeed based on, manpower development is a primary means of opening out these bottlenecks and continually putting off the threatened onset of diminishing returns.

Conclusions

INTERDEPENDENCE OF MANPOWER PLANNING AND ECONOMIC PLANNING

This argument supports the line of reasoning developed by Paukert in his recent article on " The interdependence of high-level manpower planning and economic planning " [3], but the main concern here has been quite different from Paukert's. This was not so much because of our interest in lower grades of manpower as well as the higher echelons, nor of our preoccupation with the future of particular African countries: these were reasons for extending Paukert's thesis and confirming it with reference to a particular environment, but not for breaking new ground.

[1] See I.L.O.: *Employment and economic growth*, Studies and Reports, New Series, No. 67 (Geneva, 1964).

[2] Tunisia, Kenya, Tanzania, Uganda, Zambia, Burundi, and Senegal.

[3] *International Labour Review*, Vol. LXXXIX, No. 4, Apr. 1964, pp. 339-352.

What led to our departure from Paukert's territory was (1) our emphasis on production as such, and (2) our concern with (African) manpower as the active, initiating factor of production.

There is complete agreement between us that—

(a) the future supply of and demand for . . . manpower are not independent: there are links between them; and

(b) these links are economic growth and structural changes.[1]

It follows, as Paukert implies, that plans at the national level to shape the course of economic growth and structural change will be concerned not only with the achievement of balance between manpower supplies and demands, but also with levels of production and manpower utilisation at which this balance is achieved. Moreover, this concern with the particular level of manpower utilisation at which patterns of supply and demand are matched, leads on to the idea of continuing change in which the pattern of these supply and demand relationships is continually adjusted to the requirements for the desired rate of growth.

Here Paukert was concerned with the projected pattern of output of institutions for formal education and professional training, as it related to the projected pattern of production in the economy. Clearly the pattern of change in economic activity would dictate the nature of change in the pattern of demand for recruits to the workforce—in particular recruits with various qualifications acquired from such formal training. On the other hand, the feasibility of the projected pattern of production would depend in large measure on the forthcoming supply of trained managers, scientists, engineers, etc. Therefore, if the developing pattern of economic activity was to be planned, and a plan was also to be made for the development of education and professional training, each plan would seem to require foreknowledge of the other plan. It was in these terms that Paukert conceived of the integration of the manpower plan and the economic plan by means of one of three methods: " simultaneous solution ", " successive approximations ", or " stages of development " methods.[2]

Let us see what this could mean for an African economy in which the government had already followed Paukert's advice.

It would have a comprehensive plan for economic development, embodying perspective guidelines for the output of the main categories of investment goods, consumer goods, and all types of high-level manpower; and, in greater detail and expressed with more precision, it would have medium-term and short-term targets for rates of change in these quantities. The whole would be the result of an integrated set of cost-benefit calculations, in which the valuation of potential inputs and out-

[1] *International Labour Review*, Vol. LXXXIX, No 4, Apr. 1964, pp. 339-352.

[2] Ibid., pp. 347-351.

puts would have required the use of available market information, but would also have required the adjustment of market values and their supplementation by " shadow prices " where market information was missing and also where market prices did not reflect the system of values implicit in the (agreed) aims of the government. In particular, this comprehensive reconciliation of means and ends would determine the size and the content of the national budget for education and training in the context of the plan for economic and social development.

The best available information about existing domestic and foreign sources of materials, equipment and manpower, and scope for their development, about actual and potential technical and managerial developments and about prospective patterns of change in domestic and foreign demand would have gone into the formation of the plan. All this information would have been collated against a background of recent experience and long-run historical experience of development in the country concerned and other countries at different levels of social and industrial development. Within the limits set by the available knowledge and the area of agreement on social aims, the perspective plan, the medium-term plan and the estimates for the coming year would be internally consistent and consistent with one another. They would also be systematically related to the agreed objectives in such a manner that they would represent apparent requirements for the maximum feasible rate of achievement in development.[1]

Now this planning exercise, whether or not it was highly centralised, might be tremendously important in itself. Even if the plan was no more than a political document its effect might be to reveal opportunities for mutual advantage through exchange of information and collaboration among government departments and industrial and regional groups: otherwise, in ignorance of such opportunities, these groups might be involved in mutual frustration through the pursuit of conflicting aims.

However, as Paukert implies, this " indicative " effect might be a relatively minor matter, and the principal effect might be the diversion of resources by the use of a system of incentives, sanctions, and directives, into channels appropriate for the achievement of the objectives set out.

We might stop here—as discussion of economic planning commonly does. This suggests that the planning operation is finished when the economy has been provided with *(a)* a formal plan which shows how available resources can best be applied to the achievement of development objectives, so far as this can be judged on the basis of available knowledge, and *(b)* a set of policy instruments capable of influencing the use of resources in the directions prescribed by the plan. Optimal use of resources

[1] All three of Paukert's methods have contributed to the formation of this plan but none of them (for reasons he has given) is adequate alone; nor do all three combined, even with the most extensive information, overcome difficulties due to the inherent nature of the problems of planning for an uncertain future.

in these terms implies that their allocation has been assessed on the basis of a consistent system for the valuation of factor services and products in terms which reflect development objectives, and in effect the calculation in the same terms of the incremental opportunity costs of all types of outputs. This in turn implies inter-sectoral consistency and an optimal relation, for example between over-all production development plans and projected output of qualified people by institutions of education and professional training.

PLANNED DEVELOPMENT AS A CONTINUING PROCESS

Whatever methods are used in the preparation of plans, and however extensive the information available about the past and the present, all planned uses of resources can be consistent with one another only on the basis of a set of tentative assumptions about the future, and the only sense in which they can be considered optimal is on the basis of the relation of this set of assumptions to accepted value criteria for particular resources and products. Indeed, " there is no objective future " and " the future is not there to be discovered, but must be created ".[1]

Therefore if our concern with planning stops here we are left with a plan and a set of instruments applicable to its implementation which amount to *potentially* significant means for economic development. Whether in fact these means will be effectively applied depends on the mutual adjustment through time of the behaviour of responsible people.

For this reason we have gone beyond the concept of planning as a matter of making a single comprehensive and consistent set of decisions about the optimal use of resources. We have gone on to consider planned development as a continuing process through which decisions about the use of resources and their consequences lead to further decisions. This has suggested the nature of the mechanism—based on a *learning process*—through which manpower plans and production plans in operation may in time become adjusted to one another: quite a different matter from any system of formal planning by which, at any point of time, consistent and apparently optimal plans for manpower development and for the development of production may be set out.

Now, indeed, the end-product of the initial planning operation becomes a first approximation to a programme of action. This follows from the fact that the formal plan was based on explicit assumptions about an uncertain future; as the future unfolds, these assumptions and the calculations based on them need revision; and they also need extension in detail as the occasion arises for detailed decision-making at the operative level and as more information is acquired in the course of experience. For at best the national plan provides a sketchy and uncertain base for

[1] G. L. S. SHACKLE: *Decision, order, and time in human affairs* (London, 1961).

a continuing series of production-and-employment decisions. With the closer approach of each point in time to which the plan refers, uncertainties about conditions at that time will tend to diminish as detailed knowledge required as a basis for action tends to be extended. Each final decision at the operational level will then have its place not only among contemporaneous decisions and their effects, but also as a link between related decisions made in the past and those contemplated for the future.

In its simplest form this learning process is no more than intelligent and systematic use of the fruits of experience: as different elements in the pattern of production effects reveal themselves, and the information is fed back to the planning-and-decision-making system, behaviour directed towards the development of production is modified. The adjustment may be obviously required because the outcome of production activity diverges from the expected outcome, and this reveals a tendency which has to be corrected if effects of measures for development are to be aligned with development aims; or it may be that knowledge of new techniques, new resources or new wants, acquired in the course of production experience, creates opportunities for a pattern of achievement preferred to that envisaged in prior development plans. That is, this learning process works both through the correction of past mistakes, which results from checking results against expectations, and also through the introduction of new knowledge acquired in the kind of research and experiment which are part of production experience wherever people give thought to the organisation of production as it relates to production aims.[1]

Unless it is based on explicit and articulated planning at the levels of the unit project, the industry, the region, and the national economy, the learning process (if it gets started at all) is likely to be uncertain and erratic in its effects. At least this is so in the countries with which we are concerned. This is borne out by evidence we have seen in these countries of the weakness of market institutions and of the significance of linkages among development opportunities for different projects, industries, and localities. And what we have seen of the interdependence of development in the industrial sector and the education-and-training sector suggests that this conclusion will apply *a fortiori* in some inter-sectoral linkages between development opportunities.

These circumstances supplement the main reason for the extent of reliance on national planning among these African peoples. The main reason, of course, is poverty related to customary adherence to wasteful

[1] It is common to distinguish between " welfare economics " and " positive economics " because (among other reasons) one can check propositions in positive economics by results, but one can only check the assumptions of propositions in welfare economics. Here we are concerned entirely with positive economics—questions of consequences which follow particular measures of policy in particular undertakings and in the national economy—and it seems that we must use both kinds of checks. Divergence of results from expectations points to the need to check assumptions. (Cf. GRAAFF, op. cit., pp. 1-5.)

methods of organising production, combined with knowledge of and access to more efficient methods of resource use. In communities not far removed from conditions of stagnation, national planning appeals as a means of starting up the kind of learning process described. This may mean that national planning is regarded primarily as a way of breaking out of conditions in which change is inhibited by fixed rituals governing the organisation of production. Consequently preoccupation with this " take off " phase may tend to obscure the continuing function of national planning as a means of integrating social aims and the use of resources for their achievement in a systematic and sustained process of planned development. We have seen abundant evidence of this tendency in African countries—and also evidence that the planned take off will fail unless provision is made for the continuous propagation of our learning process.

A MANPOWER APPROACH TO PRODUCTION PLANNING

This learning process and its effects were reflected in evidence we saw in a number of countries that " experience in manpower planning introduces a new dimension into the planning of production ".[1] Both in the individual undertaking and at the level of planning for the national economy, this process begins with the application of manpower analysis to providing the skills required for the execution of preconceived production plans. In either case, with experience in such use of manpower data and observation of results, the introduction of manpower analysis may tend to be brought forward in the sequence of planning operations until it provides a " manpower approach to production planning ". This experience, fragmentary and varied from one country to another as it has been, suggests a logical progress from (1) the use of manpower data for organising the achievement of *given* production objectives, to (2) the extension of production objectives on the basis of new production opportunities revealed by manpower analysis, and further to (3) the creation of new production opportunities by manpower development based on the co-ordination of manpower analysis with technological and market information bearing on the development of production.

This is not only a matter concerning the educational-and-training sector or the provision made by the national planning authority for the development of institutional education and training of different types, with differing intakes and outputs, to different levels. These things are important, as we have shown in extending Paukert's thesis and relating it to a particular environment. But the lessons of experience we have witnessed point also to the significance of the application of manpower

[1] See above, " Regional and national employment objectives ".

analysis in planning for the industrial undertaking and at intermediate levels.

The reason for this stress on the application of manpower analysis to secure the modification of behaviour at the operational level in industry becomes apparent as soon as one extends the concept of economic planning from the preliminary stages of preparing a tentative programme for action to the successive stages of organising planned economic development. Then it becomes apparent that the best national development plans—however comprehensive, feasible and optimal they appear—will come to nothing unless they change people's behaviour at production level in the direction required for the achievement of development aims. In some countries, where markets for factors of production and for products are highly integrated and channels of information between different stages of production and different sectors and regions are highly developed, the use of monetary and fiscal instruments of policy may possibly be relied on to secure required changes in behaviour at the production level. However, where markets are disintegrated, channels of communication are rudimentary, and change is inhibited by adherence to long-standing customary ways of doing things, there can be no such reliance.

Therefore the application of manpower analysis at the national level to the development of the educational and training sector may be fruitless, in terms of industrial development, even if it is optimal in terms of preconceived requirements for a maximum rate of achievement of development aims. This is so because institutional education and training can only provide important *means* for industrial development: whether or not these means are effectively used depends on industry itself.

The application of manpower analysis within industry, to take account of the changing pattern of qualifications of professionally trained recruits and educated trainees, is a first step towards ensuring that the results of a manpower approach to production planning at the national level have some effect on investment and production planning at the operational level. Its further application to manpower development within the organisation of production is, in most occupations, a complement to institutional training; for the results of training can run to waste in the absence of vocational opportunities of building on them. On the other hand, if manpower analysis is applied in the individual undertaking to selection, allocation of responsibilities, in-work training, rate-setting, promotion, etc., and to the study of performance, control of production, and investment planning, then there will be a channel through which the results of national manpower development plans can affect every aspect of behaviour at the operational level.

Where the reflexes of project planners and managers are conditioned by past experience of dependence and stagnation, a specific and drastic impact of such manpower planning techniques at the operational level may therefore be most important—at least in the context of medium-

term plans. In the very long run, when successive generations had benefited from the development of general and vocational education, the learning process as it affects industrial development could extend itself. Possibly this could occur without specific manpower planning at the operational level, because channels of information could be progressively developed, the hold of custom would tend to weaken, and people (given the " right " kind of education) would tend to give more and more thought to the organisation of production as it relates to their own production aims. However, this " very-long-run " period may be so long that it has little interest for the present generation; for educational development itself depends heavily on industrial development for its part in providing material equipment, social conditions and career incentives conducive to pursuit of education by the individual. It follows that planned development may be frustrated unless manpower development in industry makes the most of the extended opportunities resulting from development in education and professional training.