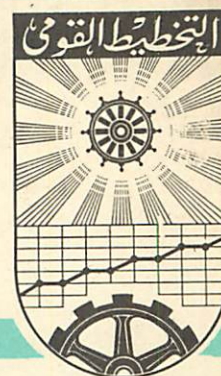


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Technological Analysis of Industries

Part I

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TECHNOLOGICAL ANALYSIS OF INDUSTRIES

CHAPTER I

The interdependence of economic, technical and technological problems in planning

National planning has to model the structure of the economy, to indicate the lines on which it must proceed and to manage all current affairs of the national economy with respect to the implementation of the plan. If so, planning cannot do without including problems of technique and technology in its field of activity. We all, perhaps, know the economic problem concerning the choice of technology which occurs in planning very often. With a view to this it might be useless to raise the problem quoted in the title of this chapter. Usually there is general agreement on this interdependence. But if we study the respective literature one must get the impression that economists or planners mostly are asked to take into consideration technical and technological problems and accomplishments. We should, however, amplify this point or better put it forward in a more precise way. To take into consideration technical and technological progress is a rather passive way of settling things. Planners must be in the reverse, first of all, active people who are trying to improve, i.e. to change the national economy and who are virtually able to do so. This can be done only if planners are fit to manage technical and technological problems freely. To take them into consideration would mean to take over that other people have done. Should we not extend our fields of knowledge, experience and activities by studying the development of technique and technology?

There often is, as we all know pretty well, a certain discrepancy or, say, rivalry between economy and technique as well as between economists and engineers. Even in case there is no theory whether priority should be given to either economy (economists) or technique (engineers), we are facing the fact that in one country or in one branch engineers are prevailing or, moreover, dominating whereas in other places things are going just the other way round.

Anyway, we have to investigate this issue thoroughly because it highly affects not only the problems of planning of industry but also research, education and training on all levels and the organisation of the national economy as well.

Simply speaking we wish to answer the questions why, what and how the planners actually must analyse, promote and manage both technique and technology. Our discussion will be based on the experience of planning activities in socialist countries where our problems have been solved so far in a rather national way.

1. The material basis of planning

Irrespective of differences in defining planning as well as its methods we must realise that planning deals with real material things. These must be studied with the view to keep them under control and to manage them in a way which will enable planners to meet the requirements of national economic progress. The primary problem of economic planning is production and labour productivity. Upon both categories depends consumption which can be regarded the final aim of planned economic activity. High consumption or its increase, therefore, can be reached if output (production) and productivity (efficiency) are increasing steadily at a high rate of growth. This, in turn, is the result of a fast extension of the main elements of production as well as of their efficient combination. It is well known that we have three main elements of production: manpower, machinery (and equipment) and raw materials (and semi-finished goods). They are called productive forces. The planner must care for an increase of production and productivity. Consequently it is up to him to study the problems by means of what and how goods are produced. In other words, this is the problem of studying and, moreover, of promoting technique and technology. The better our technique and technology are the faster economic progress will be provided that both are not subject to private or partial interests but serving the national economy as a whole.

We have thus arrived at the material basis of planning. It can be seen from this that the planner must be technically skilled to a certain degree. If not so, he has always to surrender to engineers when discussing the problems of technical and technological as one starting point of the plan.

The combination of all three main elements of production with a view to maximize its effect is a genuine economic problem. It, apparently, does not imply only the problem of how to combine them but even what is to be combined concretely and how to improve substantially each element. The planner must be fit, first, to understand quite well the problems of technical progress in order to make use of its results in his economic activity. Secondly, the planner must be able to produce clear-cut ideas as to which technical problems must be studied and solved with respect to further economic progress.

National planning must start with a thorough analysis of the decisive factors of growth, i.e. the development of the mentioned main elements of production each separately as well the combination of all. This is true even as regards developing countries. They generally wish to bridge the gap between the industrialized countries and the less developed economies. To reach this it is indispensable to make full use of all the accomplishments of modern technique and technology in those fields and branches (sectors) which they have decided to extend. It is clear that for the time being they have "to import" the relevant knowledge and experience. But after this they must gain full control of technical progress in their own economy and they must do their utmost, too, to run all imported modern equipment themselves and, furthermore, to contribute to their development. To follow this way does not mean, of course, that it will be enough to get well-trained people in the fields discussed. Skilled labour is one main element of economic progress. The second is machinery. One should not only be able to understand modern machinery and to use it rationally but also be able to produce it. This obviously is a first practical consequence for the planner which can be derived from the fact that

(skilled) labour, machines and (in addition to this but with less importance) raw materials are the main factors of growth. They are so in a combined manner. If new machines had been invented they ask for higher skill of the labour force. Moreover, higher education and skill of the labour force makes it possible to build new machines or to create new technologies. If new raw material are produced, e.g. new varieties of plastics, new processing machines have to be built etc. Anyway, there is an interdependence of all three main elements which must be given due attention in planning.

We shall try now to draw some conclusions from what has been said before:

- (i) Planning if conceived as national and comprehensive planning includes foreseeing and planning of technical and technological progress. This is to give the country the possibility to manage independently the main factors of general economic progress.
- (ii) Planning starts with thinking about production and productivity as well as about the material basis of both.
- (iii) Planning of technical progress is one starting point of planning the various sectors and branches of the national economy (and first of all industry). This refers to production, productivity, investment and manpower.
- (iv) The necessities and possibilities of technical progress determine and predict the concrete ways of planning activities in the field of research and development (areas and topics of research, scientific personnel and institutions etc).

- d) Technical progress is a business of planners and economists. It must not be left to engineers only. To think about technical progress and to promote it should absorb a great part of the planners' interest and working time.
- e) Planning of technical progress means detailed planning of the increase in labour productivity.

3. Preparatory analyses

Before the technical plan is drawn up some preparatory work must have been done. We shall discuss, briefly, some of these activities.

3.1 Technical analysis on the branch level

Within the framework of the general objectives of the long-range national plan, a detailed plan for each branch has to be mapped out. This plan must be based on an analysis of problems of the respective branch in industry. In the G.D.R. it is called basic conception of technical progress. It is in line with the mentioned general objectives (giving, of course, more details) but it is not necessarily identical with the detailed targets of the various annual plans by which any long term plan is broken down. This basic conception is meant to give a clear description of the substantial technical (and economic) trends of the respective branch. The basic conception contains all measures which must be taken by the planning authority of the branch in order to promote technical progress. The plan, however, will pick out later those measures which fit in the entirety of branch targets as well as national targets for that period for which the plan actually is

established. If e.g. a certain basic conception points out that mechanization of some operations must be carried out (from the point of the branch) which will cost, say 10 millions, the plan will finally decide when this will be realized. This is so, because the national (annual) plan has to balance in detail the requirements of all branches with the resources available. The plan, moreover, gives a precise timing of all measures. If on the other hand, the plan sets aside a considerable sum for a certain branch, the responsible planning authority for this branch is expected to have a clear and thoroughly calculated idea about how this sum could be used most rationally.

Concluding we can say that this kind of working out a basic conception for each branch enables planners, first, to be well prepared when the elaboration of the plan will start, and secondly, this is a means of being kept well informed on all technical (and economic) problems, tendencies etc. of the respective branch. These basic conceptions will tell them what they must do. Last not least, by this way the central planning actually is complemented and detailed on the branch level.

Although the concrete contents of the basic conception is different from branch to branch each conception has to give an extensive answer to a lot of questions common to all of them:

- (i) Main tendencies in the field of
 - a) technique (typical machinery)
 - b) technologies
 - c) new raw materials
 - d) products (technical data, utility)

- (ii) Organisational measures in the field of
 - a) concentration and specialisation of production
 - b) changing the production program owing to international agreements(this part contains concrete measures which enterprises have to be reorganized or set on another production program or to be transferred to another branch)
- (iii) technico-economic level
 - a) degree of mechanization and automation (how to be improved and in which enterprises preferably)
 - b) where to renew existing capacities and where to build up new ones
 - c) labour expenditure per product (how to improve it; international comparative studies)
 - d) competitive situation of products on the world markets.

All data resp. all measures must be calculated as regards their economic efficiency, i.e. funds needed and the return to be gained. Furthermore, there must be mentioned the sequence of all measures according to which the latter will be transferred to the final plan. Finally, the basic conceptions can not do without some, though rough, calculations with respect to total output etc. because problems of e.g. technology cannot be solved from the pure technical point of view. It is natural that this Offers some difficulties. Several variants of measures, therefore, are recommended.

3.2. Technical analysis on the firm level

All preparatory work for the technical plan must be done very thoroughly. In addition to the central planning in this field much has to be carried out on the enterprise level. To keep up with technical progress or to have modern accomplishments as one starting point of planning requires rather concrete studies and analyses. A system, therefore, is necessary which will enable us to cope with this basic task. This system can be sketched as follows:

A list of products must be compiled containing such which are of crucial importance for the national economy. This importance may be determined (a) by the foreign markets where our production is sold or intended to be sold, (b) by the role a certain product has to play in local production and productivity, (c) by the local demand and or by other factors. Products included in this list must be systematically analysed in various respects thus providing the necessary data for planning technical and technological progress in each case separately and concretely. This analysis has to be undertaken by that enterprise which is the main producer of the respective product.

The aims of this work are:

- a) to fix the starting points of the technical plan of the enterprise
- b) to analyse the requirements for improvement of organisation of production
- c) to analyse all data (technical, technological, economic) concerning the product as a whole
- d) to collect information which can help to improve the technical plan instantly

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CHAPTER II

The elaboration of the technical plan

We have already learned that planning of technical progress has to start on the central level. This so, because the economic growth basically depends upon combined and coordinated efforts in the field of technique and technology. Modern planning, therefore, means that any national plan should have a special section which may be called the technical plan. This section of course, has to be coordinated with all the other sections of the comprehensive plan on many lines.

1. General instructions for preparing the technical plan (directives)

The supreme planning authority gives rather concrete instructions to all other central organs which are responsible for planning in their respective fields. These instructions are naturally based on the preparatory analyses which had been briefly described in chapter I. They channel all respective planning activities in accordance with the general line of economic development of the nation.

It is true that planning of technical progress often seems to face unsurmountable difficulties. Every day innovations are made, technologies are being improved. Nevertheless the planner has to look for factors and data which could form a solid basis for his technical plan which, in addition to this, must be flexible too. The general starting points for the technical plan are:

- (i) the choice of the main branches which will be given priority in forthcoming period; efforts must be concentrated in order to solve the technical problems of these branches (this highly effects international division of labour in the field of research and development);
- (ii) results of basic research in the respective fields;
- (iii) results of applied technical research and development which can be used straight forward in production;
- (iv) informations about the best possibilities of modern technique and technology irrespective of the fact if or not they are already utilized somewhere;
- (v) informations about the actual international level and accomplishments in the various fields of technique and technology.

The most important items are (i) and (iv), which show where great efforts must be made and which results of research etc. are already available and ready for use.

Now the supreme planning authority after having studied all those data will draft its general instructions (directives) for the technical plan. This work is done annually. Those directives broken down by branches cover, at least, the following problems:

- (a) main topics for technical and technological research and development activities
- (b) new products, the output of which must start in the forthcoming planyear (kinds of products and volume of outputs)
- (c) products which are to be excluded from the production program (because they are now imported or there is no demand anymore etc.)
- (d) which products and technologies are to be standardized
- (e) which enterprises are to be specialized with respect to their program of production
- (f) which enterprises and technological (production) processes are to be mechanized resp. automatized preferably)

The Council for Research is an executive, advisory and coordinating body which is attached to the government (Council of Ministers). It is actually part of the governmental administration without, however, being engaged in pure administrative matters (except while elaborating the research plan).

- c) Finally, a central administrative institution, the State Secretariate for Research, is in charge with current affairs in this field. It is an auxiliary authority of both the Council for Research and the State Planning Commission administratively being subordinated to the latter. The State for Research is a cabinet member.

The Council for Research obviously is vested with the authority to channel almost all analytical work on all levels (central, branch, enterprise) and in all organisations, institutions as well as enterprises. It is, moreover, in a position to give sound and detailed instructions to all the bodies engaged in preparing and elaborating the research plan because its members are exclusively high-ranking scientists of the academies, universities etc. All comments on relevant technical problems given by the Council therefore, are some kind of combination of the results of technical analyses on the lower levels with ideas (or general objectives) of the central authorities on further technical progress in general. The actually helps mobilize the scientific potentiality of the country and, by this way, elaborate a well-balanced national plan.