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# USSR Report

ECONOMIC AFFAIRS

(FOUO 5/80)



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USSR REPORT  
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SCIENTIFIC-TECHNICAL PROGRAMS IN NATIONAL ECONOMIC PLANS

Moscow VOPROSY EKONOMIKI in Russian No 11, Nov 79 pp 23-32

[Article by V. Disson]

[Text] The implementation of the main thrusts of scientific-technical progress is connected with the overall solution of problems with regard to supplying production processes and auxiliary operations with systems of machinery and equipment as well as the means of automation; the creation of production lines on the basis of principally new technological processes and equipment of large, standardized capacity; the expansion of the products list and the improvement of the properties of construction materials along with perfecting the means of processing them; the application of new methods of organization and administration; the protection of the natural environment, etc. Their solution depends on the creation and assimilation in production of new technical items, materials, technology, and new methods which have embodied the results of scientific research and technical developments, discoveries, and inventions.

Under these conditions there is an increase in the value of the programmed-targeted method, which permits us to concentrate our efforts and material means on attaining the outlined goals, guaranteeing overall quality in solving the problems posed and continuity in carrying out the necessary measures; speeding up the introduction of scientific research and developments into practical utilization. It makes it possible to discover and take into consideration the interrelationships between sectors, and this is particularly important in solving the overall, intersectorial problems of scientific-technical progress. The programs consist of planned, directive documents which are being worked out to solve complicated problems requiring the promulgation of a complex of goal-oriented measures, interrelated in resources, time periods, and in the large number of participants. The place and purpose of the scientific-technical programs within the total system of planning at all levels of administration has been determined by the decree adopted by the CPSU Central Committee and the USSR Council of Ministers, "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing the Effectiveness of Production and Work Quality."

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An organic component of planning is the overall program for scientific-technical progress, which is worked out for a period of 20 years and then is refined and extended every 5 years. It represents an integrated conception of the development of science, technology, and production in the form of a system of interconnected forecasts. Preparation has been completed on the program for scientific-technical progress for the period extending to the year 2000. It establishes qualitative shifts in equipment and technology with a socioeconomic evaluation, as well as priorities in developing individual scientific thrusts; and it is recommended that these be given top priority. Proceeding from the tasks of developing the economy and the tasks of social progress, the most important scientific-technical problems are defined, both the long-term ones and those which will yield results within comparatively brief time periods. The overall program will constitute an initial document for developing the plan for the USSR's principal economic and social development for 10 years.

On the nationwide level it has been recognized as feasible to work out the following: targeted, overall, scientific-technical, economic, and social programs; programs for developing individual regions and territorial complexes included within long-range plans; basic tasks in carrying out scientific-technical programs included within the state's five-year plans; programs for solving the most important scientific-technical problems and the comprehensive utilization of natural resources, which are being worked out by the USSR State Committee for Science and Technology and USSR Gosstroy (in the fields of construction, building materials, and construction and road machine building) jointly with the USSR Academy of Sciences. On the sectorial level within the five-year plans for raising the technical level of the sectors, the USSR ministries and departments and the Councils of Ministers of the Union republics must approve the programs for solving the sectorial scientific-technical problems and the comprehensive utilization of natural resources. On the level of associations and enterprises within the five-year and yearly plans, tasks will be approved with regard to fulfilling the nationwide and sectorial scientific-technical programs.

In scientific-research, design, planning, and technological organizations, at testing (experimental) enterprises, in scientific-production and production associations (enterprises) which have been converted to the cost-accounting system, operations concerned with the creation, assimilation, and introduction of new equipment will be carried out on the basis of orderjob authorizations (agreements), comprising, in essence, local programs. These must contain definitions of the end results of the operations (including the effect on the national economy), the participants, and the time periods for carrying out the operations at all stages--from scientific research to introducing the results into production, as well as the necessary material resources, the amounts and sources of financing and material incentives.

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Specific experience has been accumulated in working out and implementing scientific-technical programs of various types during the 10th Five-Year Plan. Thus, within the state five-year plan for 1976--1980 there was approval of the basic tasks of programs with regard to solving 200 extremely important scientific-technical problems; as a rule, these were inter-sectorial in their nature.

The USSR Academy of Sciences has worked out long-term programs of comprehensive research with regard to aggregate problems in the fields of the natural and social sciences. In order to implement such programs, coordinated plans have been drawn up for joint operations by the USSR Academy of Sciences and the appropriate ministries and departments. The Siberian Department of the USSR Academy of Sciences has worked out 24 research programs on utilizing Siberia's natural riches; these comprise a component part of the general scientific program known as "Sibir'." In its plan for the republic covering the years 1976--1980 the Latvian SSR approved 11 territorial programs with regard to the most important problems and, in particular, on working out and implementing output quality control, on mechanizing manual and physically heavy work, the protection of the natural environment and the rational utilization of natural resources, as well as the comprehensive utilization and reproduction of timber resources. Territorial programs have also been worked out in a number of other union republics. Certain ministries have formulated programs for solving individual sectorial scientific-technical problems.

The decree of the CPSU Central Committee and the USSR Council of Ministers concerning the improvement of planning in long-range plans accords an important position to targeted, comprehensive programs which must be worked out with regard to key problems in the country's development. As top-priority programs for the immediate future, programs have been specified for economizing on fuel and metal, developing the zone of the BAM (Baykal-Amur Mainline), reducing the use of manual labor, and increasing the production of new consumer goods. The implementation of each of these programs is bringing about a need to promulgate a complex of scientific studies in order to select the most effective ways and means of attaining the goals set before us, of carrying out measures for the development, assimilation, and mass production of new types of output, of furnishing the production line with up-to-date technical means and progressive technological processes. The above-mentioned scientific-technical measures are components of the programs and should be approved within them as subprograms.

Obviously the number of targeted comprehensive programs, the list of which has been entrusted to USSR Gosplan for approval, will be larger. However, this list cannot be too broad, so that the principal of the high priority of their resource allocation will not be lost. At the same time, it does appear equitable to include on this list long-term, targeted programs for guaranteeing a complex of measures to raise the technical-economic level of production and output.

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Beginning with the 10th Five-Year Plan tasks concerned with raising the technical-economic level of production and output are being established in the state plans. Prior to this in the plans for the development of science and technology the chief place was occupied by planning not the end goals (raising the technical level of production), but rather the means of attaining these goals in the form of tasks for promulgating scientific research and technical developments, as well as the assimilation of new output and new engineering processes. By using such measures it was impossible to determine sufficiently the changes in the technical level of the sectors of the national economy, the influence of scientific-technical progress on improving production and increasing its efficiency, as well as on economic results. Of course, at the stages of development and assimilation society bears losses which are covered and guaranteed by economic efficiency only when there is widescale utilization of new equipment, and when it affects the improvement of technical-economic indicators of the operation of sectors and enterprises.

The indicators of the technical-economic level of production and output for every sector are established by proceeding from the tasks of its technical and economic development as defined by the principal thrusts of the country's economic and social development into the future and the five-year period. The basic tasks approved for the 10th Five-Year Plan with regard to raising the technical-economic level of production and output are directed at the following:

- improving the qualitative structure of output (increasing the proportion of progressive types of production as well as improving the total qualitative indicators of output);

- raising the level of the technical base in the sector (increasing the output in units of large, standardized capacity, furnishing production with sufficient and up-to-date equipment);

- permitting the use of progressive technological processes (growth in the scope of using the most effective technological processes, which ensure an increase in labor productivity, a reduction in the losses of raw materials and other materials and their comprehensive utilization, improvement in output quality, and protection of the natural environment);

- raising the level of production mechanization and automation (the widespread use of systems and machine complexes in production and on this basis--the mechanization and automation of the entire production cycle);

- the reduction of material consumption by production. This is one of the most important conditions for increasing its efficiency.

The incorporation of the measures enumerated above into the five-year and yearly plans has reinforced the centralized influence on raising the technical-economic level of production, the expansion of the scope of



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production and the utilization of new machines, equipment, materials, and technological processes. Nevertheless, approximately 20 percent of the tasks have not reached the level approved in the yearly plans. In particular, tasks have not been fulfilled with regard to the growth of output of the progressive types of mineral fertilizers, plastics, synthetic fibers and threads, as well as the incorporation of highly productive engineering equipment in the chemical industry. In the oil-refining and petrochemical industry there have been insufficient growth rates in the production of radial-design tires, and the planned level of durability for the tires of trucks and passenger cars has not been attained. Also failing to meet the assigned level of the most important indicators are the blast-furnace, steel-smelting, and rolled-steel production lines (the coefficient of utilizing the usable volume of blast furnaces, the expenditure of coke per ton of cast iron, the expenditure of steel ingots in producing rolled steel, and a number of other factors) in ferrous metallurgy. Tasks have not been fulfilled with regard to raising the level of mechanization at lumber yards, and this is one of the principal reasons why the lumber industry is lagging behind the planned assignments with regard to labor productivity. The dry method of cement production in the building-materials industry is not being developed as it should.

An analysis of the reasons for the non-fulfillment of the indicators of the technical-economic level of production and output has revealed that the planned measures were not sufficiently reinforced in the plan procedure by tasks with respect to the introduction of new capacities, the guaranteeing of material and financial resources, and they were poorly coordinated with the plans for capital construction and with the production of new equipment.

The development of long-term programs, the end-results of which constitute the raising of the technical-economic level of production and output, will permit a more comprehensive and targeted definition and implementation of the necessary measures for attaining the goals which have been set for us. In our opinion, these programs ought to establish tasks with regard to working out and assimilating into production new types of equipment and technological processes; they should also provide for expanding the scope of production and the use of progressive technical means and effective methods of production which have already been assimilated or have begun to be assimilated. At the same time it would be feasible to include in the programs measures with regard to bringing new equipment to the point of introduction, to developing production capacities, to building new and modernizing existing production lines, and to determining resources.

In programs concerned with raising the level of mechanizing and automating the most important production processes and, on this basis, with the growth of productivity and the elimination of heavy manual labor, it is necessary to provide for the creation and assimilation of new engineering types of machinery which are in short supply within the system, as well as further improving and expanding the production of equipment which has already

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been assimilated. In programs whose goal is to improve the technical-economic indicators of production (for example, a reduction in materials consumption and energy consumption, an increase in the overall utilization of raw materials, other materials, etc.) it would be feasible to include measures with regard to developing and assimilating new technological processes and equipment, expanding the scope of utilizing already-assimilated progressive technology, improving technical means and increasing their production. In programs concerned with improving the structure of production output as well as with increasing the proportion of the progressive types of output within the total volume of production and improving the qualitative characteristics we should include the creation of new types of output with improved parameters, along with expanding the production of items and materials which are already being turned out at a high technical-economic level.

Long-term programs can also be worked out to solve scientific-technical problems which are linked to the introduction of the most important, already completed research and developments, major inventions for the purpose of large-scale utilization of the equipment and technology which have been created on their basis. It would also be feasible to draw up programs with regard to principally new directions, when the end goals still cannot be expressed in the form of the industrial introduction of a new item of equipment or technology. Measures of such programs comprise broad scientific research studies, experimental and test verifications, with the issuing, based on their results, of proposals and recommendations in the form of plans, technical-economic grounds, and reports.

Targeted comprehensive programs ought to be coordinated with appropriate sections of the plan, as well as with material and financial resources. In our opinion, this coordination should be carried out in the following manner. In each of the long-term, targeted, scientific-technical programs two interconnected but essentially distinct thrusts are to be kept separate: 1) expansion of production and the use of created items of new equipment and technology; 2) solution of scientific-technical problems with regard to the creation of innovations.

The implementation of measures of long-term programs for increasing the volumes and utilization of new technical means and technological processes can be solved by traditional methods of planning. In order to do this, the appropriate sections of the state and sectorial plans for five-year and annual periods must include from the programs tasks with regard to increasing the volumes of output produced, the introduction of new capacities by means of building new or modernizing existing enterprises, the allocation of resources, as well as the reflection in the plans of economic, scientific-technical, and social results. Such measures can be carried out primarily within the framework of the already formed specialization and cooperation, as well as by traditional methods of planning.

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The solution of scientific-technical problems regarding the creation of innovations and bringing them to the point of industrial assimilation requires the promulgation of a complex of measures at all stages of the cycle "science--technology--production," the establishment of new ties among organizations, enterprises, and sectors, as well as, in a number of instances, the creation of new organizations and enterprises. Each of the stages of the above-mentioned cycle represents a sufficiently independent sphere of activity with a well-formed mechanism of administration, planning, and financing. Hence, during a transition from one stage to another there arise difficulties, especially when the participants in the operations are organizations and enterprises of various departments.

As experience has shown, these difficulties are overcome more successfully if the operations are conducted on the basis of scientific-technical programs which are approved for a five-year period and which are called upon to assure the necessary coordination of operations between various participants and joint operations during the transition from one stage of research and development to another. Such programs may be either a part of long-term, scientific-technical programs, or they may be utilized to carry out tasks which require solution within the given five-year period. As compared to the long-term programs, they must be more directive in their nature and, to a large extent, be detailed with regard to measures and participants.

A new decree of the CPSU Central Committee and the USSR Council of Ministers concerning the improvement of planning has provided for the working out of programs to solve the most important scientific-technical problems and problems of the comprehensive utilization of natural resources on the nationwide and sectorial levels. The targeted thrust of these programs has underscored the end result--organizing the regular production of new output and the introduction of progressive technology. They must take into consideration the results of basic and applied scientific research and ensure that they are brought to the point of practical implementation. The development of such programs on the nationwide level has been entrusted to the GKNT (USSR State Committee for Science and Technology) and USSR Gosstroy in conjunction with the USSR Academy of Sciences. In order to accord multi-faceted consideration of the achievements of science and technology in the plans of economic and social development, the programs with regard to solving the most important scientific-technical problems and problems of the comprehensive utilization of natural resources must be presented to USSR Gosplan, whereas the principal tasks of these programs will be confirmed in the state five-year plan.

In working out the programs with regard to solving the most important scientific-technical problems and the problems of the comprehensive utilization of natural resources for the ensuing five-year plan it is necessary to take into consideration the experience in drawing up and implementing the similar programs which were approved for the years 1976--1980. In

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accordance with these programs a considerable amount of operations with regard to solving more than 200 scientific-technical problems are being carried out in the 10th five-year plan. They are being utilized to create and bring to the point of assimilation in the national economy an extremely large power unit with a capacity of 1.2 million kW for the Kostromskaya GRES, a hydroelectric power unit with a capacity of 640,000 kW for the Sayano-Shushenskaya GES, and a unit with a capacity of 600,000 kW, equipped with a fast-neutron reactor for the Beloyarskaya AES. Progressive technological processes have been used as the basis for creating and putting into operation units of large, standardized capacities in the chemical, petrochemical, and oil-refining industries, as well as in the building-materials industry. In order to provide basis equipment and supplies on a comprehensive for production and auxiliary processes in various sectors of the national economy (primarily for coal mines, ore-mining operations, lumbering, hoisting and transport, warehousing, and a number of agricultural operations), where a significant number of workers are still employed in heavy, manual labor, highly productive means of mechanization and automation are being created and assimilated.

In all, the programs have planned to create approximately 2000 new types of equipment for production purposes and consumer items, of which 60 percent are intended for assimilation during the 10th Five-Year Plan. With regard to the remaining projects a stockpile is being created in order to complete them during the next five-year plan. The programs also provide for the development of about 1000 new technological processes, more than 900 types of economical materials, and about 700 automated control systems of various types, the great majority of which will be brought to the point of assimilation in production during this five-year plan. An important thrust in the programs is the development and introduction of methods and means of environmental protection, including the prevention of the pollution of water and air basins, the purification of industrial waste waters, and the creation of new methods of monitoring the environment.

A number of programs are directed at developing research which is necessary for the formation of a scientific-technical inventory for the future. In particular, the programs for the 10th Five-Year Plan have provided for a large volume of scientific studies dealing with the problems of utilizing the principle of super-conductivity, the creation of an MHD (magneto-hydrodynamic) generator, new types of gas transportation, the development of pneumatic container transport, the protection of metal from corrosion, and a number of other problems. Moreover, many programs have outlined individual tasks concerned with developing theoretical studies, working out forecasts, and research on various processes and phenomena which are necessary for the selection and the scientific groundwork for the optimum ways of solving problems and determining the directions of further work.

It also seems equitable to include in future programs tasks with regard to the formation of an inventory concerned with the most important directions for the future development of science and technology. At the same time, in

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our opinion, a number of programs, particularly those in the field of construction, agriculture, etc., should not limit themselves to carrying out only scientific research and plan operations. Provisions must be made to bring their results to the point of practical utilization under production conditions. In order to include tasks concerned with the industrial assimilation of innovations within the programs of the 11th Five-Year Plan, we must, first of all, carefully analyze how the programs of the current five-year plan are being finished up and include the unfinished projects in the new programs (provided, of course, that the work has not lost its timeliness). This will also facilitate a more equitable distribution of finishing up developments over the years. At the present time work on the majority of tasks is being finished up, as a rule, during the last two years of the five-year plan.

The programs are drawn up for a five-year period; however, with regard to tasks which are not being fully implemented it is necessary to indicate the time periods for assimilating the innovations which are being created. In all the programs it would also be feasible to determine the intended volumes of production and utilization of the items of new equipment and technology which are being created for the new five-year plan and for the following five years, when the scales will attain their optimum dimensions. The economic efficiency of the innovations must reckon on these volumes as well as determining and evaluating measures for achieving the intended volumes of production and utilization of innovations.

One of the important trends in improving the development of programs is increasing the comprehensive nature of the measures being provided in the programs. If, for example, the goal of a program is to develop and assimilate a new technological process, then it is necessary to provide for tasks with regard to the design and manufacture the required equipment, means of automation, catalysts, etc. In creating new machinery we must set up tasks to develop complete sets of items and materials. Unfortunately, in a number of programs for the 10th Five-Year Plan we have still not overcome a bureaucratic approach, and this does not allow us to fully utilize the advantages of the programmed-targeted method.

The comprehensiveness of the programs will be assured if the basic measures with respect to each task of the program are provided for in a specific sequence--from the scientific research to the assimilation of the created innovation in the national economy. Each of a program's measures must serve as a phase in the overall complex of the necessary operations, and the result obtained from its implementation must be a point of departure and mandatory for the promulgation of the ensuing phases. Unfortunately, instances are encountered wherein such important operations as designing and building test and test-industrial installations, as well as preparing production for assimilation remain outside the framework of the program. Often scientific-research work, though conducted in accordance with the program, constitutes, so to speak, its own goal, without indicating an end result and the measures to utilize this result.

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In order to put the program structures in good order and establish a sequentiality in implementing the program tasks, use is made of standardized phases for creating new items, materials, technological processes, and automatic control systems. The standardized phases, which have been worked out by the GKNT, as applied to the existing GOSTs (All-Union State Standards), define what result must be achieved at the conclusion of each phase and in accordance with what sequence the acceptance of a finished operation will be carried out. Proceeding from the new requirements, we must introduce refinements into the standardized phases in order that they may provide to a greater degree measures not only with regard to preparing new equipment to be installed in production but also with regard to preparing production facilities for the assimilation of new equipment, including the organization of regular production of the new output and the introduction of progressive technology.

Continuity of planning throughout the entire cycle of "science-technology-production" will be assured if the concluding phases of the programs with respect to assimilating the items of new equipment, materials, technological processes, and ASU (Automatic Control Systems) (which are being created in the five-year plan being planned) will at the same time also be provided for in the plans for assimilating new types of industrial output, and the introduction of progressive technology and computers in the production plans as well. Tasks with respect to increasing the scope of production of new types of output and saturating various spheres of production with them, as well as with expanding the application of progressive technological processes, should be included within the plan with regard to the principal indicators of the technical-economic level of production and be a component part of the plans of production and capital construction.

The chief condition for the effectiveness of the programs is their coordination with the tasks of the plans for production, capital construction, material-technical and financial guarantees. It has been established that the tasks of the programs being worked out to solve the most important, high-priority, scientific-technical problems are subject to mandatory inclusion in the state and sectorial plans as well as to the top-priority guarantee of the necessary resources. However, the ministries have not provided for a number of program tasks in the plans, and this has led to a disruption of the planned time periods or to their postponements. This is primarily a matter of constructing test and test-industrial installations for processing efficient technological processes, as well as preparing production to assimilate new equipment and technology.

Frequently the measures of the programs and the time periods for fulfilling them are dependent upon whether or not the appropriate tasks are included in other sections of the plan. The non-allocation of the necessary resources, at times without sufficient grounds, is reckoned to be the objective cause for adjusting the programs. It was principally for these reasons that for three years of the 10th Five-Year Plan production did

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not assimilate more than 15 percent of the items of new equipment which had been planned for introduction and which had been created in accordance with the programs; nor were about 40 percent of the test, test-industrial, and chief facilities and installations.

The lag in construction and in the putting into operation of test and chief facilities at which the processing and assimilation of new equipment is carried out constitutes one of the causes of the slow introduction of scientific-technical achievements in the national economy. This situation is frequently explained by the insufficient allocation of funds to the development and assimilation of new equipment. It is noted that these funds amount to only 25--30 percent, and sometimes even less, of all the funds allocated to science, while more than 60 percent are earmarked for applied research. However, calculations show that about 25 percent is allocated to applied research, while more than 60 percent of the funds allocated to science are earmarked for development. Thus, it is the capital investments in the implementation and assimilation of new equipment which are insufficient rather than the funds allocated to technical developments. Therefore, we must strengthen the plan's effect upon guaranteeing the program tasks.

In our opinion it would be feasible in the state plan with regard to introducing progressive technology to provide for the construction and putting into operation of the most important test-industrial installations, and in the plan for capital construction to set aside an individual line for the volume of operations concerned with their construction.

It is also necessary to strengthen the role of the financial mechanism in guaranteeing the fulfillment of the program tasks. The scientific-technical programs specify the estimated cost of operations and the financing ministries. A procedure has been established for the top-priority financial guaranteeing of the operations which are being carried out in accordance with the programs. In the state plan for financing scientific-research operations outlays for the programs are earmarked by a separate line. Nevertheless, the financial plans are approved for only one year, while the financing of operations in accordance with the programs is carried out from many sources. In a number of ministries and departments funds are earmarked not for the fulfillment of specific operations but for the maintenance of scientific institutions. Possibilities are insufficient for the consumer to influence the quality and timeliness of fulfillment of the scientific-research operations and technical developments, since these operations are often financed by means of the performer's funds.

The decree of the CPSU Central Committee and the USSR Council of Ministers on improving planning and the economic mechanism has specified a number of measures for improving the financing of operations with new equipment. In particular, it has been established that financial balance sheets and plans will be worked out not only for one year, but for the entire five-year

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plan, and this will permit the improvement of the financial support of the programs in which the estimated cost of the measures is indicated for the five-year period. In 1980 the transition carrying out operations with regard to new equipment by means of order-job authorizations (agreements) in which the dimensions and sources of financing all operations will be indicated; i.e., those which are necessary to create an item of new equipment and putting it into production, for the entire period of fulfilling them. Moreover, calculations will be made not for the fulfillment of individual stages of the operations, but for the completely finished and accepted work.

All this will allow us, with the aid of the financial mechanism, to more actively influence the execution of operations in accordance with programs which are assigned not in the form of a process, but rather in the form of end results. Of great importance for the financial support of all phases of operations for working out and assimilating new equipment, as well as compensating for increased outlays during the first few years of its operation, will be the creation of a unified fund for the development of science and technology in all sectors of industry. This fund will have to be formed from deductions from the plan profit in accordance with fixed norms. It is no less important that the plan procedure will contain provisions for reserves, including financial reserves, for scientific-research operations. In order to implement the solutions intended by the decree for improving the financial mechanism, we must work out within extremely compressed time periods a number of normative documents dealing with the practical application of these statutes. Moreover, maximum consideration must be accorded to the operational experience of those sectors where the indicated statutes have already been tried out.

The new machines, equipment, and technological processes being created (within the programs) ought to correspond or surpass in their indicators the best world and Soviet achievements. In order to include in the plans only the most urgent research and development capable of sharply improving the technical-economic parameters of new equipment in production and use, for each item to be included in the program a chart is worked out for the technical level, and calculations of the economic effect are made. The chart cites the basic technical and economic parameters of the innovation being created in comparison with the best Soviet and foreign models, the sphere of its intended use, patent status, and limit (maximum marginal) price. However, these charts do not always cite reliable information concerning the models selected for comparison, and they exhibit obsolete data for comparison.

In the programs, therefore, it is necessary to outline measures with regard to increasing the technical-economic characteristics of output, which in accordance with the decree of the CPSU Central Committee and the USSR Council of Ministers regarding the improvement of planning must be worked out according to the results of evaluating the technical level of the machinery and equipment being turned out, as well as that of other,

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production-type technology. The decree also provided for the promulgation of an all-departmental expert appraisal of the technical-economic indicators of the particularly important types of the output being created and the technological processes in the phase of the technical tasks and the end results. This will facilitate the raising of the level of developments being carried out in accordance with the programs. To carry out this expert appraisal, we should obviously enlist commissions of scholars who have worked out a comprehensive program of scientific-technical progress for the future. It would also be feasible to entrust to such commissions the expert appraisal of a list of the most important scientific-technical problems.

In order to concentrate our resources on solving the most important problems on a nationwide level, it is necessary, in our opinion, to approve not 200 programs, but substantially less. They should include primarily programs dealing with those problems whose solutions are based on the creation of principally new equipment and technology. The introduction of such innovations into production ought to exert a determining influence on the growth of labor productivity, a lowering of material consumption and specific capital investments, as well as on the multifaceted increase of the efficiency of social production and output quality. As a rule, this is linked with the organization of new or the reorganization of existing scientific and design institutions, along with the creation of up-to-date production facilities and sometimes even sectors, the allocation of large-scale financial and material resources, as well as the training of scientific and highly skilled production personnel. Hence, it is precisely with regard to such problems that we must work out programs and develop them at the state level.

Problems of a narrowly sectorial importance, as provided for in the decree of the CPSU Central Committee and the USSR Council of Ministers, will be approved at the sectorial level or upon agreement among two or three ministries. This has to do primarily with problems which are worked out on a traditional basis and which do not plan significant qualitative changes in the technical level and the technical-economic parameters of the equipment and technology being created. With regard to problems which do not go beyond the bounds of study and scientific research, and operations on which are limited to recommendations and reports, it would be feasible to work out comprehensive plans for scientific research at the sectorial level, while in case coordination is necessary with a large number of departments--at the GKNT level.

Improving the methodology of drawing up scientific-technical programs, working out problems connected with administering programs in the process of implementing them, will facilitate the speeding up of scientific-technical progress, along with the successful solution of economic and social problems.

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OVERALL VALUATION AND UTILIZATION OF PRODUCTION RESERVES

Moscow VOPROSY EKONOMIKI in Russian No 11, Nov 79 pp 33-40

[Article by Zh. Sidorova]

[Text] One of the most important principles of organizing labor payment under socialism is furnishing a social valuation of the differences in the degree of utilization of production resources in drawing up plans and their reflection in the wage mechanism.

In the complex of measures dealing with the increase in production efficiency outlined by the 25th CPSU Congress and the decree of the CPSU Central Committee and the USSR Council of Ministers of 12 July 1979 "On Improving the Planning and Strengthening Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality," an important place is occupied by problems of working out plans which most fully take into consideration the potential for production growth. One of the chief conditions for solving these problems is improving the system of material incentives.

On the one hand, a plan task determines the goal and the conditions of the labor process, the amount of output to be produced, the material and labor outlays necessary for this, and so forth. On the other hand, the plan acts as a criterion for the social valuation of the workers' labor contribution.

The unity of these functions does not negate the possibility of their contradictions, as expressed at times in a striving to lower the plan, disclosing reserves in the course of its fulfillment, and this leads to a violation of stability and balance in the plans, while, at the same time, it hardly has any effect on the sizes of wages. A solution of this contradiction may be found, in the first place, in the presence of a mechanism for evaluating the degree of the plan's stepped-up factor and, in the second place, in considering in the case of wages elements which facilitate the working out of plan tasks.

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Industry has already accumulated experience in evaluating and stimulating stepped-up plans. However, the lack of a standardized, methods approach to specifying a quantitative evaluation of the plans and the degree of their well-groundedness has retarded the scope of introducing effective forms of planning and stimulating the use of intensive factors of economic growth.

The most widespread acceptance has been gained by the methods worked out by the Ministry of Tractor and Agricultural Machine Building, the Ministry of the Electronics Industry, as well as the principles for computing a valuation which have been proposed by the Ukrainian Branch of the NIIPiN (Scientific Research Institute for Planning and Norms) of the USSR Gosplan. A detailed analysis of the methodological principles of the methods enumerated above has indicated a number of weak aspects, which do not permit an objective valuation of the degree by which the plans are stepped up. Such insufficiencies include the following: the limited conditionality of the point-type valuation and the method of expert-appraisal evaluations (employed by the Ministry of Tractor and Agricultural Machine Building as well as the Ukrainian NIIPiN), inadequate characterization of the level of utilizing reserves by the method of comparing the dynamics of the indicators in relation to the base period (Ministry of the Electronics Industry), the limited nature of the methods based on one or two summarizing indicators from the point of view of the one-sidedness of reflecting the degree of utilizing reserves. A general deficiency of the methods under consideration here is the lack of incentive levers for adopting stepped-up five-year plans.

It seems to us that the utilization of this or that method and the selection of indicators for evaluating the grounds of a plan ought to be preceded by a multi-faceted analysis of production reserves based on an optimum set of activity indicators of enterprises and associations. In order to carry out such an analysis, we can utilize the methods of economic statistics.

A prerequisite of this is, in the first place, a comprehensive characterization of the plan itself, including the conditions, methods and factors of production as expressed by a system of indicators and norms. Moreover, many of them are in a complicated cause-and-effect dependence. In order to study and evaluate the connections among a large number of interrelated phenomena, use is made of the methods of correlation and regression, and these allow us to take into consideration in "pure" form not only each of the factors to be analyzed but also their entire aggregate.

In the second place, a principle of evaluating the degree of a plan's well-groundedness is the comparability of the achieved level of the economic indicators of a given enterprise with the norm, with the level of advanced enterprises or the average-sectorial level. It is well known that the equation of a set regression characterizes the change of an indicator being studied under various values of the factors, while the coefficients of a regression indicate to what magnitude on an average the value of an indicator being analyzed changes when it is changed to a value unit of the given factor. Therefore, having placed in the equation of regression the values of the indicators of enterprises which have attained high results, we can calculate the reserves for enterprises which are higher or lower than the average-sectorial level.

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However, an orientation onto the average-sectorial level does not lead to a levelling out of the given enterprise's individual characteristics, inasmuch as we assume a differentiation of the sectorial norms of deductions made to the material-incentives fund, acting in the role of which are the coefficients of regression, depending upon the specific indicators of the enterprise.

In the third place, the formation of the material-incentives fund is linked with the fund-forming indicators, which in themselves do not characterize the plan's stepped-up quality. The methods of economic statistics make it possible for us to thoroughly analyze the influence of a significantly greater number of factors in comparison with a functional scheme for the formation of this fund, and this allows us to make a multi-faceted evaluation of the plan's stepped-up quality along with the possibility for stimulating it.

For these purposes we have undertaken an attempt to utilize one of the methods of multi-dimensional statistics--the method of main components (m. g. k.). With the aid of this method we can isolate individual groups of interrelated factors designated as components which characterize the totality of content and represent various aspects of one and the same economic phenomenon.

At the present time many studies of the most important economic problems are connected with the use of economic-statistical analysis. They include the following: correlation-regression analysis of indicators of production efficiency, including fund-forming indicators, modeling the dimensions of incentive funds, optimization of the dimensions of these funds, etc.

The widespread use of regression analysis in the practice of economic calculations is explained by the possibility of evaluating the dependence among the indicators being studied. However, the mechanism of the economic links and the reciprocal influence of factors is complicated by the fact that it makes difficult the promulgation of a profound and multi-faceted analysis. Hence, there arises the need to select more improved characteristics which would be able to adequately reflect the process being studied. In our opinion, an effective means of solving this problem is the method of main components, the mathematical apparatus<sup>1</sup> of which is often utilized also when there is a small amount of statistical data, since it allows us to obtain a good approximation in those instances when large errors are permitted with the usual regression analysis.

As distinct from a correlation-regression analysis, the method of main components is used to analyze the dependence of the resultative indicator not upon each individual factor, but on the groups of interconnected efficiency indicators; and this allows us to characterize the plan's well-groundedness more profoundly.

1. See P. F. Andrukovich, "Some Characteristics of the Main-Component Method," UCHEN. ZAPISKI PO STATISTIKE, Vol 26, Ed. T. V. Ryabushkin et al. Izd. "Nauka," 1974.

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Among the distinctive traits of the main components is their disposition in a descending order with respect to size of dispersion, and they are all interdependent. The first component, which possesses the highest dispersion, reveals fundamental dependencies among the criteria being studied, while the remaining ones reveal partial dependencies. With the aid of m. g. k. control is exercised over the process of the planned utilization of production reserves. This is possible because of the method's following characteristics: the main-component method allows us to compute the comprehensive indicator of the plan's stepped-up quality, which is based upon the value of the first main component, which, to the greatest degree, characterizes the phenomenon being analyzed. The difference between the comprehensive indicator of the plan's stepped-up quality and the efficiency indicators which are used in the analysis consists in the fact that the latter, as a rule, are determined with regard to each individual factor or by an aggregate of indicators without comparing their level with the level of the corresponding data with regard to the main administrative board as a whole or its advanced enterprises. Consequently, in computing them no use is made of the principle of comparability, which is the basis of evaluating the plan's stepped-up quality.

The main components can also characterize the complex of efficiency indicators and individual aspects of production efficiency, for example, the efficiency of using worker time, production capacity, etc. In this instance, however, the appropriate main component is the indicator of stepped-up quality with regard to any group of factors. This makes it possible to discover reserves and increase the well-groundedness of the plan not only with regard to the entire aggregate of production efficiency factors but also with regard to its individual components. The comprehensive indicator of the stepped-up quality of the plan takes into consideration the sum of the loads which characterize the contribution of each efficiency indicator.

The method's constituent parts are the graphic analysis, which discloses the principle typological groups of objects of observation, and the construction of the regression equations, which include not the individual factors, but rather components which are independent of each other. In order to solve the problem of evaluating the degree of the plan's well-groundedness and its stimulation by the main-component method, a thorough analysis was made of the indicators of 36 enterprises of Soyuzelektrokabel' of the USSR Ministry of the Electrical Equipment Industry and 14 enterprises of Soyuztyazhstankoprom of the USSR Ministry of the Machine Tool and Tool Building Industry.

With regard to the Soyuzelektrokabel' enterprises factual data were taken for the years 1971, 1975, and 1977. This made it possible to trace tendencies in the changing level of indicators and their interrelationships over a number of years. With regard to the Soyuztyazhstankoprom enterprises data for 1977 were thoroughly analyzed. The materials were processed on the BESM-4M computer at the interdepartmental statistical

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methods laboratory at Moscow State University. Taken into consideration here were factors and indicators which characterize the efficiency of using workers' time and individual types of production resources, the total effectiveness of production, etc., amounting in all to 19 indicators.<sup>2</sup> For the sake of argument (y) the material-incentives fund was taken as a percentage of the wage fund of industrial production personnel.

The preliminary grouping of factors with the aid of a logical and correlation-regression analysis (a system of coefficients of paired correlation and elasticity coefficients) led to the formation of the following sets of factors:

A group of indicators characterizing the use of workers' time

Intra-shift idle times (in man hours)  
Payment of entire-day stoppages (in thousands of rubles)  
Payment for overtime work (in thousands of rubles)  
Unauthorized absences from work (in man days)  
Shift system coefficient  
Losses from breakage (in thousands of rubles)  
A group of indicators characterizing the individual aspects of the efficient use of resources

Workers' labor productivity (in rubles)  
Production output per ruble of wages (in rubles)  
Capital return on investment (in rubles)  
Material yield (in rubles)  
Turnover rate of operating funds (in days)  
Capital intensiveness (in rubles)

A group of generalizing indicators which characterize production efficiency

Profits per worker (in rubles)  
Profitability (in percentages)  
Outlays per ruble of commodity output (in kopecks)  
Proportion of output in higher quality category (in percentages)  
Increase in gross output by means of growth in labor productivity (in percentages)  
Ratio between labor productivity and average wages  
Coefficient of use of production capacity

For Soyuzelektrokabel', based on the data which we have, 12 (1971 and 1975) and 7 (1977) main components were obtained, and 7 main components for

2. The set of indicators is a model. For the sectors we propose to include indicators which reflect their specifics as well as indicators which reflect the technical level of production.

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Soyuztyazhstanoprom. Serving as indicators of the degree of influence on the part of individual factors on a component ( $V_j$ ), while the signs associated with them (+, -) are influencing the nature of the connection. Moreover, the values of the main components are defined as the sums of the products of the coefficients on the values of the corresponding variables ( $x_{iK}$ ):

$$V_{jK} = U_j \quad x_{1K} \quad U_{j2} \quad x_{2K} + \dots + U_{jN} \quad x_{NK} . \quad (1)$$

A study of the structure of the main components, which have been subjected to satisfactory description with regard to specific criteria, with regard to the Soyuzelektrokal' enterprises has allowed the formation of some homogeneous groups in accordance with the above-mentioned groups of indicators of production efficiency. Serving as a criterion for relegating a main component to this or that group are the quantitative loads ( $U_{jK}$ ) of this or that indicator ( $x_{iK}$ ) of a given enterprise.

As analysis has shown, the operational dynamics of Soyuzelektrokabel' for 1971, 1975, and 1977 led to a significant change in the composition of the main components of enterprises which have corresponding indicators. Let us trace this on the example of the Khabarovsk Cable Plant "Amur-kabel'" imeni 50-letiya SSSR.

Table 1

Change in the Technical-Economic Indicators of the Khabarovsk Cable Plant

Indicators	1971	1975	1977
Labor productivity per worker (in rubles).	23,632	30,124	25,114.0
Profitability (in percentages) . . . . .	---	---	11.6
Return on investment (in rubles) . . . . .	2.34	2.42	1.41
Production output per ruble of wages (in rubles) . . . . .	13.35	13.67	13.1
Material yield (in rubles) . . . . .	1.58	1.57	1.36
Outlays per rubles of commodity output (in kopecks) . . . . .	81.16	95.40	91.18
Losses from breakage per worker (in man days). . . . .	10.3	1.34	2.2
Unauthorized absences per worker . . . . .	0.267	0.726	0.860
Intrashift stoppages per worker (in man hours) . . . . .	2.35	3.70	3.83
Turnover rate of operating funds (in days) . . . . .	56.0	62.00	70.70
Proportion of higher quality output (in percentages) . . . . .	---	---	33.51
Coefficient of utilizing production capacity (in percentages) . . . . .	95.0	97.00	97.0

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The data in this table testify to the variation in the level of indicators from year to year. Thus, in 1975 on the average the operational indicators increased by means of growth in labor productivity, return on investment, reduction from losses due to breakage, etc. In 1977 a certain reduction is observed in the level of indicators being analyzed, and this testifies to unutilized possibilities in fulfilling the plan for this year in the given enterprise.

A similar analysis could be cited for each enterprise of the All-Union production association. Similar research is possible due to graphic analysis, which is a constituent part of the method of main components.

Study of the distribution of enterprises with regard to the first main component in dynamics indicates that the composition of the enterprises belonging to groups with high and low stepped-up labor qualities change from year to year. Thus, in 1971 the Khabarovsk Cable Plant's technical-economic indicators were at the average-sectorial level. That year the group with high indicators with regard to the stepped-up quality of labor included the Kamskiy Cable Plant, "Moskabel'," "Tashkentkabel'," "Sevkabel'," the "Sibkabel'" PO (Production Association), and the Semipalatinsk Cable Plant, which in 1975 shifted to enterprises working at the average-sectorial level. The "Kuybyshevskabel'," Irkutsk Cable Plant, and "Donbasskabel'" improved their work and moved into the higher group with regard to the stepped-up quality of labor, even though they had lower individual indicators in comparison with 1971. This is testified to by an analysis of the main components reflecting partial dependencies. The Khabarovsk Cable Plant was in an analogous position also in 1975, a fact which is borne out by the data in Table 1.

In 1977 significant shifts occurred in the distribution of enterprises. Thus, the group of progressive enterprises was joined by "Kirgizkabel'," "Ufimkabel'," Gruzkabel'," the Saranskiy Cable Plant, and "Turkmenkabel'." The "Sevkabel'," "Kuybyshevskabel'," and "Sibkabel'" enterprises shifted into the group with a lower stepped-up quality. The Khabarovsk Cable Plant was also among this group.

It should be noted that the comparison of work indicators for enterprises is conducted with an average-sectorial level, which also varies; hence, the movement of enterprises from group to group in dynamics is relative in nature. Nevertheless, analysis has thoroughly illustrated the instability of the technical-economic characteristics of production in fulfilling the plan.

This underscores the need to utilize models of economic-statistical analysis as well at the stage of compiling the five-year plan; this would enable us to better take into consideration the operating conditions of enterprises and to provide better groundwork for the five-year plans.



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Analysis has shown also that the distribution of enterprises with regard to the first component is based not on any one of the indicators of production efficiency but on their aggregate to the extent in which they reflect a difference in the stepped-up quality of labor. For example, the labor productivity of the advanced-group enterprises in 1977 significantly exceeded the labor productivity of the remaining enterprises, while the return on investment of the advanced enterprises was more than twice as great as that of enterprises with low labor productivity. This is obvious from Table 2. This same table also cites the value of the comprehensive indicator of the stepped-up quality of labor on which the value of the first main component is based:

$$J_k = \sum U_{ji} \left( \frac{x_{ik} - \bar{x}_i}{\delta x_i} \right), \quad (2)$$

Where  $U_{ji}$  represents the loads of the indicators of the first component,  $x_{ik}$  is the value of the derived criteria in  $k$  enterprise, and  $\delta x_i$  is the root-mean-square deviation of the criterion.

The values of the comprehensive indicator of the stepped-up quality of labor in advanced enterprises in 1977 were 17 percent higher, and in the remaining industries they were 13 percent lower than the average level.

The valuation of the stepped-up quality in the form of a comprehensive indicator of the stepped-up quality can be utilized in forming incentive funds. In our computations we took not the plan data, but the factual data; hence, we determined not the stepped-up quality of the plan, but the stepped-up quality of labor in fulfilling that plan. However, the main-component method does make it possible likewise to thoroughly analyze the level of the plan (five-year and one-year) indicators in comparison with the average-sectorial or normative level and the level of advanced enterprises, having thereby determined the plan's stepped-up quality. This allows us to use the method described above in forming incentive funds at the stage of drawing up the five-year plan, and this is particularly important now, when the party and the government have outlined measures to improve the entire plan operation for guaranteeing a balanced growth of the country's economy. In this connection it has been recognized as necessary to ensure the further development of cost accounting in production associations and in enterprises, based on the tasks of the five-year plan. In order to develop the economic initiative of labor groups and expand the rights of production associations and enterprises in the 11th Five-Year Plan, provisions are being made to switch over to the formation of material-incentive funds during the five-year plan in accordance with stable norms, depending basically on the growth of labor productivity and the increase of production output in a higher qualitative category. As a rule, the growth of the fund-forming indicators is higher among those enterprises which have a lower level of utilizing production

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resources in the base year of the five-year plan. Hence, the dimensions of the material-incentive fund among them will also increase more rapidly than among those enterprises which have exhausted their possibilities for the growth of indicators. In order to avoid the appearance of ungrounded variations in the dimensions of incentives, it is necessary to differentiate among derived dimensions of the material-incentive funds, depending upon the degree of the utilization of production reserves. The practical application of the main-component method solves, to a considerable extent, the problem of taking into consideration the stepped-up quality of the plan in the dimensions of the derived means of the incentive funds. Moreover, enterprises are stimulated or affected, for the most part, among those for which the value of the comprehensive indicator of the stepped-up quality deviates greatly from the average-sectorial level. In our example these are groups of enterprises with high and low labor efficiency (Table 2).

Table 2

Comparison of average-group values of criteria with general averages for enterprises with high and low labor stepped-up qualities (1977)

Indicators	Average for entire aggregate of enterprises	Average for group of enterprises	
		Group with low labor stepped-up quality	Group with high labor stepped-up quality
Labor productivity of worker (in rubles) . . . . .	24,014.0	20,093	30,357
Profitability (in percentage) . . . .	17.4	17.0	28.9
Yield on investment (in rubles) . . .	2.69	2.04	4.41
Production output per ruble of wages (in rubles) . . . . .	13.3	11.4	17.2
Material yield (in rubles) . . . . .	1.36	1.28	1.42
Losses from breakage per worker (in rubles) . . . . .	4.47	9.51	6.0
Unauthorized absences per worker (in man days) . . . . .	.47	.5	.41
Intra-shift stoppages per worker (in man hours) . . . . .	3.35	3.5	3.29
Turnover of operating capital (in days) . . . . .	43.8	48.7	38.8
Proportion of higher quality output (in percentages) . . . . .	33.2	33.5	40.9
Comprehensive indicator of stepped-up quality (in percentages) . . . . .	100	80.0	117.0

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For enterprises of the second group, among which the comprehensive indicator of the stepped-up quality is equal to 117 percent the derived dimension of the material-incentive fund (FMP) has increased by 1.2 percent of the wage fund ( $100 + \frac{117}{100}$ ). For enterprises among which the value of the comprehensive indicator is equal to 80 percent, the dimensions of the FMP have been reduced accordingly by 0.8 percent ( $100 - \frac{80}{100}$ ).

By analogy the corrected coefficients, deducted depending on the values of the comprehensive indicator of the stepped-up value, can be applied to correct the averages sizes of the bonuses which are established for the leading workers of the enterprises (associations) from the material-incentive fund. Let us suppose that the leading workers of an enterprise (or association) have established for them a bonus for fulfilling the planned indicators averaging 25 percent of their salary on an average. In that case the bonus for leading workers of the second (highly efficient) group of enterprises is set at an amount of 30 percent ( $25 \cdot 1.2$ ) and for enterprises of the first group at 20 percent ( $25 \cdot 0.8$ ).

Economic statistical models, which may also be used in computing the increased amount for each year of the five-year plan, may serve as the basis for regulating the sizes of the incentives both in the process of forming the plan as well as in carrying it out. Hence, the distribution of enterprises into groups with a high, average, or low stepped-up quality of labor may be utilized in summing up the results of socialist competitions between enterprises and associations. The winner of a competition is that enterprise which has the greatest possible value with regard to the appropriate component.

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ENTERPRISE MODERNIZATION OBJECT OF EFFICIENT CAPITAL INVESTMENT

Moscow VOPROSY EKONOMIKI in Russian No 12, Dec 79 pp 114-123

[Article by A. Yemel'yanov: "An Increase in the Efficiency of Capital Investments;" as exemplified by the Ukrainian SSR]

[Text] The CPSU Central Committee and USSR Council of Ministers decree "An Improvement in Planning and an Intensification of the Impact of the Economic Mechanism on an Increase in Production Efficiency and Work Quality" envisages a complex of measures to improve capital construction and make rational use of material, labor and financial resources. An examination of these problems from a republic and economic region angle is of interest in this connection.

Academician T. Khachaturov's article<sup>1</sup> raised important questions of an increase in the efficiency of capital investments and an improvement in capital construction. The accumulation fund is of decisive significance in the financing of capital investments. This source's leading role in the formation of capital investments will also be retained over the long term. But a trend has been observed recently toward a reduction in the proportion of capital investments formed from national income and an increase from the amortization fund. Thus in 1965 the structure of capital investments in the republic was such: 79.7 percent from national income, 20.3 percent from the amortization fund. In 1977 the figures were 62.4 percent and 37.6 percent respectively.

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<sup>1</sup>See T. Khachaturov, "Paths of an Increase in the Efficiency of Capital Investments" (VOPROSY EKONOMIKI No 7, 1979).

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Table 1: Dynamics of the Formation of Capital Investments Formed From National Income (percentage; 1965 = 100)

Capital Investments	1970	1975	1977
From national income	126	153.1	144.1
Per percentage increase in national income	125.7	168.7	189.2
Per ruble of national income	89.5	89.5	73.7

The figures in the table show that the absolute volume of net capital investments formed from derived national income is increasing continuously in the republic. This trend is interlinked with two others: first, there is a continuous growth in the volume of capital investments per percentage increase in national income; second, the national income growth rate is outstripping the rate of increase in the resources of net capital investments.

Table 2: Dynamics of the Formation of Capital Investments Formed From the Amortization Fund (percentage; 1965 = 100)

Capital Investments	1970	1975	1977
From the amortization fund	145.4	292.1	339.3
Per percentage increase in fixed capital	152.2	206.8	207.2

It can be seen from the table that the dynamics of the amortization fund as a source of the financing of capital investments in the republic have a tendency toward absolute and relative growth. The same trend also characterizes both components conditioning the size of the amortization fund--fixed capital and the amounts of its renewal. This tendency reflects not only the dynamics of the growth of fixed capital but also the policy of expanded reproduction aimed at the accelerated replacement, modernization, reconstruction and renewal of operating equipment, an improvement in its quality and so forth. At the same time the growth of the amortization fund is accompanied by a reduction in the level of its use for its direct purpose.

Table 3: Dynamics of the Indicators of the Use of the Amortization Fund (percentage: 1965 = 100)

Indicators	1970	1975	1977
Use of the amortization fund to replace fixed capital	107.5	88.7	84.9
Renewal of fixed capital out of action owing to decay and wear per percentage growth of the amortization fund	248.7	198.8	184.1

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It is also essential to emphasize that the relation of the coefficient of the loss of fixed production capital to the norm of depreciation allowances for its renewal exhibits a steady tendency toward a decrease, particularly in recent years. This tendency has strengthened in connection with the increase in the norm of depreciation allowances, that is, the renewal process is being effected at a slower pace than stipulated by the norms, and the renovation fund is not being used for its direct purpose--an increase in capital. In other words, the formation of fixed capital is occurring extensively.

In 1977 the volume of the loss of fixed capital in the republic's material production had increased by a factor of more than 2.6 compared with 1965, and fixed capital had almost tripled in this time, in which connection the loss coefficient dropped from 2.8 to 2.5, and the use of amortization fund capital for renewal from 52 percent to 34.4 percent.

In industry in 1977 the volume of the loss of fixed capital had approximately doubled compared with 1965, whereas the fixed capital had increased by a factor of 2.8, in which connection the loss coefficient dropped from 2.3 percent to 1.5 percent, and the use of the amortization fund for renewal from 58.5 percent to 20.3 percent. The proportion of capital investments from the amortization fund going to increase fixed production capital increased accordingly. The surmounting of this tendency requires the adoption of cardinal measures on the redistribution of all forms of resources in order that the amortization fund may be utilized in full and for its direct purpose.

The increase in capital investments in the republic (gross capital investments) per person employed in material production testifies to the rapid rate of labor's "capital provision," which considerably exceeds the growth rate in the number of those employed. Thus capital investments per person employed in material production had increased 71.4 percent in 1977 compared with 1965, which is particularly important under the conditions of the increasing shortage of labor resources.

The basis of current investment policy is an improvement in the use and an increase in the efficiency of capital investments. The problem of the efficiency of invested capital here essentially consists of a choice of directions of capital investment insuring the biggest national economic result with regard for the current and long-term tasks of economic development and also of the implementation of a complex of measures to accelerate the materialization of capital investments in fixed capital. Proceeding from this, an increase in the efficiency of capital investments represents a complex of structural and organizational measures connected both with their distribution between sectors and regions, new construction, modernization, reconstruction, retooling and so forth and also with an improvement in the use of the allocated capital investments thanks to an improvement in the organization of work, material backup, a reduction in the volume of incomplete construction, the linkage of the amounts of capital investment with the capacities of the construction base and others.

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The rational use of capital investments largely depends on the sectorial structure of their distribution, which is determined by the development of the sectors, the level of accumulated production potential and the degree of its utilization. Over 75 percent of the republic's total capital investments is directed into material production.

Table 4: Dynamics of State Capital Investments in Material Production Sectors (percentage; 1965 = 100)

	1970	1975	1977
Material production, total--	132.2	187	203.8
including:			
industry	121.5	166	182.1
construction	161.6	235.9	288.6
agriculture	153.6	300.6	302
transport and communications	147	161.5	173.6
trade and public catering	156.2	142	155.7

It can be seen from the table that the preferential growth rates of capital investment were in industry, construction and, particularly, in agriculture.

At the same time, despite an appreciable increase in the volume of capital investments, a tendency has been observed in recent years toward a reduction in their growth rate, which is connected with the tasks of production intensification thanks to an improvement in the use of accumulated potential. The biggest growth of capital investments in agriculture and construction is explained by their industrialization and intensification on the basis of accelerated satiation with fixed capital.

The need for a systematic rise in the technical level of production and an increase in the proportion of machinery and equipment in the composition of fixed production capital is increasing the investment role of machine building. According to V. Krasovskiy's figures, the significance of machine building is materially conditioned by the fact that even at the present time the proportion of machine-building products (equipment, with consideration of the cost of its installation) has reached 50 percent of capital investment in production.<sup>2</sup>

Industry has the biggest share in the structure of capital investments. Together with this, a tendency is being observed toward a growth in the amount of the capital investments in construction and agriculture related to a unit thereof in industry. Thus for each ruble of state capital investments in industry in 1965 some R0.039 were invested in construction and R0.189 in agriculture; in 1977 the figures were R0.062 and R0.313.

<sup>2</sup>See METODY I PRAKTIKA OPREDELENIYA EFFEKTIVNOSTI KAPITAL'NYKH VLOZHENIY I NOVOY TEKHNIKI, Issue 26, Izdatel'stvo Nauka, 1976, p 25.

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Together with the production volume growth rate the relative capital requirements of an increase in the gross output of individual sectors is an important factor of the formation of the sectorial structure of capital investments.

Table 5: Sectorial Structure of State Capital Investments and Factors of its Formation in the Ninth Five-Year Plan (percentage)

	Capital Investment Structure	Capital Investments	
		For Production Volume Growth	including For Discharging Relative Capital Requirements
Material Production--total	100	86.7	13.3
including:			
industry	61.8	91.9	8.1
construction	3.7	78.4	21.6
agriculture	18.5	55	45
transport and communications	11.2	107.3	-7.3
trade and public catering	2.5	125.6	-25.6

The increase in the total national economic relative capital requirement of output occurred, as can be seen from the figures of the above table, as a result of the increase in the relative capital requirement of output in industry, construction and agriculture, the proportion of which constitutes 84 percent of total capital investments in the republic's material production. In the Ninth Five-Year Plan the relative capital requirement increased mainly in agriculture and construction. More than 9 percent of total capital investments for production purposes went on discharging this capital requirement.

Agriculture is the biggest consumer of capital investments after industry. It was in this sector that the biggest proportion of capital investments (45 percent) was used to cover the increase in output's relative capital requirement. The further development of the material-technical base of plant-growing and livestock raising, agricultural production's mass transition to an industrial footing and the rapid rate of the replacement of manual labor with machine labor, which is being accompanied by the increasing preferential growth of labor's capital-worker ratio compared with its productivity, should primarily be mentioned as being among the objective factors of the growth of the relative capital requirement of agricultural output.



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Among the industrial sectors the most appreciable increase in the relative capital requirement has been in the republic's ferrous metallurgy and food industry, where the construction of new highly mechanized facilities fitted out with costly equipment has been undertaken on a large scale.

A reduction in output's relative capital requirement has been observed in certain other sectors of the economy, particularly in transport and communications and trade and public catering, which has been caused by a higher production volume growth rate compared with the capital investment growth rate.

In transportation this is connected not only with a reduction in the capital investment growth rate but also with an increase in traffic and with a rise in prices and tariffs. In trade and public catering the increasing preferential production volume growth rate has been caused by an increase in the number of those employed and a certain improvement in the quality of products and services.

The increase in prices of the capacities being introduced is an important factor of an increase in relative capital requirements. Thus in the republic's industry capital investments per ruble of gross output increase grew to R1.11 in the Ninth Five-Year Plan compared with R1.02 in the Eighth Five-Year Plan or by 8.8 percent. The revision of prices for industrial products which was carried out for the purpose of equalizing profitability levels and creating normal conditions for the introduction of financial autonomy in all sectors also contributed to this. The rise in prices is mainly connected with an increase in the quality and operating properties of machinery and equipment, an improvement in the work conditions of the attendants and the release of workers engaged in heavy physical labor. The machinery and equipment are equipped with instrumentation and regulating mechanisms and automated systems for controlling production processes. The increase in the outlays on environmental protection, the complication of the extraction of minerals and so forth are also among the factors of a growth in relative capital requirements. The biggest increase in proportional capital investments per unit of output increase can be observed in the fuel industry, the construction materials industry and light and food industry.

The acceleration of the pace of scientific-technical progress and the retooling of sectors of the national economy, the extension of specialization, upon which there is a manifold increase in general overhead, and an improvement in the quality and operating characteristics of machinery and equipment, including the introduction of imported equipment, are associated with additional expenditure, an increase in prices and the increased cost of a unit of new capacity. Thus in 1974 the Ministry of Tractor and Agricultural Machine Building's "Khar'kov Tractor Plant imeni S. Ordzhonikidze" Production Association began the industrial manufacture of the T-150 and T-150K series high-speed high-powered tractors and their modifications designed to subsequently replace the T-74 and DT-75M tractors. The 1.7-1.8-fold increase in engine capacity made possible a 1.5-1.8-fold increase in labor productivity. At the

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same time the tractor's wholesale price increased by a factor of 2.4. The cost per unit of tractor capacity and, correspondingly, per unit of its productivity increased from R26/h.p. to R39/h.p. or by a factor of almost 1.5.

The increase in the expenditure on environmental protection and, primarily, on protection of the atmosphere and water basins contributed to a considerable increase in the cost of new industrial projects. For this purpose the maximum permissible concentrations of normed waste have been tightened up considerably in recent years. As a result the rate of growth of capital investments in environmental protection has outstripped the rate of growth of gross capital investments, which points to an increase in the proportion of the above-mentioned expenditure in capital construction as a whole and per unit of new capacity. In the Ninth Five-Year Plan alone capital investments connected with environmental protection increased by a factor of 1.6 in the republic compared with the Eighth Five-Year Plan. We directed 1.8 times more capital investments into the protection of the water basin (the construction of purification installations, return water supply systems and others) in the past five-year plan than in the previous one.

In addition to the expenditure on environmental protection, the increase in wages and the improvement in work conditions should also be put in the category of social factors of an increase in the cost of new capacities. The increase in wages, including the wage rates of construction workers, had a marked influence on an increase in the cost of the new projects. For example, thanks to regulation of wages in construction, the cost of projects has increased approximately 6.5 percent in the last 10 years. On the republic's kolkhozes remuneration in construction has doubled, which has led to a considerable increase in the cost of the new facilities since approximately one-third of the volume of construction and installation work is performed by the direct-labor method in the countryside.

There has recently been an increase in proportional capital investments connected with the improvement in work conditions. New planning norms have been introduced which provide for an increase in the area of production and auxiliary premises per worker, the creation of recreation areas and an improvement in ventilation and heating in production premises. Thus because of the change in the production planning norms in livestock raising the increase in the costs of new capacities in 1975 constituted more than 15 percent compared with 1966.

Expenditure on an improvement in physiological and public-sanitation work conditions (the elimination of noise, vibration, dust content and so forth) is increasing continuously. Appreciable capital investments are being directed into the construction of preventive clinics and other work-safety facilities. For example, additional capital investments on new facilities to improve work conditions and safety in ferrous metallurgy have risen to 8-16 percent of total estimated costs.

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The selection of the directions of the investment of capital in the reproduction of fixed capital or the so-called reproduction structure of capital investments is of particular importance in the planned management of investment processes. This process is conditioned on the one hand by the level of accumulated economic potential and resource potential of the country and individual regions and, on the other, it acts as a kind of regulator determining the direction of the development of all social production.

Table 6: Dynamics of the Reproduction Structure of State Capital Investments in the Republic's Economy and its Sectors (percentage)

Proportion of Capital Investments in Reproduction						
including						
of which:						
	Total	On the Construction of New Facilities	On the Development of Operating Facilities	On Modernization	On Retooling	On Expansion
Material production						
1972	100	100	100	100	100	100
1977	124.8	86.3	106.5	107.6	561.9	82.3
Industry						
1972	100	100	100	100	100	100
1977	122.5	79.7	109.1	80.4	646	95.9
Agriculture						
1972	100	100	100	100	100	100
1977	145.6	103.5	98.8	278.3	147.4	72.7
Construction						
1972	100	100	100	100	100	100
1977	117.6	82	107.2	200	537.6	56.9
Transport and Communications						
1972	100	100	100	100	100	100
1977	108.7	92.3	104.9	633.5	281.9	38.6
Trade and Public Catering						
1972	100	100	100	100	100	100
1977	76.7	83	121.7	62.1	553.2	130.3

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An analysis shows that a reduction has been observed in the republic in recent years in the proportion and absolute values of capital investments directed into new construction and the expansion of production facilities. The retooling of sectors of the national economy is being undertaken at the quickest rate. This process has proceeded particularly intensively in industry and construction. It is chiefly the modernization of operating facilities which is being undertaken in agriculture. In the period 1972-1977 proportional expenditure on the modernization of enterprises in agriculture increased by a factor of more than 27.

A distinguishing feature of the 10th Five-Year Plan is the fact that, despite the overall growth in capital investments, there is a reduction in the proportion thereof directed both into new construction and also the expansion of operating facilities. At the same time there is an increase in the proportion of capital expenditure on the modernization and retooling of operating enterprises. The reproduction process in the republic is characterized by an increase in the proportion of capital investments going on the replacement of fixed capital and, correspondingly, by a reduction in the proportion going on an increase thereof.

An important evaluation indicator of the efficiency of structural improvements is the dynamics of the materialization of capital investments in fixed capital (commissioning of fixed capital per ruble of capital investment for production purposes). Capital investments participate indirectly, via materialized fixed capital, in the creation of the end product and national income. For this reason the dynamics of the materialization of capital could be put in the category of basic indicators of the efficiency of capital investments. In connection with the fact that the materialization process proceeds with a certain time lag it is advisable to examine it by five-year plan (some errors in the calculations caused by the fact that some of the capital investments allocated in the previous five-year plan will be materialized in subsequent periods are within the permissible limits and do not distort the trend of the process).

Table 7: Dynamics of the Growth of Fixed Capital Per Unit of Capital Investment for Production (percentage)

	1966-1970	1971-1975
Material production---		
total	100	102.5
including:		
industry	100	100.3
agriculture	100	104.3
construction	100	96.7
transport and communications	100	101.6
trade and public catering	100	103

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In material production as a whole each ruble of capital investment secured 2.5 percent more commissioned fixed capital in the Ninth Five-Year Plan than in the Eighth. The difference in the efficiency indicators for individual sectors was caused by the specific peculiarities of their development and directions of the reproduction process. Proceeding from this, it follows that the following are important factors of an increase in the efficiency of capital investments: the increasing preferential growth rate of the less capital-intensive processes of the replacement of equipment, the retooling and modernization of operating enterprises, a reduction in incomplete construction, a deceleration in the rate of growth and proportion of new construction and others.

An improvement in planning-estimates documentation and a reduction in the estimated costs of production could contribute to a considerable extent to an improvement in the use of capital investments and an increase in the growth of fixed capital per unit of capital investment.

As Academician T. Khachaturov observed, "One of construction's biggest shortcomings is a considerable increase in costs over initial estimates--sometimes by a factor of 1.5-2 and even more. The rise in construction costs can only partially be explained by objective reasons--the price rises for materials and equipment and increased wages. More often the overstepping of estimated construction costs is a result of subjective, entirely removable factors."<sup>3</sup>

The increase in the estimated costs is connected in many cases with shortcomings of the construction process. The planning of a number of projects is not engendered by national economic and production necessity, and there is also unfinished work on the part of the planning organizations both in the determination of estimated costs and in the choice of planning decisions.

Factors evolving beyond the sphere of construction production exert great influence on the increase in construction costs: the increase in estimated costs as a result of the implementation of measures for nature protection and an improvement in social work conditions amounts to an average 2-3 percent each five-year period, for example. Estimated costs also rise for other reasons. Thus owing to a revision of planning decisions, the estimated costs of a number of construction projects for production increased 45-50 percent in the first 2 years of the 10th Five-Year Plan. The planning organizations' mistakes and the refinements to the cost blueprints of construction and installation work led to the estimated costs of a number of production projects increasing by more than 25 percent. These factors increased estimated costs by approximately 6 percent in the republic as a whole.

An improvement in the reproduction structure of capital investments is an important factor of an increase in their efficiency. The reproduction structure

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<sup>3</sup>See VOPROSY EKONOMIKI No 7, 1979, p 129.

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exerts a considerable influence on the amount of incomplete construction for, given the various methods of reproduction of fixed capital, the time taken to introduce it and, consequently, the amount of incomplete construction also vary. The reproduction structure which has taken shape is essentially the decisive factor of the formation of the technological structure of the capital investments of subsequent periods.

The main direction of an improvement in the structure and an increase in the efficiency of capital investments is a reduction in the proportion thereof in incomplete construction. Unfortunately, the pace of this process is extremely slow, and there is a considerable proportion of capital investments in incomplete construction for each ruble thereof materialized in capital. For this reason the new decree envisages the elaboration of measures aimed at accelerating the commissioning of production capacities and facilities at construction projects on which work has already begun and a sharp reduction in the number of new construction projects in order to bring the amount of incomplete construction down to the set norms within the next few years.

Table 8: Correlation of State Capital Investments in Incomplete Construction and in the Commissioning of Fixed Capital (percentage)

	1966-1970	1971-1975
Material production--		
total	93	74.6
including:		
industry	134.6	113.5
agriculture	77.6	53.6
construction	67.3	64.8
transport and communications	59	51.9
trade and public catering	61	54.6

An important task of the national economy is to insure that the volume of the introduction of fixed capital exceed the growth in the amount of capital investments. To this end the republic plans by 1980 to have reduced incomplete construction to 65 percent of the annual amount of capital investments compared with 75.1 percent at the end of the Ninth Five-Year Plan. According to our calculations, an additional R13 billion of fixed capital will have been procured as a result of the acceleration of construction and the concentration of capital investments at the projects nearing completion.

The main condition of a decrease in the amount of incomplete construction is a reduction in the duration of the construction. An analysis shows that the time taken to introduce a unit of production capacity during the modernization and expansion of operating facilities is appreciably less than during new construction; by a factor of almost 1.5 in ferrous metallurgy and machine building, for example.

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As Academician T. Khachaturov observed, "Settlement of the question of the modernization and retooling of operating production facilities is of paramount significance. The experience of many years has shown the indisputable advantages of modernization compared with new construction."<sup>4</sup> Thus as the result of the modernization of eight blast furnaces (in the Eighth and Ninth five-year plans) at the republic's metallurgical plants an increase in the production of pig iron was achieved in a shorter time with 1.4 times less capital investment (R31.6/ton) compared with the norm for new construction (R44/ton).

An important question of investment policy is substantiation of the optimum correlation for this stage of the development of the economy between intensive and extensive factors of expanded reproduction. Essentially this is a problem of the correlation between the expansion of production and the retooling and modernization of operating facilities. Its solution depends on a whole number of factors connected with the level of development of the production forces and the availability of natural and labor resources. The need for the reorientation of the republic's industrial production toward the predominantly intensive path is caused by the high development level of the production forces and the emerging manpower shortage (the average annual rate of increase in the numbers of industrial-production personnel in the republic's industry in the period 1971-1975 was 2.5 times less than in the period 1950-1960).

The implementation of a wide-ranging program of an increase in the people's material and cultural living standard demands an acceleration in the rate of development of the nonproduction sphere and, correspondingly, a diversion of labor resources from material production. In the period 1951-1975 the number of persons employed in the nonproduction sphere increased by a factor of more than 2.7 in the republic, whereas it increased by a factor of 1.6 in material production in this period. Investments in the modernization of production insuring its intensification by an increase in the use of accumulated potential and available reserves are the most efficient under these conditions.

At present new capacities should be introduced chiefly in the sectors and production facilities manufacturing new products. It is advisable to introduce new capacities in the traditional sectors of industry only for that part of the planned increase in the manufacture of products which cannot be procured through the retooling and modernization of operating enterprises. This does not mean, of course, that the traditional sectors with a strong production potential should renounce new construction entirely. In certain cases it is more efficient than the modernization of operating enterprises, primarily in the solution of questions of an increase in the quality of manufactured products, particularly if this is connected with the application of new production processes. The modernization of old enterprises fitted out with obsolescent equipment and techniques and premises which do not conform

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<sup>4</sup>PRAVDA 29 August 1979.

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to the current demands made on labor safety and environmental protection, safety equipment and so forth is not always efficient.

The CPSU Central Committee and USSR Council of Ministers decree provides for the correct determination of priorities in the development of sectors and economic regions to insure progressive changes in national economic proportions and an increase in the efficiency of capital investments and all social production. I believe that consideration of the above trends of the formation and utilization of capital investments in the republic will enable us in the immediate future to specify the direction of investment policy.

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IMPROVED NORMS WILL STIMULATE INTEREST IN BETTER-QUALITY PRODUCTS

Moscow VOPROSY EKONOMIKI in Russian No 12, Dec 79 pp 35-43

[Article by A. Glichev, Ya. Kotlikov: "Stimulating an Increase in Product Quality"]

[Text] A further improvement in the stimulation of an increase in product quality presupposes primarily a comprehensive approach in the solution of this problem. The implementation of individual, even highly efficient measures which are insufficiently interlinked does not, as practice shows, yield the necessary results. Despite the reinforcement of the arsenal of means of economic influence on the interests of the producer-enterprises, an improvement in product quality does not provide the manufacturers with tangible benefits and frequently ends in lower profitability compared with the profitability of long-assimilated products.

Together with the obvious successes in the production of high-quality products which are on a par with the best foreign and domestic models in their technical-economic parameters and which, in a number of cases, surpass them there are also shortcomings. Thus, according to the evaluations of the State Committee for Standards, up to 15 percent of the products subject to certification cannot be put either in the highest or first quality category. Approximately 20 percent of the products recommended for the State Sign of Quality are not manufactured at all. Checks carried out by the State Inspectorate for the Quality of Goods and Trade at enterprises producing consumer goods end in the products being relegated to lower grades in 60-65 percent of cases. The practice of violating standards has not been eradicated at many enterprises. Despite the annual increase in the manufacture of products of the highest quality category, their proportion of total production remains low in a number of sectors of industry. Thus in 1978 it amounted to 7.1 percent in the USSR Ministry of Light Industry, 7.5 percent in the USSR Ministry of Construction Materials and 5.7 percent in the Ministry of Timber and Wood Processing Industry and 12.2 percent in industry as a whole. All this considerably reduces production efficiency and has a negative effect on the rate and growth of national income and an increase in social labor productivity.

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An important direction of an improvement in the stimulation of associations and enterprises for an increase in product quality is the selection of a system of plan and evaluation indicators of their activity which influence the formation of the producers' economic interest in an improvement in the quality of the parameters of the manufactured products. An analysis of the indicators currently employed from the viewpoint of their impact on an increase in production efficiency and product quality testifies that the individual adjustments which have been made to the indicator of the volume of sold output (separation of the volume of sold output of the highest quality category, consideration of the volume sold on the basis of fulfilled economic contracts and others) have not as yet cardinally changed the producers' attitude toward the quality of the products they create.

Experiments have been conducted in a number of sectors of industry on the elaboration and introduction of indicators characterizing sufficiently fully association and enterprise activity in increasing production efficiency and product quality. The planning of the production volume on the basis of net (normative) output has enjoyed considerable prevalence in a number of sectors. Net output is the most acceptable of the value indicators for characterizing final results.

The extent to which the national economy's need for the manufactured product has been satisfied is taken into consideration at the time of evaluation of the activity of the production associations in the Ministry of Tractor and Agricultural Machine Building. Indicators by means of which the normative magnitude of the requirements and the extent of their satisfaction in the volume, structure and quality of the produced products are determined have been elaborated and introduced here, that is, the result obtained by the consumers of this product is taken into account. The qualitative satisfaction of the requirements is determined according to the proportion of products of the highest quality category in the total production volume. A system of stimulation and, in particular, norms of the deductions into the economic incentive funds is being developed in accordance with this.

An analysis of one further experiment--on the use of long-term economic norms in the Ministry of Instrument Making, Automation Equipment and Control Systems--has shown that the application of long-term economic norms increases the interest of all links of the sector in the fuller use of internal resources, including an improvement in product quality. Thus the increase in products in the highest quality category constituted 46 percent in 1977 compared with the previous year and 44.6 percent in 1978. From 1975 through 1978 the proportion of products of the highest quality category rose from 9.7 percent to 25.3 percent, that is, by a factor of more than 2.5.

Experiments have been conducted in a number of sectors of industry on working up organizational methods of product quality control and also on improving economic stimulation of the creation of high-quality products. The collation and critical analysis of all the experiments were the foundation of a further improvement in plan and evaluation indicators. This was reflected in

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the CPSU Central Committee and USSR Council of Ministers decree "An Improvement in Planning and an Intensification of the Impact of the Economic Mechanism on an Increase in Production Efficiency and Work Quality." The decisions adopted on these questions are aimed at a strengthening of the role of final production results and an improvement in the quality of the material wealth being produced. The transition in industry to the establishment in the five-year plans of the net (normative) output indicator in line with the corresponding sectors' preparation for this is envisaged. The application of this indicator will promote an increase in the manufacture of more elaborate products of the new technology and high-quality products, particularly in cases where their production is linked with an increase in labor intensiveness. The indicator of the growth in the manufacture of products of the highest quality category or another quality indicator determined for a given sector will be approved for the ministries and production associations (enterprises) in the five-year production plans.

The new indicators of an evaluation of the activity of the production associations and enterprises will be supplemented with stable long-term economic norms, including norms of the wage fund and the economic stimulation fund and of profit distribution between the associations (enterprises) and the budget. Consequently, the improvement in the system of indicators of an evaluation of enterprise activity will be underpinned by the corresponding methods and forms of economic stimulation, that is, it is a question of a restructuring of the economic mechanism. This intricate process will require a great deal of scientific-procedural and organizing work. It will be necessary, in particular, to formulate many legislative instruments and procedural documents. "This work," as A. N. Kosygin observes, "is of a creative nature, and its implementation is a very responsible business insofar as the full and consistent realization of the principles of planning and the organization of financial autonomy contained in the decree will depend on the quality of the methods materials to a large extent."\*

An analysis of the current economic mechanism from the viewpoint of its impact on product quality shows that due coordination in the application of different economic levers therein has not been achieved. This applies, in particular, to the formation and use of economic stimulation funds (FES) from the additions to the prices of products carrying the State Sign of Quality. It is known that up to 70 percent of the extra profit from temporary additions to wholesale prices may go toward the formation of FES. It was assumed that this measure would create the manufacturers' economic interest in the production of products bearing the Sign of Quality. However, the additions to the prices are being applied in limited manner. For example, in the electrical engineering industry, where economic work is being performed actively and consistently on increasing product quality, additions to the prices are applied in only 2 cases out of 10. As a consequence the extra profit obtained from the manufacture of

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\*A. Kosygin, "An Important Stage of the Improvement in the Planned Management of the Economy" (KOMMUNIST No 12, 1979, p 28).

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products of the highest quality category, as also deductions into the FES, is negligible. For industry as a whole the extra profit from sales constituted 0.23 percent of total profit in 1975, 0.27 percent in 1976 and 0.3 percent in 1977.

Naturally, this amount of extra profit cannot play an appreciable part in the formation of FES, including a material incentive fund (FMP). This also applies to those ministries in which the proportion of products bearing the Sign of Quality is high. Thus in 1977 the proportion of these products amounted to 38.4 percent in the Ministry of Electrical Equipment Industry, but the proportion of deductions into the FES amounted to only 3.62 percent and only 3.63 percent into the FMP, and in the Ministry of Instrument Making, Automation Equipment and Control Systems the corresponding figures were 17.5 percent, 0.51 percent and 0.4 percent.

One of the reasons for the negligible sum of profit deducted into these funds for an increase in the manufacture of products of the highest quality category is connected with the small amount of the single norm for the deductions. The deductions in accordance with the indicator of an increase (decrease) in the manufacture of products of the highest quality category are made from the overall sum of the FMP, which differs appreciably from ministry to ministry. Thus in 1977 it amounted to R397.2 million in the Ministry of Light Industry, R252 million in the Ministry of Ferrous Metallurgy, R50.5 million in the Ministry of Machine Building for Light and Food Industry and Household Appliances and R44 million in the Ministry of construction, Road and Municipal Machine Building. This means that, given the single norm for deductions into the FMP for an increase in the manufacture of products of the highest quality category, the actual sum of the additional deductions thereinto will vary, despite an equal increase in the manufacture of products bearing the State Sign of Quality. The initial size of the FMP is of decisive significance here.

But fulfillment of the plan for an increase in the proportion of products of the highest quality category by one and the same percentage demands different efforts from the association and enterprise collectives. Furthermore, the rate of increase in the manufacture of products of the highest quality category will differ as a consequence of the specific features of each sector, the scale of production and the material-technical base and also the social need for products therefrom corresponding to the best world achievements. As a result, the need arises for the introduction of differentiated norms of deductions into the FMP for different sectors of industrial production.

In addition, differentiated norms are also essential, in our view, for enterprises of one and the same ministry for scales constructed from a single norm for deductions into incentive funds do not take into account the enterprises' different opportunities for increasing the proportion of products bearing the State Sign of Quality. It is one thing to raise the proportion of the manufacture of products of the highest quality category from 6 percent

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to 10 percent, but it is quite a different matter to raise it from 80 percent to 81 percent. The second case is far harder, as a rule, than the first. Dissimilar efforts are also required of the enterprise collectives for bringing technically elaborate products (drills, generators, turbines and others) and comparatively simpler products to the level of the highest quality category. Therefore, to insure that the norms of deductions into the incentive funds become an effective economic lever of an increase in the manufacture of products of the highest quality category it is advisable to establish differentiated scales of the deductions which would take into consideration the particular features of the production of high-quality products in different sectors and subsectors and also groups of enterprises.

The ministries formulating the norms of the formation of FES with regard for the decisions ensuing from the decree on an improvement in planning should evidently primarily gear efforts toward the elimination of the enumerated shortcomings. It is planned to determine upgraded norms of the formation of FES for the production associations (enterprises) which considerably increase the manufacture of new highly efficient industrial-engineering products and new consumer goods. This should also be taken into consideration at the time of determination of the norms of deductions into the material stimulation fund.

The absence of stable norms of the distribution of profit between enterprises and the budget is having a negative effect on enterprises' interest in an improvement in product quality and in obtaining extra profit from this. Consequently, extra profit is not playing an appreciable part in the formation of incentive funds. Thus in 1977 only 14 percent of the extra profit was deducted into the FMP by all the enterprises and associations of the Ministry of Electrical Equipment Industry. The remainder was transferred to the budget as surplus profit. In the same year the extra profit of the enterprises of the Ministry of Timber and Wood Processing Industry amounted to R882,000, however, there were no deductions into the FMP at all. This situation concerning the distribution of extra profit obtained for the manufacture of products bearing the State Sign of Quality is explained by the fact that the enterprises and associations have the possibility of forming FES in accordance with current norms from other sources.

Importance is attached to the determination of substantiated norms of the distribution of profit between the state budget and industrial enterprises, as envisaged by the CPSU Central Committee and USSR Council of Ministers decree on an improvement in planning and the economic mechanism. This measure will contribute to galvanizing the entire financial-credit mechanism and stimulate the enterprise collectives to obtain extra profit, including extra profit from the additions to the wholesale prices for products of the highest quality category. The normative distribution of profit will also lead to the point where there will be no formation of a surplus, which in recent years constituted over 30 percent of the profit and weakened the action of the economic mechanism. The transition to a system of planned long-term norms will strengthen the link between society's economic interests and its production cells and contribute to the development of initiative and socialist enterprise.

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Stimulation of product quality has not yet occupied a fitting place in the system of encouragement of the workers. According to calculations we made for 14 industrial ministries, the bonuses from the extra profit obtained for products bearing the Sign of Quality amounted to 1.6 percent of the total sum paid out in bonuses per worker in 1976 and 1.7 percent in 1977. A reason for this is that products which are insufficiently efficient from a national economic viewpoint are sometimes submitted for the conferment of the highest quality category.

This prevents us from applying the additions in sufficiently tangible amounts. For the effect obtained by the national economy from consumption of a given product serves as the grounds for determination of the amount of the addition. Yet, as practice shows, in submitting products for acquisition of the State Sign of Quality certain enterprises are guided not so much by economic as by prestige considerations. Data on a reduction in the amounts of extra profit per percentage increase in the proportion of products of the highest quality category, in particular, testify to this. Thus in 1976 a 1-percent increase in extra profit amounted to R1,361,000 in the Ministry of Ferrous Metallurgy, R1,685,000 in the ministry of Heavy and Transport Machine Building and R977,000 in the Ministry of Automotive Industry and in 1977 to R1,071,000, R873,200 and R321,000 respectively. These figures show that insufficiently efficient products are being submitted for certification in the highest quality category. As a consequence the amount of the additions to the wholesale prices and the extra profit derived from them are decreasing. Although the plan quotas for the manufacture of products of the highest quality category are being fulfilled, the deductions into the FES from the extra profit are decreasing.

Far from all the newly assimilated products can be evaluated as being in the highest quality category. The proportion of products of the highest quality category is growing constantly, but its absolute magnitude cannot be considered adequate. In 1978 this evaluation was given to only one-fifth of new products in industry as a whole. Furthermore, this practice contradicts All-Union State Standard 15.001--73, according to which all products subject to development, assimilation and organization for production must correspond to a technical target, which contains demands for products of the highest quality category. It specially emphasizes that the demands incorporated in the technical target are based on the modern achievements of science and technology and the need to insure the products' increasingly advanced technical level and the use of progressive inventions. However, this requirement of the all-union state standard is not being met. Yet the need for the developers' unswerving observance of the requirements of state standards was stressed once again in the CPSU Central Committee and USSR Council of Ministers decree on an improvement in planning.

There seems in this connection to be an urgent need for the adoption of a number of organizational and economic measures aimed at an increase in the production of new products of the highest quality category. It is essential that the ministries' technical targets for the development of new products primarily point to the requirement that the planned products reach a level higher than

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the best world analogues. Only in individual, economically substantiated cases is it possible to determine demands for products of the first quality category. Steady and reliable information concerning the technical-economic parameters of the best domestic and foreign models, including a forecast of their developments trends, is essential for the realization of this proposal. The system of stimulating the organizations developing the new products and their workers should be organized such that it sharply differentiates the amounts of the incentive depending on the degree of innovation and efficiency of the newly produced products. It is essential to give considerable preference here to the creators of new products which significantly surpass the best world analogues.

More than 12 years of the experience of certification have shown that the evaluation of the products submitted for conferment of the State Sign of Quality must be strict and objective. Instances of the certification commissions conferring the highest quality category on products which are far from being the most progressive from the technical and economic viewpoints must be completely ruled out. This practice weakens the efficacy of certification. Preference in conferment of the State Sign of Quality should be given pioneering technology insuring our country's priority in scientific-technical progress and also consumer goods which shape new requirements and directions in fashion. The conferment of the State Sign of Quality on equipment which differs in its efficiency little or not at all from its analogues leads to the amount of the additions to the wholesale prices being small, as a rule. For example, the amount of the additions on machine-building products constitutes 3-4 percent of the wholesale price and no more than 10 percent of the effect. Given this amount of the additions to the wholesale prices, the sum of extra profit is a small quantity.

The additions to the wholesale prices for products of the highest quality category should depend to a great extent on the scale of the economic effect. In this connection their magnitude of 0.5 of actual profitability compared with the norm should be raised appreciably. The decree on an improvement in planning envisages the addition to the wholesale price being established on a scale of 0.5 to 1.25 of the profitability norm for this or an analogous group of products, but no more than 70 percent of the effect. The amount of the addition to the wholesale price for new highly efficient products and for products which have been granted the State Sign of Quality may be increased by a factor of 1.5 when the production of these products is based on developments recognized in the established procedure as discoveries or inventions. Additional incentives will thereby have been created for the enterprises to manufacture fundamentally new products, renew the scheduled list and assortment, expand the production of products of new brands, models and types and, correspondingly, to withdraw obsolete products from production.

It is also important to remove other restrictions in obtaining additions to the wholesale price for products of the highest quality category, including restrictions brought about by organizational factors. At present to obtain additions the manufacturer-enterprises must submit to the USSR State

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Committee for Prices an estimate of the economic effect corroborated by the consumers. But this estimate is preliminarily submitted to the state commission which has conferred the Sign of Quality on the product. Evidently, the state commission's decision should be a document corroborating also the estimate of the economic effect, on the basis of which the additions to the wholesale prices and the manufacturer-enterprise's deductions should be determined.

The efficiency of the stimulation of the production of high-quality products largely depends on the state of standardization. Standards, as normative-technical documents having the force of law, determine the demands made on the technical level and quality of the raw material, goods, components and end products and also on the organization of their production processes. In order to play their part in the system of product quality control in full the standards themselves must be progressive and their scientific-technical level must be sufficiently high. Unfortunately, far from all standards correspond to these requirements. The demands determined earlier in certain of them no longer correspond to the requirements of the national economy and the population. The CPSU Central Committee and USSR Council of Ministers decree determines for the USSR State Committee for Standards, in conjunction with the ministries and departments, the tasks for reviewing outdated standards for machinery and equipment and completing the elaboration of comprehensive standardization programs for the most important consumer goods in order to upgrade the demands made on product quality.

The coordination of prices and standards is of great importance. The establishment of a close interconnection between them is also one of the directions in an improvement in prices. The USSR State Committee for Standards and the USSR State Committee for Prices have put into effect instructions on the procedure of the coordinated elaboration, approval and actualization of the specifications and prices for industrial-engineering machine-building products and the products of the raw material sectors of heavy industry and light and food industry. Similar instructions for cultural-social and household goods will take effect as of 1980. The increased interconnection between standardization and price-forming will contribute to a lowering of wholesale prices per unit of efficiency of the new machinery, equipment and instruments and goods and products; an increase in the economic substantiation of the development of the new product at all stages of its creation; the fuller reflection in the standards and the specifications of the technical-economic parameters of products characterizing the efficiency of the new types of product; a reduction in the time taken to assimilate new products; and the establishment of unified times of the introduction and expiry of standards, specifications and prices.

The "Information Chart of the Economic Efficiency and the Prices of New Products" is being introduced as an obligatory appendix to the standards and specifications. It fixes the ceiling price, theoretical prime cost (price) and the economic effect. This essentially means the reflection in a single document of the specifications for the development of new products and the economic results of its introduction and also increased supervision of the

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economic substantiation of the adopted decisions. Insofar as the information chart is an inalienable part of the standards and specifications, the standards and specifications are not accepted for state registration without an information chart. This means that the series manufacture of a product whose economic expediency has not been proved will not be authorized. The instructions have only just begun to be introduced. The experience of their application will show the paths of their further improvement.

An intrinsic aspect of the interconnection of standards and prices is their technical-economic unity. A standard which reflects a product's quality in full affords an opportunity for determining the correct correlations of prices and expenditure and thereby creates all the essential conditions for better satisfaction of the public's growing requirements. Quality indicators exert a big influence on the formation of expenditure on the production of a product and also expenditure connected with its consumption, which is particularly important for consumer durables.

There is a definite dependence between expenditure and the parameters comprehensively characterizing the product which are built in to the standards. Such a dependence may be established, for example, between expenditure and the level of standardization, the indicators of the reliability and working life of household machinery and instruments and others. In this connection high demands are made of the standards both from the viewpoint of their coverage of all consumer properties and quality indicators and from the standpoints of their quantitative expression. However, at present the majority of standards still lacks many quality indicators essential for determining economically substantiated prices. This is explained, in particular, by the fact that for many types of equipment and consumer goods there is no clearly defined, stable schedule of quality indicators.

In conjunction with the ministries and departments the State Committee for Standards is currently formulating special standards for a schedule of quality indicators and also the methods of their evaluation. Such standards have already been formulated and put into effect for fabrics and garments. An improvement in the structure of standards will create, in our view, conditions for a determination of the dependence of expenditure, prices and the quality level. At the same time this will contribute to the more extensive application of the most progressive methods of the determination of prices, particularly normative-parametrical methods.

The producers' increased interest in the creation of high-quality products can only have the necessary effect in combination with a system of material responsibility. Definite forms of enterprise responsibility for the manufacture of substandard products and the violation of standards have evolved in economic practice. However, as experience shows, they do not fully correspond to present-day conditions and tasks and are insufficiently underpinned by a system of economic sanctions. The amounts of the sanctions are negligible, as a rule, they fail to take account of the damage that has been done, they are insufficiently reflected in the economic results of the enterprises' work and the specific culprits do not bear due responsibility.

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The lack of stable norms of the distribution of profit between the enterprises and the budget is also reflected here. The payment of the fines for supplies of poor-quality products and a violation of standards is made from the profit surplus and does not influence the amount of the enterprises' profit, including the FES and FMP. For example, the USSR Ministry of Electrical Equipment Industry's Ardatofskiy Illumination Engineering Plant regularly receives invoice rejects for having supplied substandard products. In 1976 the State Committee for Standards authorities excluded products worth R356,000 and profit of R81,000 from the accounting figures on plan fulfillment because of the manufacture of lamps which violated the requirements of the standards. But the amount of the FES was reduced by only R3,000, and of the FMP by R2,000.

The transition to the normative distribution of profit between the associations (enterprises) and the budget in accordance with the decree on an improvement in planning will increase material responsibility for the quality of supplied products. The decree also provides for additional measures in respect of enterprises manufacturing products of the second quality category. It is planned to apply to these products discounts from the wholesale price of the order of 50 percent of the sum of profit which the enterprises derive from sales thereof. The same discount from the wholesale price will be established for products which are not certified in time. If an enterprise continues to manufacture products of the second category after the deadline for its withdrawal from production, the discount from the wholesale price will be increased to the full total of the profit. Currently the amount of the discount does not exceed 10 percent.

The rights of the State Committee for Standards as a monitoring authority are being extended to increase material responsibility for the manufacture of low-quality products. It will be able to reduce the deductions into the FES from the sale of products which have forfeited the Sign of Quality. This rule covers all industrial-engineering products and consumer goods. Stricter sanctions will be applied for the nonobservance of contractual obligations and late supplies to the consumer of products of the necessary assortment and quality.

Compensation for losses owing to shoddy work is particularly important. Those guilty of shoddy work (manufacturer-enterprises and individual workers) compensate, as a rule, only a negligible portion of the losses. An analysis of the materials of 14 industrial ministries showed that manufacturer-enterprise and worker compensation of shoddy work in 1977 constituted 9.25 percent and 4.66 of total losses from defective work respectively. The enterprises should compensate all losses from defective work for which they are to blame. Such an approach should be recorded in the Regulations on Supplies of Industrial-Engineering Products and the Regulations on Supplies of Consumer Goods.

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The enterprises' increased responsibility for the quality of the products they produce demands the liquidation of the practice of "reciprocal amnesty." The imposition of fines for supplies of poor-quality products should be an obligatory element in economic relations between producers and consumers. Such measures are envisaged in the decree on an improvement in planning and the economic mechanism. If one enterprise fails to press sanctions against another enterprise, the state authorities should recover from it and from the workers who are the direct culprits a fine of sufficiently tangible amount. As far as personal responsibility is concerned, there is an underestimation here of the role of material responsibility as a factor of the inculcation of a conscientious attitude toward labor.

The questions that have been dealt with do not exhaust the entire complex of problems of an improvement in the stimulation of an increase in product quality, but their solution will contribute to the successful implementation of the party and government measures in the sphere of stimulation of the creation and production of high-quality products. There is also great significance in the creation of conditions increasing the efficiency of the action of economic levers and incentives. These include, in our view, the planned balance and dependability of economic relations, the renewal of fixed capital, the creation of an infrastructure insuring full preservation of the quality of the product produced, and improvement in metrological facilities, the training of workers and engineering-technical personnel with the proper qualifications and others.

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