

State Policy On Science And Technology In Ussr:1956-76

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ABSTRACT

The Soviet government explicit commitment to the development of science was quite clear since its very inception. The government was ideologically committed to bring about a scientific and technical revolution complimenting a cultural revolution. The former was to bring about changes in the higher than that under capitalism the later was to create a new man deeply entrenched in socialist values. This was to be achieved by radically restructuring the educational structure. The period of the development of science and technology can be divide into two phases; from 1917-1956 from 1956-76. In the first phase attempts were made to create a new organizational structure to develop the economy based on latest achievements of science and technology to attain higher productivity .In the second phase ,the focus shifted to the up-gradation of the existing structure, the planning of science and technology and R&D in order to sustain economic growth and consolidate the ongoing industrial revolution.

KEY WORDS

STR, IDEOLOGICAL, DETERMINISM, CYBERNETICS, PLANNING, SUPERSTRUCTURE CONSCIOUSNESS

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Since October revolution science in the USSR has been given the task of liberating the mankind. Science belonging to both the base and the superstructure was given the task of human liberation through socialism and later under communism. Lorren R. Graham stated that the Soviet Union is a nation with an explicit commitment to science, including a value system and a philosophical world view based on science which is unmatched in intensity by any other nation of the world. (Graham cited in Stephen Fortiscue; London 1986, p.32)

Science is the study of the objective world with a view to discover laws that govern it and by the help of which we invent technology for increasing production .Science and scientific knowledge can be defined as a sphere of human activity aimed at obtaining and systematizing the objective knowledge of reality. It is a form of social consciousness ,a system of notions ,of phenomenon and laws of nature .Science enables man to control the forces of nature ,develop material production and transform social relations.(Capitalism, Socialism and Scientific and Technical Revolution, Moscow, 1982, p.9)

Technology ,coming from the Greek "techné" and "logos" (notion, teaching) denotes knowledge af methods and means of working the objects of labor. According to Marx "technology discloses man's mode of dealing with nature, the process of production by which he sustains life and thereby also lays bare the mode of production ,of his social relations and of the mental conceptions that flow from them." (K.Marx, Capital, Moscow 1982, p.15). Technology and social relations are closely intertwined .Changes and progress in technology inevitably affects material production which leads to change in social relations A new social structure thus formed gives further impetus to the advancement of technology.

The period between 1956-76 is a period which is known as a period of Scientific and Technical Revolution (STR) during which an attempt was made by the government to accelerate the pace growth unprecedented in the country by completely revamping of the established system including the planning of science and technology. An attempt was made to reform the system and plan a more balanced economy .In the field of science and technology this period is marked for a revolutionary transformation. It signified the beginning of the intensification of scientific and technical development. In this period science becomes the direct productive force. The development in science sparked off revolutionary changes in technology and engineering leading to significant changes in production processes. As a result science transformed itself into a direct productive force. While the industrial revolution of the 18th century was a result of the utilization of improved methods of energy sources, the post 1950's scientific development is known for superior means of transmitting and transforming information. Its essence consists in the reorganization of the whole technological basis of all the technology of production beginning with the utilization of materials and power process and ending with the system of machines ,the form of organization and management and with the place and role of man in the production process. (Gvisshiani, Soviet Science ,Moscow, ,vol,6 no,3 1975, p.97). It creates the pre-requisites for bringing most vital forms of human activity into a single system i.e, the science a theoretical

cognition of the objective laws of nature and society and technology which completes the means of creating material wealth, management, the means of rational interconnection between expedient practical acts in the process of solving production and other problems.(Gvisshiani,p,97).

It is an outcome of the accumulated discoveries at the level of basic research i.e, one directed towards gaining new knowledge of nature and new forms of the organization of matter, since the beginning of the 20th century in the field of nuclear physics, of macro-molecular chemistry of cybernetics and sociology. (Roger Garudy .London, 1970,p,21) stresses on their functional parallel instead.

STR can be defined as a radical transformation of the productive forces on the basis of the new scientific principles of production. It is expressed in a transition to basically a new stage in the development of large scale machine industry and in conversion of science into a direct productive force. From the philosophical point of view STR leads to radical changes in the entire system of production and is embodied in a whole complex processes taking place in science, technology and production. Consequently, under the STR science, technology production, consumption system functions on a qualitatively new basis and like all revolutionary transformations is notably dynamic by nature.

However at the conceptual level there is a marked difference between a Marxist and bourgeois approach to STR. The Marxist presented a synthetic approach to STR. It clearly asserts a close relationship between production process and production relations. It examines scientific and technical progress in its organic relationship with social progress. Karl Marx while analyzing the technological changes of the 18th and 19th century explained their dependence on the emerging and developing capitalist relations. He explained that as a result of those changes the capitalist mode of production had been put on an adequate material basis – large scale machine production. He further stated that the content of industrial revolution has not been exhausted by the revolution in technology but included a revolution in production relation – the victory of capitalism over feudalism(M.Volkov, Social Science Moscow, vol, VII, p,30) Technology and social relations are closely intertwined. Changes and progress in technology inevitably affects material production which leads to change in social relations. A new social structure thus formed gives further impetus to the advancement of technology.

Modern industry, according to Marx, never looks upon and treats the existing form of process as final. The technical basis of that industry is therefore revolutionary while all earlier forms of production were conservative. By means of machinery, chemical process and other methods; it is continually causing changes not only in the technical basis of production but also in the functions of the laborer and in the social combination of labor process. (Karl Marx, Moscow, 1954, vol, I, p,457). Commenting on automation Marx further stated that as soon as a machine executes without man's help, all the movement requisite to elaborate the raw material needing only attendance from him, we have an automatic system of machinery and one that is susceptible of constant improvement in its details. (Karl Marx, p,402)

Russia at the time of the Revolution was extremely backward country. Politically it had a very repressive autocratic system of government, socially all classes were stratified having antagonistic contradictions due to the existing feudal mode of production, economically its backwardness was due to the prolonged period of feudalism in the country which obstructed growth of the economy. The policy of the government towards science and technology had inherent contradictions as it wanted to develop science and technology in order to strengthen the defense of the country on the other tried to control it apprehending challenge to its own authority.

Therefore the industrialization programme which got its momentum from 1861 reforms was dependent on foreign technology foreign capital and technical personnels. The Tsarist government was dependent on foreign loans too as the problem of internal capital accumulation was quite complex. The required reserve capital was not available due to the belated development of capitalism in Russia. A few characteristic features of the development of science and technology in Tsarist Russia are discussed briefly to make the picture clearer.

Science and technology in pre-revolutionary Russia were not given due emphasis. The factors responsible for the late development science and technology were both internal as well as external. The social value of science was acknowledged very late and also its role in social and cultural development of the people. and it was never regarded as the culminating point of people's material and spiritual development. It was only after the Crimean debacle that the need was felt to develop science and technology in order to modernize the defense system. Thus the growth of science and technology had a militaristic orientation and not for modernization of the country. Even in the years to follow science was not accepted as a civilizing or modernizing force but as a hostile force generating revolutionary ideas. Russian scientist and technicians invented new techniques and machines which were abandoned due to the hostile attitude of the administration sometimes the scientist were imprisoned or exiled by the government. Obtaining financial support from the government too was a difficult, long and uncertain bureaucratic process. (J.N. Westwood, Oxford, 1973, p,94)

Concomitantly Russia did not have a single social class or estate on which it could depend on building a strong national tradition in science. Neither the gentry nor the clergy, the relatively well educated and financially secure estates, could enter the classical gymnasium or the universities as science was opposed to the

religion of the orthodox church. It was a threat to those nobles who hoped to maintain their position on the basis of blood rather than achievement. (L.R.Graham, Princeton, 1967, 6p.). Thus we can say that the development of science and technology both qualitative and quantitative was very slow and lacked in direction. This was due to the political structure prevalent and the institutional constraints which restricted the growth of the progressive ideas as well as scientific inventions and technical development. We can easily understand that the development of science and technology in the Tsarist Russia was slow paced and had inherent contradictions. This resulted in sharp conflict between science and the rotten old decaying order.

Another important aspect was that science in pre-revolutionary Russia developed spontaneously without any support from the government. The belated development of capitalism in Russia did not take place with the help of native population. The major part of the economy was owned and controlled by the foreign technicians and capitalists. Machinery for agriculture and heavy industry was imported from the west. There were virtually no factories producing automobiles, chemical plants, iron steel equipment, bearings etc. Foreign capitalists who had a foot-hold in Russian iron and steel power engineering and oil and coal industries were obstructing the country's development and steering it towards complete dependence on foreign trusts and concerns. (Kaysanko, Moscow, 1966, p.6) The technical backwardness and dependence on foreign countries proved detrimental to the government during the World War I. The militaristic orientation of the economy, the decline in imports both in agriculture and industry resulted in decline in production and created shortages. The acute shortage of qualified workers, the congestion of transport, fuel crisis forced many enterprises to closure and productivity per worker declined in remaining enterprises.

The Russian technical intelligentsia in its origin was a creation of the Russian state, one of the oldest groups being the corps of Mining engineers established by Catherine the Great in 1773 to manage state mines and metallurgical plants. Similar bodies of trained state officials were set up in the early nineteenth century e.g., schools for transport engineers and civil engineers and forestry officials. The higher educational institutions that trained them were largely reserved for the children of the nobility and often even from the children of these in a particular specialty, such as the officials of the bureau of the Mines (K.A. Bailes, New Jersey 1978, p.25). These graduates belonged to the upper strata of the Russian society and were a privileged group. The technical schools during this period produced personnel only for administrative and control functions because direct technical work in production process was considered not a respectable profession. However after 1850's a trend towards democratization of the elite institutions began which opened the door of these institutions for commoners. The figures collected by Nicholas Hans during 1899-1913 clearly establish the fact that the social and political atmosphere was not conducive for the growth of technical personnel. The major complaint was the lack of support from the government for higher educational institutions and unbalanced geographical distribution.

Russia entered the 19th century with a very weak bourgeois class which was dependent on the Tsarist government and foreign capital. It was only at the end of the 19th century that the bourgeois emerged as a commercial class. This new though small class not only showed a healthy respect for scientific pursuits but also gave important financial aid to scientific institutions. Even more important was the bourgeois role in financing a private system of research institutes and schools for example The Society for Advancement of Exact Science and their Practical Application established by Ledevudov. (Vucinich, p.486)

The 1917 October revolution brought in a new socio-economic and political system. It set forth before itself the task of an independent self-reliant economic development and a radical transformation of social structure. It recognized the role science and technology had to play in the social economic transformation and political and cultural development of the country. The new political system which emerged had the determination to achieve a scientific and technical revolution which will compliment a cultural revolution. As a result the new government was ready to provide the desired linkages between science technology and the socio-economic system with an objective of achieving both qualitative and quantitative development of science and technology and higher productivity. The basic guidelines of the reorganization and economic transformation was quite clear and deeply entrenched in the ideological thoughts of the Bolsheviks. The basic economic principles were as follows;

- to give a firm footing to the national economy on the basis of the latest achievement of science and technology;
- To increase the productivity of labor higher than that under capitalism;
- To raise the cultural and spiritual level of the masses; to raise the educational level of the population which could create an increasing number of scientific and technical personnel;
- To oust the private capitalist elements and create a non-antagonistic socialist society which could further develop into a communist society.

The Bolsheviks not only altered the then existent socio-economic order but also shaped positive policy on science and technology. Any change in country's objective situation inevitably lead to a revision of the concrete tasks of the economic policies and the concrete form of its implementation. It can be easily said that uniform and

consistent as it was all the guidelines of Soviet economic policies were subordinated to a single goal that of creating the material and technical basis of communism.

The main architect of soviet policy for scientific and technical development –Lenin- constantly insisted that communism and science must go hand in hand and that communism can be built only on the basis of scientific knowledge. Therefore he chalked out a plan for scientific and technological development in order to consolidate not only the roots of socialism but also to create a viable atmosphere for the development of productive forces of the country on the socialist lines. The plan included;

- rational distribution of industry in Russia from the standpoint of proximity to raw material and the lowest consumption of labor power in the transition from the processing of semi-manufactured goods, up to and including the output of the finished products.;

- rational merging and concentration of industry in a few big enterprises from the standpoint of the most up to date large scale industry specially trusts;

- enabling the present Russian Soviet Republic (excluding the Ukraine and the regions occupied by Germany)as far as possible to provide itself independently with all the chief items of raw materials and organize main branches of industry;

- special attention to the electrification of the industry and transport and the application of electricity to farming and the use of lower grades of fuel (peat,low grade coal) for the production of electricity with the lowest possible expenditure on extraction and transport ,5 water power and wind motors in general and in their application to farming in particular .(Lenin,vol,27,p320-21).

In order to create material and technical basis of socialism Lenin stressed the need for the development of heavy industry based on latest achievement of science and technology. Socialist industrialization was of utmost importance as it was the only way to create labor productivity higher than that under capitalism. It was not only economically imperative but also an ideological commitment by the Bolsheviks.Thus a policy evolved for the widespread spatial dispersal of science and technology with a view to bringing it closer to the sources of raw material. Large scale heavy industry got top priority in the Soviet economic development plan. Industrial development in Russia did not have any concept of the economies of scale,optimal utilization of resources, capital output ratio etc.In the initial years restoration of the industry was of utmost importance as it was linked with the task of the restoration of the small scale industry.So rehabilitation of the industry was planned on a higher technical level on the other merger of small scale enterprises were also undertaken to consolidate them. This required a completely new power base not only for the development of heavy industry but also for agricultural sector.In this connection fuel and electricity were considered as the main inputs and it was believed that without revolutionizing the power and electricity base socialism cannot be built .As a result Lenin in 1918 in the midst of turmoil,crisis and civil war raised the slogan'communism is Soviet power plus the electrification of the whole country'. In order to achieve a higher technical level a need was felt to have a planned and guided economy on the socialist lines. Lenin attached tremendous importance to scientific substantiation of national economic plans underscoring the need to base them on the achievements of science and technology and advance methods of labor.Therefore the GOELRO plan the first long term economic plan was adopted in the countryin1918. The implementation of this plan and other plans needed planning structure .Hence planning committees at national and regional level were created.The main concern of theplanning committees during these years was perceived as the rational utilization of available resources to strengthen and develop the socialist sectors and assistance to cost accounting in condition of keen shortage of circulating funds and narrow market. Plans were also chalked out to increase the output of food fuel,oil,coaletc so that the country could rehabilitate the industry and meet its growing demand for fuel. Plans were also made to make the country export surplus. Greater emphasis was given to machine and machine tool industry as its development was necessary to make country technically independent .Hence emphasis was given to engineering industry machine tool and ferrous metal. This was deemed necessary to bridge the gap between Soviet Union and capitalist countries. On the one hand Soviet Union allowed the import of machinery ,equipment and specialists on the other, they planned to set up commission in various fields such as electricity, engineering, agriculture etc, to ensure that these short term imports result in developing the required skillsand the country becomes technically and economically self- reliant in the shortest possible time.

The government wanted to develop agriculture to the extent it could serve the country's industrialization programme.This industrialization programme was to be built upon the introduction of large scale farming on cooperative line as its cornerstone ,which was to transform the age old basis of Russia agriculture. Collectivization of agriculture was imperative for the industrialization as Stalin elaborated at the 15th Party Congress ,the way out is to convert small scale scattered farms into large collectives. These new collectives were to be given agricultural machinery by the government. In addition large scale state farms was also prepared to meet the demand of expanding industry expandingindustry.(Maurice Dobb,London ,1957,p,192) The collectivization programme of Stalin played proved a disaster for Russian agriculture

reducing the acreage as well as productivity. Despite heavy odds the First Five Year plan was completed successfully in three and a half years.

The Second Five year plan raised the slogan 'master the techniques consolidate the gain already won'. The fundamental and decisive task of the plan was defined as being the 'completion of the technical reconstruction in the whole of the national economy so that on its termination some four fifth of all industrial output would come from 'new enterprises built or completely reconstructed during the first or the second five year plan period. A condition of this task was set of mastering all aspects of the operation of the new techniques and with it considerable improvement in productivity of labour, the lowering of productivity cost and a decisive improvement in the quality of output. (Maurice Dobb, London, 1957, p.270)

Another important feature of the second five year plan was the policy to accelerate the economic development of the most backward areas of "Russian Empire". The second five year plan laid special emphasis on continuing the shifts in the geographic distribution of the productive forces and strengthened the process already started under the First five year plan.

The Third Five year plan was prepared under the lengthening shadows of the War. Top priority was given to defense sector in the plan i.e, transport non-ferrous metal special steel and chemical industry. The central slogan of the plan was that "make the Third plan a chemistry plan".

The post war plan the fourth plan continued with the emphasis on heavy industry. The main emphasis in the plan was to restore the war devastated economy on advanced technical basis in order to bring it at par with Western world and even outstep them. The same trend continued in the Fifth plan which was announced in the 19th Party Congress.

All the plans were interlinked and aimed at achieving the desired objective of creating material and technical basis of communism. As a result a planned development of science and technology was undertaken to bring about a radical transformation of the Soviet economy. Therefore for the first time a structural mechanism was created by the government which could monitor the progress of science and technology in conformity with the needs of the national economy. The general direction of the scientific and technical research throughout the country was the responsibility of the council of Ministers of the USSR, which examined and sanctioned the principal trends of development plan for science and technology, the financing of research in the fields of science and technology and the principal measures for improving the management of the development of science and technology in the USSR. (Sarah White, Francis Hodgson, 1971, p.16.) The plan for the development of the national economy is based on the programme of the CPSU for the development of the national economy which was supported by the state planning committees and Academy of sciences. The bodies mainly responsible for the Planning of science and technology were as follows ;

Another important policy decision regarding the science policy in the USSR was that a statute was promulgated in 1930 making practical usefulness as the main criteria in approving the scientific research. The increased pressure to engage in applied sciences forced the academy to set up many specialised engineering and technological institutes in 1933-34. In order to give the Academy a political and ideological orientation the Academy was merged with the Communist Academy in Moscow in 1936. The rapid growth of factory laboratory reflects the intimate link between the Soviet science and industry. Many industrial concern ran special classes or courses, thus serving as what may be called the "university workshops". (Yushkevich and Vassili P. Zubov, London, 1966, p.576).

The outbreak of the War diverted resources and the economy was turned into a war time economy. But the subsequent period witnessed a more intense development of science and technology. There were two objectives before the soviet government; one to develop the military potential of the country to beat the western world and to develop the economy and society at a much higher level. Therefore a period of 'scientific nationalism' ensued in the country. The highest priority were given to practically all branches of military oriented science. More specifically the focus was on physical and physical chemical instruments of great precision. The post war period also witnessed main scientific achievement in the field of nuclear physics and space. Nuclear technology exerted great influence on the general development of Soviet science.

The period between 1956-76 is a period which marked a shift in the planning and organization of science and technology. In the field of science and technology this period is marked for a revolutionary transformation. It signified the beginning of the intensification of scientific and technical development. In this period science becomes the direct productive force. The development in science sparked off revolutionary changes in technology and engineering leading to significant changes in production processes. As a result science transformed itself into a direct productive force. While the industrial revolution of the 18th century was a result of the utilization of improved methods of energy sources, the post 1950's scientific development is known for superior means of transmitting and transforming information. Its essence consists in the reorganization of the whole technological basis of all the technology of production beginning with the utilization of materials and power process and ending with the system of machines, the form of organization and management and with the place and role of man in the production process. (Gvisshiani, Soviet Science, Moscow, vol,6 no,3 1975, p.97). It

creates the pre-requisites for bringing most vital forms of human activity into a single system, the science i.e, a theoretical cognition of the objective laws of nature and society ;technology completes the means of creating material wealth, management , the means of rational interconnection between expedient practical acts in the process of solving production and other problems.(Gvisshiani,p,97).

It is an outcome of the accumulated discoveries at the level of basic research i.e, one directed towards gaining new knowledge of nature and new forms of the organization of matter , since the beginning of the 20th century in the field of nuclear physics ,of macro-molecular chemistry of cybernetics and sociology .(Roger Garudy .London, 1970,p,21)

A crucial role in this era is played by Cybernetics which is defined as the scientific analysis of control of animate and inanimate system of organizations based upon the method of communications. (Lee Kreshnev, Communism,vol, 14, 1965, p,56).It disregards the organizational and structural differences between animate and inanimate objects and

The soviet government had been making concerted efforts to raise the scientific potential of the country.To achieve this a planning structure was evolved and later on reorganized to meet the new demand. Therefore state plans were chalked out and based on the latest developments in science and technology. Special emphasis was laid on the improvement of research and development facilities as it plays a very crucial role in the development of an economy .Research in the field of basic and applied science and the application of its results in the production system increases national income. Therefore considerable attention was given and huge investments were made for the creation of R&D facilities in the USSR. There were essentially three groupings within the Soviet research;

1-Academy of Sciences of the USSR, its affiliate and institutions , republican academies of sciences.

2-Ministerial system and a large number of specialized research institutes

3- University, Institute of Higher Education and Research facilities.

Academy of sciences of the USSRThe Academy system, The Academy established in 1725 was the highest scientific establishment in the pre-revolutionary period. In 1925 the central executive committee passed a resolution recognizing the Academy as the highest learning establishment in the USSR.It was reorganized several times keeping in mind the growing requirement of the national economy . During the post-war years collaboration between the All Union Academy , the Republican Academies and specialized scientific research centers were consolidated. The objective of the Academy system was to control and guide the development of soviet science and its application in the national economic development.

Its essential function is to carry out a given part of the total research work conducted throughout the USSR. The 1961 and 1963 reforms placed the Academy in charge of all research in the natural and social sciences and undoubtedly oriented the direction of its research efforts towards theoretical research. In addition to exercising general guidance over such research the academy has also been asked to determine the basic trends of the natural and social sciences and to coordinate studies in these fields. In general, these studies were to be directed towards: furthering investigation in the natural sciences towards long term research directly linked with production, especially in key fields of technical progress and the study of achievements of world science and assistance in utilizing as fully as possible these achievements in the development of a communist society. Its most important areas of research are:

a) Theoretical Research: mathematics, physics, chemistry, biology and sciences of the Universe and Earth in areas of fundamental research

b) Applied Research: Electrification, mechanization and automation of production, chemicalisation of the key branches, new synthetic materials, radio-electronic, new sources of energy, new methods of energy conversion.

c) Research analysis of planning; Study of the achievements of world scientific progress, research to advance technical progress and recommendation for the introduction of new technology into the economy.

Functions

- Approval of the plan for basic research and control of scientific research in the natural and social sciences whenever conducted

- Presentation to the Council of Ministers of plans for financing materials and technical supplies and for investments in its establishment and with scientific establishments of the Union and Republican Academies.

- Planning and implementation, together with the State Committee for Science and Technology of international scientific relationship.

- Execution in conformity with the state economic plan of research plan in scientific establishments.

- Training of scientific personnel

- Preparation of reports of scientific achievements and dissemination throughout the country.

Scientific Establishments

It includes scientific research institutes, laboratories, and observatories experimental stations, libraries museums etc. At the end of 1969 there were 29 of them.

Scientific research institutes carry out a specific project and are responsible for its execution. Leading institutes are specialized research establishment whose research projects, plan is larger and more precisely defined than those of regular institute which are ordinarily preoccupied with specific problems geared to local needs leading institutes combine research and development activities often have laboratories for working on production problems attached to them

Affiliation of the USSR Academy of Sciences

.Affiliation of the academy has been created to r5edistributeacademy's regional network. They exist in the autonomous republics and districts of the Russian and other Republics. At present there are ten affiliates: Dagestan, Kola, Komi, Ural.Bhaskir, Karelian, Buryat, Eastern Siberia, Far East and Yukutsk.

Academy of Sciences in Union Republics

There are at present fourteen Republican Academics of sciences, controlling some 340 research establishments, employing around 28,000 scientific workers. The Russian RSFSR is the only republic not to have its own national academy, but its needs are served by the USSR Academy.

The republican academies of science plan and coordinate research in the fields of the natural and social sciences, train post graduates as highly qualified scientific worker and direct and e4xecute fundamental research work in the natural and social sciences. Besides, there are specialized academies not subordinate to the Academy of Sciences of the USSR but administered by ministry, state committee or Republican Council of Minister for example: Academy of Medical Sciencesof the USSR, Academy of Municipal Economy of the USSR ETC.

Ministerial System

The Ministerial system was born from the industrialization drive of the 1930's with the central government directing the development of technology and technologically based industries from above.This ministerial System coordinated and facilitated scientific research and technical advancement through its various departments branches and sub-branches. This facilitated the rapid transfer of western technology into existing Soviet industries and the establishment of new industries utilizing technology adopted from advanced western firms.(Sarah White,Britain ,Francis Hodgson,1971,p,52)

It covers all scientific establishment not subordinated to academic or higher educational institutions. The bulk of the research carried out within ministerial system was in the applied field, being connected with the various industrial ministries. Each ministry was divided into number of departments:

- a) The technical department was mainly responsible for R&D. It acted as a clearing house for plan for new technology put forward by the production department. It also guided and supervised the work of research institutes under the authority of the ministry.
- b) The scientific and technical council of the ministry was a non- executive body. Its function was to look at plans for the introduction of new technology , for automation and mechanization and to discuss the main direction of the technical development within the field covered by the ministry. Its special concern was to establish a scientifically based unified technical policy for the industry and to introduce the latest achievements of Soviet and foreign science and technology.(Sarah White,p,50).The ministry had within its control general scientific establishment for the organization and coordination of research work.

University system

In the pre-revolutionary period the universities and institutions of higher learning were the main centers for scientific research apart from the Academy of sciences But after 1917 their sole concern was teaching and research was reduced to a secondary role. There were two kinds of higher educational establishment in the Soviet Union. The universities and institutes of higher learning.in the University there are two types of faculty, faculty of social sciences and faculty for natural sciences. Whereas the institutes of higher learning are responsible for research in applied field.

Planning of R& D

Until 1949 research and developmental plans were elaborated only by the scientific research institutes and by the testing design organizations. These were approved by their supervisory authorities. For the first time in 1949 annual plan for the introduction of new technology was approved by the government. It included introduction new technology and mechanization of production. The plan for scientific research work were excluded from the plans for the development and introduction of advanced technology in 1954 and reintroduced in 1957. Expenses for mechanization and automation, for most important scientific research and testing work

were also included in 1960. In order to increase the efficiency and administration of industrial enterprises the government introduced reforms in October 1965 under which three year plan were introduced under the central control.

Besides targets for the development and introduction of new technology were included in national perspective plans. The increasing emphasis in the National Perspective plan for the R&D clearly shows government's concern for scientific research.

Concomitantly the coordinating plan elaborated by the ministries responsible for a uniform scientific policy in their branch provide the link between the Five Year Plan and the annual plans for 1967-70. These coordination plans include the whole group of activities from scientific research upto the achievements of expected results.

EXPENDITURE ON R&D

Huge investments were made for the development of science and technology in the USSR. Even during the chaotic years of war communism and NEP huge allocations were made for the training of scientists and technicians and for the development of scientific and technical potential as a whole. In the Soviet terminology and in Soviet statistical and financial reports the financing of research and development in the USSR was presented as financing of science. (Zaleski et al. OECD, Paris, 1969, p, 100).

There are three categories of expenditure on science and new technology which are as follows:

- 1- Scientific research and testing design work
- 2- Modernization of production
- 3- Financing of expenditure for new technology.

Investment in science was financed by the:

- 1- All Union Capital Investment Plan
- 2- The Republican Science Budget

All Union Capital Investment Plan

It included the amount of capital investment and the number of construction and installation works for each ministry and state agency and for each Union Republic. It included allocation for the construction of new research institutes, testing design organization and experimentation enterprises, workshops and stations. Also included in budgetary expenditure for acquisition of equipment and investment made according to the State Plan for construction and capital repair. (Zaleski et al, p, 104)

The Republican Science Budget

It included allocation for the acquisition of equipment, capital repair of buildings and equipments, wages, social insurance, study, expenditure, investment according to the state plan for construction etc.

There were other sources of financing R&D in the USSR. It consisted of different funds administered by ministries central administration for financing R&D. These are:

- 1- The Special fund for Financing of Scientific Research
- 2- The Fund for Assimilation of New Technology
- 3- The Commercial Surcharges
- 4- Special Enterprise Fund.

The Special fund for Financing of Scientific Research

This fund was allocated for branch and inter-branch scientific research and design testing work of particular importance. It was included in the National and Ministerial plan. A part of the fund is allocated directly to scientific institutes, while another part is used for payments of contracts for scientific research and testing design work. (Zaleski et al, p, 107)

The Fund for Assimilation of New Technology

A fund for the assimilation of new technology was created on the Sovnarkhoz ministerial level in order to reimburse enterprises for the supplementary planned expenditure on design testing and other work required for the achievement of batch production. The reimbursement was to be made only for the period of validity of temporary prices, that is one year with certain exceptional extension to one and a half year for products with a long production cycle. (Zaleski et al, p, 107) The fund for the Assimilation of New Technology was financed through deduction of planned cost on the factory level. These vary from 1.0 % of cost in the case of the ball bearing and motor industries to 3.5% in the case of heavy engineering and machine tools. The total amount of the Fund for the Assimilation of New Technology was 209 million ruble in 1963 and approximately 300 million ruble in 1967. (Zaleski, p, 110)

THE COMMERCIAL SURCHARGES

The commercial surcharges were used to finance testing and scientific research work of enterprises specialized in batch production. The amount of these surcharges were fixed by the Sovnarkhoz with the approval of the Ministry of Finance of the Union Republic.

THE SPECIAL ENTERPRISE FUND

Enterprises financed directly by the State budget also occasionally have access to special funds. These resources were obtained from rent income ,from entrance fees to museums and exhibitions belonging to these establishments and from incomes of laboratories and cabinets of the enterprise's scientific research and testing establishments .Such earnings can supplement the financial resources of scientific research and testing design organization allocated through the State budget.(Zaleski etal,p,115)

FUND FOR THE DEVELOPMENT OF PRODUCTION

The fund for the development for the production is used mainly for modernization, automation and introduction of new products. It was administered by the enterprise . It replaced the Enterprise Fund for Mechanisation and Automation of Production process in 1965.Improvements in enterprise performance which lead to increased labor productivity, cost reduction ,improved quality,higher rate of profit could also be financed from the funds.It was financed from three sources:

1-deduction from enterprise profits

2-30 to 50% of amortization allowances used for replacement of capital differentiated by branches of industry,

4- Receipts from sales by the enterprise of unused and superfluous equipments.(Zaleski etal,p,119)

CREDITS

Credits for the introduction of new technology were also issued in the USSR. According to general rules credits for introduction of new technology were allocated by the State Bank for (industrial enterprises) for construction and assembly project design and geological prospecting organizations on condition that these expenditures were not related to construction of new enterprises or to general reconstruction of existing enterprises and do not constitute a part of reconstruction work included in the investment plan (Zaleski etal,p,121-22.).

CONCLUSION

The above survey clearly shows the primacy of ideology in the development of science and technology in the USSR.Science was always theory based .It was given the task of liberating the mankind through socialism and then communism The Bolsheviks inherited a backward economy and financial bankruptcy.The task of the restoration of the economy on a sound technical base was of utmost urgency .The capitalist encirclement, shortages technical failure, and the ongoing conflict between the capitalist forces and the socialist supporters made the task difficult.Here the ideological determinism of Lenin and Bolsheviks helped in creating the foundation of the future socialist state . A new planning mechanism evolved and a whole range of measures were undertaken , a new planning structure was created, R&D was given emphasis and allocation ,resource allocation were made with a view to ensure rational geographical distribution and development in distant backward regions.

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