MANAGEMENT OF INNOVATIONS:
Current Problems in the Management of Soviet Science and Technology

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The object of this paper is to summarize some aspects of the management of scientific and technological development (STD) in the Soviet Union, its present problems, and some indications of their solutions. In this paper, of course, only a short survey is possible.

The modern world is characterized first of all by the changes in all fields of human activity. These changes are based primarily on changes in science and technology, and on the speed of technological innovations. But the speed of the innovation cycle strongly influences improvements in the management process. These reasons determine my interest in the management of innovations. Here I try to describe the management of STD from the dynamic point of view: the relevant information flows, and the interaction between management bodies.

For the Soviet Union with its advanced economy and large territory, one of the most important aspects of the solution of scientific and technological problems lies in the improved coordination and cooperation between the management systems of branches of industry and regional management systems*.

Comments on the management system of STD

The management system of STD is shown in Figure 1 in schematic form. All relations between different management levels and bodies, plants, and the associations of plants cannot be shown in this figure, but only the main formal links.

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*This provides the relevance of this study with IIASA's Urban and Regional project. I should like to thank all participants of this project for their support and encouragement to the author.

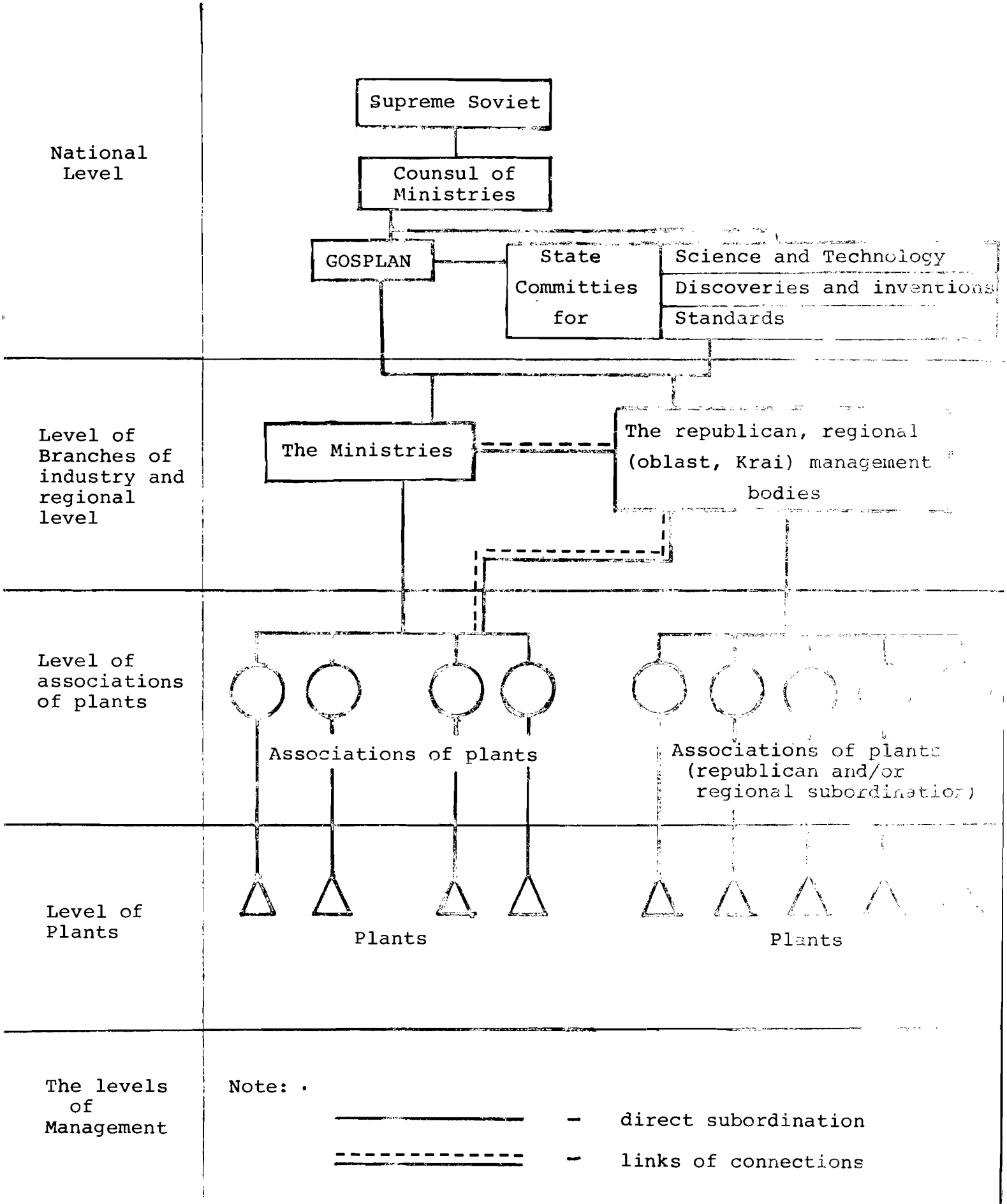

National Level
Supreme Soviet
Counsul of Ministries
GOSPLAN
State Committies for
Science and Technology
Discoveries and inventions
Standards
Level of Branches of industry and regional level
The Ministries
The republican, regional (oblast, Krai) management bodies
Level of associations of plants
Associations of plants
Associations of plants (republican and/or regional subordination)
Level of Plants
Plants
Plants
The levels of Management
Note:
direct subordination
links of connections

Figure 1.

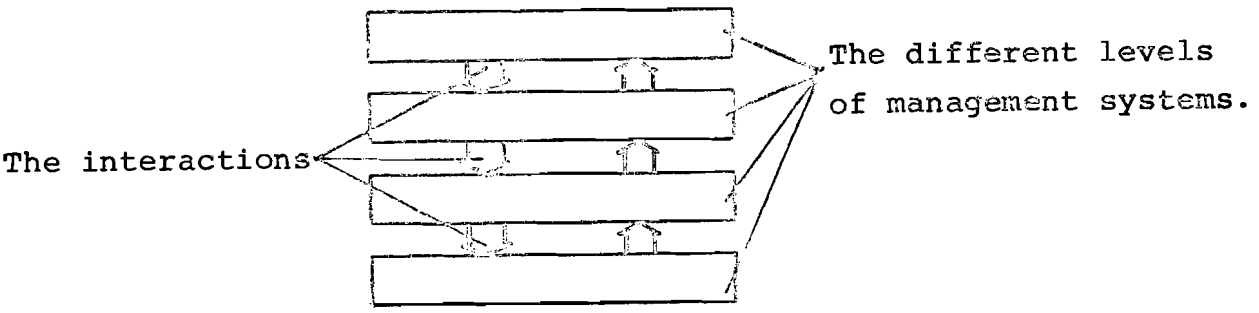
The great importance of STD for the future is determining the high degree of centralization of management systems.

The planning process, as the major part of management starts from the higher governmental levels. The Supreme Soviet of the USSR and Council of Ministers as executive bodies decide the global questions: What are the main directions for STD? What are the national goals in these fields? How many resources are needed to achieve these goals, etc.? These national goals and required resources for STD are reflected in the national plans, which are elaborated for long-term (15 years), middle-term (5 years) and short-term (1 year) periods. The general national plans are included as a necessary part of the plan for STD. National plans are carried out by GOSPLAN (State Committee for Planning) and adopted by the government. In the process of plan preparation one significant condition is observed: *the rate of new investment for STD must exceed the rate of production growth*. Moreover, our planners try to elaborate plans, the realization of which depends on the fulfillment of the science-technological plans. By these means, the consideration of the needs of science-technology are achieved in our plans.

After plan adoption, the planning process is passed down and GOSPLAN then cooperates with State Committees responsible for different fields of STD, and then sets the objectives for the management bodies (Ministries, republics, and regions). Ministries and republic (or regional) management bodies in turn define the goals and planning indices for associations of plants, single plants and organizations and their subordinates. This is the direct planning process which begins after the adoption of national plans at the government level, but during the period of the plan preparation, the intensive interactions between all levels occur. The real planning process looks like the one shown in figure 2.

Such interactions create the possibility of taking into account all reserves and potentialities of ministries, production organizations, regions, combine the economic and

Figure 2.



social interests at all management levels set the well founded objectives, goals and indices.

After finishing the elaboration and adoption of plans, the process of their realization starts. For the successful realization of plans for STD we have some economic incentives in our management system. These incentives stimulants during the period of plan fulfillment. Figure 3 shows the interaction between planning actions and the actions of the incentive system in the process of science-technological goals achievement.

The link between "plans" and "incentives" is reflected by the following consideration: indices of plans have two functions -- directive and incentive; in other words, plans determine to some extent the incentive system. Such a condition is founded as the prime role of planning in the management process.

The incentive system really acts through the special fund created by the associations of plants and single plants. These

simulation funds for STD were allocated for adopting and introducing a new technology and awarding funds for STD. Their magnitudes are associated with the major indices of enterprising work such as effectiveness of innovations, costs, income, value of product realization, etc.

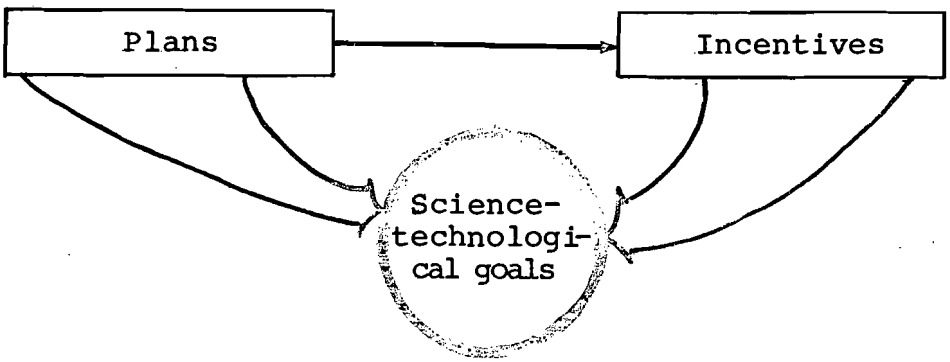
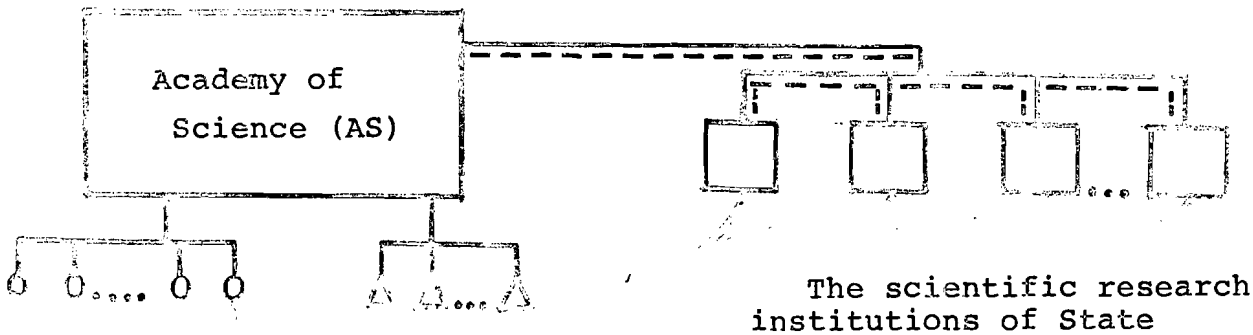


Figure 3.

But new technological ideas cannot be generated by management. These ideas are generated and developed in science-technological organizations (institutes, laboratories, etc.) (STO). This is the reason for adding to the described management system the systems of STO, which operate under the guidance of management systems. The system of STO are shown in Figure 4.

The scientific organization of the *Academy of Sciences* carries out the fundamental study of different problems on which the STO of industries; regions work on the applied technological problems; the laboratories of plants undertake the implementation stage of the innovation cycle. In the process of implementation, adoption of new ideas and innovation, the STO of industry and regions takes an active part.

The State Committees have some scientific institutions. The *State Committee for Science and Technology* has an Informational Institute (VINITI). This institute publishes the

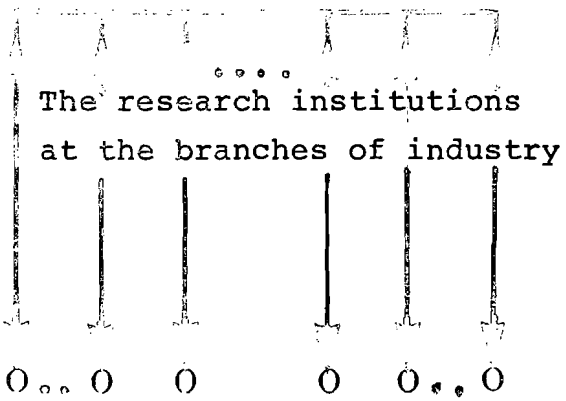


The research institutions of AS in different fields of knowledge.

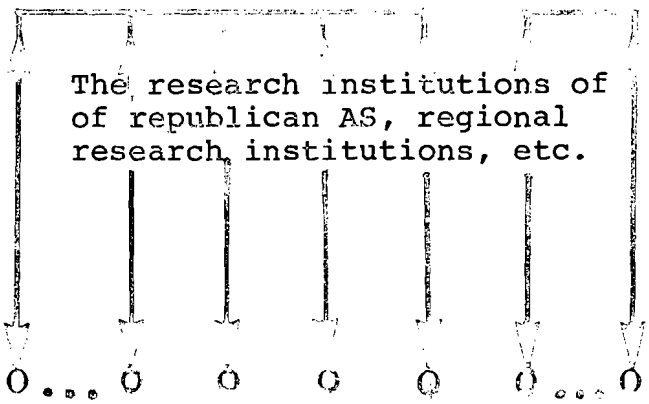
The Scientific centers of AS with their institutions

The scientific research institutions of State committies.

Universities, colleges, institutions for higher education worked partly under the contracts with industry, agriculture, and other organizations.



Technological departments, laboratories, etc. at the associations of plants.



Technological departments, laboratories, etc. at the at the associations of plants.

Figure 4: The system of Science-Technological organizations.

monthly reviews in different fields of modern knowledge. The IIASA library has some of these issues. Among these institutes, the State Committee for Science and Technology has a Research Institute for Organization and Management and an Institute for Advanced Management Education.

The *State Committee for Discovery and Inventions* has a large Institute for patents, scientific examinations and licenses. This organization provides quantitative patent information.

The *State Committee for Standards* has a special Institute which describes the technological conditions and standards, and attempts to change management systems in order to improve the quality of goods.

GOSPLAN has also two scientific economical Institutions, studying global economical and social processes in the Soviet Union. In addition the other State Committees have research institutions. These institutions investigate the special problems connected with the fields of each Committee's actions.

All these scientific organizations distribute information about new ideas and innovations, throughout the production system. Information departments exist in all STO and production organizations in order to provide effective diffusion of information. The informational flow distribution is shown in Figure 5.

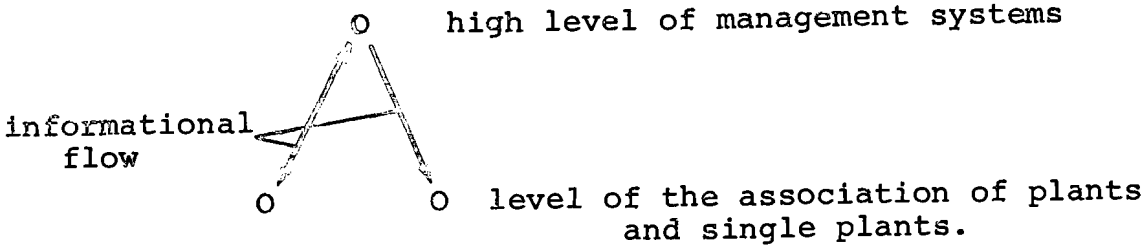


Figure 5.

Many would agree that direct information contacts between enterprises is far more effective than formal, hierarchical flows of information have developed more slowly and establishment of such contacts has met with many obstacles. There are three major reasons for such resistance: organizational, economical, and socio-psychological. We will look at these in some detail.

Organizational. The direct contacts between plants for changing new ideas and information about innovations meet difficulties because of the great number of single plants (often small). But now the process of organization of association of plants is occurring. Some plants situated in the same region, having similar or integrated production processes are amalgamated in order to provide joint production and management. After these re-organizations the total number of independent plants is reduced, and information flows are more likely to act more directly.

The associations of plants helps to solve another problem: after their organization, the redistribution of management functions may be made. The associations with their increasing economic and managerial power can readily solve many operational, short-term problems which were previously time consuming. In such conditions, the ministries and management bodies of higher levels may concentrate their attention to strategical, long-term problems. Such redistribution is of great importance, because as a rule the major decisions connected with STD must be adopted at the higher level. Such decisions are more effective also when also they are made upon strategical considerations.

The process of redistribution of management functions demands some improvements in the organizational structures of ministries, committees, etc. Modern organizational structures have to create the strongest possibilities for good strategical management. The process of such development of management is now beginning and will be continued.

Economic Aspects. Informational exchange about innovations now occurs without any direct mutual economic benefits. Only after introduction and adoption of innovations can the plants or associations gain some additional income. If the innovation proves to be unsuccessful, income may be reduced. Among these important perspectives, some loss in effectiveness and income occurs in the period of innovation adaptation. This is the economical reason for difficulties in changes of information about innovations.

Some economists hypothesize that if the associations were paid for such information, the information flows would become more direct and intensified. Realization of this proposal cannot solve the problem completely. The socio-psychological reasons remain.

Socio-Psychological. The habits of some of our managers were formed under previous conditions when the processes of production specialization was not as developed as it is today. They have tried to make all the necessary changes in the framework of their enterprises and of course they wished to adopt new ideas and innovations, but they looked only within their own systems. Now, the conditions have changed very markedly. A world view of the system is needed. The habits of these managers are resistant to change but I believe these problems may be overcome by two means: first, by educating new managers about management systems used throughout the world; second, we may try to change the out of date habits of some managers by means of motivation systems. We have now some initial attempts to solve the second questions and research in this direction becomes more and more important.

If we solve all these problems, the informational flows about the innovations in our managerial system will be going ahead in two ways; hierarchical and direct as shown in Figure 6.

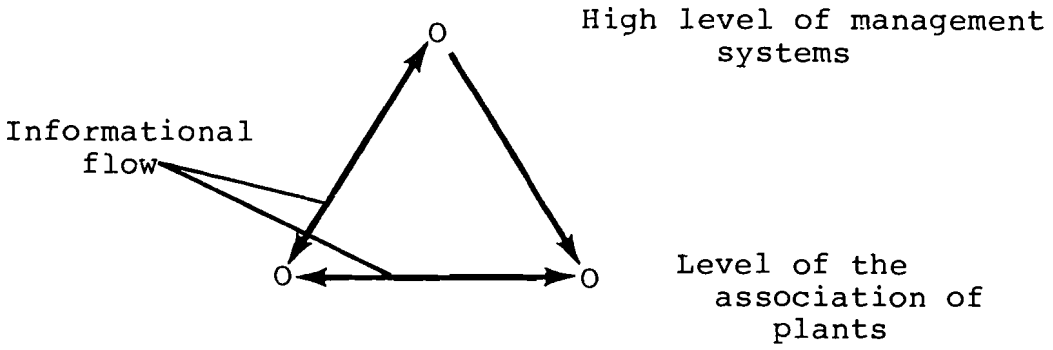


Figure 6.

In this part of the paper I have presented only a small part of our problems connected with the management of innovations. In the second part of the paper I will try to explain and show in some detail the regional aspects of management of innovations.

Regions and Innovations

The role of management systems with a high degree of centralization is very important, especially in the case of management innovation. Such systems must be supplemented by the regional, decentralized systems of management in order for full and effective utilization of all resources and reserves, creating favourable conditions for the fastest development of regions as social, economical and political units.

These are the reasons for the strong attempts of our management system to find the most harmonious coordination between the two systems of management, branches of industry through the ministries and regional management bodies. The establishment of coordination may provide the best chance for the intensive future development of our society on the basis of modern innovations.

At present we have a good system for regional management (see Figure 1). I am of the opinion that our national economy achieves the present advantages to a great extent because of the actions of this region's management system. This system operates more effectively in the establishment of regions, where economic infrastructure is the main force within the framework of geographical boundaries. For example all our republics are in economic regions. They have achieved the great economic advantages as well as the intensified social development. Republics act as socio-economic units within certain geographical boundaries and politically they are sovereign states.

These conditions create the possibility for the best management of innovations, but when the development of new regions begin, the problems of the best management of such developments arises and if we wish to develop such regions on the base of modern technology, the management of innovation problems are of the highest degree of importance. Usually, such regions do not have official geographical boundaries. They develop in order to achieve regional economic systems with high levels of production, with good social conditions for the working people, solutions of all environmental problems, etc. Now we have a great number of such regions under development in Siberia and the Far East for example.

As a rule, we try to develop these territories on the basis of Territorial-Production Complexes, for example IIASA's Large Organization Project intends to study one of such a TPC complex.

From the point of view of the management of innovations, the important question is -- how to provide the highest speed of the innovation cycle in these regions? The old, established scientific centers, (such as Moscow and Leningrad) are situated far from these places. The STO situated in the central regions cannot take into account all the specific conditions of these newly developed territories.

We now have had considerable experience for dealing with these problems. This shows that large new scientific centers in these new regions are necessary. The Novosibirsk Center is playing this role for the Siberia; and the Far East Center for the Far Eastern regions. I may say that in all parts of our country we now have scientific power for the fundamental and basic research of the problems of developing new regions. This is the main contribution of the Academy of Science for development of new territories.

Without the application and implementation of new ideas, created in such centers, the science and technology cannot achieve the general goals. I consider two ways for solution of this problem.

First, we may create a new STO with applied aims in the newly developed areas or in TPC, but this way is very expensive. Another way is to develop a management system of innovation at the regional level which can provide effective influence on the science-technological progress in the TPC. For example, a regional approach can be realized through the establishment of subsidiary offices of large research organizations. These research organizations may be situated in the central part of our country and study the general problems. The subsidiaries organized in new areas must study the original problems of these areas. In other words, the directions of this research has to depend on the needs of these regions. Therefore, large scientific organizations provide the scientific power and basic research for new regions, but utilization of this power is the prerogative of the regional management bodies.

The considerable influence of regional science-technological and social development is expected from the organization of associations of plants. When we associate the large number of the single plants operated in one territory, a new economic and science-technological power can be created. The productivity of such associations increases because of the beneficial effects of specialization and concentration of production. The association often includes a STO. Working within the region,

the association may develop not only their production but also improve social conditions in the region. For example the Moskow association "Moskwitch", which produces cars, has some plants situated in small towns within a few hundred kilometers of Moscow. The main plant helps its branches in these small towns. This enables the branches to take advantage of the modern technology and improve the social conditions for the working people. Because of these branches, there has been an intensified increase in the housing trade and the organization of new sport and cultural centers.

In coming years, the organization of the associations of plants will be continued. Our managers and scientists try to create the large, powerful association to the regions to promote development growth.

The process of association organization has also another positive characteristic connected with urban development. If the large associations are organized, the chance of removing some of the pollution producing plants to locations outside the city will emerge. The ideal urban development I think, is when only science-technological organizations, educational centers, assembly lines, etc. will remain in the city. The process of re-locating the polluting industries to non-urban areas outside the city, demands new transportation systems, changes in location and other developments.

For the effective solutions of all these problems, the strongest harmonious co-operation between regional management processes and industry is needed. In order to achieve such co-operation the Council of Ministries adopted a major policy statement a few years ago. The managerial power and responsibility of republican management bodies were increased according to this statement. Now, this process is being continued. All these events demand the development of the management of innovations. All changes occurring in the management and production systems have to be based on the needs for intensive science-technological progress and thus create the better conditions for the fastest adoption of innovatives.

Some particular problems of management of innovations have already been solved in the Soviet Union and are not included in this paper. If I have been able to give any information to show some of the new aspects of these problems, the purposes of this paper have been achieved.