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"Nowadays cybernetics has an increasing importance in the management of industrial and economical processes, in reducing the human effort and in increasing the special productivity of man's work, in the overall progress of mankind."

NICOLAE CEAUȘESCU

from the Message addressed by the President of Socialist Republic of Romania to the Third International Congress of Cybernetics and Systems

The Unitary Management Command Control Regulation System. Logistic Equation of Management

The complexity of phenomena and processes within the national economy space, the fast changes taking place in every field of the social-economic life, influenced by the technical - scientific revolution, the rapid paces in the development of the components of the national economy space, the necessity of larger and larger using the human, material and financial resources in order to assure the optimal balanced proportional economic growth, represent important factors contributing to the amplification of the decisive part of the management — control activity of every growth process field.

In socialist Romania, the management command and their complement — the control and regulation - the whole mechanism of functioning of the processes taking place within the national economy - are atributted to Romanian Communist Party. *As a leading political force of our socialist society*, the party scientifically works out the main coordinates of the objectives, directions and trajectories of optimal growth of all activities. The party organizes and manages the whole social and economic life of the country. *The unitary management* of the whole economic organism represents the objective condition in ensuring the fast balanced proportional growth of

the economy on the optimal growth trajectories within the national economy space. The coordinates of country's economic-social development are foreseen in Party's programme of building up the many-side developed socialist society and Romania's advance to communism. The objectives, the trajectories of optimal development are met into the programs and forecastings, in five-year and yearly plans of Romanian economic growth. The trajectories set within the unitary national plan of development ensures a strong dynamism and ample movements into the structure of production forces, of material production, of rational using the national income, and right using the developing national assets and of consumption fund, superior turning to account of natural and human resources, continuous increase of labour productivity, of general efficiency of the whole economic activity, the increase of profitableness with a view to ensuring an ever higher living standard of the whole people, of continuous improving the social relations. At the same time, it is ensured the wide perspective of technical-scientific revolution, gradually homogenization of economic-social development, the ever active presence of Romania in the circuit of world economy and finally the increase of nation's welfare — the supreme goal of the whole policy of the Romanian Communist Party. The objectives set by the unitary national plan of economic-social development worked out by the party and state leadership — represents guiding line of managing bodies within micro and macro economy, from all the levels of economic organism: industrial, agricultural, construction, transport, commercial enterprises, centrals, ministries, institutes of education, research and design, etc.

The building up of many-sided developed socialist society has created new conditions for the appearance of a superiour form of economic-social organization and management, based on the principles of socialist equality and equity which to mirror the fact that the management of society is done by the working class together with peasantry, intellectuals, by the whole people.

The Romanian Communist Party consistently actions, on the base of deep knowledge of social realities, towards a continuous improvement of scientific management of the whole economic-social life of the country. In socialist Romania, an organizational framework was established for efficient and direct participation of working class, of all working people in the process of working out and substantiating the decisions, in managing the whole economic-social life.

The building up of many-sided developed socialist society represents the aware creation of the working class, of the whole working people. The full turning to account of huge potentials offered by socialism, the strong and convergent guidance of all human and material resources of society with a view to optimally atain the central objective of the set policy decision — the continuous increase of people's living standard — requires a vast work management, the existence of a collective conductor covering vast and multiple qualities and political, ideological, scientific knowledge and social practical experience.

At the same time, the socialist society requires the ensurance of a scientific management of every cell of social body—from the fundamental unit

the society ensemble. Outlining this necessity — President Nicolae Ceaus points out: "We may say that the development of modern societ general and of socialist society in particular, is the aware work of wor people and requires the existence of a many sided conductor having and multiple qualities and knowledge. In fact, within our present soc a large number of conductors act. They ensure at certain levels of socia ganization the best working of public mechanism, the guidance of nume compartiments of activity. But, in their turn, all these conductors must tarily act, on the base of a *unique and central management and control.* is why, it is necessary to achieve the management of our socialist so according to the above conception, the role of collective conductor h played by the Romanian Communist Party — leading political force of entire nation — our socialist state" [1]).

The coordination, synchronization and harmonization of all proc and phenomena taking place within the national economy space req the existence of a management command control regulation system, w to penetrate in all cells of economic organism.

The Programme of the Romanian Communist Party, starting from defining features of the new society, from the necessity of improvement continuous democratization of scientific management of the whole econo social life, substantiates the optimum ways which to ensure the unitary nagement and synchronization of all activities taking place into society, on a vertical plan (in enterprises, centrals, ministries, in fields of act branches, subbranches, groups of products and products) and on horiz plan (in counties, towns, villages, etc).

In the context of continuously improving the socialist-working d cracy, of increasing the role of the working class in the direct manage of the entire economy, the activity of working people's councils is ra These councils are collective bodies of management in enterprises, cent in economic and social-cultural units where workers, foremen, engin representatives of party, union, women and young people organiza participate in.

According to the initiative of the general-secretary of the Roma Communist Party — President Nicolae Ceaușescu — it was set up the *Con of working people's councils* — supreme forum of managing the activity i field of industry, machine-building and transports. At the same time, it set up the *National Council of Working People* in industry, buildings transports, which has the role to directly participate in debating, sub tiating and working out the development forecastings in its fields of acti in identifying the optimal ways of achieving and exceeding the forecastin the plan, assuring the unitary action of working people's councils. Thr the activity of these councils in enteprises and institutes — collective b of working management — it is ensured the right of working people to dir participate in managing the production, in making the decisions in all se of social and economic life. The councils of working people assure the c

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[1]) Nicolae Ceaușescu: "Romania on the Road of Building up the Many— sided loped Socialist Society", vol. 7, Editura politică, Bucharest, 1973, pp. 29—30.

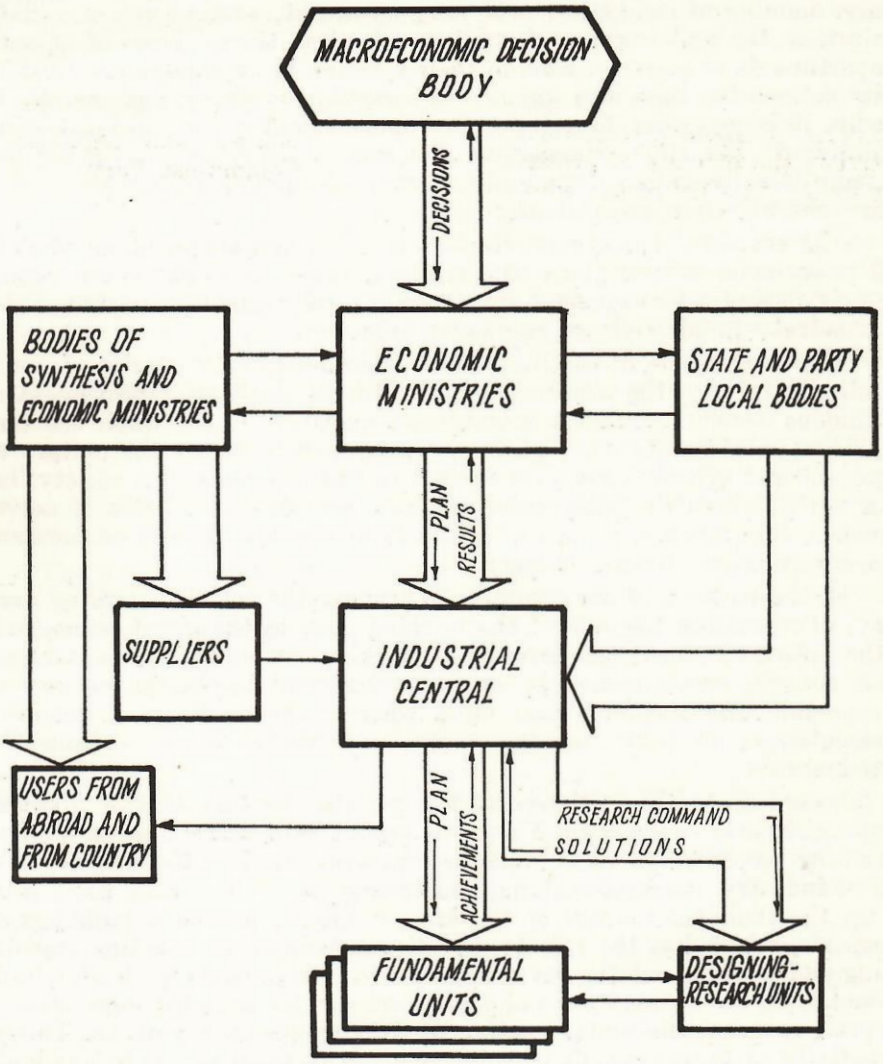

MACROECONOMIC DECISION BODY
DECISIONS
BODIES OF SYNTHESIS AND ECONOMIC MINISTRIES
ECONOMIC MINISTRIES
STATE AND PARTY LOCAL BODIES
PLAN
RESULTS
SUPPLIERS
INDUSTRIAL CENTRAL
USERS FROM ABROAD AND FROM COUNTRY
PLAN
ACHIEVEMENTS
RESEARCH COMMAND
SOLUTIONS
FUNDAMENTAL UNITS
DESIGNING-RESEARCH UNITS

Fig. 1

nuous increase of the responsibility of each working man, for fulfilling and succeeding the plan targets, for the good administration of the production means, for protecting and developing the socialist society, the national wealth.

In order to optimally fulfill the important tasks concerning the agriculture in the general strategy of country's economic-social development, worked out by the Romanian Communist Party, of achieving a modern agriculture of a high efficiency, it was established the *Councils Congress of managing the socialist agricultural units, the whole peasantry — the supreme forum of agriculture.* It ensures the direct and effective participation of working people from agriculture in working out the decisions concerning the increase of efficiency in this very important branch of economy, on the base of mobilizing all the forces with a view to entirely use the technical-material base, to rationally use the land funds and irrigated surfaces, to introduce modern agrozootechnical technologies and in this way to assure the growth of efficiency, the increase of agricultural production and the reduction of production expenses, the amplification of the role of agriculture to the national wealth, to the general economic progress of the country.

Specific to the cybernetic-economic systems which evoluate within the national economy space is the fact that their majority (starting from the workshops and sections, up on the vertical to enterprises, centrals, ministries — on the branch, inclusively — and on the horizontal to communes, town, municipallity, county) have proper bodies of command, control and regulation covering precise duties and tasks, being hierarchically subjected to the superior management bodies (Fig. 1).

All the components carrying out management and control activities in the topology of the general cybernetic system, are grouped into the *system of management command control regulation* which plays the central part in coordinating the development process of all systems within the national economy space, in placing them along the trajectories of optimal balanced proportional economic growth. The system of management,command, control, regulation forms the *nervous system* which coordinates, controls, commands and synchronises the movements and the evolution of every constituent part of the general cybernetic system of the national economy, according to the decisions and objectives set up by the Romanian Communist Party, to the forecastings of the unique national plan of country's economic-social development (Fig. 2).

The unique system of management command control and regulation is of a very complex structure, it being formed by a multitude of components organised in hierarchical networks. The decisive part is due to the *political macroeconomic decision body* which maps out the essential coordinates of the optimal trajectories of proportional and balanced growth within the national economy space, the tasks of the components within the general economic system, according to the general strategy of the country's social-economic development.

The unique management command control regulation system ensures the very knowledge of the economic and social processes, of the realities in economy, based on which the society development long-term forecasting is worked out. Starting from this, the unique management control command,

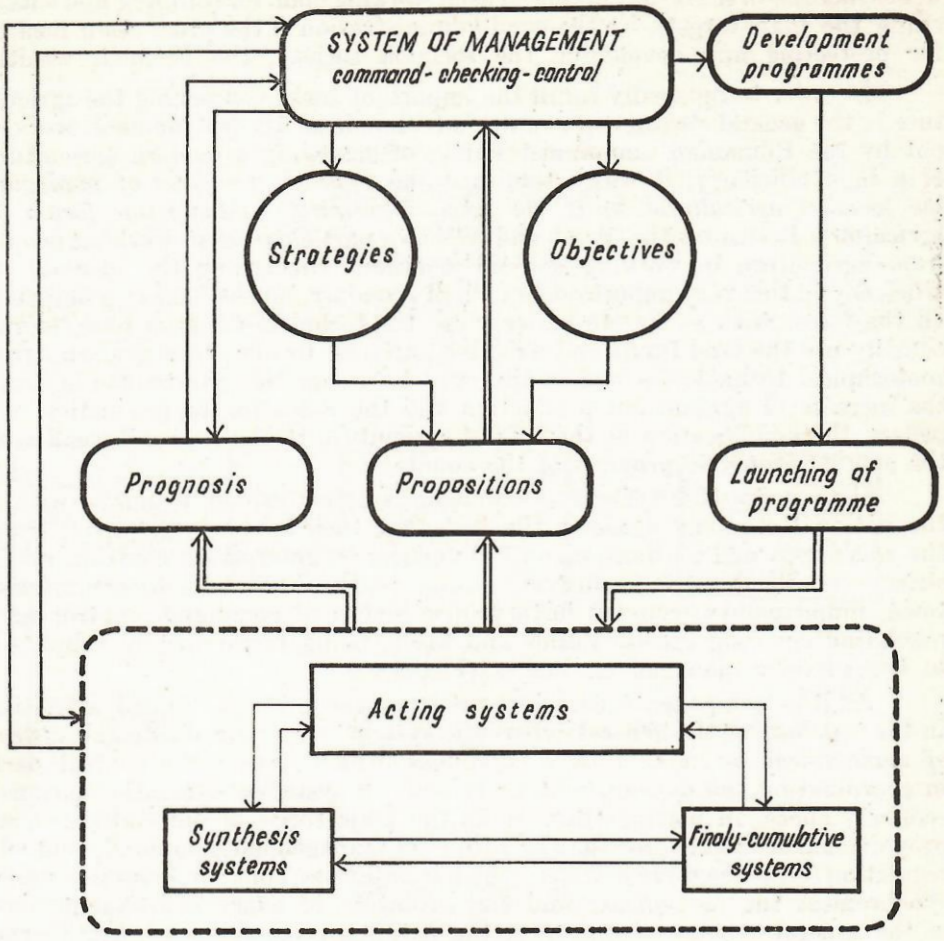


Fig. 2

regulation system warrant the adequate control and organization of every aspect of the social-economic life for an optimal operation of all activity developments, the achievement of a proper knowledge of the material and human resources, the assurance of optimal proportionality in their distributing on domains and sectors of social-economic activity and on country territory.

The unique management system disposes of an *organizational framework* for decisions-making and their achievement. The relations which are established between the political decision macro-economic body and other components of the unique management command control regulation system have as a base the *principle of democratic centralism.*

The activities taking place inside each cybernetic-economic system which evolves within the national economy space goes on according to the

orders received from the decision body. These latter are taken on the base of knowing the development level reached by the respective cybernetic-economic system and according to the tasks faced by the general cybernetic system of the national economy.

According to the Romanian Communist Party conception, to its general secretary, President Nicolae Ceauşescu, the management activity covers all the compartiments and activities taking place within the national economy space, as well as the relations established with the space of world economy. There is no kind of activity within the cybernetic-economic systems and subsystems which to remain outside the action of management command control and regulation, outside the unique conductor — the Romanian Communist Party.

The essential qualities of the management system are synthetised under the *command-control-regulation triad* (Fig. 3). Each of these functions implies the development of a whole ensemble of actions regarding the organization and coordination of the activities, in order to achieve in an optimal manner the settled decisions.

The decision acts adopted by the management command control regulation system are the vector resultant of the dialectical joining process of *diagnosis* and *forecasting proceedings*. The grounding of every decision involves first the diagnosis, the solid knowledge of the development level reached by every system apart, of his specific evolution laws, of the connections with the other systems, of the way of acting henceforth.

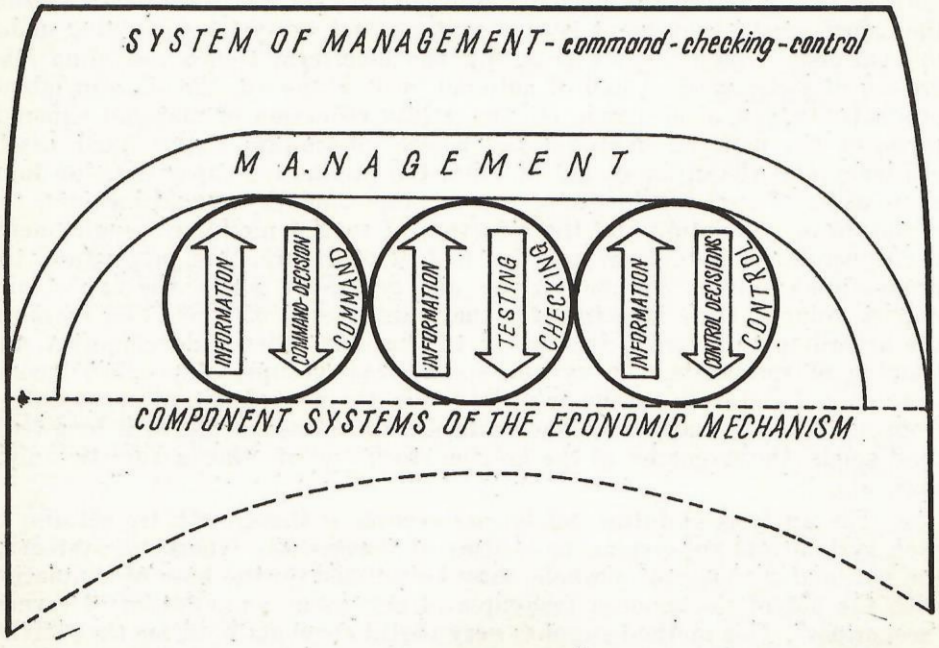


Fig. 3

Since a great deal of the adopted resolutions are "penetration" the future, they are based on the *forecasting* studies regarding the developn trends of the main processes and phenomena, within both the national s and the world space. The essential qualities of the management act lie estimating the effects to come following the decisions at present and especi in investigating these decisions in context with the previsional action of s and economic factors.

The forecasting possibilities are amplified by using the methods models studied by the cybernetic economy, conspicuous emphasizing *gnosiological aspect* of cybernetics.

In the prospective activity of establishing the growth trends of syst and subsystems under the national economy space, the identification, b on discrete economy methods, of the *optimal economic time* peculiar to e component of the national economy system, plays an extremely im tant part.

In order to substantiate the economic politic decisions regarding optimal, balanced and proportional growth trajectories of the compon of national economy and also the means of permanently improving e social-economic activity aspect and of increasing its efficiency, the sys of management command regulation and control uses the methods, tec cs and models developed under the economic logistics in the *economic p pective* domain.

Starting from the essential coordinates established as parts of the s tegy of country social-economic development, from the economic po options, the models of the economic prospective play the part of emphasi the characteristic movement laws of systems and subsystems evolving u the national economy space (Fig. 4.), the long-term trends regarding: growth of social product and of national income, the amplification of la productivity and of economic efficiency (the reduction of material expe tures, of raw material, material and power consumptions, the fixed as efficiency and the optimal way of using the productive capacities, the j cious using of agrarian lands, of every component of national income), evolution of population and the structure of the labour force employm the dynamics of industrial, agrarian and of other branches production, production evolution for main goods and groups of goods, the export import volume, their structure for the main groups of goods and mark the according to priority domains of the national science development, training of specialists, the dynamics, on social groups, of people's inc from earned and from consumer social funds, the per inhabitant consump from main goods and the endowments degree of the people with long-t used goods, the dynamics of the lodging stock and of other urbanistic bu ings, a.o.

The analysis of future tendencies regarding the growth trajectorie each system and subsystem, as well as of the general cybernetic syste the national economy as a whole, may be fulfilled on the base of simula with the aid of the modern technique of electronic computation of sev "scenarioes". This method supplies very useful elements both for the acti of substantiating the strategy of optimal, balanced, economic growth

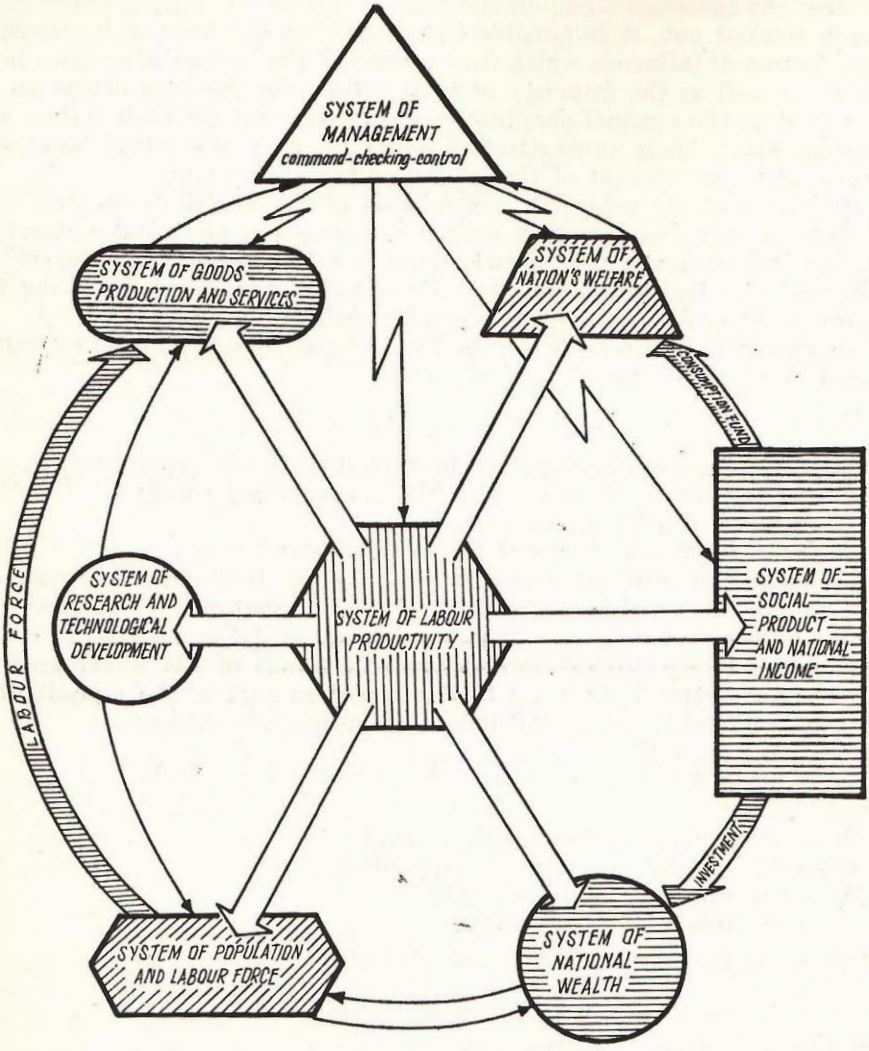


Fig. 4

for the identification of the most efficient ways and means of fitting-in and maintaining all cybernetic-economic systems on the trajectory of general progress.

The application of the scenarioes method is based on the identification of the main relations and connections among the state and command-decision variables of the analysed system and their transposition into the language specific to cybernetic — mathematical modelling. Starting from the general coordinates of development strategy of national economy's cybernetic system, from the functionality and behaviour of the system, there are setlled the intervals where the guiding parameters of each system and subsystem may

get values. At the same time, on the base of certain computing programme specially worked out, it is possible to simulate on the electronic compute certain factors of influence which may appear in the process of systems deve lopment, as well as the intensity of their action. On the base of the scena rioes regarding the optimal possibilities of development for each system an subsystem apart, their synthetization takes place in the global scenarioe regarding the development of the general cybernetic system.

In this way, by achieving a symbiosis of the modelling method wit that of scenarioes and by using on a large scale the electronic computin technique and economic informatics, there is achieved the "penetration" i the future — an important step for the complex process of designing th trajectories of optimal balanced economic growth.

In this way, for example, on the basis of a prospective model regardin the growth of the national income:

$$y_{t+1} = F_t(y_t,\ v_t,\ w_t,\ \alpha_t,\ \zeta_t)$$

it is possible, by means of computers, to simulate different growth trajectorie of the national income depending on the concepts regarding:

— the rate of accumulation: v_t;
— the growth rate of social labour productivity: w_t;
— the weight of investments intended for the development of materia production in the total volume of the national developing fund: α_t
— the degree of resources employement: ξ_t.

In order to emphasize both the growth trends of the social produc and of the proportions which are to be assured as part of the reproductio process, it is possible to use the following prospective model:

$$X_t = a_t X_t + b_t^{-1}(X_{tH} - X_t) + (1 - v_t)(1 - a_t)X_t$$

where

X_t — the volume of the social product;
a_t — the weight of material expenditures;
b_t — the efficiency of investments;
v_t — the rate of accumulation.

The *growth equation of the social product* is:

$$X_{t+1} = [1 + b_t\ (1 - a_t)\, v_t]X_t$$

and the total solution is of the form:

$$X_t = \prod_{i=0}^{t-1} [1 + b_i\ (1 - a_i)\, v_i]X_0$$

emphasizing in this way, in relational form, the fact that the growth ra of the social product:

$$r_t = b_t(1 - a_t)v_t$$

is determined by the values of the following macroeconomic indicators:

— the rate of accumulation: v_t;
— the efficiency of the invested funds: b_t;
— the weight of the national income into the social product: $1 - a$

Relaying on the afore-mentioned model *the growth trajectories* for the following macroeconomic indicators can be computed:

— the national income: $y_t = (1 - a_t)X_t$
— the accumulation fund: $z_t = v_t(1 - a_t)X_t$
— the consumption fund: $C_t = (1 - v_t)(1 - a_t)X_t$

Meantime, the influence of the accumulation rate — essential macroeconomic control parameter — of the weight reduction of material expenditures into the social product and of the growth of investments efficiency, over the growth trajectories of the national income and of the consumption fund, can be analysed.

A very important part in grounding the decisions pertinent to the growth trajectories of the components under the national economy system, is played by the *prognosis* worked out for every system and subsystem, regarding the structural shiftings which are expected in their evolution and the emphasizing of their growth potential.

In this way, for the *population and labour force system* prognosis are drawn up regarding the country population and its structure according to age and sex groups, on urban and rural media.

Prognosis are concurrently drawn up for the territorial population migration depending on the economic and social development of the country, on the territorial allocation of the labour force.

For the labour force, prognosis are drawn up regarding its allocation on branches, subbranches and departments of social-economic activity.

The prognosis drawn up on the basis of economic prospective models for the *system of goods production and services* play the part of emphasizing the developmental paces on branches, subbranches, goods and groups of goods of this system. In this way, prognosis are drawn up regarding the electrical and thermal power production, metallurgy, machine buildings, chemical industry, building materials industry, lumber working and processing, light industry, food industry, agriculture, transports, commerce and services for people, a.o.

The forecasting models of goods production and services system must concurrently emphasize the ways of permanently increasing the labour productivity, of reducing raw material, material and power consumptions, of increasing the general efficiency and the rentability of the whole production, of ensuring the growth of production quality, of technical level and competitivity of all goods on the external market.

The economic prospective models built for the *system of research and technological development* emphasize the main development trends of the research fields strong connected with the science development on world plan, its contribution to the national income growth, to the high turning to account of resources, to the increase of national wealth and to the growth of the living standard and educational level.

The prognosis for developing the *international economic relations system* emphasizes the optimal means of the country participation at the international labour division, pointing out the cooperation and assistance forms, both with the developing countries and with those economically advanced.

The forecasting models of the international economic relations system concurrently play the part of identificating the previsionable trends under the world economy space in the field of demand and supply evolution on goods groups and goods, of external prices on different markets, of credits and interests, of international transports, a.s.o.

The prognosis of growth trajectories of the *national wealth system* emphasizes the development trends of the natural resources, of power potential, the estimating of water resources and of the possibilities of covering the economy requirements, the arable soils evolution and the improvement of soil structure, the forestry stock growth, and that of the components of the accumulated goods subsystem: fixed assets, raw materials, materials, a.o.

An extremely important part is played by the prognosis regarding the growth of nation's creating potential, of the stock of public training, of science and technology, of information, of culture and civilization of the people.

In grounding the overall strategy of social economic development of the country, an essential part is played by the prognosis regarding the *amplification of the national welfare system* — a goal towards all the growth trajectories of the national economy system converge.

The prognosis drawn up for the system of national welfare play the part of emphasizing the optimal ways of permanent increase of the people's material and cultural standard of living, the growth of its prosperity and of its civilization extent.

The forecasting models of the system of national welfare, strongly interconnected with those of the system of social product and national income, emphasize the development trajectories of people's income from earned and from consumer social funds, depending on the national income growth and on the labour productivity. At the same time, they emphasize the dynamics of people's demand on food and on industrial goods, on services, the improving ways of health assistance, of hygienical-sanitary and of working conditions, of all living conditions which provide for reducing the mortality and morbidity, for extending the life delay and the active working period.

The methods, techniques and models of economic logistics used in the economic prospective activity, allow the simulation by means of computers, of numerous development alternatives depending on the options of economic policy adopted, providing at the same time the correlation of the forecasting ensemble inside an unitary and convergent frame.

There is a permanent exchange of information-similar to the phenomenon inside the communication vessels — between the prognosis drawn up for the different components of the national economy system, allowing their permanent updating and improvement.

On the base of deep knowledge of the realities within the national economy system, of the evolution tendencies of all economic-social phenomena and processes, of optimal economic time and space for each kind of activity, the macroeconomic decision, political body adopts the strategy of country's economic-social development:

a) the acceleration of production forces development, the continuous improvement of social relations; the high rates development of national

income and its optimal distribution for development and consumption with a view to assure the necessary funds for achieving an extended reproduction and continuous increasing of the nation welfare, of population's living standard and of life quality;

b) the achievement of an optimum structure for the evolution of total population and of active population;

c) the development of technical-scientific potential and of modern manufacturing technologies, the assimilation of new products having superior characteristics; the introduction on a large scale of electrification, mechanization, automatization, chimization and cybernetization of production processes;

d) the fast, multilateral, efficient development and modernization of material production system (of industry, agriculture, constructions, transports, trade and other branches); the optimization of the profile and structure of national economy, of main branches and sectors;

e) the establishment of investment programs and their right distribution on branches, subbranches and over the territory;

f) the continuous increase of labour productivity and the increase of economic efficiency in all fields of activity; the efficiently utilization of fixed assets, of all production capacities, the superior turning to account of material resources, the diminishing of production expenses, the improvement of goods quality;

g) the settlement of the main lines concerning the training of staffs according to the long-term necessities of society, by developing the education of all degrees, the increase of population educational and cultural standard;

h) the intensive and efficient participation in labour international division, to commercial exchanges and cooperation in production and technical-scientific cooperation with other states;

i) the right distribution of production forces over the territory which to ensure the favourable conditions of development for all zones; the rational organization and territorial systematization of economic-social development, the creation of new towns, the diminishing of the essential differences between village and town.

Based on the strategies the macroeconomic political decision body had adopted, the essential evolving coordinates of every system and subsystem within the national economy space are determined, finally drawing up the long-term programmes for *social-economic development.* Thus, the unique national plan represents the forecast and operational model of growth within the national economy space, which materialize the adopted strategy on the base of the elaborated forecastings. This is why, the plan is considered the *macromodel* determining the optimal balanced proportional economic growth within the economic space, precisely definying the lines of country's economic-social development.

In the complex management process of the general cybernetic system of the national economy, multiple forward and feedback connections are formed between the activities of drawing up the prognosis, of establishing the strategies and of working out the long-term programmes. The adopted strategies and programmes, for example, can modify the initially estimated evolutions by means of forecasting models, as much as their covering sphere.

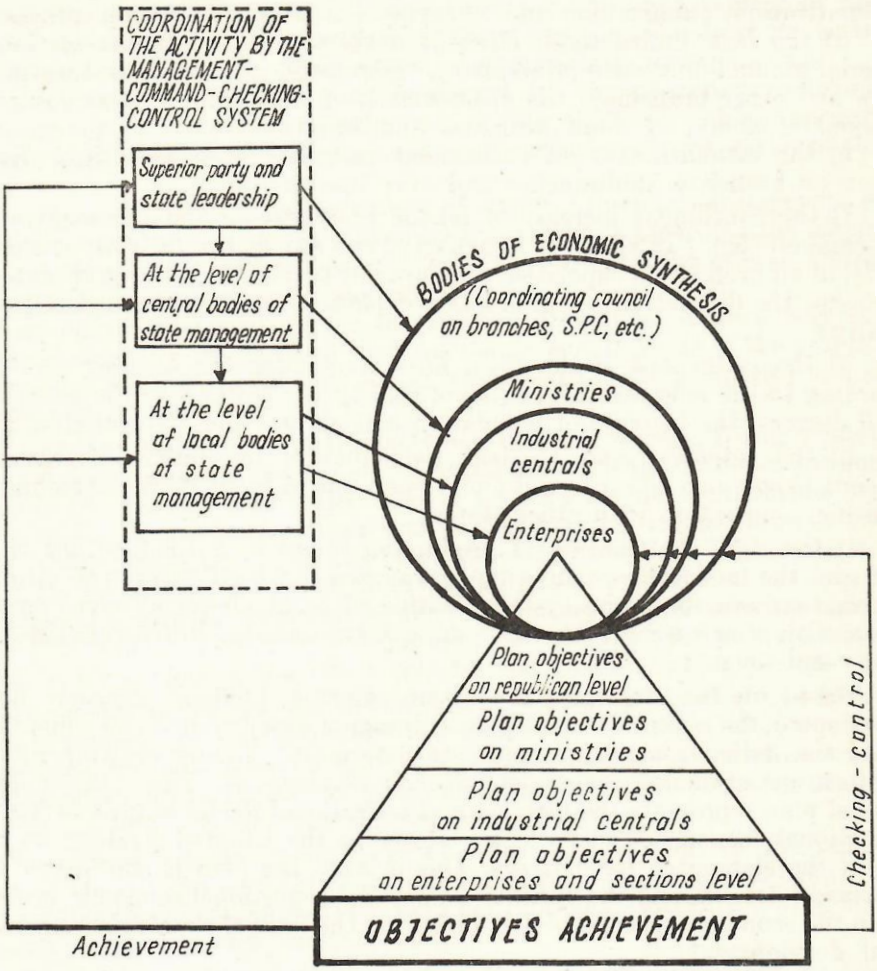

COORDINATION OF THE ACTIVITY BY THE MANAGEMENT-COMMAND-CHECKING-CONTROL SYSTEM
Superior party and state leadership
At the level of central bodies of state management
At the level of local bodies of state management
BODIES OF ECONOMIC SYNTHESIS
(Coordinating council on branches, S.P.C, etc.)
Ministries
Industrial centrals
Enterprises
Plan objectives on republican level
Plan objectives on ministries
Plan objectives on industrial centrals
Plan objectives on enterprises and sections level
OBJECTIVES ACHIEVEMENT
Checking - control
Achievement

Fig. 5

The evolution of the general cybernetic system, its transition from a state into another, are achieved through a live work consumption, supplied by the population and labour force system and through a consumption of material resources, supplied from the system of national wealth. It follows that these two systems are "energy pools" of the evolution under the national economic space and are intensified through the effects obtained by the system of research and technological development, by the system of goods production and that of international relations. To this, the impact of synthesis systems is adding — the labour productivity system, the efficiency-rentability system, the economic information system, the price and finance system-which materialize the action of the system of management command regulation control in determining the evolving parameters of the optimal trajectory for every component of the general cybernetic system, in macro and microeconomic processes and under territorial aspect.

The directing and maintaining of all the components of the national economy system along their growth trajectories are achieved on the basis of commands and decisions adopted by the system of command regulation control regarding all the systems and subsystems under the national economy space. These constitute the *decision spectrum*. So, the important *command-directing function* is emphasized, which is due to the management system.

The achievement by the Party of social-economic management, mainly the achievement of command function of unique management system on the base of the plan, has an increasing role in the action of building up the many-sided socialist society. The management according to the single national plan is the activity corresponding to the demands of aware guiding the society development with a view to attain the goals and objectives of our party — the continuous increase of people's living material and spiritual standard.

Plan decisions represent the main tool by which our party and state assure the rational utilization of resources for a harmonious development on the trajectories of optimal balanced proportional economic growth of the general cybernetic system of national economy. This is why, the single national plan covers the decisions adopted by the party for the increase of production forces, of material production system and of national wealth system, the growth of labour productivity, of the efficiency and profitableness of all economic units, systematic increase of the living standard of the whole people, the permanent strengthening of socialist property and continuous improvement of production relations.

Every component system of the general cybernetic system of the national economy, realizing its actions which define its object and part, generates specific output variables characterizing its dynamics, corresponding to the demands from the system of management, command, regulation control. These variables are grouped together in the *effect range* and represent the response of every system to the decisions from the management system.

In the activity of programme building, of designing the optimal growth trajectories under the national economy space, a larger utility field is obtained by optimization methods and techniques of the economic logistics and of the discrete economy.

Thus, beginning with the fundamental units and going on with industrial centrals, ministries on branches, subbranches, groups of products and products,

the methods of mathematical programming (linear, convex, parametric, stochastic) allow the calculation of optimal solutions for using all the production capacities, for reducing the consumption of materials and energy, for maximizing the volume of net and physical production, for increasing the labour productivity and the efficiency of profitableness.

At the same time, the economic logistics approaches allow the optimal correlation and harmonization of solutions under departamental, branch and territorial aspect.

An especially important part is played by the methods, techniques and models of economic logistics in the range of investment optimization, of optimal dimensionning and placing of new projects, as well as of the identification of optimal ways for developing and modernizing all the components of the general cybernetic system of the national economy.

The structuring of the national economy space on the base of certain topology which to allow the comparison of certain growth trajectories is a sine qua non condition of solving the problem of quantifying the macroeconomic optimum for the models of economic growth.

The output variables return through multiple channels towards the system of management command control regulation grouping themselves together in the *effect range*. The informational type output variables are brought back through the economic information system, which covers like a nervure network the whole space of the national economy. Based on these, the system of management command control regulation analyses the development of each system and subsystem, the way of fulfilling the tasks, as much as the alert and entropic states under the economic space. Thus, the *control function* of the management command regulation and control system is achieved.

At the same time, the economic information system has the task of supplying the required data set for the forecasting models and for the economic growth programmes drawn up by the system of management command regulation and control.

In case that, following some perturbations, deviations from the established trajectories are recorded, *control decisions* are taken. In this way, another important function of the analysed system, the *control function*, is achieved.

There is a dialectic unity between the essential attributes of the command, control regulation and self-regulation system. As a whole, the management of the systems within the national economy space is achieved by a complex process of interaction and osmosis, where the unique management command control regulation system — as a coordinating system — labour productivity system, efficiency and profitableness system, financial and price system, as well as the economic information system participate in.

The unique management command control regulation system disposes of multiple mechanisms of decisions making and transmitting, as well as of receiving and processing the information regarding the evolution state in each moment of the system within the national economy space. The management of national economy, the decision act in its inner structure gets new valences by the contribution of modern methods of cybernetics, economic logistics and informatics, of quantum economy.

1. THE ECONOMIC-CYBERNETIC MODEL OF MANAGEMENT. LOGISTIC EQUATION OF MANAGEMENT. LOGISTIC EQUATION OF THE FUTURE

In the prospective design activity of economic growth trajectories, of directing the systems and subsystems along the progress and civilization highway, the system of management command regulation and control widely uses the methods, techniques and models from the management science arsenal. Within their frame, a major part is played by the *economic-cybernetic model of management* — an important tool for simulating, by aid of computers, the economic optimal balanced proportional growth trajectories.

The economic-cybernetic system of management, a maximum synthetical structure — focusses and processes the main elements from the models solving of all the systems evolving in the national economy space. The output variables of this represent decisional parameters, defining the evolution coordinates of all the systems and subsystems under the national economy.

In such a way, the strong symbiosis formed between the economic-cybernetic model of management and the other models of the national economy system, is emphasized as much as its part in the ensemble of the cybernetic models complex of the national economy system.

The cybernetic model of management has the task of emphasising under the equational form, the coordinates of optimal balanced proportional economic growth for all systems evolving within the national economy space: of population and labour force, of material production and services, of national wealth, of nation welfare, of scientific research and technological development, of international economic relations, a.s.o. In order to substantiate the strategies regarding the rational and balanced distribution of production forces all over the country, the unique management command control regulation system uses the cybernetic model of gradually homogenizing the national economy over the territory.

In order to emphasize, under relational aspect, the evolution coordinates for every evolving system under the national economy space, the system of management command control and regulation takes into account the essential *strategic aim: the maximization of nation's welfare.*

The cybernetic management model — the nucleus of the whole models ensemble of the national economy system — is a dynamic model with discrete variables, of which *state vector* synthetically describes at any moment, the position of the general system under the national economic space.

Depending on the permanent information flow taking place between the system of management command control and regulation and the other components of the general cybernetic system of the national economy, the *state vector*, X_t, of the *management model synthetically quantifies the elements regarding:*

— *the country population*, of which the active population on social-professional structure, on sex groups, on urban and rural media, a.o.;

— the components of *national wealth:* the human resources, those of the ground and underground on categories and types, the fixed assets on types and branches of economy, the material stocks and reserves, the currency

stocks, the people's household stock, the elements regarding the creative capacity of the nation, a.o.;

— the level of elements describing the *nation's welfare*;

— *the labour productivity, the efficiency and the rentability on* branches and subbranches of the economy, on activity categories, a.o.;

— the *level of activities in the goods production and services system, in the research and technological development system, in the economic international relations system*, a.o.;

— the level of activities taking place inside the finance and price system;

— the level of activities inside the social product and national income system.

As regards the *management vector*, denoted by U_t, its components, of which *optimal value* arises from the solving of the cybernetic management model, refers to the *fundamental macroeconomic decisions:*

— the portion of national income allotted to the national fund for social-economic development and that allotted to the consumption fund;

— the weight of investments intended to goods production and services system in the whole of the national social-economic developing funds;

— the weight of investments intended to the social-cultural field and to house buildings in the whole of the national social-economic developing fund;

— the portions of investments volume intended to the goods production branches for the development of industry, agriculture, buildings, transport, movement of goods, that allotted for science and technologic engineering development, a.o.;

— the distributing of labour force on branches and subbranches of the national economy;

— the volume and structure of export and import;

— the level and the intensity of economic cooperation in the production and scientific-technical cooperation with other countries.

The dynamic equation of the management cybernetic model, expressed *in vectorial form*, is:

$$X_{t+1} = G_t(X_t,\ U_t;\ \sigma_t);\ X_0 = \alpha.$$

Here, by α is denoted the initial state of the system, and by σ_t the input-coupling vector of which components quantifies the information taken by the management model from the other models of the general cybernetic model of the national economy. In this way, this vector synthesizes information regarding the necessary of material and financial resources for providing the growth of the goods production and services system, the people's consumption demand, the dynamics of research and technological development, the foreign exchanges evolution, a.s.o.

The development vectorial equation of the cybernetic management model synthetically emphasizes the state of the national economy general cybernetic system at the moment t depending on its state at the previous moment, on the adopted options, as much as on the values of input-coupling vector components value σ_t.

Grounded on the logistic study of the model, depending on the actual-hystorical conditions and on the political options for social-economic development the *admissible commands range*, denoted by $\mathcal{U}$, is established.

As a matter of fact, the admissible commands range is the cartesian product of the sets $\mathcal{U}_t$; that is:

$$\mathcal{U} = \mathcal{U}_1 \times \mathcal{U}_2 \times \ldots \times \mathcal{U}_k,$$

where $\mathcal{U}_t$ is the variation range of the order i component of the management vector.

Several mathematical relationships which quantify the *restrictions* which the general cybernetic system has to respect in its evolution, are added to the evolution vectorial equation of the management model. They reflect in relational form the major economic policy elements regarding the way of using the natural resources, the land and forestry fund, a.c. . At the same time, for the developing countries, they quantifies several conditions regarding the growth rates which have to be provided in such a way that the gradual decreasing and erasing of delays is achieved, as well as the reaching of the economic level of the advanced countries.

A great deal of the model equations are intended to satisfy the consumption needs of the population, to permanent develop the nation's welfare.

The corresponding equations of the cybernetic management model quantifies the way in which the output variables of the national economy general cybernetic system have to behave, in the period under consideration under the model.

The restrictions system of the economic-cybernetic management model, in vectorial form, is:

$$\sum_{t=0}^{T} H_t(X_t, \ U_t; \ \sigma_t) = \Lambda$$

where T is the time period under consideration, and Λ — the quantifying vector of the resulting tasks from the development programmes.

By using some forecasting methods and techniques from the economic logistics arsenal, the observability, accesibility, directing and controlling regions of the model are determined, depending on the admissible commands range, on the structure of the development and restriction vectorial equation, on the previsional horizon.

Taking into account the presence of human being with his permanent increasing and diversifying needs at ground of *the social-finality*, the system of management command control and regulation settles the boundaries for each stage, in the limits of the accesibility region, the *general progress region*, denoted by $\mathcal{P}_t$. In establishing this, the macroeconomic decision body takes into account the necessity of increasing the national wealth and according to this, the nation's welfare, by harmoniously combining the nation's present interests with those in the future.

The control of the system evolution in the "progress region" is made by means of the output *variables vector*, denoted by ω_t.

The components of the vector ω_t refere to the value and the structure of the national income and of the components of the national wealth, to the indicators characterizing the nation's welfare, the productivity level and the economic efficiency, the intensity and the efficiency of the foreign trade exchanges a.o.

To provide for the general cybernetic system development in the progress region $\mathcal{P}_t$, settled by the macroeconomic decision body, the following vectorial equations are inserted as part of the model;

$$\omega_t = \varphi_t\ (X_t,\ U_t,\ \sigma_t) \in P_t$$

Concatenating all the elements of the afore-mentioned cybernetic management model, the following vectorial form of this results:

$$\begin{cases} X_{t+1} = G_t(X_t,\ U_t,\ \sigma_t); & X_0 = \alpha \\ \sum_{t=0}^{T} H_t(X_t,\ U_t,\ \sigma_t) = \Lambda & U_t \in U_t \\ & t = 0,\ 1,\ 2,\ \ldots,\ T \\ \omega_t = \varphi_t(X_t,\ U_t,\ \sigma_t) \in \mathcal{P}_t \end{cases}$$

where T is the time period along which the evolution of the general cybernetic system of the national economy is analysed.

The dimensions and the complexity of this model presented in synthetical, vectorial form, may be extremely important. From the identification of the actual forms for numerous types of mathematical functions which intervene within its frame, as much as of their parameters, extremely complex methodological, statistical and mathematical problems arise. It is necessary to point out that for providing the required data base for building the numerical model — an extremely important problem — is due to the economic information system.

From the multitude of the trajectories emphasized by the economic-cybernetic management model, through an iterative optimization process, that one which provides the optimal balanced and proportional growth of the general cybernetic system ensemble under the national economic space, is chosen.

In the view of optimization, the performance-functional, respectively the model performance is previously established. Taking into account that the sensitivities of the model trajectories depend on the actual form of the performance-functional, the way of selecting it is an extremely complex economic problem.

As follows from the analysis carried on in the chapter referring to the economic logistics, the adding of many performance-functionals to the economic-cybernetic management model and the simulation of different growth trajectories by means of computers is necessary. On this basis, the best fitted growth trajectory to the proposed tasks may be selected. The performance-functionals joined to the economic-cybernetic management model has to emphasize the growth trajectories which provide for the *maximization of the national income, of the national wealth and of the nation's welfare.* They will be of the form:

$$max\ J(X,\ U) = max \sum_{t=0}^{T} \beta_t(X_t,\ U_t;\ \sigma_t)$$

Thus, the cybernetic management model gets *a dynamical programming model with discrete variables.*

We have to point out the fact that the qualitative study of logistic properties of the cybernetic model of management, of its solutions, supplies very useful information for the planning activity.

At the same time, the logistic study has to emphasize the way in which the optimal evolution trajectories are influenced by the input-coupling vector σ_t of the parameters got from other models, as much as by the choosing of the parameters $\mathcal{P}_t$ and $\mathcal{U}_t$ of the economic-cybernetic management model.

The knowledge of the sensitivity of evolution trajectories, in connection with different elements of the model is extremely useful in the building stage of the numerical model. These makes possible to select the most suitable statistical-mathematical methods of preparing the numerical information and of computing the model parameters. The knowledge of the logistic properties of the model provides also for useful information for the economic analysis, as well as for the activity of building the algorithms and the actual computing programmes of the optimal trajectories.

By using the economic logistics algorithms from the chapter 6 the *optimal command* of the economic-cybernetic management model is obtained:

$$\{\widetilde{U}_t\}_0^{T-1} = \{\widetilde{U}_0,\ \widetilde{U}_1, ...,\ \widetilde{U}_{T-1}\}.$$

The synthesis of the optimal command of the economic-cybernetic management system represents the *logistic management equation:*

$$\widetilde{U}_t = \xi_t(\widetilde{X}_t,\ \widetilde{X}_{t-1}, ...,\ \widetilde{X}_{t-k};\ \sigma_t, \sigma_{t-1}, ..., \sigma_{t-k}).$$

The information emphasized by the logistical management equation provides for extremely useful elements for the design activity of the optimal, balanced and proportional growth trajectories.

At the same time, logistic equation of management supplies the necessary elements in substantiating the optimal decisions regarding the ensurance of general cybernetic system growth, by taking into account the influence factors which may appear and certain disturbances occuring from the world economy space as a result of crisis generated by the present international economic order.

The logistic management equation, in vectorial form, may be written in a developed form as:

$$\widetilde{U}_t^i = \xi_t^i(\widetilde{X}_t,\ \widetilde{X}_{t-1}, ...,\ \widetilde{X}_{t-k};\ \sigma_t, \sigma_{t-1}, ..., \sigma_{t-k})$$

the $\widetilde{U}_t^i$ components quantifying the command-directing decisions of systems and subsystems under the national economy space.

The *management algorithm* (Fig. 6) represents the actual way in which the system of command regulation control gets the optimal decisions vector for each stage, by using the management equation .The management algorithm study is one of the fundamental chapters of the economic logistics.

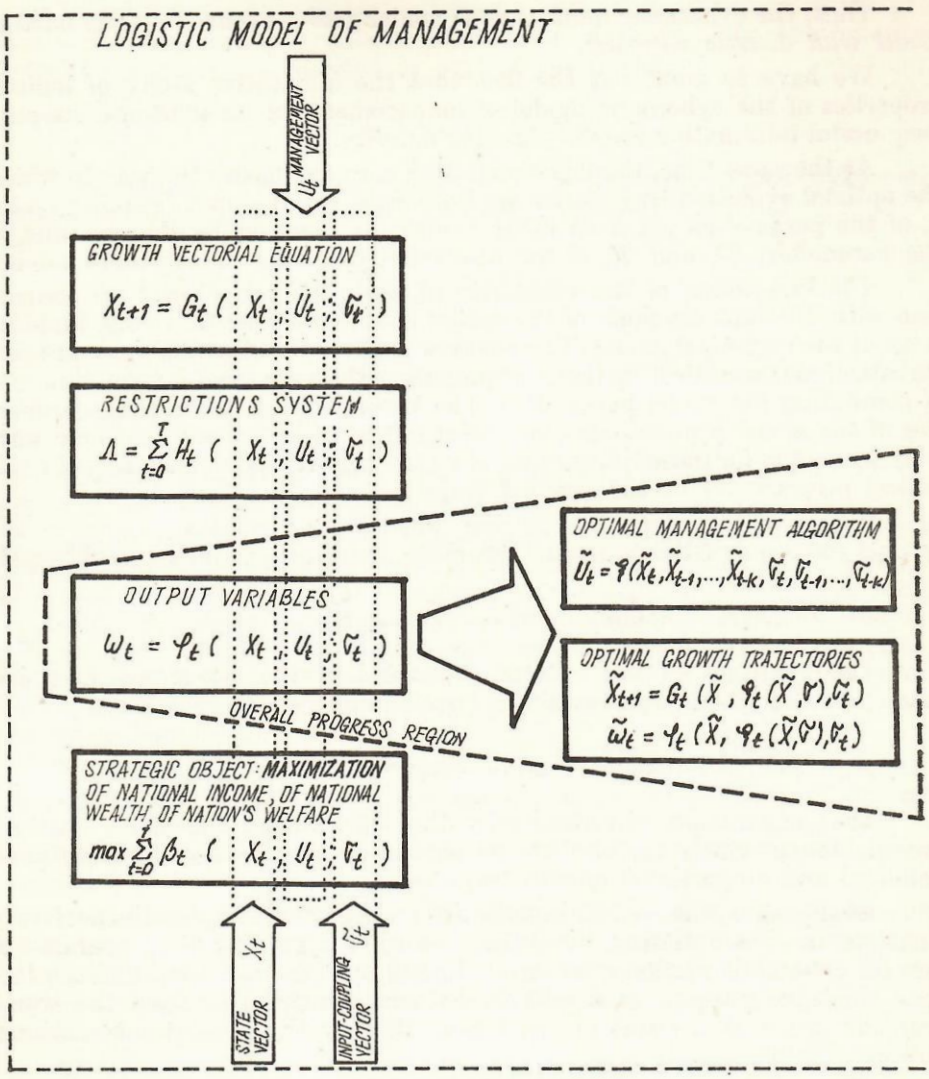


Fig. 6

The coordinates of the optimal balanced and proportional trajectories of the general cybernetic system of the national economy in the progress field are emphasized by the following vectorial equations:

$$\widetilde{X}_{t+1} = G_t(\widetilde{X},\ \xi_t(\widetilde{X},\ \sigma);\ \sigma_t)$$

$$\widetilde{\omega}_t = \varphi_t(\widetilde{X},\ \xi_t(\widetilde{X},\ \sigma);\ \sigma_t)$$

representing the *logistic equation of the future.*

The logistic equation of the future supplies extremely useful elements in analysing the way to fulfill the tasks regarding the growth of general welfare, the increasing of the national wealth dimension, of the whole economic potential of the nation. The state and output variables provided by solving the logistic equation of the future allow the permanent control of the way in which the tasks settled by the developing programmes are fulfilled.

At the same time, by using the elements the logistic equation of the future provides, the speed of drawing together the evolution trajectories of the general cybernetic system of the national economy with the evolution trajectories of the economic more advanced countries is emphasized.

There is a strong osmosis between the logistic equation of management and the logistic equation of the future. In fact, the evolution trajectories both under the states space and output space, emphasized by the logistic equation of the future, are determined relying on the provided information from the logistic equation of management.

2. ECONOMIC-CYBERNETIC MODEL FOR GRADUAL HOMOGENIZATION OF THE NATIONAL ECONOMY UNDER TERRITORIAL ASPECT

The territorial distributing strategy of the labour forces (Fig. 7) has as object the intensification of the process *of gradual homogenization of the national economy under territorial aspect.* The adopting of some strategies regarding the intensification of the process of social-economic territorial homogenization affects the transversal structure of the most part of the general cybernetic system components of the national economy; the labour productivity system, the efficiency and rentability system, the goods production and services system, the system of national wealth, the population and labour force system, the system of nation's welfare, a.s.o.

The territorial homogenization of the national economy provides for the more extensive attraction of every district of the country in the economic circuit, for the developing of new production branches inside of each one; the dimensions of goods production and services system are thus developing, its structure is improving either by weights shifting in favour of branches and subbranches of economy, or by the first time coming out of some new subbranches. In this direction the weight change between the industry and agriculture subsystem, in favour of the first one, is edifying, as well as the perfectioning of the system typology through the coming out of new industrial sectors.

The territorial homogenization generates major effects over the labour productivity system, as well as over the efficiency and rentability system. The extending of natural resources embracing of every district in the economic circuit, their plenar development among the new economic projects and new subbranches causes a high dynamics of labour productivity, a good efficiency of the whole economic activity, a substantial increasing of the rentability of every economic unity. In their turn, through the feedback connection, these make possible the continuing in a constant pace of the

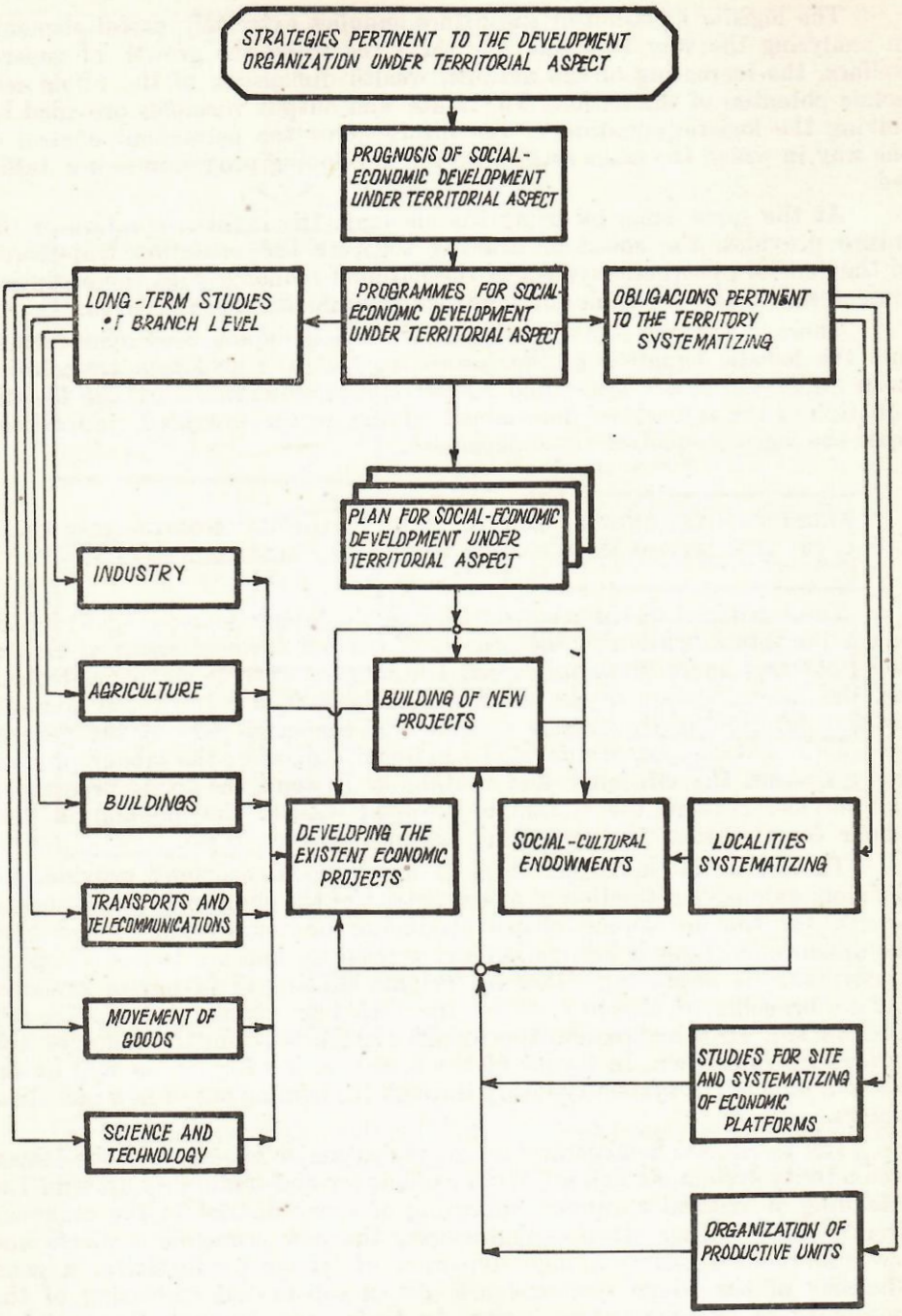

STRATEGIES PERTINENT TO THE DEVELOPMENT ORGANIZATION UNDER TERRITORIAL ASPECT
PROGNOSIS OF SOCIAL-ECONOMIC DEVELOPMENT UNDER TERRITORIAL ASPECT
LONG-TERM STUDIES AT BRANCH LEVEL
PROGRAMMES FOR SOCIAL-ECONOMIC DEVELOPMENT UNDER TERRITORIAL ASPECT
OBLIGACIONS PERTINENT TO THE TERRITORY SYSTEMATIZING
PLAN FOR SOCIAL-ECONOMIC DEVELOPMENT UNDER TERRITORIAL ASPECT
INDUSTRY
AGRICULTURE
BUILDINGS
TRANSPORTS AND TELECOMMUNICATIONS
MOVEMENT OF GOODS
SCIENCE AND TECHNOLOGY
BUILDING OF NEW PROJECTS
DEVELOPING THE EXISTENT ECONOMIC PROJECTS
SOCIAL-CULTURAL ENDOWMENTS
LOCALITIES SYSTEMATIZING
STUDIES FOR SITE AND SYSTEMATIZING OF ECONOMIC PLATFORMS
ORGANIZATION OF PRODUCTIVE UNITS

Fig. 7

territorial homogenization process and consequently the increase of the presence degree of every district under the economic growth process.

These important changes under economic plan determine qalitative changes under social plan reflected inside the population and labour force system: the change of the population's social structure, the preponderance of the working class and especially of the active population in the whole of the population, the weight decreasing of the working in agriculture population, as an effect of the field labour mechanization, of chemization, of funciar improvements, a.s.o.

All this lead to the permanent increase of the national wealth, and finally, of the standard of living — the object of the whole strategy of the country economic development, towards which the wide extended trajectories designed by us are converging.

Such an approach of forecasting and decision problem for the territorial development seems to be a problem of two level optimal programming: macroeconomic level and territorial level. In the complex process of harmonizing the interests of each county with those of the development of national economy, a great importance is devoted to the information flows which are formed among the macroeconomic level and the territorial one which are materialised through the resources and constraints on on hand and through the output variables of the territorial models on the other hand, models which are transmitted to the macroeconomic level, where the results are centralized. On this base, there are transmitted new information to territorial levels, this fact generating the reconsideration of the mechanism over the territory by using the new constraints.

The solving process of the model for gradual homogenization of the national economy under territorial aspect comes to an end in several iterations (Fig. 8).

The models built by such an approach actually represent *dynamic programming models*, *generally nonlinear*. The nonliniarities intervene in the model through different production functions.

Within the frame of the model, the essential branches and subbranches are taken into account, as much as for the development of each territorial unit, as for the national economy ensemble. This allows the use of some physical indicators, essential for the model restrictions, regarding the natural resources (raw materials and materials, from import or internal production) of which consumption is bounded at the national economy system level.

From the afore-mentioned analysis follows that the cybernetic model for gradual homogenization of the national economy under territorial aspect reflects as much the structures on vertical (through branches and other economic departments), as those on horizontal, through the territorial units.

Thus, the existence of following flows results:

— flows between the system of management command control and regulation and the territorial units, composed of information regarding the available investments fund of material resources allocation, of plan indicators, a.s.o.: at the same time, flows arise between the territorial levels and the management system, regarding the fulfilling of task;

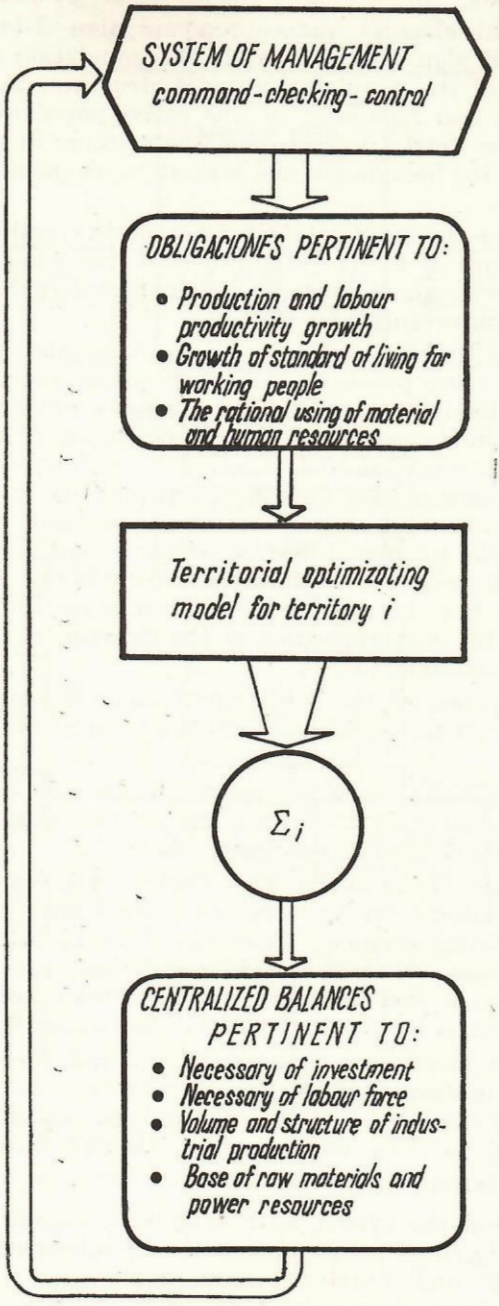

SYSTEM OF MANAGEMENT
command-checking-control
OBLIGACIONES PERTINENT TO:
• Production and labour productivity growth
• Growth of standard of living for working people
• The rational using of material and human resources
Territorial optimizating model for territory i
Σ_i
CENTRALIZED BALANCES PERTINENT TO:
• Necessary of investment
• Necessary of labour force
• Volume and structure of industrial production
• Base of raw materials and power resources

Fig. 8

— flows between the system of management command control and regulation and the national economy branches, of which content is similar to that of previous flows:

— flows between the territorial units;

— flows between branches; these also consist of material and labour force flows.

In the view of writing the cybernetic model for gradual homogenization of economy under territorial aspect (Fig. 9) the following notations are used:

K_t^i — the volume of fixed productive assets existing at the beginning of the year t in the branch, respectivelly the subbranch i;

L_t^i — the labour force allocated to the branch, respectivelly subbranch i in the year t;

Q_t^i — the volume, in physical units, of the production of the branch, respectively subbranch i, in the year t.

All the above mentioned indicators refere to the territorial units analysed.

For industrial branches, linear production functions may be used, as:

$$Q_t^i = f_t^i \cdot (\alpha_t^i K_t^i + \beta_t^i K_{t+1}^i); \qquad \alpha_t^i + \beta_t^i = 1.$$

These represent the functional relationship taking place between the production size, on one side, and the yearly average level of the fixed productive assets, on the other side.

At the same time, relationships of the following form are considered:

$$L_t^i = \gamma_t^i K_t^i$$

showing the necessary labour force size for using the fixed assets. The parameters α_t^i and β_t^i represent weights depending on the puting into operation rate of the new production capacities. In case of uniformely puting into operation along the year, the parameters α_t^i and β_t^i have the following values: $\zeta_t^i = \beta_t^i = 0.5$.

The parameters f_t^i and γ_t^i represent respectively the branch (subbranch) and the inverse of the endowement coefficient of the work force with fixed assets in the same branch.

For the agricultural branches linear production functions in L_t^i and K_t^i will be considered.

$$Q_t^i = a_t^i(\alpha_t^i K_t^i + \beta_t^i K_{t+1}^i) + b_t^i L_t^i.$$

The dynamic character of the model expressed by the *following evolution equation of the productive assets:*

$$K_{t+1}^i = (1 - \mu_t^i)\, K_t^i + \sum_{\tau=0}^{\theta_t} \lambda_{t,t-\tau}^i \cdot Z_t^i; \qquad i \in I.$$

The following notation have been used:

μ_t^i — the out of use growing rate of the fixed assets as effect of wear;

$\lambda_{t,t-\tau}^i$ — the quantifying rate of the weight of investments made in the year $t - \tau$r in the branch i which are materialized in fixed productive assets in the year t;

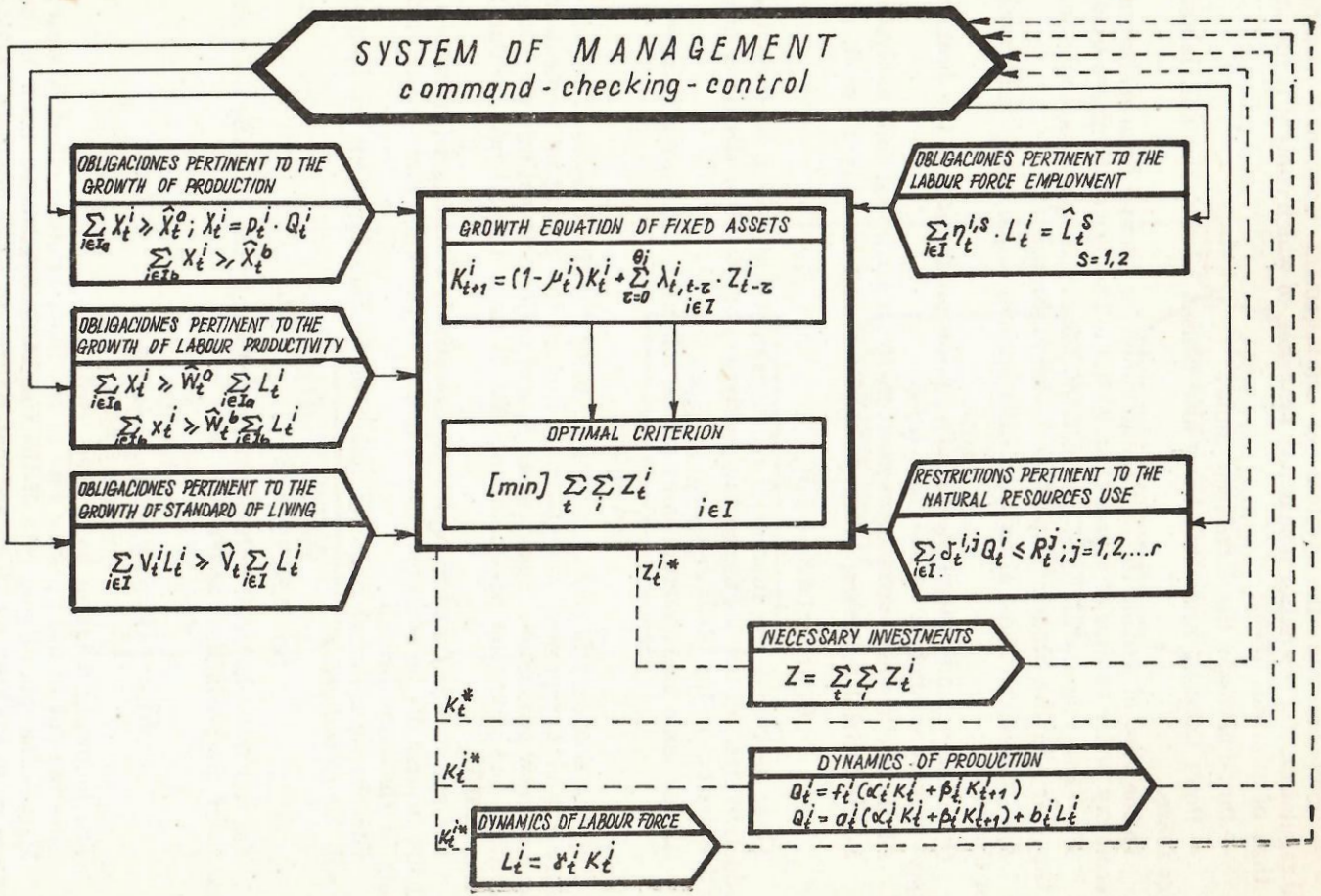

SYSTEM OF MANAGEMENT
command - checking - control
OBLIGACIONES PERTINENT TO THE GROWTH OF PRODUCTION
$\sum_{i\in I_a} X_t^i \geq \hat{X}_t^a$; $X_t^i = p_t^i \cdot Q_t^i$
$\sum_{i\in I_b} X_t^i \geq \hat{X}_t^b$
OBLIGACIONES PERTINENT TO THE GROWTH OF LABOUR PRODUCTIVITY
$\sum_{i\in I_a} X_t^i \geq \hat{W}_t^a \sum_{i\in I_a} L_t^i$
$\sum_{i\in I_b} X_t^i \geq \hat{W}_t^b \sum_{i\in I_b} L_t^i$
OBLIGACIONES PERTINENT TO THE GROWTH OF STANDARD OF LIVING
$\sum_{i\in I} V_t^i L_t^i \geq \hat{V}_t \sum_{i\in I} L_t^i$
GROWTH EQUATION OF FIXED ASSETS
$K_{t+1}^i = (1-\mu_t^i) K_t^i + \sum_{\tau=0}^{\theta_i} \lambda_{t,t-\tau}^i \cdot Z_{t-\tau}^i$
$i \in I$
OPTIMAL CRITERION
$[\min] \sum_t \sum_i Z_t^i$
$i \in I$
OBLIGACIONES PERTINENT TO THE LABOUR FORCE EMPLOYMENT
$\sum_{i\in I} \eta_t^{i,s} \cdot L_t^i = \hat{L}_t^s$
$s = 1,2$
RESTRICTIONS PERTINENT TO THE NATURAL RESOURCES USE
$\sum_{i\in I} \sigma_t^{i,j} Q_t^i \leq R_t^j$; $j = 1,2,\ldots r$
Z_t^{i*}
NECESSARY INVESTMENTS
$Z = \sum_t \sum_i Z_t^i$
K_t^*
K_t^{i*}
DYNAMICS OF PRODUCTION
$Q_t^i = f_t^i(\alpha_t^i K_t^i + \beta_t^i K_{t+1}^i)$
$Q_t^i = a_t^i(\alpha_t^i K_t^i + \beta_t^i K_{t+1}^i) + b_t^i L_t^i$
K_t^{i*}
DYNAMICS OF LABOUR FORCE
$L_t^i = \sigma_t^i K_t^i$

Fig. 9

θ_i — the quantifiying rate of the necessary period for the complete achieving of the investment objects in the branch or subbranch i;

Z_t^i — the fundamental *decision variable*, representing the investments volume in the year t in branch i.

The restrictions of the model are:

(i) *Restrictions regarding the employment of labour*

One of the objects of the model is that of emphasizing the development way of the territory economy, so as to provide for complete employment of the labour force taking into account the active population structure on sexes. As different branches of the national economy are differently occupying the male labour force, respectively female labour force [1]), separately, a restriction will be included for every labour force group:

$$\sum_{i \in I} \eta_t^{i,s} \cdot L_t^i = \hat{L}_t^s; \quad s = 1,2.$$

It has been noted by:

$\hat{L}_t^s$ — the labour force volume from the "s" group which has to be employed in the year t ($s = 1$ represents the male labour force, $s = 2$ the female labour force);

$\eta_t^{i,s}$ — the rate representing labour force weight of type in the totality of labour force which is employed in the branch i ($\eta_t^{i,1} + \eta_t^{i,2} = 1$).

By I the branches set considered in the model has been denoted. The coefficients $\eta_t^{i,s}$ differs from a branch to another.

(ii) *The restrictions regarding the limiting of natural resources*

It will be supposed that within the frame of the district, a lot of "r" limitative resources have been identified. The economic structure of the district had to be developed in such a way as to satisfy the restrictions of not exceeding these resources.

Such restrictions may have the following form:

$$\sum_{i \in I} \delta_t^{i,j}, Q_t^i < R_t^j; \qquad (j = 1, 2, ..., r)$$

where $\delta_t^{i,j}$ is the specific consumption in year t, form the resources j for the branch i, and R_t^i is the available quantity in year t from the resource of type j. The normative rates $\delta_t^{i,j}$ are supposed as decreasing in time, as result of the measures adopted for reducing the material consumptions.

(iii) *Restrictions regarding the synthetic indicators*

Within the frame of the economic-cybernetic model for homogenization under territorial aspect some compulsory restrictions regarding the evolution of standard living of industrial, agricultural production, of labour productivity, a.s.o., are introduced. An initial group of restrictions refers to the industrial, respectively agricultural level, which has to be provided:

$$\sum_{i \in I_a} X_t^i \geqslant \hat{X}_t^a; \quad \sum_{i \in I_b} X_t^i \geqslant \hat{X}_t^b$$

---

[1]) For example, in the siderurgy industry the male labour force is predominating, while in the ready-made-clothes industry the female labour force is predominating.

where

$X_t^i = p_t^i \cdot Q_t^i$ — represents the production volume, expressed in value units, in year t in branch i;

$\hat{X}_t^a$ and $\hat{X}_t^b$ — represents the compulsory levels which are to be provided from the industrial, respectively agricultural production;

p_t^i — represents the price in year t for the product of type i.

The $\hat{X}_t^a$ and $\hat{X}_t^b$ values, prescribed by the macroeconomic level, are established in agreement with the balances on the national economy ensemble.

A second group of restrictions is:

$$\sum_{i \in I_a} X_t^i \geqslant \hat{W}_t^a \sum_{i \in I_a} L_t^i; \quad \sum_{i \in I_b} X_t^i \geqslant \hat{W}_t^b \sum_{i \in I_b} L_t^i.$$

These quantifies the labour productivity level in industry, respectively in agriculture, which the economy of the territory has to reach. By I_a wil be denoted the ensemble of the indicators corresponding to the industrial branches, by I_b — that corresponding to the agrar branches, and by $\hat{W}_t^a$ and $\hat{W}_t^b$ the labour productivity level which has to be reached in industry, respectively in agriculture.

As regards the standard of living of population, the model contains elements for providing the correlation of the average income level for an worker displaying his activity in the corresponding territorial unit, with the average income on the ensemble of economy:

$$\sum_{i \in I} v_t^i \cdot L_t^i \geqslant \hat{v}_t \sum_{i \in I} L_t^i$$

where v_t^i is the average income for an worker in the branch i (subbranch) i in year t, and $\hat{v}_t$ is the average level of the incomes, which has to be reached on the ensemble of the territory in year t.

The shown equations refere only to the *first iteration* of resolving the economic-cybernetic model, respectively that in which the macroeconomic level referes to the aggregate indicators level regarding the total production which has to be reached, the labour productivity and the average income per worker which must be assured. In the following iterations, restrictions are added to the model, regarding the upper and lower bound between which the physical production of every branch has to be placed, the raw material and material consumption from import or centralized distributed, a.s.o.

These restrictions are of the form:

$$\hat{A}_{t,k} > \sum_i a_{t,k} \cdot Q_t^i; \quad \hat{B}_{t,k} > \sum_i b_{t,k}^i \cdot Q_t^i$$

The unknowns of the model are Z_t^i and represent the investments having to be made in year t in branch i of the economy of the analysed territory, so as to provide the adequate development of this. The unknowns Z_t^i are determined from the condition of minimizing $\sum_t \sum_i Z_t^i$, consequently from the

condition that the objects settled by the macroeconomic level should be achieved by using a *minimal volume of investments*. Taking into account the linearity of all the relations of the built model, it results as a model of dynamic linear programming.

The interconnections between the macroeconomic and the territorial level are expressed by means of the restrictions the first one imposes for the territory as much as by means of output variables the territorial level transmites to the central level. *The output variables of the model* have the following form:

$Z_t = \sum_i Z_t^i$ — represents the total volume of the anual investments;

$Z_t^i = \sum_i \omega_t^i Z_t^i$ — represents the necessary anual investments volume from import.

By ω_t^i is denoted the weight of investments of import in the total of investments in the branch i.

The import variables of the model are as follows:

$A_{t,k} = \sum_i a_{t,k}^i \cdot Q_t^i$ — represents the necessary volume of raw materials and materials from internal production which are centralized distrubuted;

$B_{t,k} = \sum_i b_{t,k}^i \cdot Q_t^i$ — represents the necessary volume of raw materials from import, a.s.o.

Obviously, for estimating the material balances at macroeconomic level, also the transmission of the production level which has to be reached in every branch, is imposed.

The results obtained by solving the afore-mentioned cybernetic model will be supplemented with a lot of social-economic analyses regarding other aspects of the complex process for gradual homogenization of the economy under territorial aspect.

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The prospective management of the general cybernetic system of the national economy, the convergent directing of all its components according with the overall strategy of economic development, represent decisive activity for inscribing every country along the progress and civilization highway.

The economic-cybernetic models of the system of management comand control and regulation — the logistic equation of management —, built by using the science of society management, represent essential elements of the whole ensemble of economic-cybernetic models of the overall system of the national economy.