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Scientific Preoccupations in the Economic Computation Technique and Economic Cybernetics

The paper shows the activity of the Economic Computation and Economic Cybernetics Center-Bucharest, concerning the mathematical and cybernetical methods applied to economy. The organization of the Center, the results obtained and the principal objectives for studies and research in the field of economic calculation and cybernetics are shown below.

In the contemporary society, the scientific potential of a people represents a built-in element of the country's progress, economic and cultural development and strengthening of its national independence and sovereignty.

Scientific research constitutes one of the most important fields where each people's genius, thought and creative capacity manifest themselves. Our people has plentifully shown its gifted features, strength, talent and ability to contribute to the national and international science development. The upward development of science in our country during the years of people's power and the continuance of the Romanian science progressive traditions have at their bases the scientists' assimilation of the Marxist-Leninist world and society outlook.

Considering the picture of the world science development it has been ascertained that in the advanced countries the State's and scientists' efforts are particularly directed towards those fields of research which govern the material production development, the progress of economy and culture.

An important part is played by the economic subjects, in the whole of scientific fields aimed to provide the best development of productive activity. Starting from the necessity of investigation and use of objective laws which operate in the socialism building process, one of the most important tasks of scientific investigation in economics consists in the dealing with problems concerning the management and planning of economic activity, production and labour organization.

Under the circumstances of the completion of socialist construction the society' s technical and material basis develops at an ever speedy rate and the national economy is continually turned into a more and more complex system while the problem of scientific management of economic activity has an important significance.

In contemporary society production and labour organization require the application on an ever wider scale of modern mathematics and cybernetics in order to secure a scientific management of production process.

Society's complexity, its production force sizes imply the fast knowledge of social development ratio and particularly in the conclusive field of material production. The more production develops, even higher the necessity of an accurate, operative knowledge of phenomena taking place in economy, in order to ensure operative methods of maximal efficient management of economic activity.

Just under these circumstances cybernetics represents one of the most epochal findings of human genius, in the vast, diversified field of knowledge. Cybernetics plays a prominent part in society's material production development, in industrial and technical revolution, in modernization of enterprises, in technological process automation and optimal development of production, in the increase of social labour productivity.

The modern process of production increasingly calls for a marking of the limits of economic cybernetics as an autonomous subject, its separation from general cybernetics. In the conditions of the rapid growth of production and as a consequence of the giant volume acquired by economic information it falls to the specialized cybernetics the main task to elaborate the economic information system. This must be able to contribute to know the activity of enterprises, economic branches and of the national economy as a whole. This information system should be based on an accurate, operative, inexpensive and high degree of mechanization. Its working speed and structure should make it capable to point out in due time the phenomena occuring in various fields of the economy.

From this point of view economic cybernetics investigates the process of obtaining, transmitting, storing and coding economic information, the data processing methods and the different devices performing data processing and transmitting.

The economy organization and management science in the modern acceptation of contemporary society implies an extremely versatile and efficient information system necessary to rationally guide the material production at enterprise, branch or economy level.

Within this framework it is worth stressing the increased attention paid in our country to mathematical methods applied to economy, to economic computation and cybernetics technique in socialist enterprises management, planning and organization. It is necessary to mention the activity carried on by the Nuclear Physics Institute, Calculation Center of Bucharest University, Calculation Institute of Cluj, Calculation Center of the Polytechnic Institute of Timişoara, Center of Mathematical Statistics of the Academy of the Romanian Socialist Republic, Calculation Center of Iassy. Similar trends have also been shown in economic higher education where new subjects were introduced, new courses were set up and the like.

The activity of the Economic Computation and Economic Cybernetics Center Bucharest also goes along the same line. This Center was founded in 1963 corresponding to an objective, continuous necessity of economic higher education.

In the course of the two years since its foundation, within the Economic Computation and Economic Cybernetics Center there has taken place an

activity which although at its beginning proved fruitful and materialized in a series of scientific papers.

Thus, 24 scientific papers signed by over 60 authors were submitted to the Center's first symposium, in December 1964. 80 scientific papers signed by over 160 authors were on the agenda of the February 1966 scientific session. This fact is a proof of the Center's activity development in 1965.

The Center's collaborators and investigators have elaborated and published a series of valuable papers. The most important achievement is the issue of the volume "Economic Computation" (Calculul Economic), highly valued by both domestic and foreign specialists. Besides, the fourth volume of the "Economic Studies and Investigations" (Studii şi Cercetări Economice) collection, issued by our Center, contains 25 papers worked out by about 40 authors. Moreover, the Center's collaborators have published their papers in various Romanian and foreign specialized periodicals. The topics of those published papers cover various problems related with different fields of activity. The importance of mathematical methods and modern calculation technique applied in economic practice was underlined in all the published papers.

Good results were scored in the output quality control of automatic machine-tools, by means of mathematical statistics methods, in statistical control at reception of commodities, in operational security determination of central exchanges produced by domestic industry. Besides, mathematical programming methods were used to optimize oil products range and to draw up optimal transport plans for population's coal supply. The works done to optimize fodder rations have shown that important savings can be achieved in farming too by linear programming application.

The Center's achievements final results represent a starting point for the approaching of some new problems of basic and applicative investigations along the line of economic computation technique, in 1966.

"The researchers should secure a close blending of theory and socialist building practice paying an ever greater attention to elaborate theoretical problems concerning our society's development, to investigate the objective laws which operate in the socialism building process. The study of problems dealing with economic management and planning activity and with production and labour organization should have an important place among the researcher's preoccupations" said comrade Nicolae Ceauşescu in his speech concerning the improvement of organization and guidance of scientific investigation, submitted to the Great National Assembly session, in December 1965.

The Economic Computation and Economic Cybernetics Center Bucharest envisages to center its activity on some important objectives in order to increase its contribution to these tasks fulfillment.

The Center's preoccupations will permanently be to contribute to the forming of future economists, particularly planners, statisticians and economists, who will apply, according to their speciality, mathematical and cybernetical methods and the modern calculation technique in production and labour organization. That is why the Center which operates under the sponsorship of the Institute of Economics — the greatest higher education establishment for training economic staff in our country — will support the latter specialized departments to include in their curricula, where need will

be, chapters concerning the application of economic computation modern methods. Under the existing circumstances the attraction into the Center's activity of an increased number of specialists will support the action of technical knowledge improvement of economic computation of economists working in enterprises. The specialists will also help organizing some training-in courses for specialized staff for their better handling economic computation modern technical methods and means.

The Center will also develop investigations concerning the mathematical patterns of production processes at enterprise level, for the beginning. Electronic computers will be used to optimize these processes. Efforts will be directed to the working out of basic and applicative investigations of economic computation technique and economic cybernetics intended to support the solution, on scientific bases, of various problems occuring in our economic practice at enterprise level. The Center will also be preoccupied to organize the application of economic computation technique and economic cybernetics under the territorial profile.

The Economic Computation and Economic Cybernetics Center — Bucharest has improved its organizational structure according to the above mentioned requirements and carries on its activity in the following investigation departments:

1. Study and Research Committee for economic computation.
2. Study and Research Committee for economic cybernetics.
3. Study and Research Committee for planometry.
4. Study and Research Committee for production and labour organization.
5. Study and Research Committee for economic information system.
6. Study and Research Committee for econometrics.
7. Study and Operational Research Committee for applications in economy
8. Study and Research Committee for economic sociology.
9. Study and Research Committee for economic conjuncture.
10. Information and Scientific Documentation Committee for economic computation and cybernetics.

The Center's investigations are performed in a laboratory equipped with modern computation equipment.

Organization of Economic Computation and Economic Cybernetics Committees will take place at regional level — where necessary.

Economic Computation and Economic Cybernetics Sections are to be established in some ministries, central institutions and big enterprises with the aim of granting methodological and practical guidance of economic computation and analysis work. Such a network, systematically organized, creates the possibility of a unitary guidance of economic computation technique and cybernetics in enterprises and ministries as well as of the training of the specialized staff in this field. This action can bring out a positive contribution in securing an operative, cheap, high quality economic information system.

The achievements carried out in our country and in other countries in the application of mathematical methods in economy will be popularized by the Center, in the future, too.

The Center's publishing activity will achieve a more organized character — according to the trends asserted above — and "Studies and Investigations on Economic Computation and Economic Cybernetics Journal" will be one printed at every two months in Romanian and quarterly in foreign languages of world-wide circulation. This activity is intended to secure the exchange of periodicals, papers and printed matters on economic computation technique with other countries' specialized institutions.

A characteristic feature of science in our epoch consists in cooperation of researchers working in various fields for the application of the results of their work. This cooperation is determined by the diversification of investigation branches and fields and by their close interpenetration and dependency. Economic computation and cybernetics — perhaps more than other fields of activity — require the necessity of this cooperation. Only the collective work of economists, mathematicians and engineers can prepare a good ground to apply modern mathematical methods to economy. That is why the Center should focus its attention to carry on strengthening the links between scientists and specialists working in various fields of economic activity. Thus the investigation forces will be ever more closely united to work in this field which is useful for our national economy.

The debates, which took place on the occasion of the February 1966 Center's session, were part of scientific preoccupations in the field of economic computation and cybernetics. Over 400 university people, investigators, engineers, economists, and other specialists of enterprises have actively taken part in this session debates. They widely exchanged opinions and information on present problems of scientific investigation in economic computation and cybernetics field.

The wide, diversified topics and the great number of investigators taking part at that session debates are a proof of the increased interest of specialists of research institutions education and various sectors of economy for economic computation and cybernetics methods. The delivered papers demonstrated by their contents, the fact that the problems directly linked with production economic practice requirements, play a central part in the Economic Computation and Economic Cybernetics Center's activity.

The investigations concerning the economic computation technique and cybernetics patterning, materialized in the papers submitted to the session, rendered evident the ever increasing possibilities offered by the mathematical tool in improving production organization and management, planning work and in optimizing various economic processes.

It is worth underlining the fact that the session works paid a great attention to calculation technology use in most various fields of economic activity. An important number of papers referred to optimize production processes, to improve quality of products, to better organize work in machine building, chemical, oil, and textile industries, transport and telecommunications as well as in farming and trade. A large number of these papers offered scientific solutions with immediate applicability in economy. Another group of papers approached present subjects of economic cybernetics, economic information system, planometry and economic sociology problems.

The diversity of papers topics also rendered evident the fact the modern economic computation technique and the promotion of mathematical, statistical-mathematical and cybernetical methods become an ever wider part

of specialists circles preoccupation, although they belong to most different professions. This also proves the strengthening of cooperation links between scientists, researchers and specialists working in the most various fields of activity.

The Februry 1966 scientific session debates of the Economic Computation and Economic Cybernetics Center-Bucharest and the suggestions made by numerous participants, helped to better materialize the trends in the activity of the Center's ten committees.

Thus, it is necessary that the activity of the Study and Research Committee for economic computation should especially be directed to the following: to improve computation methodology of various plan and statistical indices, as those referring to the expression of total commodities production volume and particularly to the delivered and cash collected commodity output; to measure labour productivity; to calculate cost price etc.; to perform certain calculations to optimize economic and techno-economic indices within the framework of various links of national economy; to determine the economic investments efficiency and to introduce the new technique.

Study and Research Committee for economic cybernetics will also enrich its investigation topics adding new problems concerning the elaboration of new economic patterns in order to find optimal solutions of economic problems and to improve the production programming methods.

Study and Research Committee for planometry will focus its activity on investigations aimed to improve economic planning methods, to extensively use mathematical methods and modern technical computation means at various levels of economy. The importance of the balance system in planning is well known. This calls for the widening of scientific investigation range as the application of modern methods in this field, too.

The topic of the Study and Research Committee for production and labour organization will also record an essential expansion, first of all by including in the investigation schedule certain subjects, such as: rationalization of the organizational structure of enterprises, optimization of production, material means and labour force capacities, the better organization of auxiliary and administrative office activity.

Study and Research Committee for economic information system will direct its activity towards the investigation of various aspects connected with accounting records adapted to the requirements of mechanization and automation of collecting, transmitting, processing and storing economic information.

Study and Research Committee for econometrics will direct its topic to a broader use of statistical and testing methods in products qualitative control, to determine plants and equipment safe operation, to calculate stock problems and economic phenomena seasonableness.

The applicative investigations require the development and improvement of economic computation equipment. That is why the Study and Operationel Research Committee for applications in economy will focus its activity on investigations in the field of mathematical programming technology, economic decisions theory, graph theory, game theory, etc. In order to reach these aims the specialized investigators' contribution will increase so as to meet the requirements.

It is known that the economic sociology is a vast investigation field for the researchers who are called to investigate the methodological aspects of calculation technique concerning the economic implications of social phenomena, to study population and its material and cultural standard of life, to examine public opinion, social psychology themes and the like. The close approach of some of these problems will contribute to a great extent to sociological investigation in our country.

Study and Research Committee for economic conjuncture was set up within the Center in order to investigate computation methods and technology to prepare the necessary data to study the market, prices dynamics and supply and demand of various goods.

Experience shows economic computation and cybernetics technique turns more and more into a practical tool to solve multiple problems of scientific organization of production and labour. The encouraging theoretical and practical results obtained up to now in the field of economic computation and cybernetics technique represent a modest contribution to the development of a new, scientific subject, the utility of which is ever more, world-wide asserted.

PRÉOCCUPATIONS SCIENTIFIQUES DANS LE DOMAINE DE LA TECHNIQUE DU ÇALCUL ÉCONOMIQUE ET DE LA CYBERNETIQUE ÉCONOMIQUE

En partant des objectifs du programme de développement de l'économie nationale pendant la période 1966—1970 et des tâches tracées par le IXe Congrès du Parti Communiste Roumain dans le domaine de l'intensification de la recherche scientifique et de l'utilisation des résultats de la science dans la production matériélle, l'auteur analyse les préoccupations en ce qui concerne les investigations et les recherches de calcul économique et de cybernétique économique qui ont lieu dans la République Socialiste de Roumanie.

Le développement de la base technique et matérielle du socialisme, le caractère complexe des liaisons réciproques entre les différentes branches de production exigent des méthodes de planification et de direction de l'économie fondées sur le calcul et des informations opératives et exactes, qui puissent assurer l'utilisation optimale des ressources matérielles et humaines dont dispose l'économie nationale.

Afin d'accomplir cette tâche, le Centre de Calcul Economique et de Cybernétique Economique de Bucarest doit contribuer à l'amélioration du travail de planification, de direction du processus de production et d'accomplissement du plan dans les meilleures conditions dans les unités économiques. Dans ce sens, le Centre de Calcul Economique et de Cybernétique Economique se propose d'atteindre les objectifs suivants:

1. L'encouragement de l'étude des méthodes mathématiques, statistiques et cybernétiques dans l'enseignement économique supérieur, en vue de la préparation des spécialistes qui devront analyser les informations économiques en s'appuyant sur les programmes de calcul à commande électronique.

2. L'organisation des recherches théoriques concernant la technique de calcul économique et de cybernétique économique.

3. L'organisation des applications pratiques de la techniques du calcul économique, au niveau de l'entreprise, de la branche et de l'économie.

4. L'organisation de l'application de la technique du calcul économique et de la cybernétique à l'échelle du territoire économique.

5. L'élaboration des modèles micro et macro-économiques; l'optimisation des processus de prodution, l'optimisation des constructions, des transports, des télécommunications et d'autres secteurs d'activité économique.

En tenant compte de ces exigences, le Centre de Calcul Economique et de Cybernétique Economique a amélioré la structure de son organisation, en menant son activité dans les secteurs de recherche suivants :

1. La commission d'études et de recherches pour le calcul économique.
2. La commission d'études et de recherches pour la cybernétique économique.
3. La commission d'études et de recherches pour la planométrie.
4. La commission d'études et de recherches pour l'organisation de la production et du travail.
5. La commission d'études et de recherches pour le système d'informations économique.
6. La commission d'études et de recherches pour l'économétrie.
7. La commission d'études pour les recherches opérationnelles avec des applications en économie.
8. La commission d'études et de recherches pour la sociologie économique.
9. La commission d'études et de recherches pour la conjoncture économique.
10. La commission d'informations et de documentation scientifique dans le domaine du calcul économique et de la cybernétique économique.

Le Centre poursuit ses recherches dans le cadre d'un laboratoire nanti en machines modernes de calcul.

De même, selon les nécessités, on envisage l'organisation de commissions pour le calcul économique et la cybernétique économique à l'échelon des régions, ainsi que la création de sections de calcul économique et de cybernétique économique pour certains ministères, des institutions centrales et des grandes entreprises, dans le but de guider la méthodologie et la pratique du travail de calcul et d'analyse économique. Un tel réseau, organisé systématiquement, crée la possibilité d'une direction unitaire de la technique du calcul économique et de la cybernétique économique dans les entreprises et les ministéres, ainsi que de l'instruction des cadres spécialisés dans ce domaine. Cette action peut avoir une contribution positive pour la réalisation d'un système opératif d'informations économiques, de qualité et à peu de frais.

L'auteur montre que c'est justement dans ces conditions qu'un rôle important revient à la cybernétique en ce qui concerne le développement de la production matérielle de la société. dans la révolution technique et industrielle, dans la modernisation des entreprises, l'automatisation des processus technologiques et l'optimisation de la production, dans l'accroissement de la productivité du travail social.

En ce sens, il est nécessaire de poursuivre le développement des recherches dans le domaine du modelage mathématique des processus économiques et de l'optimisation des modèles respectifs à l'aide des calculateurs électroniques. A l'égard de l'activité du Centre de Calcul Economique et de Cybernétique Economique de Bucarest, l'auteur montre que les efforts seront dirigés vers le solutionnement des différents problèmes posés par notre pratique économique au niveau de l'entreprise, dans ce but, une collaboration plus efficace sera réalisée entre les chercheurs de différentes spécialités (ingénieurs, économistes, mathématiciens et ainsi de suite).

En tant qu'unité fonctionnant auprès de l'institut d'enseignement supérieur économique, dans son activité, le Centre accordera une attention particulière à la formation des futurs cadres d'économistes capables d'appliquer les méthodes mathématiques et cybernétiques, la technique moderne de calcul dans l'organisation de la production et du travail.

En s'appuyant sur les conclusions résultant de la session du Centre de Calcul Economique et de Cybernétique Economique de Bucarest, qui a eu lieu en février 1966, l'auteur présente les principaux objectifs du centre, dont l'activité menée dans le cadre de 10 commissions de spécialité, se joint aux efforts généraux de la recherche scientifique dans notre pays, au service du progrès et du bien-être du peuple roumain.

НАУЧНЫЕ ЗАДАЧИ В ОБЛАСТИ ТЕХНИКИ ЭКОНОМИЧЕСКОГО РАСЧЕТА И ЭКОНОМИЧЕСКОЙ КИБЕРНЕТИКИ

Исходя из целей программы развития народного хозяйства на период 1966—1970 гг., из намеченных IX-ым Съездом Румынской Коммунистической Партии заданий в области интенсификации научных исследований и применения результатов науки в материальном производстве, автор рассматривает задачи в области изучения и исследований экономического расчета и экономической кибернетики, проводимых в Социалистической Республике Румынии.

Быстрое развитие материально-технической базы социализма, комплексный характер взаимосвязей между различными отраслями производства требуют методов планирования и руководства народным хозяйством, основывающихся на расчете и оперативной точной информации, обеспечивающих оптимальное использование материальных и трудовых ресурсов, которыми располагает народное хозяйство.

При выполнении этого задания Бухарестский Центр Экономического Расчета и Экономической Кибернетики должен внести свой вклад в дело улучшения в хозяйственных организациях работы по планированию, руководству производственным процессом, выполнению плана в наилучших условиях. С этой целью Бухарестский Центр Экономического Расчета и Экономической Кибернетики ставит перед собой следующие задачи:

1. Внедрение математических, статистико-математических и кибернетических методов в высшее экономическое образование в целях подготовки специалистов, которые должны будут перерабатывать экономическую информацию на основе программ расчета с электронным управлением.
2. Организация теоретических исследований техники экономического расчета и экономической кибернетики.
3. Организация практического применения техники экономического расчета и экономической кибернетики на уровне предприятия, отрасли, народного хозяйства.
4. Организация применения техники экономического расчета и экономической кибернетики в территориальном экономическом разрезе.
5. Разработка микро- и макроэкономических моделей, оптимизация производственных процессов, оптимизация строительства, транспорта, связи и других секторов экономической деятельности.

В соответствии с этими требованиями Бухарестский Центр Экономического Расчета и Экономической Кибернетики улучшил свою организационную структуру и проводит свою деятельность по следующим разделам исследований:

1. Комиссия по изучению и исследованиям в области экономического расчета.
2. Комиссия по изучению и исследованиям в области экономической кибернетики.
3. Комиссия по изучению и исследованиям в области планометрии.
4. Комиссия по изучению и исследованиям в области организации производства и труда.
5. Комиссия по изучению и исследованиям в области системы экономической информации.
6. Комиссия по изучению и исследованиям в области эконометрии.
7. Комиссия по изучению и операционным исследованиям с применением в экономике.
8. Комиссия по изучению и исследованиям в области экономической социологии.
9. Комиссия по изучению и исследованиям в области экономической конъюнктуры.
10. Комиссия по научной информации и документации в области экономического расчета и экономической кибернетики.

Центр проводит свои исследования в лаборатории, оснащенной современными вычислительными машинами.

Имеется также в виду — в случае необходимости — организация комиссий по экономическому расчету и экономической кибернетике в областях, а также создание отдельных отделов экономического расчета и экономической кибернетики в отдельных министерствах, центральных учреждениях и на крупных предприятиях, целью которых является методологическое и практическое направление работы по экономическому расчету и анализу. Такая систематически организованная сеть создает возможность единого направления техники экономического расчета и экономической кибернетики на предприятиях и в министерствах и подготовки специализированных кадров в этой области. Эта деятельность может внести положительный вклад в обеспечение оперативной системы экономической информации, высококачественной и дешевой.

Автор указывает, что именно в этих условиях на долю кибернетики приходится важная роль в развитии материального производства общества, в промышленно-технической революции, в модернизации предприятий, автоматизации технологических процессов и оптимизации производства, в повышении производительности общественного труда.

В этом отношении необходимо развитие исследований в области математического моделирования экономических процессов и оптимизации соответствующих моделей при помощи электронных вычислительных машин. Касаясь деятельности Бухарестского Центра Экономического Расчета и Экономической Кибернетики, автор указывает, что усилия будут направлены на оказание помощи при разрешении различных вопросов, возникающих в нашей экономической практике на предприятиях, с целью чего будет обеспечено наиболее эффек-

тивное сотрудничество между исследователями различных специальностей (инженерами, экономистами, математиками и т. д.).

В качестве организации, работающей при наиболее крупном институте высшего экономического образования, Центр включит в свою деятельность как одно из важнейших заданий содействие созданию будущих кадров экономистов, которые должны будут уметь применять математические и кибернетические методы, современную вычислительную технику в организации производства и труда.

Применяя выводы, сделанные на сессии Бухарестского Центра Зкономического Расчета и Зкономической Кибернетики, состоявшейся в феврале с. г., автор указывает важнейшие задания Центра, деятельность которого, проводимая в 10 специальных комиссиях, включается в общие усилия научных исследований в нашей стране, поставленных на службу прогрессу и благосостоянию румынского народа.