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Turning to Account the Results of the Scientific Research of Economic Cybernetics and Economic Informatics in the Instructional-Educational Process

Significant moments in the development of the scientific research of economic cybernetics and economic informatics at the Economic Cybernetics Department and Laboratories. Contributions in this field of other departments of the Bucharest Academy of Economic Studies.

The building of the multilaterally developed socialist society and the creation of conditions for transition to the construction of communism expressed in the ample processes of Romania's socio-economic development, of profound social transformations and general progress of our society, is organically linked in the strategy of the Romanian Communist Party with the latest scientific and technical gains, of human knowledge in general [5]. The ever stronger development of science, education and culture represents an essential condition and objective need of carrying out our economic and social plans and programmes, the strategic objectives of our economic policy in all fields of activity [4]. In his report to the Party National Conference in December 1987, President Nicolae Ceaușescu stressed as a direction for action the intensification of research work for its still closer link with production and education. One of the thezes formulated by the Party General Secretary refers to the very fact that the link among research, education and production must become a general feature of activity in all sectors [7]. It is of utmost importance in orienting the further development of scientific research, in improving staff training and professional education.

Within the development strategy adopted by the Party Ninth Congress and integrated into the Programme of the Romanian Communist Party

for building the multilaterally developed socialist society and for the advance to communism stress is laid on the decisive role devolving in this process upon science, education and culture and, first and foremost, on their latest, most up-to-date and most advanced gains. The Party General Secretary, Nicolae Ceaușescu underlines the possibilities provided by the modern technical means of computation and automation, the analysis instrument created by the newest domains of mathematics, cybernetics and information in obtaining best results in production [3] as well as the imperative need of training staff able to turn to account the productive values of the electronic devices, the cybernetization of the economy, the automation and chemicalization of production [2].

In the spirit of the best progressive traditions of the Romanian economic school, the Academy of Economic Studies in Bucharest has ensured the development and modernization of the economic higher education on the basis of the use of the outcomes of economic scientific research having asserted itself as its outstanding promotor. The studies in the fields of economic theory and analysis, finance, bookkeeping, planned management, organization of economic units, world economy, statistics, etc. represented along the years and decades new overtures of economics, important contributions to its development, to the setting up of real schools for the deepening of economic research and, at the same time, for the training of hundreds and thousands of staff for the national economy. The modern orientation of economic scientific reserach and of economic higher education towards all that is new and efficient is evident also in the promotion of studies in the fields of economic cybernetics and informatics

The education reform of 1948 has created favourable conditions also for the modernization of economic higher education within the Academy of Economic Studies. The concern for the new techniques of economic information processing is found in the educational field in the introduction of the study on the mechanographic computation technology. This is continued in the studies on economic and statistical computation and economic modelling and since 1951 they have been met in educational forms of economic informatics, such as the automatic processing of economic-statistical data. As an expression of the blending of the development of scientific research and economic education the first laboratories for the mechanization of economic-statistical computation were set up in the same year, laboratories within which the students are instructed to use the new methods and techniques of analysis and planning. Likewise, throughout the 50's scores of didactic materials were printed in the lithography of the Academy of Economic Studies representing lectures on statistics in industry, agriculture, foreign trade, living standards and other branches and fields of the national economy which have made their own important contribution to improving the system of indices, in statistical-economic computation, in the automatic processing of economic-statistical data.

The elaboration by Acad. Prof. Manea Mănescu of economic cybernetics as a branch of the new science-cybernetics represented an important contribution of the Romanian economic school to the development of economic scientific research and then of economic higher education [55]. The subsequent development of studies was to confirm the intuited values of economic cyber-

netics as regards the amplification and deepening of the outlook on approaching the economic phenomena and processes, a better elaboration of economic decisions, the enriching of the arsenal of methods, techniques and models of analysis, forecast and planning. The economic higher education has benefitted by this scope rendered by the economic scientific research through the introduction since 1959 of lectures and practical works on economic cybernetic modelling and mathematical programming at the Statistical Department of the Faculty of General Economy as well as at the Faculty of Finance-Credit-Bookkeeping.

The Academy of Economic Studies has further promoted studies in the field of modern economic computation and economic cybernetics remarkable results having been obtained both in the instructional-educational sphere of staff training and in that of deepening fundamental, development and applicative economic research. A new, stimulative framework has been created ever since 1963 through the setting up at the Economic and Statistical Computation Department of the Centre for Economic Computation and Economic Cybernetics. Its functions define it as an integrated unit of education, research and production, aiming to ensure the modernization of economic education, to promote the methods of economic cybernetics and informatics in close concordance with the demands of the economy in full swing.

The Economic Computation and Economic Cybernetics Centre was organized and functioned on nine commissions of studies and research: economic computation, economic cybernetics, planometrics, production and labour organization, economic information system, econometrics, operations research with applications in economics, economic sociology, economic conjuncture. Having worked within them was a large number of teaching staff of the Academy of Economic Studies, the Polytechnic Institute and the Bucharest University as well as specialists of central and synthesis bodies— the State Planning Committee, the Central Board of Statistics, the National Council of Science and Technology, the Finance Ministry, the Electric Power Ministry, the Foreign Trade Ministry, the Chamber of Commerce, the State Committee for Labour and Wages —, specialists of research and design institutes (constructions and the economy of constructions, the technology of machine-building, atomic physics, energetics, automation, the Statistical Centre of the Socialist Republic of Romania, a.s.o) as well as of the "23 August", "Electromagnetica", "Vulcan", "Danubiana", "Griviţa Roşie", "Automatica", "Autobuzul", "UREMOAS", "FMUAB", "Flacăra Roşie" production units, the Group of plants for electrotechnical devices and automation installations, the Romanian Cotton Spinning Mill, the Bucharest Garment and Knitwear Factory. The concentration of ample forces in the university, research- and production fields has permitted the obtaining of important results in planned management and economic forecast, in the economic information system, the management of production processes, the modelling of economic phenomena and processes, etc., having contributed to enriching the curricula both in the economic higher education and in the teaching of economic disciplines in the technical higher educational establishments. An eloquent expression of the high level of economic research has been the appearance of the treatise on economic computation [56] focusing fundamental theoretical elements as well as an extremely rich applicative experience and which for some time

represented a reference work for both the university lectures and for the extension of modern economic applications. Some papers of interest for enriching the curriculum of the economic higher education as regards the application of mathematical statistics in production have also appeared [88], [89].

Having stimulated a multilateral progress in all fields of socio-economic and scientific life, the Party Ninth Congress has generated new openings of decisive importance also for scientific research and the economic cybernetics education, for the intensification of their integration into production, for their extended and deep interaction with economic practice. The synthesis of the targets and orientation in the development of the two fields is expressed through the need of paying in the technical and economic higher education, in universities, greater heed to electronics and cybernetics [1]. Organizational conditions are thus created for the institutionalization of the economic higher education of cybernetics and informatics by turning to account all that has created the scientific research and the nucleus of the Romanian school of economic cybernetics. The Faculty of Economic Computation and Economic Cybernetics and the specialized department — the Economic Cybernetics Department were set up in the 1967/1968 academic year. Integrated into it is also one of the strongest research teams in this field — the Centre of Economic Computation and Economic Cybernetics, reorganized as a unit with a multilateral character with a view to intesifying its closer, organic link with the needs of education and of the economy.

Concordant with the strategic orientations of the Party economic policy and with the present and future demands of the national economy and starting from the positive experience of the scientific research nuclei in the field of economic cybernetics and informatics, mainly of that already set up at the Bucharest Academy of Economic Studies, the use of scientific research of economic cybernetics and economic informatics for the training of specialists has been extended in the ensuing years both in its relation with production and with education. Specialized teams have been set up at the economic faculties of the universities in Cluj-Napoca, Iași, Timișoara, Craiova and Brașov and at the Higher Educational Establishment in Sibiu. Telling for the general characterization of the phenomenon, for its ampleness and depth is that such developments have simultaneously taken place also in other fields, such as the technical and mathematical ones, and then in technology, medicine, linguistics, the humanistics sciences, etc.

In the 60's, with the modern trends in the Romanian economic scientific research the economic higher education started being improved through the appearance of new disciplines, such as economic computation, the automation of economic information processing, operations reserach (as a basic trend of mathematics applied in economy), the programming of electronic computers, economic cybernetics, etc. For all this, the academic and research staff, the associate specialists in production have published in the lithography of the Academy of Economic Studies corresponding didactic material representing courses and lecture models, collections of problems, case studies, etc. This effort aimed at turning to account in the training of students as well as in the enriching of the knowledge of specialists in production the latest

preoccupations and trends in using cybernetic modelling and the electronic computation technology in economy.

The development of studies concerning labour productivity and the planning of its growth, the rate of economic increase, the economic processes in industry, agriculture and forestry, foreign trade, living standard, etc. has entailed an ever stronger blending of economic analysis with the quantitative methods, with the survey of the economic phenomena and processes by means of economic mathematics. The works which have appeared as a result of these studies, such as those on economic computation [55] and applications in economy of mathematical programming [9], [10], the mechanization and automation of statistical computation and of economic and administrative activities [59], [60], courses in statistics of some branches [58], [62] and basic fields [57], [61] of the national economy, studies of cybernetics and informatics [67], [74] with applications in the decision processes in economy [24], in economic computation [99], in the survey and prospecting of the market phenomena [34], [35], the statistics of agricultural production [29] and the quality of the industrial output [90], etc. constituted a support for improving the curricula of many disciplines with an economic character and for enriching the knowledge conveyed with elements of modern orientation as well as powerful and efficient instruments for a profound economic analysis.

The principled theoretical aspects of economic-mathematical modelling synthetized in a homonymous work [63] stimulate the development of studies on the elaboration of decision processes [25], the planning of industrial investments [12], [44], the efficient programming of production and enterprise management [21], [22], [26], [48], the analysis of inter-branch connexions [11], [91], [96]. The studies on economic forecast are focused within a special seminar functioning within the Academy of Economic Studies, at the Economic Cybernetics Department, under the scientific coordination of Acad. Prof. Manea Mănescu whose works were published in study books on long-range growth models [13] and industrial production functions [14]. The continuation of such preoccupations is to be found in studies on forecasting in certain branches and fields of activity [86]. As to the educational process new chapters of lectures on socio-economic forecasting have been introduced.

An important contribution in the field of research and of improving the training process was made by the studies on modern programming and structured programming languages [40], digital computation methods [41], [75], [76], teleprocessing [70], economic data organization [71], enterprise games, etc.

On the basis of these studies doubled by those on case and problems generated by scientific research contracted with production units (industrial, agricultural, building-assemblage), with research and design units, new concepts, categories, methods and techniques on multisectorial analysis, the theory of production functions, the critical path analysis, mathematical programming, the stock theory, teleprocessing and the automatic retrieval of reference information, etc. have been introduced into the curricula both at disciplines in the so-called "common trunk" and at the specialized ones. Already in the first half of the 70's such aspects were found in the lecture programmes of the faculties of the Academy of Economic Studies (Economic

Computation and Economic Cybernetics, Finance-Bookkeeping, the Economy of Industry).

Within the economic higher education, at the Academy of Economic Studies in Bucharest, the foundations were laid and the setting up of the Romanian school of economic cybernetics was perfected, a school which through the genuine conceptual and methodological apparatus for investigating the economy shaped its individuality and gained unanimous world recognition. Starting from the thezes of dialectical and historical materialism, from the contemporary economic realities concepts have been elaborated, such as those of cybernetic-economic system and model, economic time, economic space, dynamic equilibrium, conditioned economic reflex, etc. representing at present the fundamental background of the science of cybernetics, components of the patrimony of the contemporary science; outlined are the action of the general law of feedback in the economic space as well as the feed-back and feed-before mechnisms in adjusting the cybernetic-economic systems and creating conditioned reflexes in the economy. New fields of economic cybernetics have been initiated and developed, such as economic logistics, economic quantics and economic genetics with a wide epistemological opening and with practical applications in identifying the state of dynamic equilibrium, in outlining the gravitational phenomena of propagation in the economic space, etc. All these achievements and results linked with the scientific and didactic activity of Acad. Prof. Manea Mănescu have been gathered in the monograph "Economic Cybernetics" [64] later on published in translation by printing houses in Great Britain, the U.S.S.R., the German Democratic Republic, the People's Republic of China, the Polish People's Republic.

The practical need of a thorough knowledge of the problems as regards the functioning of the economic mechanims has led to the development of the study of complex systems [27], of decision-making in factories [17], of nonlinear optimization [45], integer [49], stochastic [84] and multicriterial [85], of the simulation of economic processes [98], of the system of general economic indices [100] or in nonindustrial branches [31], of scientific management of the factory [28], of quality control [19] and reliability. Studies have likewise been developed in the highly topical field of computer aiding along directions concerning the programming of electronic computing equipment [18], [72], [82], the informatic systems in the economy [23], standard programming [54], teleinformatics [73], distributed informatics [42], a.s.o., and the systemic investigation of market decision processes [36], [37] has intensified.

The characteristic disciplines representing a subject of study at the Faculty of Planning and Economic Cybernetics have enriched with modern modalities of economic data processing (such as graphic and distributed processing, the relational data bases, etc.) and with the interactive work with computers of the mini and micro family; the study in a systemic conception of the management of production processes and economic administration of the factory has also been extended. The habits of using applicative programmes have been created and developed on the basis of original programme packaged of high scientific standard conceived and implemented by the

members of the Economic Cybernetics Department and Laboratories on statistical analysis and forecast computation [46], [47], the control of production processes [33], the economic-cybernetic modelling of retailing activities [50], the physical-financial planning of overhauling and repair of fixed assets [69], the integrated administration of statistical data bases [39], teleprocessing [43], the multicriterial processing of surveys [66]. The publication of specialized dictionaries in the fields of socio-economic statistics [51], marketing [38], population [93] and enterprise management [15] represented an important contribution to the instructional-educational process. The studies made in the fields of population [30], [83], [95]and social structure [52], [53] constituted important finalizations in improving the educational process. The demography lecture which has been delivered for more than 20 years at the Faculty of Economic Planning and Cybernetics as well as that on territorial planning introduced after 1980 constitute original elements for the curriculum of the economic higher education in this country.

The concern for the study of the national wealth represented a contribution of utmost importance to developing the economic scientific research and the economic higher education. Its problems have been studied for more than twenty years at the Academy of Economic Studies where under the sponsorship of Acad Prof. Manea Mănescu this fundamental concept of maximum synthesis of economics has been approached in a systemic, integratory outlook as a "summator" of the history of a nation's economy strongly connected with the economic development, with the productive forces and relations. Already since 1980 the study of the national wealth within the curriculum of the Faculty of Economic Planning and Cybernetics has entered a new, higher stage. The introduction of the homonymous specialized course has permitted to extend the knowledge acquired in the study of the national wealth both within the course in political economy as well as a final-cumulative system of the general cybernetic system of the national economy within the course in economic cybernetics. The study of the national wealth in an independent lecture organically correlated with the other disciplines and formal tive activities of the future economist represents an original internationa-contribution of the Romanian economic school to the instructional-educational process of the future specialist.

The treatise on national wealth [65] materializes in original and synthesis works the contribution of the Romanian economic thinking to the progress of social science and practice based on the materialistic-dialectical analysis of the laws of social development and taking into consideration the present conditions of evolution of the contemporary economy. The national wealth is conceived as a category of the national economic potential expressed by the "productive force-progress-wellbeing" trinomial and which plays a basic role in the equations of development: national wealth-economic growth, national wealth-economic balance, national wealth-economic space and time, national wealth-the nation's welfare. As a matter of fact, already in 1966, at the International Congress of Sociology at Evian, Acad. Prof. Manea Mănescu has underlined a number of basic elements of the correlation between the national wealth and the economic development standard as well as its valence in characterizing the material basis of society and of living standards.

This contribution of the Romanian economic school has rendered a wide opening for deepening the complex knowing of the economic phenomena and processes and a new way of constructing the logic of the economic analysis, of modelling and simulating the scenarios of development. Were we to express ourselves in the synthetic language of figures, the contribution of scientific research at the Economic Cybernetics Department and Laboratories to the instructional-educational process would be translated in hundreds of materials with a didactic character (lectures, collections of problems, case studies, selections of practical work, guide-books, handbooks, course models, computer programmes, programming reference material, etc.) published in the 1963—1988 period through the printing house of the Academy of Economic Studies and of which still in the current use of the students, at present are 24 courses and textbooks, 10 collections of practical work and problems, five guide-books for students' scientific research work (scientific circles, yearly and diploma papers), over 100 computer programmes existing in its own programme library. Having contributed to this representative scientific and didactic work is the entire academic and research staff of the department, to a great extent, through the works for the students' use published by the printing house of the Academy of Economic Studies and which we were unable to include into the selective bibliography because of the lack of space. An important contribution to deepening scientific research and to its turning to account in the instructional-educational process was made by the over 40 papers for a doctor's degree elaborated by the members of the Department and Laboratories of Economic Cybernetics in the 1963—1988 period representing a real, original support in improving the content and in modernizing the economic higher education.

It is remarkable that the contribution of scientific creation in the analysed field has been amplified through valuable contributions of the teaching staff of other departments of the Academy of Economic Studies as regards economic modelling [16], [32], [80], [92], applications of mathematical statistics in the economy [88], [89], operations research [26] and digital computation [41] enterprise management games [68], [77], decision-making in factories [78], simulation of economic processes [79], [98], structured programming [97], the study of reliability [20], mechanization and informatization of bookkeeping [81], etc.

This year, a jubilee for the Academy of Economic Studies and for the Economic Cybernetics Department and Laboratories we subordinate the efforts of our work team to the orientations of the April thezes as regards the decisive role of science in the entire development [6], a still greater role of scientific research and education in all fields [8]. In the spirit of these demands and orientations studies will be developed at the Department and Laboratories of Economic Cybernetics concerning the cybernetic modelling of the components of the national wealth, the systems of raising labour productivity and reducing production costs, the elaboration of export systems, the organization of relational data banks, computer aided research-design-production, the working out of production control systems and the functioning of the factory economic-financial mechanism, the creation of specialized programme packages for an interactive graphic economic analysis, etc.

By extending the cybernetization processes, the cybernetic science answers the major requirements for the implementation of the programme of raising labor productivity [8] essential and decisive within the plans of Romania's socio-economic development. The dialectics of cybernetics is thus inscribed on the great trajectory of the Romanian people's progress and civilization, of building the multilaterally developed socialist society and advance to communism.

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