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The Influence of Distributed Informatics on the Evolution of Informatic Units

The study presents some current trends appearing in the evolution of informatic systems and in that of informatic units under the influence of the ever growing demand to extend distributed informatics. The study also suggests some directions, domains and activities which are of particular interest for scientific research and technological engineering in informatics.

1. PRESENT TRENDS IN THE EVOLUTION OF INFORMATIC SYSTEMS

The knowing of the tendencies and directions of development of the informatic systems is of particular interest for both the scientific research and technological design activities and for establishing the organizational forms, the types of informatic units and their functions which are worked out to meet with future demands and to stimulate the most efficient ways and means of using modern data processing and teleprocessing technics.

Based on the users' demands, as main generating and stimulating factors, on the one hand and, on the extremely rapid development of scientific research and technology in the field of data electronic and teleprocessing, on the other hand, the new trends in the evolution of informatic systems can be characterized by an ever increasing proliferation of efficient data processing methods and technics, by their organic integration into management, research and design activities, into production, services, a.s.o., by this aiming to increase labour productivity and quality and to raise the level of cybernetization of human activity. This tendency implies the bringing closer to or even integration of the electronic processing means into the user's activity, a fact which suggests a solution to decentralize the electronic processing capacities.

Worth mentioning, in order to stress this ever more marked tendency are the objectives and targets resulting from the long-range programmes and the 1981—1985 Five-year Plan, underlined in the documents of the Twelfth Congress of the Romanian Communist Party [1], from which we quote: .. ... Action should be taken for the cybernetized management of technological processes, for the generalization of work on several machines, for a rational use of work time, the use of electronic technics in production scheduling, in computation and registration work and, on this basis, the reduction to the strictly necessary number, of office workers"... At the same time, both the volume and frequency of information demands continue to grow (some authors [3] maintain that these demands are growing in a geometrical proportion) information on activities, phenomena and processes surpassing the limit of the information system the user belongs to, from the organizational point of view, simultaneously with the demand to shorten the reply up to the level of the systems' performances in real time. This tendency implies the development, diversification and specialization of the systems based on data banks, the achievement of the data base and bank networks having as a technical support the computer networks, the extension and diversification of possibilities for users to have access to these banks, and in conclusion, it gives a solution for maintaining and developing centralized data processing systems.

Emphasis is laid more and more on the demands of users, especially of the staff in management, research, design, education and in other fields to achieve informatic systems which should meet, to a greater extent, with the requests for an operative execution of computation work, for an operative tactical management (of production with priority) and for a strategic management. Consequently, management requires to add to the existent informatic systems preponderantly retrospective informatic systems (of bookkeepings, statistics), new qualities enabling the informatic systems to look, to a greater extent, to the present (operative) and to the future (strategic), to work out and integrate into the informatic systems management models, simulation, forecast models, a.s.o., to develop the management systems of data base and banks with functions which should facilitate the simulation of processes, states and trends [7], a.s.o. The demands of scientific research, education, design, of current operational activities imply an increased share of the informatic systems in real time, both of process and management.

The further increase in the level of generalization and standardization of programme products and of the models used in informatic systems, of automation of the analysis, design, programming and operating activities, for a permanent raising of labour productivity in this field, for shortening the design (adaptation) -implementation cycle, for reducing the cost per unit of processed and used information and, finally, for a sensible raising of the efficiency of informatic activity continues to hold priority within the information development objectives.

The rapid progress scored, in the past few years, in the working out and improvement of the designing methods and technics and data banks exploitation [8] and of data teleprocessing systems along with the diversification and growth of the technical performances of the computers, of micro and mini electronic computers, of intelligent terminals of medium and light

teleprocessing terminals come to support and stimulate the materialization of the trends manifested in the evolution of informatic systems. The above-mentioned trends implying the users' present and future demands presented also with a view to directing the evolution of the informatic systems along with the priority directions of research, development and utilization in the fields of production of data teleprocessing and electronic processing equipment and of achieving programme products [4] ever more converge to a new, qualitatively higher stage, that of distributed informatic systems. This stage will also coincide with a substantial qualitative leap in the field of data bank elaboration and utilization sphere and in that of teleprocessing systems as basic technical elements of the distributed informatic systems [9].

In approaching the distributed informatic systems, the study does not deny the necessity for centralized data processing systems [5]. They are dealt with as a necessity of blending (completing) the practically evinced advantages of the centralized systems with the advantages offered by distributed informatics (these last advantages appearing as drawbacks of the centralized systems).

A synthetic definition of the distributed informatic systems may characterize them as systems bringing the electronic computer nearer the user, by integrating it into the user's activity, geographically disseminating the data input and output units and if necessary also, the processing units, for a direct access to them, of various categories of users, of various work places. Thus, in the conditions of the distributed informatic systems, the interface between the electronic computer and the user is direct unlike with the centralized electronic processing systems in which this interface is often achieved through the specialized staff of the computation centres. In the cases when the user hands over the documents with the input data (for electronic processing) at "the gate" of the computation centres and awaits or returns to the same "gate" to receive the sets (volumes) of charts with the results obtained by processing, no real integration of these instruments into the user's current activity is obtained. The current demands for operative data processing in sections, sectors, offices, workshops, etc., though relatively simple in many cases, yet with a high frequency of execution and with a big volume of routine data and operations, become inoperative at the required time, in the conditions in which processing is achieved in a closed specialized system. One of the values of distributed informatics is that it eliminates such disadvantages, and makes the "barriers" between the user and the electronic computer disappear. And since distributed informatics does not mean a mere distribution of mini or micro electronic computers at as many work places as possible to satisfy the local demands for data processing but rather a qualitatively technical development of communications [4] in the data processing systems which should include powerful electronic computers to ensure both the organization of distributed data banks and bases and the administration of complex communications within these systems, distributed informatics can also be defined as a solution for a rational and efficient blending of the advantages offered by the centralized and the local data electronic processing systems.

2. TRENDS AND REQUIREMENTS IN THE EVOLUTION OF THE FUNCTIONS, RELATIONS AND STRUCTURE OF THE COMPUTATION CENTRES

In their greater majority, the present computation centres are conceived to satisfy mainly the requirements of the classical * centralized systems of data electronic processing.

The passing to the utilization of data banks and implicitely of data teleprocessing technics and further, the passing to the distributed informatic systems implies a reconsideration of the functions, of the system of relations with the outside and of the internal organizational structure of the computing centres [9].

As regards the trends and requirements appearing in the evolution of the computation centres it is also significant that the sphere of action of the research, analysis, designing and execution functions of data processing is marking a continuous tendency of widening, often surpassing the limits of the system to which the respective computation centre is subordinated. Informatic systems feeding on input data from several information systems and/or supplying processed data to several information systems have appeared and are developing. Thus, by pursuing the objective of a constant raising of efficiency, there is a growing demand for the organization of specialized informatic systems having as a technical support the data banks which ensure the increase of efficiency, the reduction of the level of data redundancy and of the consumption of parallel effort in the achievement of data processing systems by considerably reducing also the cost per unit of processed and used information.

From this point of view, the physical borders of the computation centres tend to diminish and to turn into logical borders of the data processing and teleprocessing systems, of the distributed informatic systems.

The data processing execution function now prevailing in the activity of most of the computation centres will be developed and raised to the level of administration and management function of the respective informatic system which will comprise several points of processing, collection, validation, transmission, integration, etc. of the geographically distributed data within and above the limits of the given information system.

At the same time, there is a growing tendency, on the one hand, of a more organic integration of the informatic systems into the whole range of activities and operations within the information systems they belong to, greater emphasis being laid on the automation of operations upstream the computer (to cover the whole range of operations made on the information, from its generation to its turning to account) and, on the other hand, there is a growing tendency to deepen the integration of the informatic methods and technics into the operations and management activities. With the achievement of such an integration, the administration function of the informatic systems will be extended, in fact, to the administration function of the decisional and operational information systems (also implying the corresponding informatic system).

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*) By classical data processing system we mean those systems which do not include data banks and processing systems.

The evolution of these trends and requirements, to the effect of their materialization directly influences the system of relations of cooperation with and subordination to similar other systems and the users.

Thus, the process of integrating the user into the designing, implementing and exploiting activities of the informatic systems will be accentuated.

At the same time, the user will be exempted from a number of tasks concerning the preparation of data for processing, from constraints regarding the variety of local and operative processings, from making changes, etc.

The organizational structure of the units and of the compartments concerned with the improvement (automation, cybernetization) of the information systems is more and more directed towards the setting up of complex design and implementation teams (teams on designs, on systems and on applications) to the detriment of the solution of setting up distinct, separate compartments on groups of activities (analysis, design, programming, implementation).

3. INFLUENCES ON THE DISTRIBUTION AND USE OF CATEGORIES OF RESOURCES SPECIFIC OF THE ACTIVITY OF THE INFORMATIC UNITS*)

The Specialized Staff Resource

Considering the extension of the sphere of the informatic systems, the increase of their complexity including the accentuation of interdependences (and consequently, the accentuation of the level of integration into the basic activity) along with the demands of passing to the distributed informatic systems, the working out, designing, modelling and programming potential tends towards a concentration into powerful multidisciplinary collectives as part of which the importance of specialists in organizing the systems, in working out the distributed informatic systems, the management systems of distributed data bases and banks [7], of automatic (standard) operation systems, of standard decks of application programmes in the economic-mathematical and technical-mathematical modelling will continuously increase. The share of this category of personnel in the total staff working in informatics will increase and stress will be laid on specialization on types of systems.

The operating staff tends towards decentralization and towards a relative reduction following the growing degree of automation of operations upstream the computer and the integration of some operations now specific of the computation centres, in basic activities (for example, the cashier's activity in a shop working at a terminal- the cash register, or of a designer carrying out computations through a terminal).

The speed and scope of the contemporary scientific and technical development in the field of informatics requires the intensification and perpetuation to the training system of specialized staff in the computation centres. The technical and scientific standard of specialists in informatics will become an ever more decisive factor in raising labour productivity for the whole of so-

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* The informatic units also include the institutes, groups and collectives of technological research and design which are carrying out their activity in the field of informatics.

ciety. At the same time, the demand of supplying all users, the entire population with general knowledge in the field of informatics is becoming still more obvious, a fact which is also reflected in the curricula of both secondary and higher education and in the programmes of vocational training.

The Equipment Resource

The electronic computer is developing its multifunctionality and is more and more turning into an interconnected system of equipment of data collection, recording, transmission, processing, interrogation and representation, geographically distributed, which implies giving priority to the condition of technical-functional compatibility of all these installations.

The demand, apparantly contradictory, to achieve centralized informatic systems and, at the same time, to ensure varied operative local processings has led to the diversification of the types of electronic computers (big universal computers, microcomputers, minicomputers, intelligent terminals) in a greater concordance with the diversity of the processing requirements. There is a growing tendency of providing electronic processing units which should include all these types of computers.

In the conditions of the distributed informatic systems, the availability, operativeness and efficiency of using equipment are growing.

The Programme Products and Models Resource

The share of the standard programme products in the total of these products will constantly increase [6]; part of them will be directed towards local processings to use the minicomputers as intelligent terminals.

The exploiting systems for local processings will be, to a greater extent, accessible to users (and operators) not specialized in informatics; the languages used will get nearer to the natural language (economic, technical, etc.).

A considerable part of the designing and programming potential will concentrate on the carrying out of management systems for distributed data banks and bases, both general and systems oriented toward certain types of activities (of informational systems).

An ever more important part in the structure of the modelling activities will be held by the models for the management [2] of various types of activities and systems.

Within these conception, design and programming activities, the share of the activities for the study, establishment, organization and circulation of information, as an object of processing, is continuously growing.

The Resource of Information Subject to Processing

The structuring and organization of information in data bases and banks, in the distributed informatic system will accentuate the process of a more rigorous definition of the informational entities (indicators, norms, indices, etc.) and of the relations between them and will lead to the development of their mathematical formalization, to the sensible improvement of methodologies, especially of the activities exercising a powerful influence on

the informational systems (planning, statistics, finance, bookkeeping, etc.) and to the reduction of uncontrolled redundancy in the information systems.

By bringing the processing points nearer the places of primary data generation and collection (a requirement specific of the distributed informatic systems), a sensible increase in the quality of these data will be obtained concurrantly with an increased operativeness in their processing and use.

The volume of primary data recorded on intermediate (technical and classical) sockets will be considerably reduced, which will lead to the obtaining of important results as regards the saving of materials, the increase in the quality of data, the saving of manual labour and the raising of operativeness in processing.

In conclusion, it can be said that the activity of the informatic units enters a new stage, predominated by new, complex requirements and qualitative aspects, requiring an assiduous research work for finding the most efficient ways and solutions for the development of informatics in the next decade.

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L'INFLUENCE DE L'INFORMATIQUE DISTRIBUEE SUR L'EVOLUTION DES UNITES D'INFORMATIQUE

On présente certaines tendances actuelles qui prennent contour dans l'évolution des systèmes informatiques, ainsi que dans l'évolution des unités d'informatique sous l'influence de la demande croissante d'extension de l'informatique distribuée. Dans le même temps, on suggère des directions, domaines et activités qui présentent un intérêt spécial pour la recherche scientifique et l'engineering technologique de l'informatique.

ВЛИЯНИЕ РАСПРЕДЕЛЕННОЙ ИНФОРМАТИКИ НА РАЗВИТИЕ ИНФОРМАТИЧЕСКИХ ОРГАНИЗАЦИЙ

В работе показаны нынешние тенденции развития информатических систем (АСУ), а также информатических организаций, под влиянием всё более расширенного спроса на распределенную информатику. Одновременно, в работе указано на некоторые направления, области и трудовые процессы, которые представляют особый интерес для научного и технологического исследования в информатике.

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