

8. H. A. Simon, Science of the Artificial, (MIT Press, Cambridge, 1969), pp.156.
9. R. L. Ackoff and M. W. Sasieni, Fundamentals of Operations Research, (Wiley, N. Y., 1968), p. 443.
10. W. B. Crowston and G. L. Thompson, Decision CPM: A Method for Simultaneous Planning, Scheduling and Control of Projects, Opns. Res. 15, pp. 407-426, (1967).
11. W. B. Crowston, Decision CPM: Network Reduction and Solution, Opnl. Res. Quart. 21, pp. 435-452, (1970).
12. R. Bellman and R. Kalaba, Dynamic Programming and Modern Control Theory, (Academic Press, N. Y., 1965), Chap I-II, pp.1-55.
13. J. F. Woodward, Quantitative Methods in Construction Management and Design, 2nd ed., (Macmillan, London, 1975), Chap.9, pp.162-167.
14. L. Cooper and M. W. Cooper, Introduction to Dynamic Programming, (Pergamon, N. Y., 1981), Chap.4, p.47.
15. T. J. Hindelang and J. F. Muth, Dynamic Programming Algorithm for Decision CPM Networks, Opns. Res. 27, (2), pp. 225-241, (1979).
16. D. R. Robinson, A Dynamic Programming Solution to Cost-Time Tradeoff for CPM, Mgmt. Sci. 22, (2), pp. 158-166, (1975).

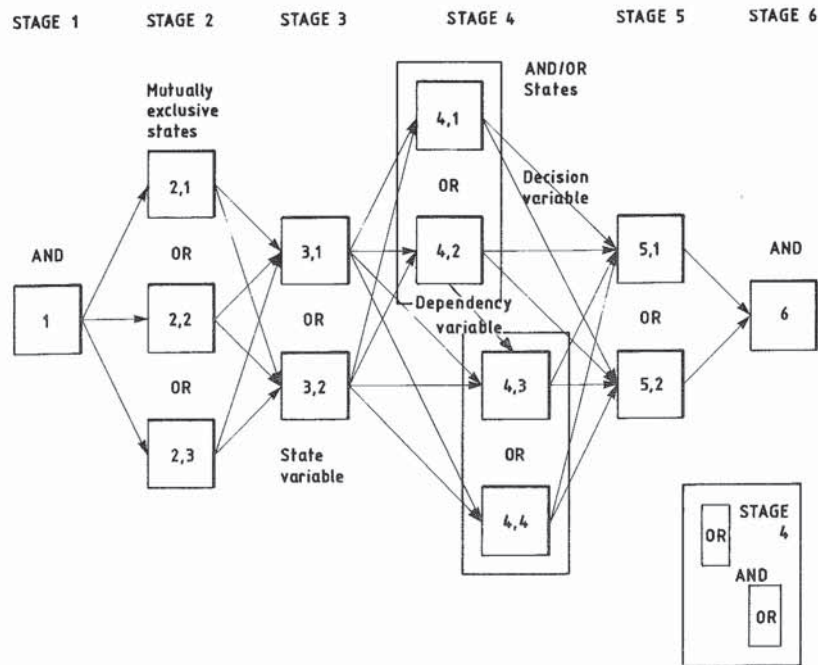


FIG. 1: SIMPLIFIED MULTI-STAGE DECISION MODEL

Computer Aided Management of Building Enterprises

dr.eng.Eugen Beiu, eng.Crina Oltean-Dumbravă

Faculty of Civil Engineering, Polytechnical Institute, 3400 Cluj-Napoca
Str. Emil Isac nr.15, Romania

eng. Csaba Arkossy

Building Trust of Cluj-Napoca
3400 Cluj-Napoca
Str. Deva nr. 1-2, Romania

KEYWORDS

Computer aided system analysis, Computer aided system design, Computer aided management, Integrated management system in building activity.

ABSTRACT

The paper presents a brief modular conception of a computer aided management system elaborated for a building enterprise, as well as the computer aided execution stages. The object adopted was to make up a socio-cybernetic system capable of significantly raising management quality in view of obtaining higher economical performances. It may be achieved by creating a complex "instrument" that amplifies the planning, organizing, coordinating, control and adjusting capacity of those in managing position. This instrument is an Integrated Management System based upon man-computer symbiosis that works through a permanent dialogue between people and computer. The conception, achievement and utilization of this system is carried out in five stages, presented in the present paper; Global analysis of enterprise, using the method and technique of computer aided system analysis; Elaboration of conceptional outline, the logical and technical designing making use of computer aided system design; System construction by elaborating the programs and setting-up the computer equipment; Computer aided initiation in stages and modules; Conversational use of bank of data. Achieving highly automatized socio-cybernetic systems for data processing is a remarkably complex and difficult task requiring great intellectual efforts. The use of computer is efficient even from the system analysis and system - design stages. The computer is a skilled partner in further activities of system initiation by primary loading the data storage units and conversation use of the system, as well.

La Direction d'une Entreprise de Construction
Assistée par le Calculateur

dr.ing. Eugen Beiu, ing.Crina Oltean-Dumbravă

Institut Polytechnique, Faculté de génie civil
3400 Cluj-Napoca, str.Emil Isac nr.15 Roumanie

drd.ing. Csaba Arkossy

L'Entreprise de Constructions
3400 Cluj-Napoca, Str. Deva nr.1-2 Roumanie

MOTS CLEFS:

Analyse de système assistée par ordinateur, Direction assistée par ordinateur, Elaboration de système assistée par ordinateur, Système intégré de direction en constructions.

RESUME:

L'ouvrage présente sommairement la conception modulaire d'un système de direction assistée par le ordinateur, élaborée pour une entreprise de constructions, ainsi que les étapes de réalisation aidées par le ordinateur. L'objectif adopté c'est la réalisation d'un système sociocybernétique qui permet l'élevation significative de la qualité de la direction pour aboutir à des résultats économiques de haute performance. On peut atteindre l'objectif proposé en créant un "instrument" complexe qui amplifie la capacité de planification, d'organisation, de coordination, contrôle et réglage de ceux qui dirigent. Cet "instrument" est un système intégré de direction basé sur la symbiose homme - ordinateur (dialogue permanent homme-machine). La conception, la réalisation et l'utilisation de ce système parcourt cinq étapes, présentées dans l'ouvrage: Analyse globale de l'entreprise par l'utilisation de la méthode et de la technique de l'analyse de système assistée du ordinateur; Elaboration de la conception cadre, logique et technique, en se servant du ordinateur; La construction du système par l'élaboration des programmes et l'installation des équipements de la technique de calcul; Initialisation assistée par le ordinateur, en étapes et modules; Exploitation en conversation de la banque de données. La réalisation des systèmes sociocybernetiques à un haut niveau d'automatisation dans le travail des données est une tâche extrêmement complexe et difficile, à une grande dépense intellectuelle. Il est nécessaire et d'une grande efficacité d'utiliser le ordinateur déjà à l'étape d'analyse de système et dans l'élaboration de système. Le ordinateur est un partenaire habile encore dans l'initialisation du système par le chargement primaire des bases de données et aussi dans l'exploitation dialoguée du système.

INTRODUCTION

An essential concern of developing the present management systems consists in devising and achievement of certain techniques, methods and integrated systems setting the operative management at a higher level enabling it to run the economic organization efficiently, dynamically at an appropriate rapid response to the present moment's requirements.

One of the ways to achieve this objective is the use of electronic computer as a partner and a skilled and well trained assistant.

In the present paper we are going to present the results of our preoccupations in this respect, materialized in theoretical and practical elements (conception, technical design, programmes, modules, built and tested etc.).

THE REQUIREMENTS AND FUNCTIONAL AREA OF COMPUTER AIDED MANAGEMENT

Considering the multitude of technical means that can be employed in computer aided management systems, we have stated that the general task of computing technique is to act as an intelligent interface among people from various compartments and functions, to actively help them in solving inherently occurring problems concerning management of material, human, financial processes within the economic units.

The technical system (hardware and software) then simply called "Intelligent Technical Interface" (ITI) must satisfy the following important requirements:

- to memorize a metalanguage, i.e. the rules of the language the man renders the given patterns, the patterns of data, the patterns of information as well as the control patterns needed to define the system under management;
- to critically analyze and accept the declarative description of patterns and notify all syntactical, logical errors, the omissions committed by man, and that can be automatically detected;
- to memorize the rules of expression, conditions that should be fulfilled in communicating data concerning the actual achievements of the reported quantities, as well as those referring to their mutual relationship;
- to critically analyze and accept the primary data the supports of physical structures reported are loaded with, to notify all sorts of errors automatically detectable;
- to memorize the rules of the language defining the procedures of data processing, respectively the inferential mechanism for non-procedural processing;
- to critically analyze and accept the detailed description of the logical and arithmetical processing procedures of data (being reported in the given structures) as well as the

strategy of solving the problem by inferring, notify the errors detected in the analytical descriptions;

- to memorize the rules of questioning language (of defining the requirements);
- to critically analyze and accept the questions or actuating commands concerning the supply of analytical or synthetical data, and notify the interrogation errors;
- to respond to the solicitations declared, performing the necessary processing carrying out, if necessary, a conversation to clarify some options of the beneficiary;
- to provide the security and integrity, of information stored and in conditions of simultaneous access of more beneficiaries.

The intelligence of the ITI system depends on the quality of technical provision, by means of which the beneficiaries ensure the fulfillment of the above requirements.

The functional range of the ITI system has implications in all the subsystems of the Integrated Management System, i.e. comprises the subject of production, the object of production, means of production, execution technology, programming, launching, control, coordination, a reporting of production, the strategical and tactical management and organizational arrangements.

THE MANNER IN WHICH THE ITI IS RENDERED FUNCTIONAL

The accomplishing of the ITI system is conceived by the authors as a generative process-induced through some "germs" modules.

The first "germ" module is employed to the computer aided system analysis. By its means a global complex analysis of enterprise management system is effected. The results of diagnosis analysis are used as a starting point in the design of the new management system.

With the second "germ" module the computer aided informatic design is performed, i.e. the elaboration itself, the construction of the ITI system, by self-development from "germ" modules to its perfected form and content, containing all the functional modules, including that of "management expert" which should play the role of councillor in management problems.

The functional modules of the ITI contain in an integrated conception all the informational applications appropriate to various categories of tasks. Thus, there are "classical" applications with card indexes, applications making use data administration systems and applications of the artificial intelligence exploring a stores of knowledge. At a more advanced stage ITI will have synopsis at its disposal, having access to information in the data banks that will be set up within the national system of informatics.

In the reflexion of the material and spiritual existence of the organization a fundamental role is played by the reflexion of the primordial existence of the organization as such, with all its structural components (functional structure, organizing structure, informational system structure - decision etc.) with its operating regulations. This part of reflexions, as a rule remains outside the concern of those who design the data stores for enterprises.

So, it is not enough that the data banks to reflect the inputs, the intermediary states and the output of a material, energetic, human and monetary nature of the economic organizations. The information banks should be developed in the direction of reflecting the "keeper" of socio-economic phenomena.

The authors have, therefore, formulated the requirement that ITI should also be an extension of deciding group consciences and master information referring to the structure of the organization, its operational rules, its manner of behaviour. Moreover, the ITI should possess information about its own existence, its informatory patterns and about its stock of information.

Eventually, the ITI should contribute both to improving the organizational structures and its manner of operation, as well as to improve its own existence being of great assistance to people working in the field of informatics.

UTILIZATION OF ITI SYSTEM

For categories of people come into contact with the ITI during its elaboration and operation:

- . informaticians, who elaborate the ITI modules, define the management system under consideration by describing the structures, the validation rules, the decision tables, and the defining of processing procedures of data, of the inferential mechanism, respectively (that solves the problems). We infer the existence of: a set of automatic data processing equipment, as well as a basic software, languages, systems of data bank administration, compilers, and of language interpreter of artificial intelligence etc.
- . experts in management who collaborate to building up the data bank in the field of management on the profile of the given enterprise;
- . caterers of primary data, who are immediately warned of they erred in introducing the information in the data banks;
- . managers from the various levels of decision structures who are the beneficiary (consumers) - the main users of the information resulting from the requested processings.

In elaboration and utilization of ITI system we have passed through the following stages:

- computer aided system analysis which gradually comprises the

whole unit;

- designing the functional modules of ITI, defining the environment of ITI and its own structure, defining the procedures elaboration of decision tables etc. (the computer-aided information designing);
- detailed elaboration and test of modules;
- loading the data banks;
- loading the data banks with information concerning the planned and accomplished states of the entities and relations between the entities declared and the data patterns;
- carrying out the routine processing;
- questioning the data banks and knowledge storage in view of controlling the events tendencies and of preparing the necessary decisions for adjusting, selforganizing, conforming and for solving the problems occurring.

As concerning the elaboration of incorporated modules in the ITI system we could remark that the improvement of modelling requires that the present thesaurus of modelling concepts be developed. On this purpose the interdisciplinary and multidisciplinary researches should be extended and intensified, since within the phenomena occurring in economic enterprises we find manifestations of all forms of motions of matter. Thus, the multidisciplinary researches should make use of dialectic-materialist philosophy, systems theory, technology and ergonomics economics and cybernetics, the theory of biosystems, psychology and psychosociology, the science of organization and management, mathematics, informatics, operational researches etc.

The multidisciplinary research should be raised to interdisciplinary level by transfers of concepts and methods from a discipline to another, integrating the partial results into a correlated unitary vision.

The preoccupations of the authors in this field have lead to series of new concepts, useful in modelling such phenomena as shown previously. The present paper doesn't permit but a selective enumeration of some of the concepts elaborated such as:

- temporal sets, dynamic sets, dynamic graphs;
- evolution program graphs, graph behaviour;
- cellular structures, operator graph of the cellular structures;
- organizational tunnel, antientropic activities program;
- selfconscienceness of the organization, the deciding group's conscienceness, the quality of management, the critical level of disturbances, hierarchy of adaptation forms;
- criteria of intelligent behaviour in the adaptation reactions of the enterprises etc.

CONCLUSIONS

The elaboration of the socio-cybernetic systems, having a high degree of automation in data processing, is an extremely difficult task, requiring great intellectual efforts. The use of the computer is already necessary and efficient in the system analysis and system design stage.

The ITI system fulfills this requirement and has been elaborated for a building enterprise (The General Building and Assembly Company Trust of Cluj-Napoca) and has led to a significant rise of management quality to obtaining remarkable economic achievements.