

**THE INTEGRATION OF THE FUNCTIONAL AND INFORMATICS
ASPECTS OF ORGANIZING THE ECONOMIC MANAGEMENT
UNITARY OPERATIVE SYSTEM OF INFORMATION**

Tudor LEAHU, Assoc. Prof., PhD
Free International University of Moldova
E-mail: leahu.ts@mail.ru

Ala COTELNIC, Prof., PhD
Academy of Economic Studies of Moldova
E-mail: acotelnic@hotmail.com

JEL classification: C81, C82, D83, O14, O33

Abstract

At the level of the economic management unitary operative system and its constituent sub-systems the functional and informatics aspects of organizing the circulating situational information in its environment are disclosed. In the first aspect the place and interconnections between the object and subject of management, and information and sub-systems processing system are examined. We have elaborated and characterized the conceptual scheme of formation (obtaining) and functional interconnections between the categories of economic situational information.

Regarding the second aspect, the particularities of organizing information in functional and informational terms are elucidated. Methods of organizing data on both memory types (internal and external) of the computer are revealed.

Functional and informatics integration of economic situational information organizing was carried out through establishing the concordance of organizational methods of achievement on the manual and technical physical environments of the supports.

Keywords: *organization, economic information, functional, informatic aspects, proceedings, forms, methods, manual and technical supports, concordance, integration*

1. Introduction

Economic information evolves and will evolve into two - managerial and informatics (technical) - environments at present and in unpredictable perspective, therefore it is necessary to ensure the most rational and effective transition of semiotic presentation, of forms and methods of their equivalent organization in both environments. In this context it is appropriate to carry out research on the study and analysis of possible forms and methods of realization of one evolutionary situation, namely their organization on the physical manual and technical spaces. Considering that the unitary information process flows under the both conditions of the management and the technical environment, it is necessary to establish the consistency between the forms and the procedures of the organization of its constituents, and, on this basis, the integration of the latter. By such an approach, groundwork is prepared and conditions of automatic functionality in the real time regime of the information activities in organic interconnection with the material ones are ensured.

2. Degree of problem investigation and purpose research

Currently, it is attested practically a complete lack of investigation of the problem in question, both from a scientific point of view and from the practical aspects of the concepts of organizing information and elaborating methods of economic information. The latest research in the field was carried out in the 70-80s of the 20th century. Such a situation was created due to the formation of a profound discrepancy between the superior performance level of the technical means of data processing (multifunctionality, direct physical access, low price, excessive speeds, expanded memory space, etc.), of programmed resources (simplicity, elaborative and applicative facility) and the rudimentary level of organizing information. Currently, for the three basic components of informatics (technology, programs, information), the concept of interconnection and their inseparable interaction in the unitary process of operation has not been elaborated. As a consequence, the first two, according to their functional capabilities, have essentially advanced, whereas the domain of their application (information) has proven to be unprepared for their effective utilization. This situation requires special attention to be paid to the problems of the establishment and functioning of the ways of organizing the information. In the given context, it is essential to clarify and finalize the notions of organizational form of information and the organizational unit (organizational) functioning of the economic informatics system (E.Ic.S.), as a monolithic assembly of interconnected and interactional informatics resources, establishing their distinction and predictable perspective.

Starting from the foregoing considerations, as well as from the dynamic character of the informatics components, their complex composition and the necessity to ensure their homogeneous existence and functioning, their theoretical topicality and their applicative importance, investigations have been carried out regarding the organizational aspect of the information and informatics resources. In this respect, it is becoming more and more convincing that the improvement of E.Ic.S. can be achieved not only on the account of the progress of basic informatics resources, but of all such resources, with a synergic organization.

3. Applied methods and materials

Research on the present subject was carried out on the basis and with the application of investigation methods of the theory, analysis and synthesis of information, managerial theory, systems theory and system analysis, crowd theory, theory of economic informatics and cybernetics, graph theory, algorithm theory, theory of informatics resources selection, etc.

The materials applied for this purpose refer to the scientific literature of economic informational management, economic informatics and fields adjacent to these specialities, the results of the elaborations and implementations of the design decisions of the informatics systems at the economic partner units, the university scientific activities, the normative and legislative acts of the Republic of Moldova and the results of the author's own investigations.

4. Analysis and results

4.1. Functional aspect of organizing the economic situational information

In accordance with the principle of motivation, the informational situational processes occupy an intermediate position between the led object (L.O) and its management system (M.S.O.) (object (process) \rightarrow situational information \rightarrow decisional information). In the case, when all the informational units in the limits of L.O., on the whole, form a single organizational unit –the system of information (S.It.), the place and the interconnections of the L.O. and M.S.O. information, are presented schematically in figure1 [1, p. 54; 7, p. 39]:

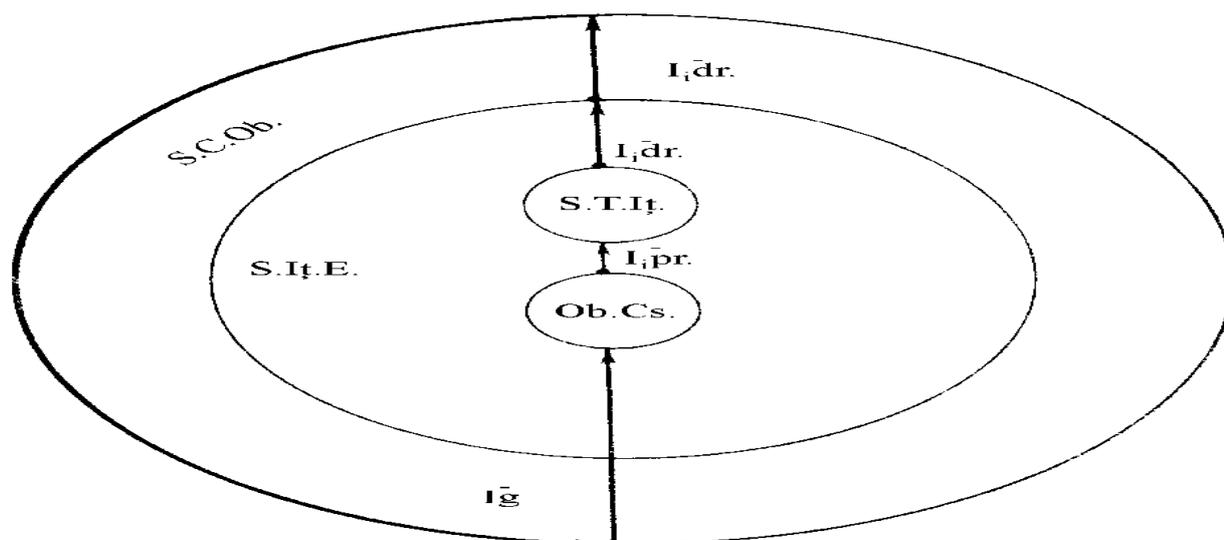


Figure 1. Place and interconnections of the information of unitary economic management process

The above figure demonstrates that the values of the primary situational information (I_{ipr}^-) are formed in the environment of L.O. (Ob.Cs.), after they are provided with their transformation system (S.T.It.). Here, proceeding from the available algorithms, it takes place the informational, structural and calculation processing of those primary or initially informational values. The derived values, obtained as result of these processing information (I_{idr}^-), are farther offered to the management system of the led object (S.C.Ob.), within the framework of which the analysis is made and, on its basis, the necessary management information (I_g^-) is formed. The latter, in turn, are provided to the inputs of the driven object (Ob.Cs.) and, in accordance with these values, it organizes its working in a new variant.

Thus, conceptually, economic information is organized and moved within the framework of managerial process of the economic object. But, this system (S.C.Ob.) has not organizational or informational aspects, but also, consists of certain interconnected and interactional material components with a view to support the functioning and evolution of the managed object.

In such case the conceptual organization of economic information on the material sub-systems of S.C.Ob. schematically is presented in figure 2 [1, p. 56; 3, p. 385; 7, p. 40].

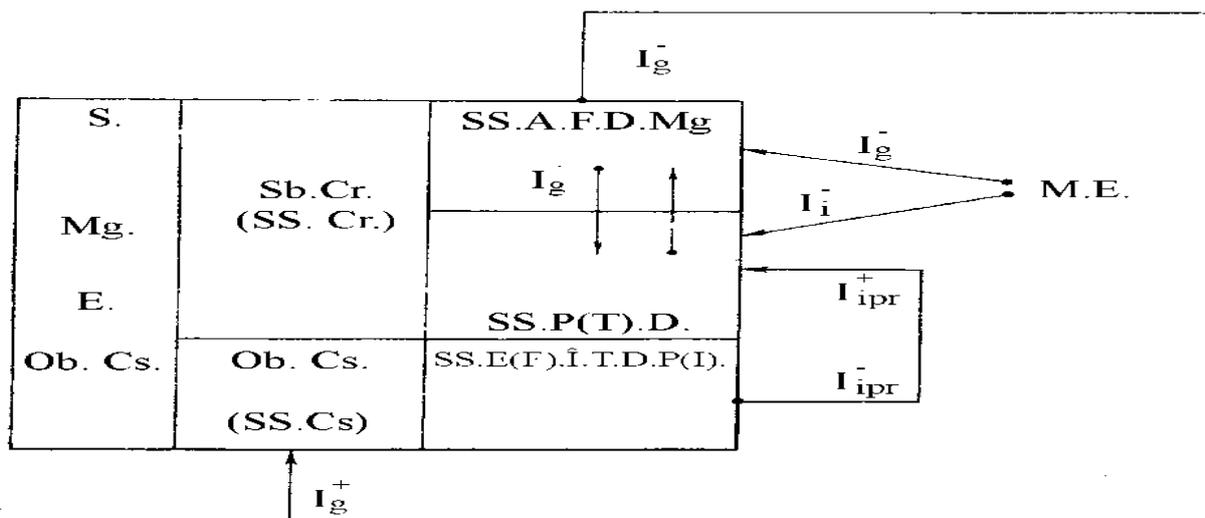


Figure 2. Conceptual scheme of the organization of information within the economic management system of the driven object (S.Mg.E.Ob.Cs.), the subject of the management (S_b.C_r) (the driving subsystem–SS.Cr) and the managed object (Ob .Cs.)(subsystem led- SS.Cs.)

According to the forming directions and the exercised functions in the processes of transformation, the economic information can be divided into three categories – of evidence, forecast and normative, and reference. Besides them, in the process of economic analysis of Ob.Cs. functioning and its “behaviour”, which foresees the involvement of all three categories of information, the fourth category of information appears – that of analysis, sometimes called analytical.

Figure 3 presents the orientation scheme of formation and of successive moving of the economic situational information of certain categories [1, p. 62; 2, p. 195; 7, p. 43].

The scheme confirms the fact that in the unitary process of the economic information dynamics there are three basic categories of connections between the different groups: connections of the incalculus (informational and structural) processing; connections of calculus (arithmetical, statistical methods, of multi-factorial, economic-mathematical analysis, ect.) processing, connections of functional utilization. The first two categories of connections take place within each group of information and between each of them or between all three groups. The connections of common utilization of information are motivated by the necessity of achieving the economic analysis function by the following basic variants of combining: evidence information + forecast information; evidence information + rate setting information; rate setting information + forecast information; evidence information + rate setting information + forecast information. In any variant of combination there exists the possibility of including settlement and reference information.

The combinative connections (of functional transformation and utilization) are specific for the same rate - setting, settlement and reference information. Practically, the majority of the derived values of the evidence and forecast of informational entities are obtained through involving this category of information. They also serve as the basis for many management decisions. From such positions, conventionally the values of the rate-setting, settlement and of reference informational

units can be perceived as source of feeding of the processes of obtaining derived values of evidence, forecast, economic analysis, etc.

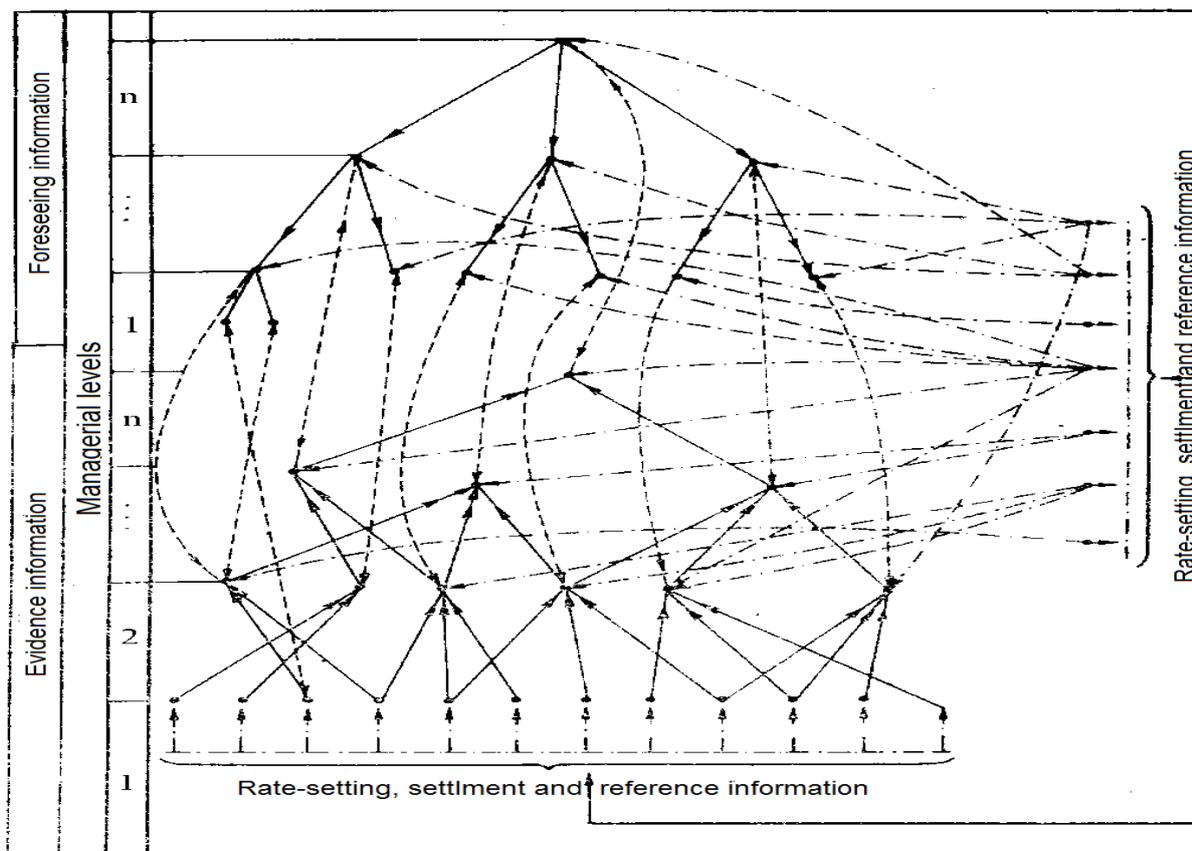


Figure 3. Scheme of the conceptual work of forming (obtaining) directions and functional interconnections between the groups (categories) of economic situational information: → forming directions (orientations) for the values of informational units based on the calculus and incalculus processing of initial data; ← - → directions of joint utilization of situational information with a view to carry out economic analysis ; ·····→ directions of joint processing of the rate - setting and settlement, of reference informational units values with the values of informational units of others categories of economic information; · - managed objects (processes) of certain managerial level (1÷n).

4.2. Informatics aspect of organizing the economic situational information

The main difference between the functional and the informatics aspects of organizing economic information consists in the fact that the former is of a general (conceptual, universal) nature, while the second refers mainly to informational units, regardless of affiliation and use of values in the processes of solving informative problems, complexes or sub-systems of issues. For this reason the functional organization of economic information is more of imaginary order, in reality being organized in the shape of a set of documents, portfolios, shelves, etc., well-arranged and ordered according to certain principles, which ensure the access and protection of necessary informational units.

Just as in functional aspect the situational information is treated from positions of ensuring with resources any material unit, it is viewed under an evolutionary angle in certain spatial and temporal rays, therefore, in moving. In the given case, the main thing is the composition and not the structure of the informational units.

At the same time, the informatics aspect of organizing the economic information is of reverse character, because, firstly, it is achieved starting from the structural informational units and physical environment of its placing, so as further to determine the methods of their organization. That is why the data base structures establish the logic of their organization, regardless of physical environment, where they are placed [1, 5, 8, 9, 11, etc.].

Nowadays, in the daily practice of economic informational activities, the physical informatics aspect is achieved prevalently concerning each issue, because, as a rule, the initial informational resources are oriented towards solving such unities, often being organized in the shape of separate data files. Only in case of obtaining certain informational products (exit situations) it takes place the concatenation of initial data files for database forming.

The conventionality of treating in practice the notion of database is aroused by its unilaterality of meaning and content, which exclusively starts only from the goals of joint processing of two and more informational entities (usually, in economy – two and more data files), to elaborate an output (of synthesis) document. But, the integrated organization of the informational resources is limited not only by the processing goals, which itself refers to each solved issue, but first of all – of the goals serving the managerial activities. Therefore, it is necessary for the database to be interpreted not as informational entity, but, especially, as organizational shape of information for such managerial space, as the economical unit is. That is why it can be considered the equivalent of the information system of the led object (process). Concerning functions, complexes of issues or particular issues of each type (material, informative, decisional), the organization of information can be presented in the form of such varieties of entities as the informational collection, massif and recording.

As previously noted the organization of informational entities on the informatics environment is produced through data structures, because each of them is coherent and owns certain organizational methods of realizing these structures, predetermined by certain physical spaces of location (recording, reading) and their specificity. Thus, the informatics aspect of organizing economic information is examined according to the following chain: information entity → data structure → organizational methods.

If the data structure is conceptual (logical) and, therefore, independent of the concrete properties of its space, then its organization (repartition) is physical and, therefore, dependent on the material presentation space. As a result, it was demanded such a modality of treating the organization of informational units on the informatics environment, as “packing (wrapping, setting)” data, understood as the physical organization of data structures on the storage space.

Just as the types of informatics memories and data placement proceedings are of a wide variety, the organizational methods also have a complex composition. Starting from these positions, depending on the type of physical memory space, two sets of methods of data organization are distinguished: specific to internal memory and specific to external memory.

At present, the most common and well-known methods of packing the successive and list data structures, which are specific to physical space of operative memory, are those successive, in chain, in nest and in node [1, 7, 10, 11].

For the other three organizational methods, the arbitrary physical organization of structural data units is appropriate, their registration and reading being provided by the link addresses assigned to each such unit. For this reason, their achieving is based on the gradual dynamic distribution of memory, together with the release of physical space. Therefore, if successive organization is carried in a purely technical way, then the successive data structure is physical, while the other organizational methods have associative elements (link addresses).

If data on operative memory is organized on unitary physical support (ferrite kernels) and the diversity of their packaging is ensured by varying the ways of placing and addressing the information units, then, on the external memory, the methods of data organizing predominantly depend on the physical properties of the supports, which this type of memory is constituted of [1, 7, 8, 9, 12].

4.3. Functional-informatics integration of the economic situational information organization

The meaning of this integration is reduced to the establishment of the equivalence of the methods of structural units' organization and the transformative modalities of the examined information. The general purpose of its establishment is motivated not only by the value of awareness and permanent consideration of the existing equivalents in the environment of the modern information system, but also by their correct operation, in the case of transition from one aspect of treatment to another, by ensuring the identity and their unity in any process of presentation and transformation.

As the functional aspect of economic management is inherent to human nature, and for this reason it was comprehended and realized by the subject first manually, it is related to the forms and methods of manual organization of information. Therefore, the functional and informatics integration of economic managerial system information requires the establishment of the concordance of the manual and automatic forms and methods of achieving this organization.

Depending on the multiplicity of the registration of values of the informational units on the same physical spaces, the degree of flexibility of manipulation with such units, there are distinguished forms based on organization on physical supports and forms based on the diversity of possibilities of programmed variation of the location of information units and organizing various physical domains for the same purpose. The concordance of the organizational forms of information of the economic management system, based on supports is presented in Table 1 [1, p. 92].

The physical (material) organization of all examined organizational forms is carried out starting from the composition of the situational functional content compartments (operational organization of information in sub-systems, sectors, complexes of problems and informative issues in particular). The implementation of informatics means and methods has contributed to the distinction of physical and programmatically directed organizational forms.

For manual organizational environment, such forms can be exemplified through accounting forms, such as memorial - order and diary - order. Until now the database, the main difference of which is to ensure the logical organization of data, is the only organizational form based on the programmed information management, independent of physical properties of the supports, the latter being performed not only by the programmatic system, but also by the associative elements, by means of which the values of nominated units are linked.

Table 1. Concordance of physical organizational forms of situational information of the economic managerial system based on supports

Organizational forms (physical units)					
Functional (manual)			Informatics (automatic)		
No.	Type	Supports	No.	Type	Supports
1.	Card indexes Catalogue	Documents	1.	card indexes	Perforated cards
		Cards with marginal perforation			Magnetic cards
2.	Folding	Documents	2.	Reels index	Perforated cards
	a) simple				Magnetic cards
	b) tied				Magnetic tape cassettes
3.	c) with rail (bookshelf)	Documents	3.	Reels	Perforated tape
					Magnetic tape
3.	Shelf: a) with non-sectioned shelves	Documents, catalogues, registers of norms and other constant digital data, guides, indicators, dictionaries, regulations, guidelines, etc.	4.	tape	Magnetic tape
	b) with sectioned shelves				Cartridges
4.	Board: a) with non-sectioned shelves	Documents, catalogues, registers of norms and other constant digital data, guides, indicators, dictionaries, regulations, guidelines, etc.	5.	pack	Hard disks
	b) with sectioned shelves				Hard disks
4.	Board: a) with non-sectioned shelves	Documents, catalogues, registers of norms and other constant digital data, guides, indicators, dictionaries, regulations, guidelines, etc.	6.	disk index	Taped disks
					Laser disks
4.	Board: b) with sectioned shelves	Documents, catalogues, registers of norms and other constant digital data, guides, indicators, dictionaries, regulations, guidelines, etc.	7.	Floppy disk index	Magnetic floppy disks
			8.	Library of CD, DVD, STICKS	Compact disks, optical disks, DV-disks

In the economic domain, the physical units of organization have evolved both depending on the types of media on which the information or data is located, as well as of the technical means that fix (record) it on the memory material environment. Initially the majority of information was concluded on the physical spaces of various paper supports in the shape of the documents of various forms, the composition and structure of which are predetermined by the content, composition and structure of the reflected (described) objects and activities. With the implementation of the informatics technique, various paper and cardboard supports have been elaborated and applied at the beginning, further on being invented and used physical data environments based on the effects of electricity and light. Respectively, their forms of organization have evolved in the directions presented in the Table.

Finally, it is necessary to mention that the trend of data media evolution is such that by ensuring the reliability and excessive increase of the volumes stored on them a single unit of them will encompass the entire information system of the managed object. In such a situation, the usefulness of their forms of organization will decline, focusing on the methods of data organizing on the internal memorization space of the support unit.

The concordance between the functional and informational methods of situational information organization of the economic managerial system is presented in Table 2.

Table 2. Concordance between the functional and informatics methods of organizing the situational information of economic managerial system [1, p. 96; 4, p. 102]

Methods of organization		
Functional	IT (internal)	
External	On internal memory	On external memory
Sequential	Sequential	Sequential
Sequential – indexed	In nest	Regional
—	In chain	Sequential – indexed
		Direct
	In knot	Regional (Library)

From the table it is obvious that at the moment the composition of the data organization methods is not so developed, which is why the requirements of their processing are not fully and completely satisfied, and which fact confirms the incomplete achievement of performances required by the management system. Therefore, on the basis of progress of the development of technical and operational characteristics, it can be confirmed that in the future the elucidated supports will evolve in the direction of the dimensional miniaturization and the excessive increase of the density of placement of the information and data volume on a space unit thereof.

5. Conclusion

From the positions of serving the functions of the unitary economic management system, the organization of information requires permanent management of the following principles and their properties:

- 1) interpreting the object of management as a material-managerial-informational core;
- 2) indissoluble organic bond between economic material objects and activities;
- 3) precedence and succession of the economic material processes;
- 4) intermediate position between the managed object and its management system;
- 5) ensuring the functioning of the object and its management system by organizing information in the form of flows;
- 6) opposite orientation of the movement of situational informational flows that precede (normalization, regulation and forecasting) of those who succeed (evidence, statistics, management) material activities;

- 7) through structural and calculation infiltration of information that precedes the ones that follow the material activities the third category of information - economic analysis - is formed;
- 8) during processing the normative and reference information serves as basis for the formation of the values of the majority of the derived information units;
- 9) dual (transformative and functional) role of previous information preceding economic material activities contributes to their organizational combining;
- 10) organization of information at the level of economic unit in the form of a network, appropriate to the cross-linking way of accomplishing its activities;
- 11) diversity of variants of information organization is caused by the environment and the principles of the distribution approach.

From the positions of informatics achievement of various forms and methods of organizing the economic situational information it is necessary to take into account the following moments:

1. the modalities of information organization are determined starting from the characteristics of parameters of the field of application of the means and methods in the following order: information entity → data structure → method of organization;
2. the elaboration, implementation and operation of the forms and methods of informatics data organization are based on the specifics of the functional organization of the information;
3. depending on the category of physical supports, the forms and methods of functional (manual, documentary) and informatics (automatic, technical support) organization of the information are distinguished;
4. in the same context, forms and methods of physical and logical organization of data are highlighted;
5. the specificity of support and matching of the forms and methods of data organization requires their classification in two groups: suitable for the internal and proper for the external memory;
6. through establishing the correspondence between the modalities of organizing information, their functional-informatics integration is produced, which contributes to the automatic preparation of the data for processing and use;
7. along with the miniaturization and maximum increase in data fixing density per space unit, the necessity in certain physical units of organization of the supports will be totally reduced, special attention being given to the methods of presentation and organization of information on the support space.

REFERENCES

1. LEAHU, T. Organizarea, structurarea și transformarea informațiilor sistemului managerial economic./ Organizing, structuring and transforming the information of the economic management system. Chișinău: CEP USM, 2009. 431 p. ISBN 978 – 9975 – 70 – 876 – 0
2. LEAHU, T. The basic version of the content, composition and functioning of the unitary information informative economic fund (U.II. Iv.F.). Proceedings of the 5th International Conference of knowledge management: projects, systems and technologies. “Carol I” National Defense University Publishing House, Romania, Bucharest, 2010, pp. 192-197. ISSN 2069 - 1920

3. LEAHU, T. The conception of the composition, elaboration and working of the unitary informational informative fund (U.I.Iv.F.) of the economic unitary knowledge base (E.U.K.B.). Proceedings of the 4th International Conference of knowledge management: projects, systems and technologies. "Carol I" National Defense University Publishing House, Romania, Bucharest, 2009, pp. 192-197. ISBN 978-973-663-783 -4
4. LEAHU, T. L'aspect fonctionnel d'organisation des informations de système managerial économique. The proceedings of the fifth international simposium on economic informatics, Romania, Bucharest, 2001, pp 383-389. ISBN-99450-4-X
5. LEAHU, T. Evoluția și concordanța aspectelor funcțional și informatic ale tehnologiilor activităților informaționale economice./ Evolution and concordance of the functional and informational aspects of the technologies of economic information activities. Materialele Conferinței internaționale „Tendințe în dezvoltarea tehnologiilor informaționale în domeniul învățământului și managementului” Chișinău, Editura A.S.E.M., 2003, p. 99-102. ISBN 9975-75-179-2
6. ЕМЕЛЬЯНОВА, Н., ПАРТЫКА, Т., ПОПОВ, И. Устройство и функционирование информационных систем./ Design and operation of information systems. Москва: Форум, Инфра-М, 2012. 448 с. ISBN 978-5-16-003008-1
7. ЛЯХУ, Ф. С. Экономическая информация: организация, структура и преобразование./ Economic information: organization, structure and transformation. Кишинев: Контабилсервис, 1996. 219 с. ISBN 9975 – 921– 00 - 0
8. МИШЕНИН, А. И. Теория экономических информационных систем./ Theory of Economic Information Systems. Москва: Финансы и статистика, 2014. 240 с. ISBN 5-279-01987-9
9. ТЕЛЬНОВ. Ю. Ф. Информационные системы и технологии./ Information systems and technologies. Москва: Юнити-Дана, 2012. 303 с. ISBN 978-5-238-02382-3
10. ТИТОРЕНКО, Г. А. Информационные системы в экономике./ Information systems in economics. Москва: Юнити-Дана, 2012 г. 463 с. ISBN 978-5–238–010167–9
11. ХОРОШИЛОВ, А. В., СЕЛЕТКОВ, С. Н., ДНЕПРОВСКАЯ, Н. В. Управление информационными ресурсами./ Information resource management. Москва: Финансы и статистика, 2009. 269 с. ISBN 5-279-03168-2
12. LAUDON, K. C., LAUDON, J. P. Management Information Systems. A Contemporary Perspective. Second Edition, Macmillan Publishing company - New York, 1991. 312 p. ISBN-10: 002389073X
13. NEUMANN, S. Strategic Information Systems. Competition through information Technologies - Macmillan College Publishing Company, Inc., 1994. 328 p. ISBN-10: 002386690X

Rezumat

La nivel de sistem managerial economic unitar și sub-sisteme componente ale lui sunt dezvăluite aspectele funcțional și informatic ale organizării informațiilor situaționale circulante în mediul lor. În cadrul primului aspect sunt examinate locul și interconexiunile informaționale dintre obiectul și subiectul de gestiune, sistemul și subsistemele de procesare a informațiilor. Este elaborată și caracterizată schema conceptuală a direcțiilor formării (obținerii) și interconexiunilor funcționale dintre categoriile informațiilor situaționale economice.

Privind cel de al doilea aspect, sunt elucidate particularitățile organizării informațiilor în plan funcțional și informatic. Sunt revelate procedeele organizării datelor pe ambele tipuri de memorie (internă și externă) ale calculatorului.

Este efectuată integrarea funcțional-informatică a organizării informațiilor situaționale economice prin stabilirea concordanței formelor și metodelor organizaționale de realizare a ei pe mediile fizice ale suporturilor manuale și tehnice.

Cuvinte-cheie: *organizare, informații economice, abordare funcțională, informatică, procedee, forme, metode, organizare, date, suporturi manuale, tehnice, concordanță, integrare*

Аннотация

На уровне единой системы экономического менеджмента и его составляющих подсистем раскрыты функциональный и информатический аспекты организации циркулирующей в их средах ситуационной информации. В рамках первого аспекта проэкзаменированы место и информационные взаимосвязи между объектом и субъектом управления, их системой и подсистемами преобразования информации. Разработана и охарактеризована концептуальная схема направлений формирования (получения) результатных значений информационных единиц и функциональных взаимосвязей между различными видами экономической ситуационной информации.

Относительно второго (информатического) аспекта, рассмотрены особенности организации информации в функциональном и информатическом планах. Выявлены и проанализированы способы организации данных на физическом пространстве обоих типов памяти (внутренней и внешней) компьютера.

Осуществлено функционально-информатическое интегрирование организации экономической ситуационной информации путём установления соответствия между различными организационными формами и методами её реализации на материальных средах ручных и технических носителей.

Ключевые слова: *организация, экономическая информация, функциональный аспект, информатический аспект, способы, формы (единицы), методы организации, организация данных, ручные, технические носители, соответствие, интегрирование*

Received 10.06.2018

Accepted 20.06.2018

Published 29.06.2018