

**THE FUNCTIONAL - INFORMATICS APPROACH TO THE
STRUCTURING OF UNITARY ECONOMIC MANAGERIAL SYSTEM
INFORMATION**

Tudor LEAHU, Assoc. Prof., PhD

Free International University of Moldova

E-mail: leahu.ts@mail.ru

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Abstract

This article delimits and reveals the decisive reason and imperative factors of the necessity in structuring economic information. The objective character of this management phase with such resources is emphasized. As currently and in the unpredictable perspective, the information in question is formed and manipulated in two spheres of their existence and evolution – managerial and informatics (technical) – it becomes imperious the use of their primal elucidation in each of these domains, so that they can be integrated then into a unitary one. Performing and conducting investigations in the given succession contribute to the superior performance of both the management domain and the applied informatics means and methods for ensuring its functioning. Also, given the fact that economic information has a fairly wide range of issues to examine, it is essential to establish those that are appropriate to the purpose of research. Since the aim of the article is to integrate the information in the aspects of their processing within the management functions and the informational environment, their functional and informational treatment is incontestably logical.

Starting from these considerations, in the present work, at the conceptual level, the constitutive units of the economic content information entities are highlighted, systematized and analysed. An analogy is made between the logical (content, functional) and physical (informatics) structural information units, and on this basis - their concordance. Within the framework of the unitary process of economic management, the structural material and informational units (situational (informative), decisional) are brought into correspondence. Through such a theoretical approach, as well as practical realization, a field is prepared for the development and functioning of the economic management information systems that act in real time regime.

Keywords: *structuring, informational structural logical (functional, informative (situational), decisional) units, informational structural physical (informatics) units, concordance, integration*

1. Introduction

In order to perform a work or to manipulate an object certain organizational activities are necessary, imposed by both considerable volumes and complicated structure, as well as by the pronounced specific of the works. But, in order to organize any activity or to put into action any object, it is required first to highlight those actions or constituents in their composition, which interconnections and interactions ensure the existence and achievement of the predestined role of integrity. Therefore, the organization of any activity and functioning of any object cannot occur without the preliminary setting of their structure. This thesis refers to any information that is considered as an organic component of the management process and object of manipulation, processing and use.

The necessity and the content of the paper are motivated by the analysis of the created situation and the continuous perspective of the existence and evolution of information in two spheres - material and managerial, the integration of the structural information units of which will contribute to the automatic realization of the unitary process of economic management.

2. The degree of investigation of the problem and purpose of the research

At present, the evolution of basic informatics resources (technical, programmed, informational) is characterized by uneven progression, the first two advancing considerably in development, and the third - not being prepared to the necessary level for their application. The created situation is caused by the inadequate organization of information, which would ensure the continuous automatic realization of the information process in integrity. At the same time, in order to organize the functioning of any object (process), it is necessary, first of all, to determine the constituent components, that is, its structuring.

From the scientific point of view, and even more so, of the practical realization, the structuring of information of the economic managerial system is insufficiently investigated nowadays. It means to highlight the structural units, of which the informational compartment of the unitary economic management system consists.

Since currently such information is formed, processed and circulated in two environments - managerial (external) and informatic (internal) - objectively it is necessary to reveal the structural components of both spheres, their systematization according to the size of the reflecting area, establishing correspondence between them and, on this basis - their integration into an inseparable totality.

Starting from the above-mentioned considerations, taking into account the expressive evolutionary character of the informatics resources and the necessity to guarantee their homogeneous existence and functioning, theoretical topical and applicative importance has any research related to the structural aspect of the economic information resources. In the given sense, the performances of the informatics achievement of economic problems are manifested on the account of the qualitative and quantitative expansion of the rational structural aspect of the information resources.

3. Applied methods and materials

Research was carried out on the basis of the theory of investigation, analysis and synthesis of information, management theory, theory of systems and systemic analysis, theory of economic informatics and cybernetics. A part of the content of the applied materials of the present paper was formulated due to the consultation and analysis of the scientific bibliographic sources of economic informational management, economic informatics and cybernetics and the fields adjacent to these specialties. Another part of information is obtained following the elaboration and implementation of projection methods and techniques of the informatics systems used by the economic organizational units of the Republic of Moldova, former S.U. and other countries.

4. Analysis and results

4.1. Functional approach to structuring of the economic situational information

The highlighting of functional structural information units is motivated by pragmatic factors, as they are created out of the needs of serving certain functions or functional management works with the intention to achieve certain goals.

The crystallization and formation of examined informational units have been produced according to the spatial and temporal descriptive (reflective) areas of the existence and evolution of the managed material objects and activities. The concordance between these units and their descriptive areas is as follows: attribute → property (name, feature, parameter, value, etc.); indicator → object (activity); informational massif (picture) → group of objects with some of the same features; informational collection → the same homogeneous group of objects, but with some common specific features (values), represented by some attributes, communications or separated indicators, other specific features remaining individual; system of information → the ensemble of interconnected and interacted objects (activities, resources) for obtaining a common result [1; 2; 5; 7].

Structurally, the attributes are formed by the semiotic combination of symbols; the indicators – by pragmatic (functional) merge of attributes; the informational massifs - by synthesizing the attributes or indicators; the informational collections – by the combination of previously enumerated three units; finally, the system of the information - by systematic spatial and temporal organization of all informational units in the environment of an object (activity).

With account of composition, all structural functional information units are of static (organizational) character. However, in addition to them there is also a dynamic structural unit, such as an information flow, whose composition can include any structural units in any combination. That's why it has much in common with the informational collection, but the latter may have fixed predestination, not being orientated in the space and time. Therefore, the flow is nothing but the information collection channeled into certain spatial and temporal coordinates. To be noted that the flow does not obligatory consist only of various combinations of structural informational units, but also from every variety of them.

If the structural units are the composition of the information core of the managed object, then the flows reflect the dynamics (movement) of these units. As a rule, due to combined composition the flow is the basis for the formulation of the decision, while structural units predominantly have a descriptive (reflection) role, although in some cases their values serve as basis for the undertaking of certain activities (foreseeing) and respecting certain limits (rating).

With account of composition, complexity of formation and reflecting area, the examined informational units follow one after another in such a sequence: attribute → indicator (communication) → massif (picture) → collection (flow) → system.

In the future, the formation through stratification of the new structural information units will depend on the evolution of the diversity of the management functions, the composition and the number of objects (activities), their described components and characteristics, and on the possibilities of organizing and processing the values of these units by the informatics system.

Ideally, the superior degree of performance of the latter can lead to a single informational unit under the shape of informational fund with flexible possibilities of forming and distributing its components in any spacial dimension and temporal term of utilization.

4.2. Informatics approach to the structuring of the economic situational information

Unlike the functional structuring, the informatics one is achieved on the basis of the physical properties and "capacities" of memory space of presentation, recording, distribution and organizing of functional informational units. Depending on the method of approach, two categories of structural informational units are distinguished - logical and physical. The first are nothing more than the physical equivalents of those functional, while the latter are the possibilities of physical environments of various technical information means and of their devices to materially realize the functional information units [1, 4, 7, 8, 9, etc.].

The physical presentation of the values of informational units on the environment of the certain devices (of input, display of the values of these units) has an auxiliary role, of intermediate and operative character, as they achieve these units only during operation, without remembering them later, thus serving as an interface (channel) of transport and recording on the physical memory space and extracting the nominated values off this environment, to display them.

Regarding the technical means of extraction, recording, distribution, accumulation, etc. of primary data that serve as interfaces for the processes of automatic informational, structural and calculus processing, it is necessary to mention that, at present, they often have different ways of presenting the functional information units physically. Such situation fairly requires the co-ordination or unification of the physical presentation of these units so as they traverse as few as possible "obstacles" of transformation from one form of presentation to another until it is saved and processed by the computer.

If the data input and displaying devices of the values of informational units are co-ordinated after productivity and connected in physical mode with other devices of computer and for this reason it automatically works in tandem with them, without causing essential stoppings, then the informatics technical means of other classes until now do not have such possibilities, working discreetly with the computer. In this respect, quite sharply becomes the issue of unification of this presentation on any media and technical devices, the final goal of which consists in offering the informational units in such material form so that they are received by the memory and accessed by the processor for storage and processing. So, the physical informational units, formed in computer, must be unified for all informatics technical means and devices. That is why their composition should be predetermined by the features of informational units, which are structured, stored and processed by the computer.

The logical information units in the computer are in the shape of measurable constructive physical units of various types of memories, such as position (element), physical cell, and etc. That is why, such presentation refers to the general notion, as it is the memory structure. For the same reason, it is motivated the systematization of physical informational units into two groups — one on the

internal memory of the computer, and another - on the external one. The first include the bit, semi-syllable, syllable, semi-word, word and double word.

Constructive possibilities of internal memory allow physical presentation of functional information units as well as in the form of page and segment. In the version of paginational organization of the memory, the informational massifs are divided into parts (sub-massive) - nominated pages. Then, when the memory is organized segmentally, the files can contain the programs, subprograms and initial data, each of them being considered the segment. Be mentioned that the page may be subdivided into blocks of established sizes.

In such a way, the following physical informational units can be organized on the internal memory in ascending order: bit → semisyllable (4 bites) → syllable (octet) → semiword (two octets) → word (4 octets) → double word (8 octets) → page segment. If the syllable, semiword, word and double word are units of a physically structured order, as each of them constructively is organized in the form of cell, then the block, page, segment are of the organizational order, because they consist of sets of cells. Therefore, the first informational units are elementary, because they are linked to the constructive realization of the most elementary functional information unit - the attribute. At the same time, the block, the page and the segment are the composed physical information units and they form constructively such functional informational units as, respectively, the indicator (block), informational massif or sub - massif (page, segment).

The structural physical informational units are characteristic not only for internal (basic) memory, but also for the external memory, it consisting also of certain constructive elements. For this type of memory, physical information items are used, which are developed in the shape of sector (section), block (physical record), extent (track) and volume (tome). The last two units are of constructive order, while the first two units are formed by segmentation of magnetic uninterrupted space of track.

Regarding the "possibilities" of physical presentation of functional informational units it comes out that the volume (module) can place on its media much more data files and vice versa, a file may be located on several modules. That's why the notion of "volume (module)" identifies the external data support and not at all functional information unit.

The first two units of physical structures on the external memory (sector, block) refer more to the material development of such a functional information unit, as recording, while the extent and module relate mainly to the informational massif and sub-massif.

Logical informational units are nothing but analogies of functional units. That is why it is more about their terminological aspect.

Depending on the physical environment, on which they are fulfilled, there are external (functional) (p.A) and internal (informatics) structural informational units. In the composition of the latter it is highlighted (in ascending order) the field (word), recording (logical), the data file, the data collection (set of files) and database (ensemble of systematized files or data collections). They are nothing but analogues of the functional information units, namely the attribute, the indicator, the file, the information collection and the information system.

4.3. The functional - informatics integration of the structuring of economic situational information

The concordance between economic structural situational informational units of the logical (of functional sense) and technical (material, informatics) types is presented in the table 1 [1, 5, 6].

Table 1. Concordance of the equivalents of economic structural situational informational units

Levels of formation	Structural situational informational units					
	Functional (logical)		Informatics (physical)			
	External	Internal	On internal memory	On external memory		
Initial (semiotical)	Sign (letter, digit, others)	Symbol	1 bit (rank, ferrite core)	1 bit (impulse)		
Primary logical	Attribute (naming, digit)	Word, field (key, value)	Semi-syllable (4 bits)	4 bits (impulses)		
			Cell (field, 8 bits, syllable)	1 octet (8 bitgs)		
			Semiword (2 cells)	2 octets		
			Word (4 cells)	4 octets		
			Double word (8 cells)	8 octets		
Logical more superior	I	Indicator	Recording	Block (physical record)	Block (section, sector, a part of track of the magnetic disc, or of magnetic tape)	
		Document	Recording, set of recordings			
	II	System of information of the led object	System of the data files (database)	Data file	Physical page	Extent-track of the magnetic disc
				Collection of data files	Physical segment	Set of the tracks, cilinder
				Module (cub of memory)	Volume (module-package of magnetic discs, magnetic tape coil, etc.)	

From the Table it is clear that according to the descriptive ray (reflecting) the concordance of the examined information units is not univocal because the possibilities of physical presentation do not always ensure the equivalence between the content and its material realization. So, depending on the content, the unity of the primary logical level (attribute, word) is materialized by the five physical units. A reverse correlation is also observed in the logical level units I and II.

The diversity of the composition of structural functional information units is motivated by the varieties of the described spatial and temporal rays, but of informatics – by the varieties of physical environments and of their possibilities to form the material amounts to fix the values of these information units in order to keep, process and utilize them.

Counterposition of the equivalents of examined units is also caused by the intention to establish as accurately and clearly as possible the achievement of one aspect of their treatment by another one. In this respect it is noticed that some units of this category in one aspect do not have structural independence (logical and physical), while in another aspect they are considered structural elements.

It is also observed the assignment of some and the same names to various logical and physical structural information units.

It should be noted that the organization of information resources in the form of the database has contributed to the formation of the new internal structural logical information units or to the modification of the names initially applied with the purpose of their bringing into line with the specific of the datologic environment of the concrete data management system (D.M.S.).

4.4. Concordance of the equivalents of structural material and informational units

In isolation from the material environment, the information loses its motivation and does not achieve the integrity of the unitary economic management process. In the interconnection, the motivation, the role and place of material and informational activities of this process are presented schematically in fig. 1.

At present, the varieties of above compartments and sub-compartments are motivated not by the categories of economic activities (material, informative, decisional), but by the level of evolution of the existing means and methods that perform these activities. At the same time, such a differentiation of the listed activities is not negligible, as without it disappears the possibility of their knowledge, study, analysis, performance, and therefore their optimal realization by means of the most productive processes and technologies.

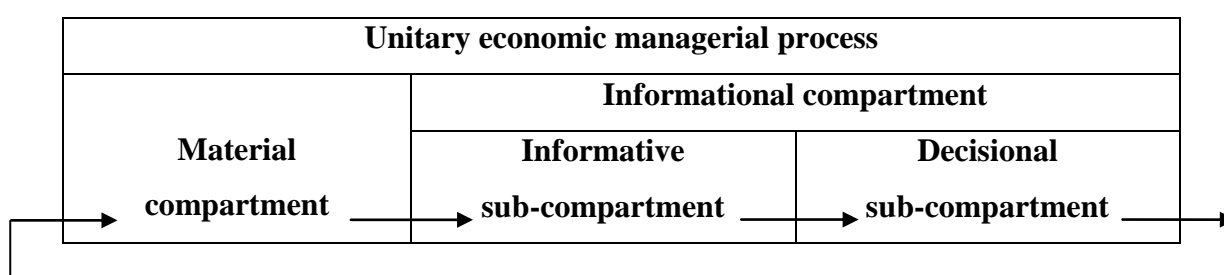


Figure 1. The composition, interconnection and interaction of compartments and sub-compartments of the unitary economic management process [1, p. 145; 3, p. 845]

At the moment, the following evolution of the structural information units is observed in the economic informational field: attribute → indicator → massif → collection → system. If the first two from those listed refer to an object or a concrete material situation and for this reason they have a particular aspect, then the next three have an attribution to sets of such objects (situations), and, therefore, they are of systemic order.

The massif of information reflects the events (resources) on the one-sided position, on the basis of some of the same quantitative and qualitative parameters. This particularity confirms that it refers to a homogeneous group of material elements. At the same time, the collection of information, also can refer to a group of this nature. But, if the massif contains one and the same composition of descriptive values for each object (the work) of the group, then the collection can consist of additional and constant values for the whole group. Finally, the information system refers to the multitude of objects of diverse composition, interconnected and interacted to obtain a common result.

On the basis of the rays and specifics of the content, it is possible to establish the consistency between the structural units of these three categories (material, informative, decisional) characteristic for the existing situation of the unitary economic management process and presented in Table 2.

The structural units of any predestination are of the static order, as each of them has its well-determined portion of functioning and influence on the objective reality. At the same time, their compositional variability depending on the spatial and temporal evolution of events is specific for dynamic structural units. That is why they include diverse structural units in various joints, the variants of which are predetermined by the concrete managerial situation. In this sense the flow of information can serve as example of such informative dynamic unit.

It is to be noted that often the flow is interpreted as oriented massive of information. In this case, only the movement and not the structural component is taken into account, which in some cases can consist of only one unit (for example, the same massif), and in others - from several units.

Table 2. The concordance of structural material and informational (situational, decisional) structural units of the unitary economic management process

Unitary economic managerial process			
Structural materials units		Structural informational units	
		Situational	Decisional
1.	Object (activity)	Attribute, indicator	Peculiar decision
2.	Uniform group of the objects (activities)	Massif of the information (array)	Unilateral of the group decision
3.	Set of the varied objects (activities)	Collection of information	Complex (multilateral) of group (groups) decision
4.	Lots of the uniforms and varied objects (activities) oriented towards achievement of a common goal	System of information	Systemic decision

5. Conclusion

- 1) The structuring of the information is done depending on the semantic and semiotic aspects of their existence and evolution, the first being materialized in a functional plan.

- 2) On the informatics environment the structuring of the information is carried out starting from the physical properties and "capabilities" of the material space of presentation, recording, distribution and organization of the values of informational units.
- 3) Depending on the mode of approach to the content and its material presentation it is necessary to divide the structural informational units into two categories - logical and physical.
- 4) Because of the pronounced variety of physical possibilities of presenting the values of information units on the material media, it is necessary to coordinate or unify the physical accomplishment of structural data units with the purpose of traversing fewer "obstacles" – physical transformation interfaces from one form of presentation to another until their storage and manipulation. Therefore, physical data units of the computer are required to be unified with the same structural units of other informatics technical means.
- 5) As the computer has two types of physical memory space, it is necessary to divide data structures into internal and external data.
- 6) According to this concept, the objective is to elaborate, systematize the composition, perform the concordance of the functional informational structural units and the situational logical and physical informational units (Table 1).
- 7) Based on the results of the concordance, the integration of the functional and informatics aspects for informative and decisional units is carried out (Fig. 1).
- 8) As a result of composition analysis of the existing situational informational units it was established that after the descriptive (reflective) ray their concordance (coincidence) is not univocal.
- 9) The concordance of the structural material, informative and decisional units is necessary for the purpose of awareness and automatic realization of the unitary management process (table 2).
- 10) Such approach contributes to the realization of the informational system as an integral unit, indispensably interconnected and interacted within the framework of the economic management system.

In this context, at present it is becoming more and more convincing that the achievement of certain performances in the informational compartment can occur through the most appropriate awareness and the most rational operation with the notions and actual structural information units.

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Rezumat

În articol sunt delimitați și elucidați motivul determinant și factorii imperativi ai necesității structurării informațiilor economice. Este accentuat caracterul obiectiv al acestei faze de management cu astfel de resurse. Așa cum în prezent și în perspectiva imprevizibilă informațiile în cauză sunt formate și manipulate în două sfere de existență și evoluție a lor – managerial și informatic (tehnic) – devine imperioasă utilitatea elucidării lor primordială în fiecare din aceste domenii, pentru ca mai apoi ele să fie integrate într-un tot unitar. Efectuarea și realizarea investigațiilor în succesiunea dată contribuie la performanțe superioare atât a domeniului de gestiune, cât și a mijloacelor și metodelor informatice aplicate pentru asigurarea funcționării lui. De asemenea, având în vedere faptul că informațiile economice dispun de o gamă destul de extinsă de aspecte de examinare, esențială devine stabilirea acelor din ele, care sunt adecvate scopului cercetării. Deoarece în articol se urmărește obiectivul integrării informațiilor în aspectele de procesare a lor în cadrul funcțiilor de gestiune și mediului informatic, incontestabil logică este tratarea lor funcțional-informatică.

Pornind de la aceste considerente, în lucrarea de față, la nivel conceptual sunt evidențiate, sistematizate și analizate unitățile constituente ale entităților informaționale de conținut economic. Este efectuată analogia dintre unitățile informaționale structurale logice (de conținut, funcționale) și fizice (informatice), iar în această bază – concordanța lor. În cadrul procesului unitar de management economic sunt aduse în corespondență unitățile structurale materiale și informaționale (situaționale (informative), decizionale). Prin astfel de abordare teoretică, cât și realizare practică se pregătește teren pentru elaborarea și funcționarea sistemelor informaționale și informatice de management economic ce acționează în regim real de timp.

Cuvinte-cheie: structurare, unități informaționale structurale, unități logice (funcționale, situaționale (informative), decizionale), unități fizice (informatice), concordanță, integrare

Аннотация

В статье раскрыты и рассмотрены определяющий мотив и настоятельные факторы необходимости структурирования экономической информации. Подчеркнут объективный характер этой фазы менеджмента информационными ресурсами. Так как в настоящее время и в непредвиденной перспективе такая информация формируется и подвергается манипулированию в двух сферах – менеджмента и информатической - становится насущной потребностью в их рассмотрении первоначально в каждой из них, для того чтобы на этой основе в дальнейшем интегрировать информационные единицы в единое целое. Выполнение и практическая реализация исследований в приведенной последовательности способствуют достижению значительных совершенств как в области управления, так и применяемых информатических средств и методов обеспечения её функционирования. Также, имея в виду тот факт, что экономическая информация обладает достаточно широкой гаммой аспектов её рассмотрения, существенным является установление тех из них, которые наиболее адекватны (подходящи) целям исследования. В связи с тем, что в статье преследуется объектив интегрирования информации в аспектах её преобразования (процессирования, переработки) в среде функций управления и в информатической среде, логически неоспоримой является её функционально-информатическое интерпретирование.

Исходя из данных соображений, в представленной работе, на концептуальном уровне, выявлены,

систематизированы и подвержены анализу составляющие информационные единицы экономического содержания. Проведена аналогия между логическими (содержательными, функциональными) и физическими (информатическими) структурными материальными и информационными единицами, а на её основе определено их соответствие. В составе единого оперативного процесса экономического менеджмента согласованы структурные материальные и информационные (ситуационные (информативные), управляющие) единицы. Посредством применения как такого теоретического подхода, так и практической реализации подготавливается почва для разработки и функционирования информатических систем экономического менеджмента, функционирующих в режиме реального времени.

Ключевые слова: *структурирование, информационные структурные логические (функциональные, информативные (ситуационные), управляющие (решения)) единицы, информационные структурные физические (информатические) единицы, соответствие, интегрирование*

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