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ESTABLISHING AND ACHIEVING THE OBJECTIVES OF ECONOMIC INFORMATION SYSTEMS THROUGH ALGORITHMS SPECIFIC TO BUSINESS APPLICATIONS

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Abstract: *The paper presents the solutions for establishing and achieving the objectives of economic information systems through algorithms specific to business applications. Any information system needs to implement different objectives in accordance with the goals of the company it develops and so it must get the optimal algorithms for resolving smart problems with appropriate solutions. Smart algorithms are capable to resolve complex problems and out of the box requirements that derived from atypical situations generated by economical situations or business logic. The information systems are included in the information systems, and they are intended to serve the management of the economic unit, so it can be appreciated that the main objective of the information system coincides with the general objective of the basic economic activities. The main objective pursued by the introduction of an information system is the selective and timely provision of all levels of management with necessary and real information for the substantiation and operational elaboration of decisions on the most efficient development of the entire activity in the economic unit. The main objective therefore refers to the entire activity in the economic unit. In order to get to know the activity better, and to carry it out in the best conditions, other secondary objectives can be defined, which are called "conditions" for achieving the main objective. There must be compatibility between the main objective and the secondary objectives, in the sense that the achievement of the secondary objectives must lead to the achievement of the main objective. By implementing mathematical models and* *using computing techniques in specific activities, the computer system imparts increased values to the information system in terms of quantity and quality.*

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JEL Classification: *C23, C26, C38, C55, C81, C87*

1. Introduction

The computer system is included in the information system and has as object of activity, in general, the process of automatic data collection, verification, transmission, storage and processing, data are the raw material and information is the finished product.

Regarding the relationship between the computer system and the information system, it can be appreciated that the computer system tends to equalize the dimensions of the information system, but does not have the same scope as the latter, because within the information system there may be activities that can not be 100% automated.

An information system is composed of the following groups of elements:

- The technical-material basis of the system;
- The necessary SI programs;
- Information base;
- Scientific and methodological basis;
- Human resources;
- The organizational framework.

The technical-material base - consists of all the equipment for data collection, verification, transmission, storage and processing. Represents the hardware of the computer system (Schubert, 2019; Livesey, 2021).

Necessary programs SI - represents the software of the computer system and includes all the programs necessary for its operation: the operating system, specialized software for data management (DBMS, SGF), application programs.

Information base - refers to the data subject to processing, information flows, systems and code nomenclatures

The scientific and methodological basis consists of mathematical models of economic processes and phenomena, methods and techniques for the realization of information systems.

Human resources - are made up of specialized staff (analysts, programmers, system engineers, database administrators, operators, etc.) and system beneficiaries. Because IT analysts cannot know the specifics of all the beneficiary units they may come in contact with over time, the IT team also recruits specialists from the beneficiary unit to have an idea of what can be done. with the computer, but especially to know very well what they want from the computer, in the context of the future computer system. Thus, a mixed team for the creation of the computer system is created (Sieja, 2019; Karimi, 2020).

Organizational framework - is specified in the organization and functioning regulation of the unit in which the computer system operates.

The functioning of a decisional information system presupposes the development of the following activities:

- collecting data on the state of the managed system and its environment;
- data transmission for processing;
- data processing in order to provide information necessary for the decision-making process;
- adopting decisions and sending them for execution;
- ensuring control and monitoring the implementation of decisions. The information system makes the connection between the managed system and the management system, being subordinated to them. This link is bidirectional. It can be said that the information system is the „shadow" of the economic processes in the unit. The use of the calculation technique produced changes in the way of carrying out the activities carried out within an information system, and implicitly determined the appearance of the computer system concept.

2. Defining business objects for economical applications

Classification of the objectives from the point of view of the fields of activity on which the economic effects are reflected:

General objectives - are the objectives that affect the basic activity within the economic unit (supply, production, sales).

Objective example: Increasing the load capacity of production capacity. It is achieved by implementing mathematical models, planning, programming, scheduling, launching and tracking production. OR by implementing advanced models and techniques for planning overhauls and overhauls of equipment.

Objective example: Increasing labor productivity. It is done through the rational use of labor (operational monitoring of personnel activity is done on the computer).

Objective example: Optimal use of transport capacity (for car parks). It is achieved by implementing mathematical models that optimize transport routes, correlating the volume of goods to be transported with the capacity of means of transport (Korab, 2019; Riechmann, 2021). Example of objectives:

Decrease in the number of administrative staff or increasing the profit and profitability of the economic unit.

Specific objectives - are the objectives that affect the functioning of the information system.

Example of objectives: Increasing the speed of response to requests from beneficiaries. Increasing accuracy and precision in the process of data processing and information management is mandatory for economical managers. Ensuring the completeness of the information necessary for the management and ensuring the opportunity of the information necessary for the management. Simplifying and streamlining information flows. The economic effects of achieving the objectives of the information system are difficult to quantify, but can be estimated. In the end, they will positively influence the development of the basic activity. In conclusion, the economic effects of IT implementation are direct and indirect.

In terms of the possibilities to quantify their effects (objectives)

- Quantifiable objectives (quantitative): increase the volume of production, decrease transport costs, decrease specific consumption of raw materials and materials
- Non-quantifiable objectives (qualitative): increasing the prestige of the economic unit - is achieved for example by increasing the quality of production (or services), decreasing the refusals to the beneficiary

At the level of an economic unit, a lot of objectives can appear, but because the resources to achieve them are limited, it is necessary to know and prioritize them according to the requirements of the management. By presenting the objectives to the management and then to the employees, it is possible to know them, better understand the requirements for achieving the objectives, and as a result will gain a closer and wider acceptance of all factors that can compete in implementing the systems (Schubert, 2019; Karimi, 2020).

Classification of information systems according to the field of activities to which they refer (field of use):

- IT systems for managing economic and social activities. Their specificity is that the input data is usually provided by man-made documents (or by manually entered data). The output data is provided by the system in the form of documents (lists, reports, graphs, etc.) for a better perception of them by humans.
- IT systems for the management of technological processes - is characterized by: Input data are provided in the form of signals (electronic pulses) transmitted by certain devices automatically, which characterize various parameters of the technological process: pressure, temperature, humidity, composition. The output data are transmitted in the form of signals to some

enforcement bodies (regulators) that automatically modify the parameters of the technological process. This executes the command and automatic control of the technological process. Examples of such systems: the technological process regarding the manufacture of cement, the direction and control of steel mills, petrochemical processes, the manufacture of paper, etc.

There are differences between the objectives of the two categories of systems. Those for the management of technological processes have as objectives the improvement of the efficiency of the aggregates, the pursuit of the safety in operation, the increase of the quality indicators of the products, the improvement of other technical-economic indicators.

IT systems for the research and design activity - they aim to ensure the automation of scientific calculations, computer aided design and other facilities necessary for the specialists in the respective fields (Sieja, 2019; Riechmann, 2021). IT systems for the management of special activities (fields) - intended for specific fields of activity: information and documentation, medicine, legal field, etc.

Depending on the hierarchical level occupied by the economic system in the organizational structure of the company:

IT systems for the management of the activity at the level of the economic unit - can be decomposed into computer subsystems associated with the functions of the economic units: SI for production, SI financial-accounting, SI commercial, SI for human resources, etc.

IT systems for the management of the activity at the level of the organizations with group structure IT systems at the level of the autonomous utilities, at the level of some departments, etc. The structure of an IS of this type results from the integration according to systemic principles of the IS related to the component units, the outputs of these IS being taken over by the IS of the management body of the entire organization.

Territorial IT systems - at the level of the administrative-territorial units, they serve the substantiation of the decisions adopted by the local management bodies (city, county).

IT systems for the management of branches, sub-branches and activities at the level of the national economy - are elaborated and administered by the ministries, departments or bodies that have by law the task of methodologically coordinating the respective groups of activities.

General functional IT systems - intersects all branches and activities that take place in the space of the national economy: the financial system, the banking system, the statistical system.

Information systems play operational, managerial and strategic support roles in business and organizations, and can be grouped into enterprise information systems, operational information systems and managerial information systems.

It is important for a manager to understand that SI directly supports functions for operational and managerial functions of the organization in accounting, finance, human resources, marketing and operational management. For example, marketing managers need information about volume and sales trends, provided by marketing IS (Applications: Sales Management,

Market research and forecasting, Promotion and advertising, Automation of the business of sales, Interactive Marketing, Customer Relationship Management – Costumer Relationship Management = CRM-, Production Management).

Economic managers need information on financial costs and benefits, provided by financial IS (Applications: Preparation of Revenue Budget and expenses, Financial Planning, Cash Management, and Investment Management). Production managers need information to analyze resource requirements and labor productivity provided by manufacturing. Personnel managers need information on rights employee salaries and professional development, provided by Information Systems of human resources (Applications: Personnel Records, Payroll and Staff Qualification Improvement) (Korab, 2019; Livesey, 2021).

Operational Information Systems processes data generated and used in business operations. Depending on the role they have, there are several categories: processing systems a transactions - records and processes data resulting from transactions, updates the bases data and produce a variety of documents and reports; process control systems - provides operational decisions that control physical processes; automated systems services - those that support communications.

Information Systems have always been necessary for the processing of data generated and used in business operations. Operational SI produce a variety of information, but they (information) does not highlight which information products are best suited for managers. For this reason, further processing through computer systems is necessary.

3. Algorithms used to integrate economic data into application modules

Searching and Sorting are two of the most common subproblems in programming. They are an essential part of many data processing processes. Search and sorting operations are frequently performed by people in everyday life, such as searching for a word in the dictionary or searching for a number in the phone book. The search is much simplified if the data in which we perform this operation are sorted (sorted, arranged) in a certain order (words in alphabetical order, numbers in ascending or descending order).

Sorting data consists of rearranging the data collection so that a field of the items in the collection follows a certain order. For example, in the phone book, each item (subscriber) has a name field, an address field, and a field for the phone number. This collection follows the alphabetical order by name field.

If the data we want to sort, that is, sort, is in the internal memory, then the process of rearranging the collection will be called internal sorting, and if the data is in a file (data collection of the same kind on the media external), then we will call the process external sorting (Sieja, 2019; Livesey, 2021).

Each element of the data collection is called an item and this in turn is made up of one or more components. A C key is associated with each item and is usually one of the components. We say that a collection of n articles is ordered ascending by the key C if C (i) ≤ C (j) for 1≤i<j≤n, and if C(i) ≥ C(j) then the string is ordered descending.

Search algorithms

There are some basic search techniques, and we'll assume that the data is in internal memory in a series of articles. We will search for an article by a field that we will consider a search key. The search process will show the position of the searched item (if any).

Noting with k1, k2, ..., kn the keys corresponding to the articles and with the key we are looking for, the problem is to find (if any) the position p with the property a = kp.

Items are usually kept in ascending order of keys, so we'll assume that k1 <k2 <.... <kn.

Sometimes it is useful to find out not only if there is an item with the desired key, but also to find where otherwise a new item with the specified key should be inserted so that the existing order is maintained.

So the search issue has the following specification:

Date a, n, (ki, i = 1, n);

Precondition: $n \in N$, $n \geq 1$ şi $k_1 < k_2 < .... < k_n$;

Results p;

Postcondition: ($p=1$ şi $a \leq k_1$) sau ($p=n+1$ şi $a > k_n$) or ($1<p\leq n$) şi ($k_{p-1} < a \leq k_p$).

To solve this problem we will describe several SUBPROGRAMS.

A first method is sequential search, in which all keys are examined successively.

```
Search Secv subprogram (a, n, K, p) is: { n∈N, n≥1 and}
{k1 <k2 <.... <kn}
{Searching for p as:}
{(p=1 şi a ≤ k1) or (p=n+1 şi a>kn)}
{or (1<p≤n) and (kp-1 < a ≤ kp)}
    Let p: = 0; {Case not yet found}
If a≤k1 then p: = 1 otherwise
If a> kn then p: = n + 1 otherwise
For i: = 2; n executes
If (p = 0) and (a≤ki) then p: = i End if
End if
End if
End if
End - SearchSecv
```

It is observed that by this method n-1 comparisons will be performed in the most unfavorable case, since the counter i will take all the values from 2 to n. The n keys divide the real axis in n + 1 intervals. The same number of comparisons will be made in n-1 of the n + 1 intervals in which the searched key can be found, so the average complexity has the same order of magnitude as the complexity in the worst case.

Obviously, in many cases this algorithm makes unnecessary calculations. Once the desired key has already been found, it is useless to cycle through the other values of i. In other words, it is possible to replace the FOR cycle with a TIME cycle.

```
CautSucc subprogram (a, n, K, p) is: {n∈N, n≥1 and}
{k1 <k2 <.... <kn}
{Searching for p as:}
{(p=1 şi a ≤ k1) or (p=n+1 şi a>kn)}
{or (1<p≤n) şi (kp-1 < a ≤ kp)}
    Let p: = 1;
    If a> k1 then
While p≤n şi a>kp execute p: = p + 1 End while
End if
End-SearchSecv
```

Another method, called binary search, which is much more efficient, uses the "divide et impera" technique on data, determines the relationship between the key of the item in the middle of the collection and the search key. Following this check, the search is continued in only half of the collection. This reduces the volume of the remaining collection for search by successive halves. Binary search can be done practically by calling the BinarySearch function (a, n, K, 1, n), described below, used in the subprogram given below.

```
The SearchBin subprogram (a, n, K, p) is: { n∈N, n≥1 şi k1 < k2
< .... < kn }
{Find p such that: (p=1 and a ≤ k1) or}
{(p=n+1 şi a>kn) or (1<p≤n) şi (kp-1 < a ≤ kp)}
If a≤k1 then p: = 1 otherwise
If a>kn then p: = n + 1 otherwise
p: = BinarySearch (a, n, K, 1, n)
End if
End if
sf-SearchBin
The BinarySearch function (a, n, K, St, Dr) is:
If St≥Dr-1
then BinarySearch: = Dr
otherwise m: = (St + Dr) Div 2;
If a≤K[m]
then BinarySearch: = BinarySearch (a, n, K, St, m)
otherwise BinarySearch: = BinarySearch (a, n, K, m, Dr)
End if
End if
End-BinarySearch
```

In the BinarySearch function described above, the variables St and Dr represent the ends of the search range, and m represents the middle of this range. Note that the BinarySearch function is called recursively. Recursion can be easily removed, as can be seen in the following function:

```
The BinSeaNotrec function (a, n, K, St, Dr) is:
While Dr-St> 1 executes
m: = (St + Dr) Div 2;
If a≤K[m]
then Dr: = m
otherwise St: = m
End if
End if
BinSeaNotrec: = Dr
End-BinSeaNotrec
```

An algorithm is a finite text, a finite sequence of sentences of a language. Because it is invented specifically for this purpose, such a language is called algorithm description language. Each sentence of the language specifies a certain rule of calculation, as will be seen when we present the language Pseudocode (Schubert 2019; Riechmann 2021). Stopping at the meaning of the algorithm, at the effect of its execution, we will notice that each algorithm defines a mathematical function. Also, from all the following sections it will be very clear that an algorithm is written to solve a problem. However, it will be seen from several examples that there are several algorithms for solving the same problem.

4. Conclusions

Within the informational process, the information formation phases take place economic: collecting data resulting from the direct productive process of the system economic, their verification and transmission for the actual processing (regardless of technical means), the formation of economic information and its archiving. Part of the phases of the information process (eg data collection from primary evidence) is performed within the operational (managed) subsystem of the system economic. It can be appreciated that the subsystem in which the information process takes place together with part of the operational subsystem it forms the managed subsystem of information cybernetic system. The main role of the information subsystem is to provide information for the management of the entire economic system, for the functioning of the information system and for its maintenance within some preset limits (Sieja, 2019; Korab, 2019). Algorithms solve complex economic problems, which can be automated or can solve atypical and specific situations by adapting different application modules to meet the requirements of economic operators.

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