

## EXECUTIVE INFORMATION SYSTEMS' (EIS) STRUCTURE AND THEIR IMPORTANCE IN DECISION-MAKING. A COMPARISON BETWEEN DECISION SUPPORT COMPUTER SYSTEMS

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### ABSTRACT

*The rise of competitiveness at the economic level due to the acceleration of decisions-taking process as a result of situations occurring within a company led to the creation of information systems that enhance the managers' knowledge of the environment where the organization operates. The abundance of information solutions help the decision makers within a company steer better in the business they belong to.*

*Due to the fact that the information processed by means of information systems comes from the majority of departments in a company, the management can thus identify the source of problems and take measures to correct the errors encountered.*

**KEYWORDS:** *Executive Information Systems, Decision Support Systems, Management Information Systems, EIS structure, decision making*

### 1 INTRODUCTION

The ability to use computers as a part of the information systems in business has been put into service since the early 1960s. The first applications mainly targeted the mechanization of existing tasks. Once the computer systems have evolved, applications were designed with a view to support the organization management.

The oldest approach was the introduction of Management Information Systems (MIS). These systems were operated by individuals who had advanced knowledge in the field of information solutions and were used to generate reports containing information about the organization.

Later, for managers to be helped, the Decision Support Systems (DSS) are introduced. They offered assistance to management concerning specific decision-making tasks and provided analytical capabilities to handle large data volumes.

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However, despite the superiority of both systems over non-computerized solutions and the relative success within small and medium enterprises, they failed to supply the necessary assistance to executive management [1].

These systems have contributed to the configuration of the existing technology in the field. Once the Internet became widespread and got developed, research in the field of information technology has intensified and led to the creation of advanced computing solutions that would come to the aid of executive management.

The spread of communications networks has led to the development of databases and tools for analysing them. Therefore, the Executive Information Systems (EIS) appeared, which, according to Applegate, are defined as „a computerized system that allows managers to access information sources, internal and external, which have been restricted to an easily accessible graphical system”[2].

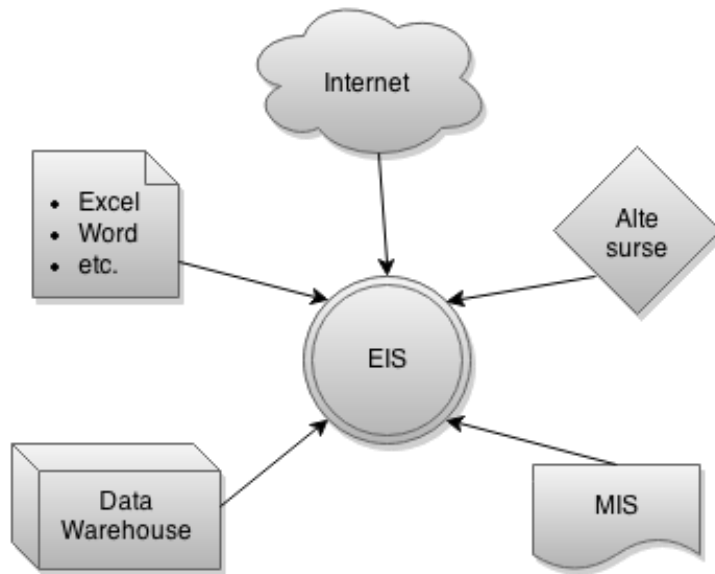
An Executive Information System (EIS) represents a type of Management Information System (MIS) whose purpose is to facilitate access to information and support executive management in the decision-taking process, by offering internal and external information, relevant in reaching the organization strategic objectives.

The EIS targets executive management that needs a rapid evaluation of the company situation or of a company department. These systems are meant for users who urgently need information that helps the decision-making process.

After carrying out an analysis on the EIS operation manner, we have come to the conclusion that the idea behind an EIS is to facilitate comparison and display of information, without subsequent processing. The user can therefore see the situation where the department concerned is to be found, this allowing them to focus on the decision-making process.

Generally speaking, an EIS is created to display data, such as sales receipts, pending orders etc. This information can then be used to make decisions in relation to the development and expansion of the activity or its restriction in order to protect the company from any possible financial issues.

The advantage of an Executive Information System is that it uses data from various sources which can be easily read and interpreted (Data Sources for the EIS - fig. 1). At the same time, an EIS offers the possibility to the user to obtain detailed results for the information required.



EIS Data Sources – Fig. 1

(Other sources)

The objective of creating an EIS was to develop computer applications that would highlight information aimed at helping top-management. Typically, an EIS provides data that only decision-makers in a company can use.

## **2 EIS STRUCTURE**

The structure of an EIS is made of the following elements:

### **a) Hardware**

The hardware configuration of a computer solution of the EIS type must meet both the needs of management, that operate the EIS at the executive level, as well as the needs of the other departments that populate the database with the information that is processed by the system.

For the hardware configuration of an EIS, the following components are to be considered:

- Entry data introduction devices (PC on which employees use to enter data, barcode reader etc.);
- At least one LAN network (allowing the interconnection of all devices that enter data with the database);
- Units that store information (Servers that host the database and process the requirements of the executive body);
- Information display devices (PC or other mobile devices which management use to view the reports that an Executive information System generates).

b) Software

The software is essential in designing an effective EIS. Therefore, the software components and the manner in which they manage to integrate data into a single system, are very important. The basic software needed for an EIS includes three components:

- Basic software – text (documents and data);
- Data Base (where all the data received from external and external sources is collected);
- Graphic software (transforms all the data from the data base into visual diagram-based information);

c) Interface

An EIS must collect the relevant data and submit them to the decision makers. The interface of an Executive Information System is a crucial component and must be designed so that the data presented should be comprehensible and easy to interpret. This represents the element of interaction between the user and the information stored. Its aim is that the person who interacts with the data be able to monitor processes and receive the feedback needed to take a decision.

The user interface concept includes interactive aspects that facilitate system operation and interaction with its components. The design of the interface is logically designed so that the user may be able to grasp the functionality of the controls. In general, interfaces are based on the following mechanism:

- Entry - allows users data introduction and system manipulation;
- Exit-allows users to see the results of their interaction with the system;

In general, the objective of the user-system interaction user system through an interface is to achieve a result by means of the introduction of minimum controls, thus rendering the system capable of distinguishing between useful results and the rest.

Î Lately, due to new technologies, the trend is to create an EIS on online platforms. Thus, access to the application can be done anywhere and the investment in hardware is diminished due to "Cloud Computing" which allows the download of information in an environment where resources are theoretically limitless. Most companies, however, opt for a system that takes all the data and operates by means of data-centers owned by that company or even located in the company premises. This usually happens because they are concerned with the level of information security.

We are tackling the "User Interface" as a distinct element (apart from software) because we consider that it has an equally important role in relation to the other elements.

When the objectives are represented by the creation of an Executive Information System, the factors which should be taken into account are: the configuration of the hardware and the software applications (including user interface). These elements are extremely important in order to obtain the desired results.

The problems that can arise if the hardware configuration does not match the data flow or if the software applications are not well configured and chosen, are likely to lead to a misuse of the system by displaying partial or erroneous results or even to data loss.

### **3 THE DECISION-TAKING PROCESS IN A COMPANY**

According to the *Oxford Dictionary*, decision-taking represents „the action or process of making important decisions”[3]. Therefore, taking a decision involves a process where the problem and its solving are analyzed with a view to ensure that the decisions taken are to be effective. An effective decision, according to Peter F. Drucker, involves five steps: [4]:

- a. Clear realization of the fact that the problem is generic and can be solved only by establishing rules or principles;
- b. Definition of particularities that problem-solving must satisfy;
- c. Thought-processing over what is "to be done", as the solution to meet all the requirements laid down, should be given consideration before the adaptations, compromise and all the necessary concessions for the solution to be acceptable;
- d. The creation, on the basis of the decisions, of the necessary steps to be taken for the fulfillment of the objective;
- e. The "Feedback" that shows the validity and efficiency of the decisions over the current flow of events;

Therefore, these steps contribute to making the right decisions whose repercussions are important for an analysis.

The first step, as indicated by Drucker, refers to the level of awareness regarding the problem and its implications. Consequently, identifying the problem is the first step in the decision-taking process. It is said that a *well-defined problem is a half-solved one* (quote by Charles F. KETTERING). Relevant information for the problem should be gathered in order to carry out an analysis of the causes and nature of the problem, therefore, making it possible for the problem to be detected.

A clear distinction must be made between the problem and its symptoms, which can many times cover the real causes. Therefore, a manager must seek out the "critical factor" in the workplace. At the same time, the manager must take into account the causes and determine whether they are controllable or not. Thus, they may lay down rules or principles with regard to solving the problem.

The second step concerns the characteristics of the solution offered in solving the problem. To define the characteristics, it is necessary that the problem should be known in detail. The business world is replete with relevant information due to the development of information technology. All available information should be utilized to the full in order to complete an analysis of the problem, clarifying all the aspects of this problem. At the same time, the characteristics of the problem are determined by its nature as well. Thus, at the same time as the establishment of the causes, one is to define the requirements that must be met and which must be taken into account in solving the problem.

The third step, as expressed by Drucker, refers to finding a "crude" solution for solving the problem. This solution should have a single objective, solving the problem. At the same time, we must not take into account the collateral implications of the solution given. The existence of this solution is conditional on fulfilment of the previously established requirements, as a consequence of the analysis made upon the factors that led to the emergence of the problem.

The fourth step involves the definition of the necessary steps to solve the problem. At the same time, it also takes the creation of alternative solutions concerning the action taken. Once the problem has been determined, on the basis of relevant information, the manager must establish alternative actions that can be used in solving the problem. Only realistic alternative solutions should be taken into account. It is equally important to take into account the time and cost constraints and the psychological barriers that will restrict the number of alternative solutions.

After finding alternative solutions, the next step in the decision-making process is to select an alternative that seems to be the most suitable in problem solving. Alternative choice must also be presented to the group that may be affected by its implementation. Acceptance of the decision by the members of the group is always useful and desirable for its implementation to be effective.

After choosing the decision, the next step is to transpose the decision into effective action. Without such action, the decision will remain merely a statement of good intentions. The manager must transform its decision into the employees' decision as well. In order to achieve this, his subordinates should be able to trust this decision. Subsequently, the manager must follow the evolution of the decision.

Feedback is the final step in the decision-making process. At this point, the manager must ensure the existence of channels through which feedback is to be obtained, thus monitoring the progress of the decision. Feedback can come in the form of organised information, reports or observations. The importance of the feedback received is that it affects the course of the decision. Therefore, the original decision may suffer adjustments along the way, whenever feedback is not positive or when more effective solutions can be found along the way.

We consider that the process of decision making at the executive level represents an action which involves the analysis of information, the creation of solutions and their implementation. At the same time, the entire process includes several areas of activity from a company and imposes rules and principles on how to solve the problem encountered.

#### **4 THE ROLE OF INFORMATION SYSTEMS IN THE DECISION-MAKING PROCESS**

It is well-known that information plays a crucial role in the success or failure of an organization. "Any information obtained by the decision-makers will have a low impact on the company's performance if it is not taken into account in the decision-making process" [5]. Even if the same information is also available to other companies operating in the same industry, competitive advantages consist in how information is used and its impact.

The organizations that have learned to use the information they possess experience a larger development on the market where they operate. The usage of information helps create higher values and helps identify competitive advantages. Therefore, the actions taken by the organisations who use the information they have helps increase the performance of those organisations.

Executive Information Systems play an important role in the decision-making process within companies. The preliminary results of the research made by George Ditsa show that "there is a high degree of utilization of systems of the EIS type [...], the users considering the information received from an EIS" as satisfactory [6]. Therefore, the

utilization degree of the reports processed through an Executive Information System is quite high. Thus, the information received is used in the decision-making process.

Organizations tend to rely increasingly more on the development of strategies undertaken following the analysis of the information received, both within the firm and outside it. The data analyzed in terms of drawing up a strategy have a very vast content.

For example, for a company that wants to expand and sell its products outside the country borders to be able to do this successfully it takes an analysis of the internal factors (the finance available for the expansion, the production capacity etc.) and the external ones as well (relating more to the country where they wish to operate). Therefore, it is very important for the company to know information related to case-law, taxation, culture, social data etc. which are to be taken into account and included them in its development plans.

It is proven that the companies that have integrated a computer system that retains and processes information related to the activity of the company in question have a higher degree of success. This is the result of the use of information obtained from the information systems and their inclusion in the decision-making process.

The decision-making process is "complex, involving many variables that cannot be fully understood " [7]. At the same time, this represents an integral part of management and manifests itself at each decision-making level, such as the strategic one (strategic management deals with the development of organizational goals, strategies and policies as an integral part of the process of strategic planning), tactical (develops short and medium-term planning and environmental policies, budgets and drafts the policies that function as guidelines for the running of the company) and operational (short term plans such as the planning production for the week under way). The making of a decision is based on information, and the information is needed to determine the structure of the problem, explore and choose the solutions and to analyse the effects of the solution adopted.

We think that information in the form of reports generated within the "decision making" modules is extremely useful and is included in the decision-making process. In this regard, organizations tend to rely to a high extent on the information provided by the implemented computer systems. Decision makers will no longer be confronted with a variety of uncertainties and decisions are based on accurate data. Therefore, more often than not, the actions of managers will have the estimated result.

## **5 DECISION SUPPORT SYSTEMS - DSS**

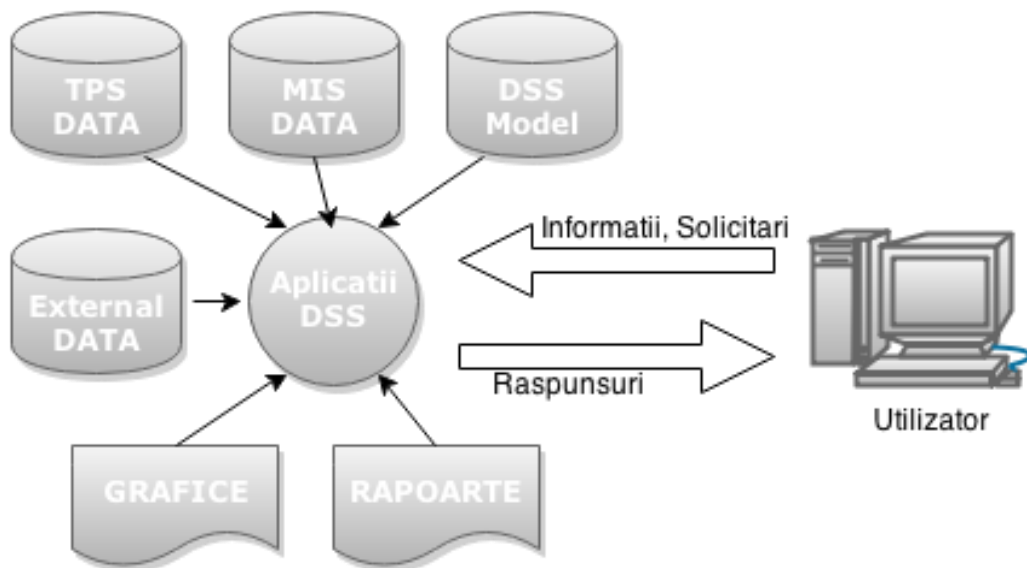
Decision Support Systems have been created at the same time with the development of computing systems and their reduction of size. The history of the use of such systems starts in the mid-1960s.

The concept of Decision Support System is perceived differently by various authors, thus, in an article written by K.P. Tripathi, he defines a DSS as being "an interactive computer system, flexible and adaptable using rules and models and which is connected to a database and the decision makers have access to the information that can assist them in solving the problems they encountered. Thus, a DSS supports a complex decision-making process and increases its effectiveness "[8].

A DSS uses synthesized information, exceptions, patterns and trends using analytical models. Decision Support Systems help in the decision-making process, but do not provide a decision per se. Decision-makers take useful information from raw data, documents, personal knowledge etc., to identify and solve problems. Decisions are taken on the basis of this process (The architecture of a DSS - Fig. 2).

The characteristics of a Decision Support System are:

- Provides support for decision-makers in semi-structured and structured problems;
- Offers support to managers in various managerial levels;
- Supplies support in design, choice and implementation processes;
- Is adaptable according to the needs and the type of data analysed;



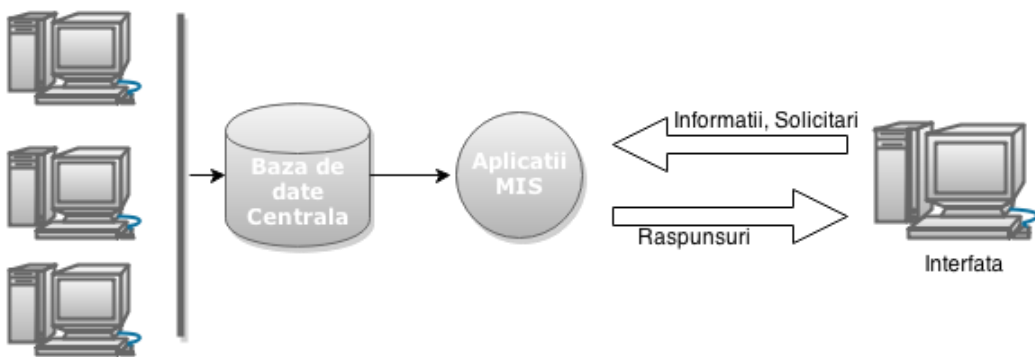
(DSS Applications, Graphs, Reports, Information, Requirements; Answers; User)

Architecture of a DSS - Fig. 2

## 6 THE MANAGEMENT INFORMATION SYSTEM - MIS

The Management Information System is a system for data collection, storage and dissemination in the form of the information needed to carry out the duties of the management (Architecture of an MIS – Fig. 3).

For a manager, the Management Information System represents an implementation of organization systems and procedures. The objectives of such a system are the implementation of the organizational structure and the dynamics of the economic entity in order to lead the organization in an effective way.



Architecture of an MIS – Fig. 3

(Central Data Base, MIS Applications; Information, Requirements; Answers; Interface)

At the same time, through data collection and processing, the use of an MIS aims at maintaining the degree of competitiveness of the company.

The characteristics of a Management Information System are the following:

- It is based on long-term planning;
- Offers an all-encompassing view of the organization structure and dynamics;
- It relies upon strategic, strategic and operational information;
- Notifies the management about exceptional situations;
- Generates advanced information, thus providing a competitive advantage;
- Creates links between all the sub-systems in the organization, supplying the management a clear picture on problems;
- Uses a central data base.

## 7 COMPARISON BETWEEN EIS, DSS AND MIS

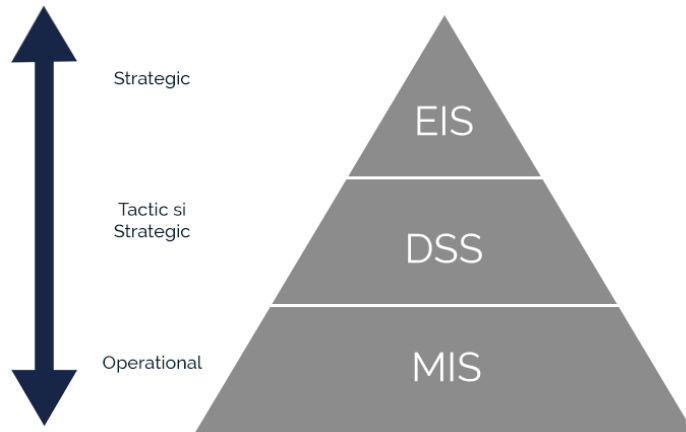
In the book *Executive Information Systems*, Ion Lungu and Adela Bâra highlight the following remarkable differences between a Decision Support System and an Executive Information System[9]:

- a) *The volume of information and flexibility.* An EIS is able to collect information from both internal and external sources, processing these data through a set of tools that allow it to adapt to the needs of the user;
- b) *The degree of specialization.* Most of the solutions of DSS type are functionally specialized, so they can meet the needs of a specific group within the organization's management. On the other hand, an Executive Information System caters for all the needs of the executive management of the company;
- c) *Interface.* The interface of a Decision Support System is complex and requires time and advanced knowledge in computer use. The EIS has a "user-friendly" interface and is geared for persons who do not have the time available to get familiar with complex interfaces and advanced data-mining processes;
- d) *The speed of response.* Executive Information Systems are optimized in order to get replies as rapidly as possible, unlike DSS which works with large volumes of data and whose interface requires additional resources.

We can notice that Management Information Systems, unlike the Executive Information Systems, are more complex regarding the reporting process and are built on systems for processing transactions. They are often used to support structured decisions, described in detail.

MIS supports the strategic level of management, but they are usually used at other decision-making levels.

As it can be seen in the figure below, the three information systems operate at different levels of decision-making. The Executive Information Systems (EIS) are designed to provide essential information to top management in an organization (Levels of decision-fig. 4). Here you can see the type of data taken from the organization by an EIS: i.e. it retrieves data which both MIS and DSS process and work with.



Decision Levels – Fig. 4

(Strategic, Tactical and Strategic, Operational)

## 8 CONCLUSIONS

The use of information systems in the framework of organizations represent a key element for the activity of the economic entity and, at the same time, for the management of that entity. Information systems support the organizing, planning and rendering efficient of the whole decision-making process, but they also constitute a good aid in knowing the organization situation and capacity to develop.

According to the needs of the company, there exist several information systems that are capable of organizing and synthesizing the information so as for every department to be monitored. The differences between the three types of information systems analyzed above provide a clear vision of the manner of information reporting. Consequently, according to the decision level, the degree of usage of these systems is varied because their efficiency from one level to the other is different. For the top-management to succeed in making strategic decisions, the level of information they analyze must be structured so as to supply a large perspective over the entire activity undertaken.

The projected information systems must be capable of presenting the information in a clear manner, easy to understand and use for them to prove their efficiency and the level of usage to be high.

More often than once, the management from the strategic level of companies who do not operate abroad are reluctant in using an information system that would provide a view of

the activity of the organization they coordinate. This is due to the fact that the operation of most information systems require advanced skills in the field.

Executive Information Systems are thus designed so as to require a low level of operation skills for the usage degree to rise. As a consequence, the efficiency of such an implemented system increases.

As for the usage of a Decision Support System, it is capable of providing structured data on the organization which can be subsequently used in the decision-making process. The synthesis capacity of such a system is high, but the level of information skills needed to operate it is higher than in the case of an Executive Information System.

The role of Management Information Systems is to supply information from all the departments of the company. Therefore, the information quantity is high, but its usage in the decision-making process is not efficient.

The management of strategic level requires synthesized information that target the development opportunities of the company or the problems existing there. Consequently, economic information play a crucial role for the top-management, as what happens in the administrative departments is only relevant to the management of the operational level.

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