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РУМЪНСКА АКАДЕМИЯ, ИНСТИТУТ ЗА НАЦИОНАЛНА ИКОНОМИКА

INFORMATION SYSTEMS AND HIERARCHICAL LEVELS OF MANAGEMENT

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Abstract: When the stress is put on the use of information systems, their relations to the hierarchical levels of management and managerial decisions taken at each level should be studied. Particular information needs and requirements are formed at each level and in order to meet them certain information technologies should be implemented. When the stress is put on the use of information systems, their relations to the hierarchical levels of management and managerial decisions taken at each level should be studied. Particular information needs and requirements are formed at each level and in order to meet them certain information technologies should be implemented.

Keywords: Information Systems, Decision Making, Hierarchical Management Levels

Decision making is the major task of the company's managers. Such decisions present their conscious will and are results of their activities. They demonstrate the managers' powers. These decisions involve the necessary actions, affecting the business establishments' operations. In any establishment at any level the managers take decisions. The final purposes of such decisions could be the survival of the establishment, as well as the basic salary of a new employee. All decisions influence to a certain extent – great or small – the activities of the company. Therefore the managers have to develop their decision-making capacity.

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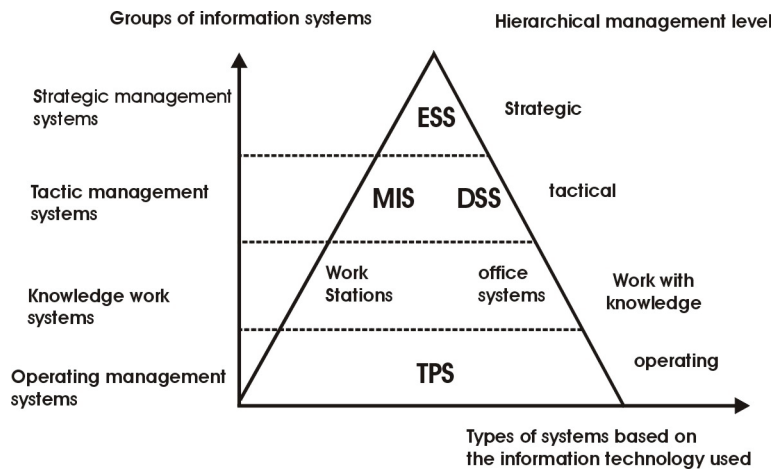
information technologies should be implemented.

Based on the hierarchical level of management, on the decisions made at each level and on the information technologies used the following major groups and types of information systems could be differentiated: (Fig.1)

- Operating management systems - TPS – Transaction Processing Systems
- Knowledge work systems – work stations, office systems;
- Tactical management systems - MIS - Management Information Systems, and DSS - Decision Support System;
- Strategic management systems – systems supporting the chief executive (ESS - Executive Support Systems),

This classification is essential for the estimation of capacities, role and significance of information systems in managerial decisions taking within the business establishment.

Figure 1 Types of information systems based on the hierarchical level of management and information technologies used



Source: Nutt P., *Making Tough Decisions. Tactics for Improving Managerial Decision Making*, Oxford, 1990, p. 126

From consumers' point of view the **operating management systems** maintain the implementation of the business establishment's every day activities and provide options for their control. The major aim of such systems is to answer some questions, as: what is the quantity of merchandise available in stock; what is the amount of remuneration paid for the month; what is the number of the absent workers and employees; are there any vacant rooms in the hotel, etc.

From information technologies' point of view the operating management systems are implemented as transaction processing systems, also called systems of computerized data processing. Transaction in information systems is any activity related to functioning of a particular organization.

The transaction processing systems are computerized systems supporting the performance of routine operations within the organization, as for example: accepting an order for purchase of goods or services; employing a worker; preparing an invoice; emitting a cash slip, opening/closing an account, drawing on/depositing sums in accounts, etc. They contribute to the

promptness and accuracy of data processing.

The transaction processing systems are connected with the decisions taken at the lowest level within the management systems and usually in one functional area (for example, marketing and sales, accounting). Examples of such systems are the hotel reservation systems, order systems, automated telling machines, etc. Upon transaction processing the *data* are usually *calculated, classified, sorted, saved and read, and summarized*. Any transaction could be described through these operations.

At an operative management level the decisions related to assignments, goals and resources are clearly defined. The number of transactions is typically great. There is a similarity between the transactions in different establishments. The procedures for their implementation are well known – they determine the sequence of steps for the transaction implementation, information subject to processing and storing, its protection, actions to be undertaken upon errors. Table 1 presents the sequence of steps for the implementation of "Making a reservation with a hotel".

Table 1. "Hotel Reservation" Transaction

Receptionist	Computer information system
1.Introduction of a module – reservation 2.Accounting for the basic services used by the client 3.Protection of customer’s valuables in the hotel 4.Customer’s leaving the hotel	1.1.Providing the customer with a key and the hotel passport 2.1.Checking the type and payment performed by the customer – cash, credit card, bank transfer, etc. 3.1.Operating with the safe-keeping system – in individual safes or a common safe. 3.2.Provision of an invoice and a key, proving that the customer is the holder of the safe 4.1. Changing the room status from “being vacated” into “vacant not replenished” 4.2.After the customer’s departure the data are automatically deleted 4.3. Preparing for a new transaction

It is comparatively easy to make the transaction automatic as the PC programs usually follow strictly the steps of manual processing. Standard projects, as well as ready-to-use packages can be implemented.

The **knowledge work systems** are significant for managerial decision taking, as they contribute to new knowledge integration and generation within an establishment, as well as to new product planning. This is implemented through the use of specialized *work stations*, providing means of analysis, graphical processing, documents management, communications. They provide the capacity for performance of complex mathematical calculations, models visualization, real processes simulation, etc.

At this level of management the *office systems* are also implemented to disseminate information, manage the documents flow, to coordinate the activities, to facilitate the communications between the employees. Usually the office systems involve means of work processing, desk publishing activity, communications (electronic mail, video conferences, voice mail), electronic diary.

Tactic management systems are used by the medium management level. This is the level where management information systems and decision support systems are

applied to facilitate the decision making process. *Management information systems* provide periodic (weekly, monthly, annual, etc.) reports on the company activities summarizing the data collected by the transaction processing systems. Therefore they are called report systems. They are used in *structured decisions* making. This is the case when we know what information we need to make the decision, what factors should be taken into consideration, what parameters determine if the decision is right or wrong.

If we take for example the above-mentioned case for hotel reservation, we could generate periodic reports for the reservations made on the basis of the data collected upon daily transactions processing. Such reports would be criteria for taking of decisions on:

- ✓ Efficiency of work in the respective hotel;
- ✓ Proportion between the reservations made and refused;
- ✓ Improvement of attendance in the hotel;
- ✓ Introduction of modern technical media.

In order to take such decisions external information – i.e. economic trends, central bank’s interest rate, need for loans, etc. – should be taken into consideration.

The traditional management systems are typically not flexible, they do not provide great analytical capacities, the form and contents of reports are pre-set and are not subject to change. The new systems of this kind are more flexible – their software provides the manager with the opportunity to compile new reports, to combine upon one's desire data from different transaction processing and knowledge work systems.

Decision support systems are applied in taking of *semi-structured and unstructured decisions*, for which there is no explicit procedure, and the estimation factors can not be preliminarily determined. Such decisions are to be taken relatively rarely – this is not a periodic process. For example, for the introduction of on-line reservations the following questions should be answered:

- ✓ What is the cost of this variant?
- ✓ How much would this variant help the customer?
- ✓ Should the existing variants of supply of tourism services be retained?
- ✓ How would this variant affect the policy of the respective hotel?

The practice proves that it is not possible to provide adequate reports to facilitate the process of such decisions making. Consequently the decision support systems should be flexible. They should give the manager the opportunity to determine what information he/she needs and how he/she could obtain it. Decision support systems provide greater analytical capacities as compared to the tactic management systems. They are based on data analysis models. They render operative account of the information from environment – for example, the prices quoted at commodity and stock markets. Decision support systems should be designed in a manner letting the manager work easily with them, so that the managers could use efficiently and completely their functional capacities.

Strategic management systems are used for strategic decision making. They provide the managers with the opportunity to answer questions as: in what area we

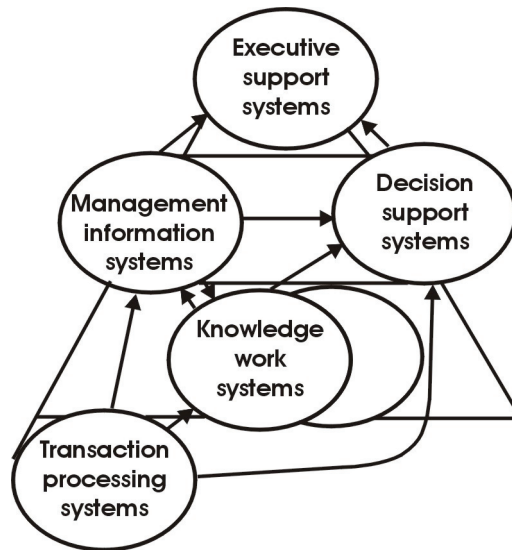
can develop our business; what investments we should make to protect our business from cyclic crises; which assets of the company we should sell in order to provide resources for the new investments. For this purpose a class of information systems called *executive support systems* is applied. They provide the opportunity to take unstructured decisions. Unlike other information system, those supporting the chief executive are not designed to solve particular problems. They provide a common computer and communication medium, which supports the solution of a dynamically changing set of assignments. Executive support systems are designed to extract summarized information from the management information systems and decision support systems. At the same time they receive information from the outer environment – for example, of new laws, competitors, etc., and filter, compress and monitor critical data.

Usually the executive support systems have limited analytical capacities, but they provide a powerful software for graphic processing and are able to submit promptly data from different sources in the office of the chief executive or in the conference hall.

It should be taken into consideration that the executives work in a quickly changing environment. The questions they should answer are also changing and could not be foreseen. Therefore the executive support systems should be able to *adapt* to dynamic changes. At the same time their implementation should be easy and comfortable, and if possible, to change in accordance with the executive's individual style, with his/her requirements and preferences.

For the executives taking managerial decisions it is important to know the relations between the major types of information systems used at different hierarchical levels of management within the organization. It is essential to realize that the systems at lower levels usually provide data for the systems at higher levels (see figure 2).

Figure 2 Relations between the major types of information systems at different hierarchical levels



Source: Laudon K. and J. Laudon, *Management Information Systems*, Pearson Prentice Hall Intl, 2004, p.210

There should be integration among the different types of systems to provide circulation of information throughout the different levels of management. But this is an expensive process. Usually in practice the integration between systems is implemented evolutionally. Most of the systems are separately developed, as their parallel development would require huge investments. This evolutionary approach is now showing some negative consequences, resulting mainly from the

poor integration between the separate systems. There are some data doubling or contradictions. These reduce the efficiency and some narrow spots in functioning of the organization occur. Some of the large-scale companies like „General Motors“, „Ford“, „IBM“ can afford and proceed to the development of *integrated information systems*, performing reengineering of their activities. As a result of this their competitive power on the global market is enhanced.

Table.2. Organization's basic functions

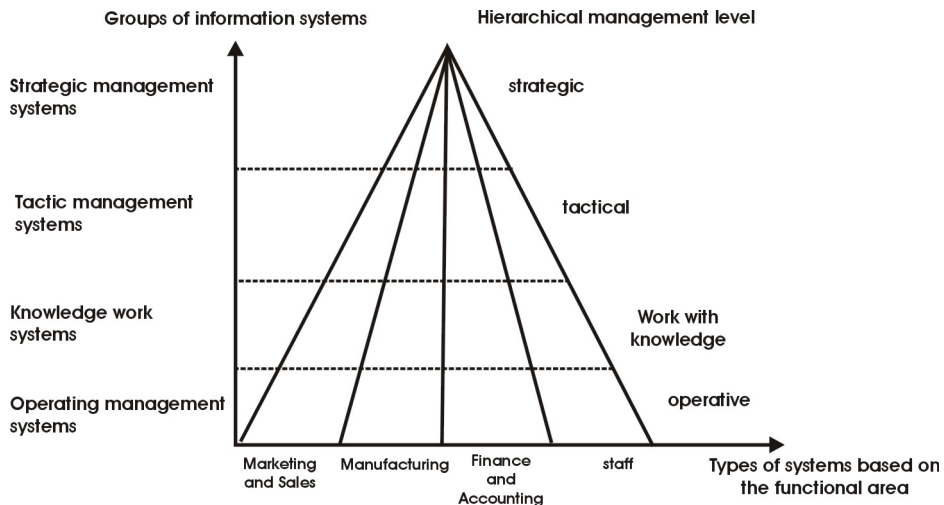
Function	Contents
Manufacturing	Goods manufacturing and services rendering. This function determines the branch to which the organization belongs
Marketing and sales	Selling the goods and services produced

Finance and accounting	Management of the organization's financial resources (money, shares, securities). Rendering account of the movement of financial resources
Staff	Employment and development of labour force, maintenance of information concerning staff, work done, remuneration

The basic functions of the organization (see Table 2) are supported by differentiated systems – for example for marketing and sales, for staff management, etc. In the large organization the information support of sub-functions of major functions is also differentiated. For example, the

function of manufacturing can be decomposed into process management, materials planning, designing, etc. In banking this function can be decomposed into customers' attendance, settlements between banks, support of services provided and sales among banks.

Figure 3 Types of information systems according to hierarchical levels and functional areas



The implementation of the organization's basic functions is supported at all hierarchical levels of management (see Figure 3). For example for the sales at an operating level a system of order processing is used; through the knowledge work systems the product promotions are planned; the management system monitors the reports of actual sales by regions, by periods, as well as their proportion in planned sales; long-term sales forecasts are worked up at a strategic level.

Different organizations develop different systems for the same functional areas, as

each of them has specific goals, strategies, structure and carries out particular activities in a different manner. For some standard activities as accounting, pay-roll preparing, etc. it is possible to use standard decisions, but they usually have to be additionally adjusted and adapted.

The reform in information era is considered a relatively new activity, in which the information systems and technologies play an essential, sometimes leading part for managerial decision making. The changes necessitated by information technologies, occupy and have

always occupied a significant part in the changes performed within the organizations. The tangible novelty in the reform of information era is the existence of information technologies and the role they play in managerial decision making.

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