

Basics of information systems

Lecture 2 Structure and classification of the information system.

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INFORMATION SYSTEM STRUCTURE

THE SYSTEM (FROM THE GREEK SYSTEMA - THE WHOLE, MADE UP OF PARTS OF THE COMPOUND) - IS A SET OF ELEMENTS THAT INTERACT WITH EACH OTHER, FORMING A CERTAIN INTEGRITY, UNITY. WE GIVE SOME CONCEPTS THAT ARE OFTEN USED TO CHARACTERIZE THE SYSTEM.

A SYSTEM ELEMENT IS A PART OF A SYSTEM THAT HAS A SPECIFIC FUNCTIONAL PURPOSE. COMPLEX ELEMENTS OF SYSTEMS, IN TURN, CONSISTING OF SIMPLER INTERCONNECTED ELEMENTS, ARE OFTEN CALLED SUBSYSTEMS.

THE ORGANIZATION OF THE SYSTEM IS INTERNAL ORDERING, CONSISTENCY OF INTERACTION BETWEEN THE ELEMENTS OF THE SYSTEM, MANIFESTED, IN PARTICULAR, IN LIMITING THE DIVERSITY OF THE STATES OF THE ELEMENTS WITHIN THE SYSTEM. THE STRUCTURE OF THE SYSTEM - THE COMPOSITION, ORDER AND PRINCIPLES OF INTERACTION OF THE ELEMENTS OF THE SYSTEM THAT DETERMINE THE BASIC PROPERTIES OF THE SYSTEM. IF THE INDIVIDUAL ELEMENTS OF THE SYSTEM ARE SEPARATED BY DIFFERENT LEVELS AND THE INTERNAL CONNECTIONS BETWEEN THE ELEMENTS ARE ORGANIZED ONLY FROM THE HIGHER TO THE LOWER LEVELS AND VICE VERSA, THEN THEY TALK ABOUT THE HIERARCHICAL STRUCTURE OF THE SYSTEM. PURELY HIERARCHICAL STRUCTURES ARE RARELY FOUND; THEREFORE, SOMEWHAT EXPANDING THIS CONCEPT, THE HIERARCHICAL STRUCTURE IS USUALLY UNDERSTOOD AS SUCH STRUCTURES WHERE, AMONG OTHER CONNECTIONS, HIERARCHICAL CONNECTIONS ARE OF PARAMOUNT IMPORTANCE. SYSTEM ARCHITECTURE - A SET OF SYSTEM PROPERTIES THAT ARE ESSENTIAL FOR THE USER. THE INTEGRITY OF THE SYSTEM IS THE FUNDAMENTAL IRREDUCIBILITY OF THE PROPERTIES OF THE SYSTEM TO THE SUM OF THE PROPERTIES OF ITS INDIVIDUAL ELEMENTS (THE EMERGENCE OF PROPERTIES) AND, AT THE SAME TIME, THE DEPENDENCE OF THE PROPERTIES OF EACH ELEMENT ON ITS PLACE AND FUNCTION WITHIN THE SYSTEM.

The structure of the system should be understood as the organization of its individual elements, taking into account their interrelationships and the goals set for the system. An element of the system is any part of it that is not subject to dismemberment under this consideration.

Within the framework of an information system, subsystems of various purposes are distinguished, which can be considered as independent systems. From the point of view of the role of subsystems in solving control problems, they are divided into functional and supporting.



The structure of the information system as a set of supporting subsystems

Components of an IS

People

- End users: the people who use the IS or the information from the IS
- · IS specialists: the people who develop and operate IS

Hardware Resources

- All physical devices used in information processing
- · Machines, data media, peripherals

Software Resources

- All information processing instructions including programs and procedures
- System software, application software and procedures

Components of an IS (cont.)

Data Resources

- Facts about the business transactions
- Processed and organized information
- Databases of organized data

Network Resources

- · Communications media
- · Network infrastructure: hardware and software
- · The Internet, intranets and extranets

Information, technical, mathematical, software, organizational and legal support are usually distinguished among the supporting subsystems.

information support - methods and tools for building the information base of the system, including systems for classifying and coding information, unified document systems, information flow schemes, principles and methods for creating databases;

technical support - a set of technical means involved in the technological process of converting information in the system. First of all, these are computers, peripheral equipment, equipment and data transmission channels;

software includes a set of programs for regular use, necessary for solving functional problems, and programs that allow the most efficient use of computing technology, providing users with the greatest convenience in their work;

software - a set of mathematical methods, models and information processing algorithms used in the system;

legal support - a set of legal norms governing the creation and operation of an information system, the procedure for obtaining, transforming and using information; organizational support - a set of solutions that regulate the processes of creation and

functioning of both the system as a whole and its personnel.

Systems structures are of different types [4], different topology (or spatial structure). Consider the basic topologies of system structures (see Fig. 2.1 - 2.4).

An example of a linear structure is the structure of metro stations on a single (noncircular) line. An example of a hierarchical structure is the management structure of a university: "Rector - Vice-rectors - Deans - Heads of departments and divisions -Teachers of departments and employees of other divisions". An example of a network structure is the structure of the organization of construction and installation work during the construction of a house: some work, for example, installation of walls, landscaping, etc. can be performed in parallel. An example of a matrix structure is the structure of employees of a research institute department performing work on the same topic.



Figure: 2.1. Linear type structure



Figure: 2.2. Hierarchical (tree) type structure

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Figure: 2.3. Network type structure



Figure: 2.4. Matrix type structure

Information systems can be classified according to a variety of different criteria. The considered classification is based on the most essential features that determine the functionality and features of the construction of modern systems. Depending on the volume of tasks being solved, the technical means used, the organization of functioning, information systems are divided into a number of groups (classes) (Fig. 1.1).



Figure: 1.1. Classification of information systems

Operations support system

In an organization, data input is done by the end user which is processed to generate information products i.e. reports, which are utilized by internal and or external users. Such a system is called operation support system.

The purpose of the operation support system is to facilitate business transaction, control production, support internal as well as external communication and update organization central database. The operation support system is further divided into a transaction-processing system, processing control system and enterprise collaboration system.

Transaction Processing System (TPS)

In manufacturing organization, there are several types of transaction across department. Typical organizational departments are Sales, Account, Finance, Plant, Engineering, Human Resource and Marketing. Across which following transaction may occur sales order, sales return, cash receipts, credit sales; credit slips, material accounting, inventory management, depreciation accounting, etc. These transactions can be categorized into batch transaction processing, single transaction processing and real time transaction processing.

Process Control System

In a manufacturing organization, certain decisions are made by a computer system without any manual intervention. In this type of system, critical information is fed to the system on a real-time basis thereby enabling process control. This kind of systems is referred as process control systems.

Enterprise Collaboration System

In recent times, there is more stress on team effort or collaboration across different functional teams. A system which enables collaborative effort by improving communication and sharing of data is referred to as an enterprise collaboration system.

Management Support System

Managers require precise information in a specific format to undertake an organizational decision. A system which facilitates an efficient decision making process for managers is called management support system.

Management support systems are essentially categorized as management information system, decision support system, expert system and accounting information system.

Management information system provides information to manager facilitating the routine decision-making process. Decision support system provides information to manager facilitating specific issue related solution.

Transaction Processing Systems (TPS)

EXAMPLE: payroll, accounts payable, point of sale (P.O.S.), ATM machine software

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TPS PAYROLL SYSTEM



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Figure 6.7 - Payroll system shown as an instance of the basic systems model.

MANAGEMENT INFORMATION SYSTEMS(MIS)

• INFORMATION SYSTEM AT THE MANAGEMENT LEVEL OF AN ORGANIZATION THAT SERVES THE FUNCTIONS OF PLANNING, CONTROLLING, AND **DECISION MAKING BY PROVIDING ROUTINE SUMMARYAND EXCEPTION REPORTS.**



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DIFFERENCES BETWEEN THE TPS AND THE MIS TRANSACTION MANAGEMENT PROCESSING SYSTEMS INFORMATION (TPS) SYSTEMS (MIS)

- SUPPORT OPERATION
- MANAGEMENT AND CONTROL
- ROUTINE, NORMAL OPERATIONS
- STRUCTURED

- PROVIDE DECISION-MAKING SUPPORT FOR ROUTINE, STRUCTURED DECISIONS
- CLOSELY LINKED TO AND FED BY TPS

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• STRUCTURE AND SEM-STRUCTURE

THANK YOU FOR ATTENTION!