A DIFFERENT WAY TO CATEGORIZE INFORMATION SYSTEMS—
CHAPTER TWO

While the model for categorizing information systems that is discussed in Chapter 2 in the text is valid and used by many IS professionals and MIS programs, there are other ways to classify information systems. The following is an equally valid typology of information systems based on the purpose of the information system and how it functions.

1. Information Needs and Levels of Management
2. Top-Level Decisions
3. Middle-Level Decisions
4. Low-Level Decisions
5. Knowledge and Data-Management Decisions
6. Information Systems That Meet the Needs of Management
8. Office Automation Systems (OAS)
10. Management Information Systems (MIS)
11. Types of MIS Reports
13. Expert Systems
Information Needs and Levels of Management

The graphic below illustrates how this typology is positioned based on the information needs and hierarchical levels of organizations. Information (depicted on the right side of the graphic) comes into the organization from the bottom, normally through transactions conducted at the operational level. That information is filtered and summarized as it is transmitted up through other systems to those located higher in the organization's hierarchy. For example, a bank deposit comes in to the organization’s information systems as a transaction conducted at a local bank branch and is transmitted through the organization’s transaction processing system. As the information about the bank deposit moves through the bank’s various information systems, it is summarized and filtered until it reaches the top hierarchical level of the bank—top management. At this point, the information system used by top managers probably only references the total of all bank deposits for that day made throughout the bank’s locations, rather than the individual bank deposit or its detail data.

On the other hand, decisions (depicted on the left side of the graphic) tend to be made at the top and elaborated or made “tangible” as they “trickle” down to lower levels. For example, a top management decision to move to a client/server platform (see Chapter 6, Computer Hardware) for all of their information systems might trickle down to middle management, where it is expanded to include the specific operating system (e.g., Windows vs. Unix—see Chapter 7, Computer Software), and then trickle further down to the operational level where decisions are made as to which vendor to use, when to purchase, which individuals receive the clients first, etc.

**Top-Level Decisions**

It is obvious from this discussion that the information needs of each of the hierarchical levels may differ based on the types of information they receive and the types of decisions they have to make. Typically, top managers make *strategic* decisions that have
the greatest impact on the organization—their decisions impact the actual survival of the firm. Their decisions also carry the longest term impact; a typical top manager makes decisions that will affect the firm five or more years in the future. Top managers need enough internal information to understand where the organization is today, but their primary need is external information about the economy, the marketplace, their industry, and the competition.

**Middle-Level Decisions**
Middle or tactical-level managers make tactical-level decisions that usually translate the decisions made by top management into tactical plans that impact the organization for two to four years. Their information needs are divided between internal and external. They also need internal data from lower in the hierarchy that is summarized and filtered to permit tactical managers to make decisions and to control their subordinate areas.

**Low-Level Decisions**
Lower-level or operational managers focus on internal information normally provided within their own functional area. While purchasing decisions require external information, most of the information needs of operational managers are internal. Operational decisions typically impact the organization for less than a year.

**Knowledge and Data-Management Decisions**
Finally, knowledge and data managers—typically professionals such as lawyers, doctors, or market researchers—make decisions based on information obtained from specialized databases or internal databases. Their needs are quite different from those of “line” managers—managers in these positions are usually referred to as “staff” managers.

**Information Systems That Meet the Needs of Management**
The different types of information needed and the different types of decisions to be made require different information systems to meet management’s needs. The following typology, illustrated in the graphic, is one way of looking at how information systems address those needs.

**Transaction Processing Systems (TPS)**
A transaction processing system (TPS) processes the routine, daily transactions of an organization. These systems are typically developed to handle high volumes of data at a fast rate. The outputs of these systems fall into two general categories: 1) hard and soft copy reports that summarize the data and 2) data that feeds into other organizational systems, such as a DSS or MIS. For example, a bank’s demand-deposit (chequing account) TPS processes the daily deposits, withdrawals, cheques, charges, interest, and fees on demand deposits. The outputs from the demand deposit TPS include reports detailing statistics about the transactions (e.g., number of transactions at a branch, average transaction for that branch) that do not contain sophisticated calculations or comparisons to other data (e.g., comparisons to the same period the previous year), and also the TPS data itself that feeds into the MIS and other bank systems.
While some TPS are still processed by batch during off-hours, such as payroll TPS, most other TPS today are processed online with transactions updated immediately. While this is expensive, it means that information is up to date through the last transaction, which can save money. For example, a bank can have confidence that a customer won’t cash a cheque for more money than is in his chequing account because the bank’s records are always up to date. Prior to online transaction processing, a bank teller might cash a cheque for a customer who had other cheques cleared but not processed that would overdraft the chequing account.

**Office Automation Systems (OAS)**

An office automation system (OAS) simply automates office tasks, such as producing letters, memoranda, spreadsheets, presentations, graphics, and reports from databases; distributing these documents electronically through email; and scheduling individual and group calendars and other resources (such as meeting rooms or audiovisual equipment). Office automation systems can be used by an individual to manage his or her own individual work or, when used on a network, can be used to assist in group- or organization-wide automation of these tasks.

Originally, OAS were purchased on an application-by-application basis; a word processing application was purchased that might or might not work well with a spreadsheet application that was purchased separately and might come from a different vendor. Today, most OAS are purchased as suites of software, such as Microsoft Office or Corel WordPerfect. Many OAS suites only include word processing, spreadsheet, database, and presentation software, with little personal productivity software. In that situation, additional purchases of personal productivity software, such as Microsoft Outlook or Palm Pilot, will be needed for the complete automation of these routine tasks.

**Knowledge Work Systems (KWS)**

Knowledge work systems (KWS) provide access to databases and other sources of knowledge for professional workers who need to find specialized information. For example, lawyers are knowledge workers who require access to Lexis, a legal database that includes legal precedents and cases. Many KWS function as interfaces to these specialized databases. Use of these specialized databases may be expensive, with fees based on licensing per user, per time period, per use, or per time expended accessing the database.

The rapidly growing area of knowledge management typically includes a KWS that may be intranet-based to access both internal and external information. Use of intranet technology means less training and expense in developing the KWS, sometimes known as a portal or gateway. In this situation, the KWS portal frequently can also be used to access external information from the specialized databases mentioned above. For example, a lawyer might use her firm’s intranet-based KWS portal to access a client’s previous history with the firm and then use the same portal to access Lexis to determine precedents for that client’s current case.
Management Information Systems (MIS)
A management information system (MIS) filters and summarizes data from a TPS and may access other internal data as well to produce reports for routine management decision making. The MIS may also access external data, such as the prime rate or a stock’s previous price. For example, a bank’s demand deposit MIS might produce a report for the local branch manager that would summarize transactions at the branch to assist the branch manager in making decisions, such as staffing (based on growth trends shown in the MIS report) or whether to order more cash for the branch’s vault (based on growth trends and type of transactions, i.e., cheque cashing, deposits with cash returned, and cash withdrawals). These are routine decisions that management makes, and the information that goes into the decision is easily extracted in a report, either on hard copy or electronically displayed on a monitor.

Types of MIS Reports
MIS reports may be produced periodically (e.g., weekly, monthly) or ad hoc, on request by the user. Today, more and more MIS reports are produced by online user request. MIS reports fall into several categories:

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<tr>
<th>Report Type</th>
<th>Description</th>
<th>Example</th>
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<tr>
<td><strong>Summary</strong></td>
<td>Simply summarizes data from the TPS, perhaps with comparisons to previous periods, departments, etc.</td>
<td>A transaction-volume MIS report would summarize all of the transactions for a specific period(s) of time, such as daily, weekly, etc. The total of transaction volume by branch for all branches/stores could be used to observe growth or identify areas where the increase in volume is below the average and action might be necessary.</td>
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<td><strong>Exception</strong></td>
<td>Presents only information that falls outside certain parameters that have been set, such as outside ± 10% of a budgeted expenditure</td>
<td>A budget-exception MIS report lists all revenues and expenditures that fall outside the parameters set by management during the budget-setting process. All budget exceptions, such as electric utility costs, that fall above or below an amount set by management would be shown on the report and used by management to determine what caused the exceptions.</td>
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<td><strong>CSFs</strong></td>
<td>Presents only information related to critical success factors that top management has identified as being critical to the success of the organization</td>
<td>A bed-occupancy rate MIS report lists the bed-occupancy rate for a hospital, including the rate by hospital unit as well as the total bed-occupancy rate. Bed-occupancy rate is a CSF that is on any hospital’s list of critical success factors.</td>
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<tr>
<td><strong>Key Indicator</strong></td>
<td>Presents only information related to key indicators that top management has</td>
<td>A medication-error MIS report lists the number, severity, and location of medication errors on a periodic basis (usually daily), with</td>
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identified as being indicative measures of areas that must be tightly managed
weekly, monthly, and annual comparisons. Medication errors are indicative of problems in critical areas such as the quality of nursing care.

**Decision Support Systems (DSS), Group Decision Support Systems (GDSS), and Executive Support Systems (ESS)**

A decision support system (DSS) provides assistance for non-routine decision making. There are three types of DSS:

1) individual, known simply as DSS
2) group DSS (GDSS)
3) executive DSS (ESS)

All three types of DSS essentially organize and structure data, rules, models, and other inputs to give users the ability to make non-routine decisions. All three DSS are discussed thoroughly in Chapter 14.

**Expert Systems**

An expert system mimics the expertise of a domain expert to automate decision making. Some expert systems only assist in decision making or only make decisions when the decision rules are clear, or otherwise forward the decision to a human expert. Expert systems are a branch of artificial intelligence (AI) and are thoroughly discussed in Chapter 15.