**UNIVERSITY** OF **MARYLAND**
**University College**

# Learning Resource

# The Complete Information System

Keeping in mind that our focus is on a computer-based information system, we will look at the information system (IS) from two viewpoints—that of its function and that of its structural components. From the functional perspective, an information system is a medium for recording and storing data, and disseminating information that has been extracted from this data. This perspective focuses on what users do with the information that is accessed via the IS.

From a structural perspective, an information system is "*a collection of multiple pieces of equipment involved in the dissemination of information. Hardware, software, computer system connections and information, information system users, and the system's housing are all part of an IS*" ("Information System," n.d.)*.*

Note that there are two distinct components or parts of the IS—the humans that design, develop, and use the IS, and the technical components that comprise the IS structure. From either perspective, the purpose of an information system is to collect, store, retrieve, and distribute information used to support decision making, analyze issues, present complex topics in a visual format, and/or even provide the basis for creating new products or services.

All of this data flows through three processes:

- input (collection of the raw data)
- processing that data into information; that is, converting the data into a form that can be understood
- output (providing the information to those who will use it)

There is also a feedback loop which takes the output that has been evaluated and returns to be added to or corrected as input.
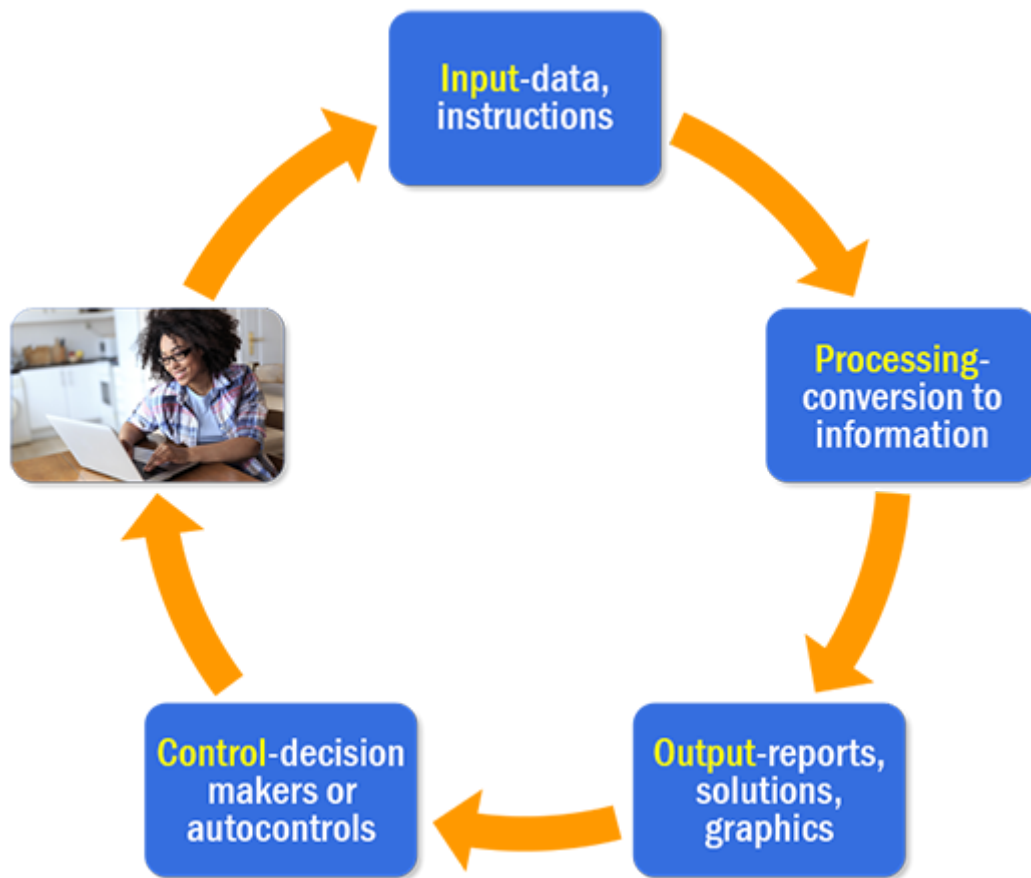
**Circular Flow Diagram**

Diagram adapted from Fuad, 2017. Image credit: valentinrussanov/Signature Collection/iStock

# The Components of a Computer-Based Information System

Fuad (2017) lists five primary components of an IS:

1. **Hardware resources**: These resources are all the physical equipment and associated devices, machines, and media. The list of equipment includes not only the computers themselves and peripherals such as keyboard and mouse for input, monitors and printers for output, but also the data media—that is, all tangible objects on which data is recorded. The data media comes in many forms such as sheets of paper, CDs and DVDs, flash drives, etc. Optical character recognition (also optical character reader, OCR) devices may be used for converting text on forms to a digital format.

2. **Software resources**: This set of resources includes not only a computer's operating system, and programs or apps, but also the operating instructions that are employed by the end users of an IS. User manuals (how to use an app or how to fill out a data entry form) are examples of a software resource.

3. **Data resources**: This is the raw material that an information system requires. It can come in many forms:

   - Numbers, alphabetical, or other characters that describe a transaction or event

- Text data—sentences, paragraphs used in communication

- Image data—photos, shapes, figures

- Audio data—human speech or other sounds that are recorded for a specific purpose (for example, bird calls or songs, muffler noise abatement levels)

4. **Network resources**: Remember that the purpose of an IS is to collect, store, retrieve, and distribute information that is used to support decision making, analyze issues, present complex topics in a visual format, and/or even provide the basis for creating new products or services. This often requires telecommunications networks: internet (connection to the World Wide Web), intranet (private communication networks inside a business), or extranets (private connections between businesses). This category includes the physical communication media such as twisted pair wire, coaxial cable, fiber-optic cable, microwave systems, and communication satellite systems. The people, hardware, software, and data resources that support the operation and use of the internal network(s) or access to the internet are also required.

5. **People resources**: This category includes the end users and IS specialists.

- The end users are those who use the information provided by the IS. Most of us are end users of information systems. But more specifically, end users are those with careers in such fields as accounting, sales, engineering, management, banking, airline reservations, or human resources.

- IS specialists develop, operate, and support an information system. These are the system analysts (designers), programmers, testers, computer operators, data specialists, and data entry personnel.

# Structural Differences in Information Systems

There are different types of information systems, depending on whatever activities the IS needs to support. One way to categorize different systems is by the type of decisions that need to be made: operational, tactical, or strategic (Kimble, n.d.).

1. **Operational**

- The **transaction processing system** (TPS) is probably the system you interact with most often. This system collects data from user inputs and then generates outputs based on the data collected. The data collection is typically obtained through automated or semiautomated activities and basic transactions. For example, you decide upon a product and place an order for that product with an online seller. All the information related to that order (size, color, shipping preference, cost, banking or payment information, shipping address) is collected and the order processing begins. Behind the scenes, inventory updates are made, and your information may also be shared with an operations support system, resulting in emails from the company or suggestions for other products

you may like. Examples of TPS include payroll systems, reservation systems, order processing systems, and personal banking activities. The TPS is used to generate information that is shared with and used for other systems (both within and external to the company). Some of this data is shared or sold to third-party companies for their use.

- An **operations support system** (OSS) converts business data (such as financial transactions, "hits" or "likes" on a website, orders placed, etc.) into information that can be used via data mining. This is the foundation information for customer relationship management (CRM) or social customer relationship management (SCRM).

2. **Tactical**

- A **management information system** (MIS) is used by lower management in problem solving and making decisions and to ensure the smooth running of the organization. Structured procedures and accessible data for making decisions are in place. This type of system also allows managers to see trends and overall performance by evaluating current with previous outputs. This type of IS deals with the past and present rather than the future. Examples of an MIS include personnel (human resource management—HRM) systems, inventory control systems, and sales. A management reporting system is typically included.

3. **Strategic**

- A **decision support system** (DSS) pulls data from sources. This data is then reviewed by higher management, which makes long-term determinations based on the compiled data. A DSS must be flexible to handle the fact that there may be no clear procedures for making the decision and if the factors to be considered in the decision can be readily identified in advance. Typically customized reports are generated based upon a particular set of data and a particular output format.

- A **knowledge management system** (KMS) is used to disseminate or share the knowledge generated by all other systems. A KMS serves as a central repository for the retention of a business's knowledge and is used to improve performance and consistency and enable a speedy response to inquiries from clients and partners.

# Apps That Support Information Systems

This set of software resources starts with:

- a computer's operating system

- the programs or apps that allows both the development and maintenance of an IS

- the interface that allows the end user to use the IS

Every general-purpose computer in whatever form—mainframe, workstation, desktop, laptop, tablet, smartphone—requires an operating system (OS). The OS is the heart of the computer, enabling all the other components (hardware and software) to perform the functions assigned to them. The OS is the software component that manages the hardware pieces and all of the other software, enabling both parts to perform the functions for which they are designed. The OS also controls some aspects of security—specifically, allowing only authorized users, via a user ID and password that are entered, to access the system.

Regardless of the platform (device), the OS coordinates the use of the system hardware with the application programs that enable the user to perform tasks. In the same way an OS is loaded on hardware that is compatible with that particular OS, application programs can be loaded only on top of an OS with which the application program is compatible.

Computers that support an IS would also use a network operating system that supports a number of computers that are linked via a network. Most often, one machine, a server, is the computer that controls access to the resources (hardware and software) used by the other computers on the network. This server may also provide a centralized storage area for data. The other computers on the network are called clients. A network OS (e.g., Microsoft Windows Server, Apple OS X Server, Linux Server) is a different software package than that used on a standalone OS.

## Operational Software Applications

It is probably the case that your only experience with TPS systems is via the interface you use. Behind the scenes, the TPS software can be put into three categories (Bernstein, n.d.):

- A **front-end program** is an app that sends and receives menus and forms. It is the interface that the user sees and offers the user options to choose. It collects the user's input.

- A **request controller** receives messages from front-end programs and then, in turn, initiates the proper transaction programs.

- A **transaction server** performs the work the user requested. It is typically connected to a database that may collect the input data and initiate other programs. It may also return a reply that is sent back to the device on which the front-end program is loaded (Bernstein, n.d.).

## Tactical Software Applications

An MIS uses several different types of software apps, depending on the focus of the business. Function-specific apps include:

- customer relationship management (CRM)

- enterprise resource planning (ERP)

- supply chain management (SCM)

- human resource management (HRM)

- database management systems (DBMS).

The best software for any business is software that helps the business increase or measure productivity in order to run its operations better, cut costs, and replace paper processes (Mohamed, n.d.).

Data gathered and processed by the TPS is sent to the MIS which, in turn, produces routine reports used by management. The software is used to generate these reports. These reports include:

- summary reports that show totals and trends.

- exception reports that can display out-of-the-ordinary data.

- periodic reports, generated on a schedule (daily, weekly, monthly, quarterly, etc.) and which typically are printed.

- demand reports, generated outside a normally scheduled periodic report, in response to a specific request for certain information.

**Strategic Software Applications: DSS and KMS**

With the introduction of integrated computerized decision support systems to support day-to-day operating activities, managers can "download and analyze sales data, create reports, and analyze and evaluate forecasting results. DSS can help managers perform tasks, such as allocating resources, comparing budget to actual results, drilling down to analyze results, projecting revenues, and evaluating scenarios" (Power, Examples of DSS, 2002).  Executive dashboards and scorecards can be used to track operations and support strategic decision making based on facts and data and not on hunches and gut instincts.

Most of the newer and updated DSS have the following attributes in common (Power, Using Computerized DSS, 2002):

1. Real-time access to rich media/data enables many remote users to collaborate.

2. DSS applications can be accessed anywhere and anytime.

3. Large data sets that include historical data are easily accessed.

4. Excellent graphs and charts are available for viewing the extracted data.

5. Real-time updates to the data are available when needed.

The biggest players (and perhaps the most expensive to implement) in the DSS field are SAP and Oracle. SAP is the largest in the market. and features accounting and distribution software suites as well as software systems for manufacturing, human resources, payroll, and customer relationship management (ERPsoftware360, n.d.). Oracle, the second largest, develops marketing and enterprise resource planning software, as well as CRM and SCM software ("Oracle Corporation," n.d.).

You can review many other options at http://www.capterra.com/knowledge-management-software/ (http://www.capterra.com/knowledge-management-software/)    .

As with DSS, KMS-based tools need to match the needs of the organization to a tool category. Several of the most highly recommended knowledge management software suites include:

- Zendesk—a cloud-based application that can be implemented for small or large numbers of customers

- eXo Platform—used by large enterprises, midsize businesses, and public administrations

- Confluence—organizes a repository of information, opinions, and knowledge that helps in answering questions and creating how-to documents.

Remember, however:

> KM is about managing people, culture, and organizational practices & structures. Effective KM initiatives are therefore never exclusively technology driven. However, in conjunction with sound practice, KM tools are invaluable at providing support to KM initiatives and at facilitating interaction, exchange of ideas, locating experts, and storing knowledge in both structured and unstructured forms (Frost, 2017)

Today, these tools serve as a competitive advantage within the knowledge sharing field.

## Summary

The heart of almost every information system is a database. You may be familiar with a simple database management system, Microsoft Office's Access. Excel could also be used as a database in an information system since it is a repository of information that can support information and knowledge discovery, decision making, and visual analytics.
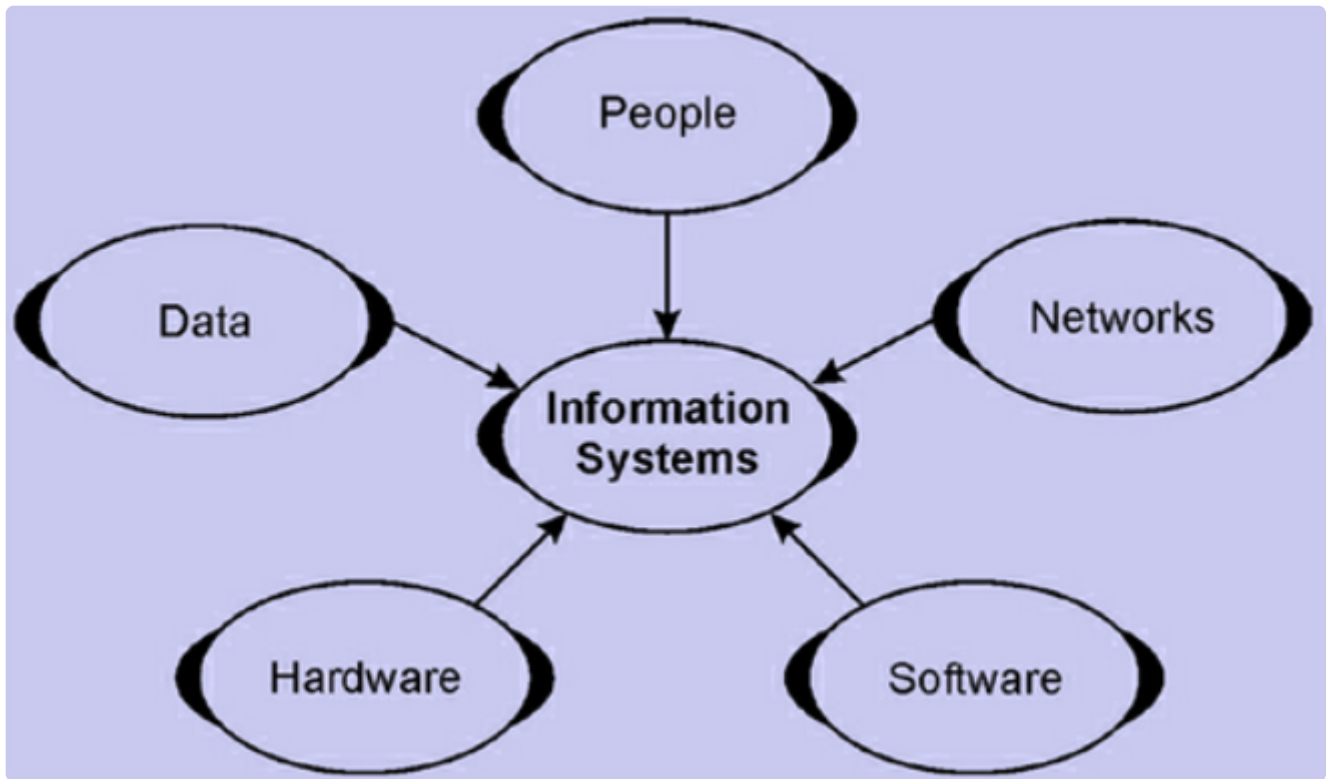
**Information Systems**

Source: Mbaknowl.com. (n.d). Used with permission.

The purpose for gathering data is to provide information, and that information, in turn, can be used for decision making. Regardless of the type of information system, all information systems involve hardware and software that support the sharing or processing of data into information. And every IS also must include the people who support the system, as well as those who benefit from the information that is generated and shared.

In your next assigned reading, you will be introduced to the system development life cycle. This process outlines ways in which an information system may and should be developed.

# References

Bernstein, P. (n.d.). *Transaction processing system examples and SOA approaches*. Retrieved from http://searchdatamanagement.techtarget.com/feature/Transaction-processing-system-examples-and-SOA-approaches

ERPsoftware360. (n.d.). Top 5 client-server ERP software applications. Retrieved from http://erpsoftware360.com/erp-software.htm

Frost, A. (2017). KM Tools. Retrieved from http://www.knowledge-management-tools.net/knowledge-management-tools.html.

Fuad, S. (2017, January 22). *MIS Lecture 3*. Retrieved from
http://uotechnology.edu.iq/ce/Lectures/SarmadFuad-MIS/MIS_Lecture_3.pdf

Information system (IS). (n.d.). In *Technopedia*. Retrieved from
https://www.techopedia.com/definition/24142/information-system-is

Kimble, C. (n.d.). *Information systems and strategy*. Retrieved from http://www.chris-
kimble.com/Courses/World_Med_MBA/Types-of-Information-System.html

Kline, J. (2015, May 7). What are the best knowledge management tools out
there? Retrieved from https://www.quora.com/What-are-the-best-knowledge-
management-tools-out-there

Mohamed, A. (n.d.). The best software for small businesses (SMEs) - essential guide.
Retrieved from http://www.computerweekly.com/feature/The-best-software-for-small-
businesses-SMEs-Essential-Guide

Oracle Corporation. (n.d.). In *Wikipedia*. Retrieved from
https://en.wikipedia.org/wiki/Oracle_Corporation

Power, D. (2002). Examples of decision support systems (DSS) aiding business decision-
making. In *Decision support basics*. Santa Barbara: Greenwood. Retrieved
from http://searchbusinessanalytics.techtarget.com/tutorial/How-decision-support-
systems-DSS-can-help-business-decision-making

Power, D. (2002). Using computerized decision support systems, and the history of DSS. In
*Decision support systems: Concepts and resources for managers*. Santa Barbara:
Greenwood. Retrieved from http://searchbusinessanalytics.techtarget.com/tutorial/Using-
computerized-decision-support-systems-and-the-history-of-DSS

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http://uotechnology.edu.iq/ce/Lectures/SarmadFuad-MIS/MIS_Lecture_3.pdf