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Models: Logical and Physical

Model – a pictorial representation of reality. Just as a picture is worth a thousand words, most models are pictorial representations of reality.

Logical model – a nontechnical pictorial representation that depicts what a system is or does.

Physical model – a technical pictorial representation that depicts what a system is or does and how the system is implemented.

Process Modeling and DFDs

Process modeling – a technique used to organize and document a system’s processes.

- Flow of data through processes
- Logic
- Policies
- Procedures

Data flow diagram (DFD) – a process model used to depict the flow of data through a system and the work or processing performed by the system. Synonyms are bubble chart, transformation graph, and process model.

The DFD has also become a popular tool for business process redesign.
### Differences Between DFDs and Flowcharts

- Processes on DFDs can operate in parallel (at-the-same-time)
  - Processes on flowcharts execute one at a time
- DFDs show the flow of data through a system
  - Flowcharts show the flow of control (sequence and transfer of control)
- Processes on a DFD can have dramatically different timing (daily, weekly, on demand)
  - Processes on flowcharts are part of a single program with consistent timing

### Symbols in DFDs

- Many set of symbols are used in the industry
- Generally, there are three commonly used symbols as follows:
  - External Agents
  - Data Stores
  - Processes
- There is one connection as below:
  - Data Flows

### External Agents

**External agent** – an outside person, unit, system, or organization that interacts with a system. Also called an *external entity*.

- External agents define the “boundary” or scope of a system being modeled.
- As scope changes, external agents can become processes, and vice versa.
- Almost always one of the following:
  - Office, department, division.
  - An external organization or agency.
  - Another business or another information system.
  - One of system’s end-users or managers
- Named with descriptive, *singular noun*
Data Stores

**Data store** – stored data intended for later use. Synonyms are *file* and *database*.
- Frequently implemented as a file or database.
- A data store is “data at rest” compared to a data flow that is “data in motion.”
- Almost always one of the following:
  - Persons (or groups of persons)
  - Places
  - Objects
  - Events (about which data is captured)
  - Concepts (about which data is important)
- Data stores depicted on a DFD store all instances of data entities (depicted on an ERD)
- Named with *plural noun*

Process Decomposition

**Decomposition** – the act of breaking a system into subcomponents. Each level of abstraction reveals more or less detail.

**Process Concepts**

**Process** – work performed by a system in response to incoming data flows or conditions. A synonym is *transform*.
- All information systems include *processes* - usually many of them
- Processes respond to business events and conditions and transform data into useful information
- Modeling processes helps us to understand the *interactions* with the system’s environment, other systems, and other processes.
- Named with a strong action verb followed by object clause describing what the work is performed on/for
Logical Processes

- **Logical Processes**: work or actions needs to be done no matter how the system is implemented.

Three types of logical processes:
- **Function**
- **Event**
- **Elementary process**

Types of Logical Processes

- **Function** – a set of related and ongoing activities of a business. A function has no start or end.
- **Event** – a logical unit of work that must be completed as a whole. Sometimes called a *transaction*.
  - Triggered by a discrete *input* and is completed when process has responded with appropriate *outputs*.
  - Functions consist of processes that respond to events.
- **Elementary process** – a discrete, detailed activity or task required to complete the response to an event. Also called a *primitive process*.
  - The lowest level of detail depicted in a process model.

Data Structures

- **Data attribute** – the smallest piece of data that has meaning to the users and the business.
- **Data structure** – a specific arrangement of data attributes that defines an instance of a data flow.
  - The data attributes that comprise a data flow are organized into data structures.
  - Data flows can be described in terms of the following types of data structures:
    - A *sequence* or group of data attributes that occur one after another (e.g. Address).
    - The *selection* of one or more attributes from a set of attributes.
    - The *repetition* of one or more attributes.

When to Draw Process Models

- **Strategic systems planning**
  - Enterprise process models illustrate important business functions.
- **Business process redesign**
  - “As is” process models facilitate critical analysis.
  - “To be” process models facilitate improvement.
- **Systems analysis (primary focus of this course)**
  - Model existing system including its limitations
  - Model target system’s logical requirements
  - Model candidate technical solutions
  - Model the target technical solution