5.1 Logical versus Physical Models

* Logical Model
  + Shows what the system must do, regardless of how it will be implemented physically
* Physical model
  + Describes how the system will be constructed
* Many analysts follow a four-model approach
  + Physical+Logical model of the current system
  + Physical+Logical model of the new system

5.2 Data Flow Diagrams

* Systems analysts use graphical techniques to describe an information system
  + Data Flow Diagram (DFD)
    - Uses various symbols to show how the system transforms input data into useful information
    - Shows how data moves through an information system but does not show program logic or processing steps
* Four basic symbols represent processes, data flows, data stores, and entities.
* Process symbols
  + Process receives input data and produces output
  + Contains business logic that transforms the data
  + Process name identifies a specific function
  + In DFDs, a process symbol can be referred to as a black box
* Data flow symbols
  + Line with a single or double arrowhead
* Data flow and process combinations that must be avoided
  + Spontaneous generation
  + Black holes
  + Gray holes
* Data store symbol
  + Represent data that the system stores
  + DFD does not show the detailed contents of a data store
    - Specific structure and data elements are defined in the data dictionary
  + A data store must be connected to a process with a data flow
* Entity symbol
  + Shows how the system interfaces with the outside world
  + DFD shows only external entities that provide data to the system or receive output
    - DFD entities also are called terminators because they are data origins or final destinations
    - Source and sink entities

5.3 Drawing Data Flow Diagrams

* Graphical model is created based on fact-finding results
  + Review guidelines for drawing DFDs
  + Apply guidelines and create a set of DFDs
* Guidelines:
  + Draw the context diagram so that it fits on one page
  + Use the name of the information system as the process name in the context diagram
  + Use unique names within each set of symbols
  + Do not cross lines
  + Provide a unique name and reference number for each process
  + Ensure that the model is accurate, easy to understand, and meets the needs of its users

5.4 Drawing a Context Diagram

* First step in constructing a set of DFDs

5.5 Drawing Lower-Level DFDs

* Leveling and balancing techniques are used (see powerpoint for figures)

5.6 Data Dictionary

* Central storehouse of information about a system’s data
  + An analyst uses the data dictionary to collect, document, and organize facts about a system
  + Defines and describes all data elements and meaningful combinations of data elements
* Data element (data item/field)
  + Smallest piece of data that has meaning within an information system
  + Combined into records (data structures)
    - Record: Meaningful combination of related data elements that is included in a data flow or retained in a data store
  + Using CASE tools for documentation
    - More complex the system, more difficult it is to maintain full and accurate documentation
    - Modern CASE tools simplify the task
    - A CASE repository ensures data consistency
  + Documenting the data elements
    - Every data element in the data dictionary should be documented
    - Objective: provide clear, comprehensive information about the data and processes that make up a system
  + Recorded and described attributes
    - Data element name and label
    - Alias
    - Type and length
    - Default value
    - Acceptable values
    - Source
    - Security
    - Responsible user(s)
    - Description and comments
  + Documenting the data flows
    - Data flow name or label
    - Description
    - Alternate name(s)
    - Origin
    - Destination
    - Record
    - Colume and frequency
  + Documenting the data stores
    - Data store name or label
    - Description
    - Alternate name(s)
    - Attributes
    - Volume and frequency
  + Documenting the processes
    - Process name or label
    - Description
    - Process number
    - Process description
  + Documenting the entities
    - Entity name
    - Description
    - Alternate name(s)
    - Input data flows
    - Output data flows
  + Documenting the records
    - Record or data structure name
    - Definition or description
    - Alternate name(s)
    - Attributes
  + Data dictionary reports
    - Alphabetized list of all data elements
    - Report describing each data element and indicating the user or department
    - Report of all data flows and data stores that use a particular data element
    - Detailed reports showing all characteristics of data elements, records, data flows, processes, or any other selected item stored in the data

5.7 Process Description Tools in Design

* Documents the details of a functional primitive and represents a specific set of processing steps and business logic
  + Typical tools: structured English, decision tables, and decision trees
* Process descriptions in object-oriented development
  + O-O analysis combines data and processes that act on the data into objects, and similar objects can be grouped together into classes
  + O-O processes are called methods
* Modular design
  + Based on combinations of logical structures, which serve as building blocks for the process
    - Sequence
    - Selection
    - Iteration
  + Structured English
    - Subset of standard English that describes logical processes clearly and accurately
      * Use only the three building blocks of sequence, selection, and iteration
      * Use indentation for readability
      * Use a limited vocabulary
  + Decision tables
    - Logical structure that shows every combination of conditions and outcomes
    - Numbers of rules doubles each time a condition is added
    - Best way to describe a complex set of conditions
  + Decision trees
    - Graphical representation of conditions, actions, and rules found in a decision tables