The Conceptual Data Modeling Process

- Develop a data modelfor the current system.
- Develop a new conceptual data model that includes all requirements of the new system.
- In the design stage, the conceptual data model is translated into a physical design.
- Project repository links all design and data modeling steps performed during SDLC.

Conceptual, Logical, And Physical Data Modeling

Feature	Conceptual	Logical	Physical
Entity Names	✓	✓	
Entity Relationships	✓	✓	
Attributes		✓	
Primary Keys		✓	✓
Foreign Keys		✓	✓
Table Names			✓
Column Names			✓
Column Data Types			✓

Designing Forms and Reports (Cont.)

Form: a business document that contains some predefined data and may include some areas where additional data are to be filled in

An instance of a form is typically based on one database record.

Designing Forms and Reports (Cont.)

- **Report**: a business document that contains only predefined data
  - Itisapassivedocumentusedsolelyforreadingor viewing data.
- A report typically contains data from many unrelated records or transactions.

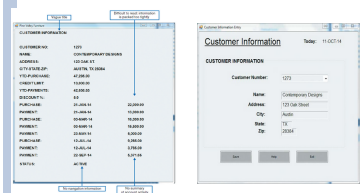
Introduction to Entity-Relationship (E-R) Modeling

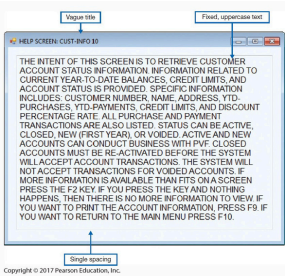
- **Entity-Relationshipdatamodel** (**E-R model**):a detailed, logical representation of the entities, associations and data elements for an organization or business area
- **Entity-relationship diagram** (**E-R diagram**): a graphical representation of an E-R model

Introduction to Entity-Relationship (E-R) Modeling (Cont.)

- **Entity**: a person,place,object,eventor concept in the user environment about which data is to be maintained
  - **Associative Entity**: anentity type that associatesthe instances of one or more entity types and contains attributes that are peculiar to the relationship between thoseentity instances
- **Entity type**: collection of entities that share common properties or characteristics

Formatting Forms and Report



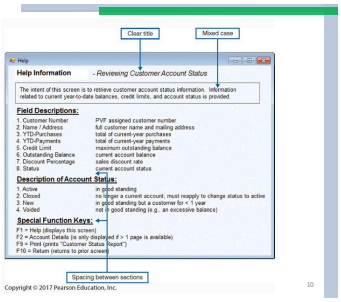


Attributes (2)

- Required attribute (boldface)
  - theattributethatmusthaveonevalue for every entity instance
- Optional attribute
  - theattributethatmaynothaveavalue for every entity instance
- Composite attribute (,)
  - Theattributethathasmeaningfulcomponent parts
- Derived attribute ([])
  - attributewhosevaluecanbecomputed from related attribute values
- Multivalued attribute ({})
  - Theattributethatmaytakemorethan one value for each entity instance

STUDENT
Student_ID
Student_Name
Student_Campus_Address
Student_Campus_Phone

EMPLOYEE
Employee_ID
Employee_Name(First_Name, Last_Name)
Date_of_Birth
[Employee_Age]



Usability Problems with Hardware Devices

- Visual Blocking
  - Extenttowhichdevice blocks display when using
- User Fatigue
  - Potentialforfatigueover long use
- Movement Scaling
  - Extent towhichdevice movement translates to equivalent screen movement
- Durability
  - Lack ofdurability or need for maintenance (e.g., cleaning) over extended use

Usability Problems with Hardware Devices (Cont.)

- Adequate Feedback
  - Extent to which device provides adequate feedback for each operation
- Speed
  - –Cursor movement speed
- Pointing Accuracy
  - Ability to precisely direct cursor

Providing Feedback

- Three types of system feedback:
  - –***Status information***: keep user informed of what's going on, helpful when user has to wait for response
  - – ***Prompting cues***: tell user when input is needed, and how to provide the input
  - – ***Error or warning messages***: inform user that something is wrong, either with data entry or system operation

Table 11-10: Examples of Poor and Improved Error Messages

Poor Error Messages	Improved Error Messages
ERROR 56 OPENING FILE	The file name you typed was not found. Press F2 to list valid file names.
WRONG CHOICE	Please enter an option from the menu.
DATA ENTRY ERROR	The prior entry contains a value outside the range of acceptable values. Press F9 for list of acceptable values.
FILE CREATION ERROR	The file name you entered already exists. Press F10 if you want to overwrite it. Press F2 if you want to save it to a new name.

Attributes (1)

- **Attribute**is a namedpropertyorcharacteristicofan entity that is of interest to the organization
  - An attribute nameis a noun andshould be unique
  - To make an attribute name unique and for clarity, each attribute name should follow a standard format
  - Named using a capital letter followed by lower case letters such as Vehicle_ID
  - Place its name inside the rectangle for the associated entity in the E-R diagram.
- **Candidate key**–an attribute (or combination of attributes) that uniquely identifies each instance of an entity type
- **Identifier**–a candidate key that has been selected as the unique, identifying characteristic for an entity type
  - Choose a candidate key that will notchangeitsvalue
  - Choose a candidate key that will never be null

Table 11-14: Common Properties of Windows and Forms in a GUI Environment That Can Be Active or Inactive

Property	Explanation
Modality	Requires users to resolve the request for information before proceeding (e.g., need to cancel or save before closing a window)
Resizable	Allows users to resize a window or form (e.g., to make room to see other windows that are also on the screen)
Movable	Allows users to move a window or form (e.g., to allow another window to be seen)
Maximize	Allows users to expand a window or form to a full-size screen (e.g., to avoid distraction from other active windows or forms)
Minimize	Allows users to shrink a window or form to an icon (e.g., to get the window out of the way while working on other active windows)
System Menu	Allows a window or form to also have a system menu to directly access system-level functions (e.g., to save or copy data)

[**Source:**Based on Wagner, 1994]

Table 11-15: Common Errors When Designing the Interface and Dialogues of Websites (1 of 2)

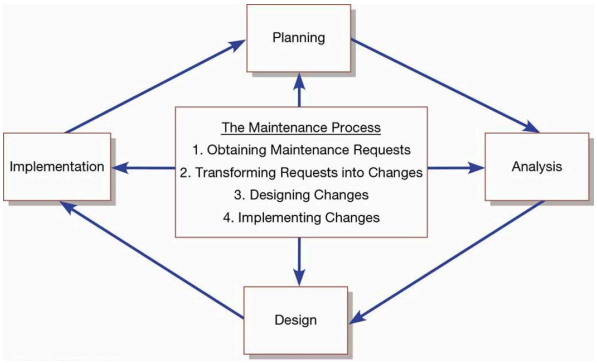
Error	Description Avoid opening a new browser window when a user clicks on a link unless it
Opening New Browser Window	is clearly marked that a new window will be opened; users may not see that a new window has been opened, which will complicate navigation, especially moving backward. Make sure
Breaking or Slowing Down the Back Button	users can use the back button to return to prior pages. Avoid opening new browser windows, using an immediate redirect where, when users click the back button, they are pushed or forward to an undesired location. Avoid overly long and
Complex URLs	complex URLs because it makes it more difficult for users to understand where they are and can cause problems if users want to e-mail page locations to colleagues. Avoid having pages with no "parent" that can be reached by
Orphan Pages	using a back button, requires users to "hack" the end of the URL to get back to some other prior page.
Scrolling Navigation Pages	Avoid placing navigational links below where a page opens because many users may miss these important options that are below the opening window.
Lack of Navigation Support	Make sure your pages conform to users' expectations by providing commonly used icon links such as a site logo at the top or other major elements. Also place these elements on pages in a consistent manner.

Measures of Usability

10.5 Explain how toassessusabilityanddescribe how variations in users, tasks, technology, and environmental characteristics influence the usability of forms and reports

- Methods to assess usability:
  - –**Learnability**–usability dimension concerned with how difficult it is for the user to perform a task for the first time
  - –**Efficiency**–usability dimension concerned with how quickly users can perform tasks once they know how to perform them
  - –**Error rate** –usability dimension concerned with how many errors a user might encounter and how easy it is to recover from those errors
  - –**Memorability**—How easy is it to remember how to accomplish a task when revisiting the system after some period of time?
  - –**Satisfaction and aesthetics**—How enjoyable is the system's visual appeal and how enjoyable is the system to use?

Maintenance Activities Parallel Those of the SDLC

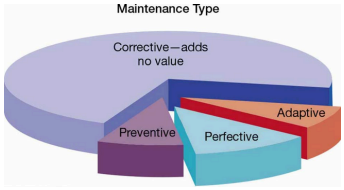


Different Types of Maintenance (1)

- **Corrective maintenance** refers to changes made to a system to repair flaws in its design, coding, or implementation
- **Adaptive maintenance** refers to changes made to a system to evolve its functionality to changing business needs or technologies
- **Perfective maintenance**refers to changes made to a system to add new features or to improve performance
  - Many professionals feel that perfective maintenance is not really maintenance but rather new development
- **Preventative maintenance** refers to changes made to a system to avoid possible future problems
  - E.g., increasing the number of records that a system can process far beyond what is currently needed

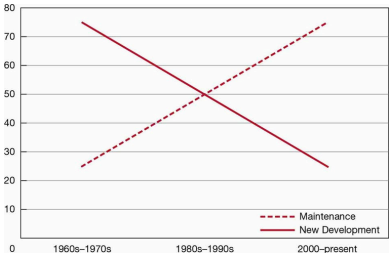
Different Types of Maintenance (2)

Type	Description
Corrective	Repair design and programming errors
Adaptive	Modify system to environmental changes
Perfective	Evolve system to solve new problems or take advantage of new opportunities
Preventive	Safeguard system from future problems



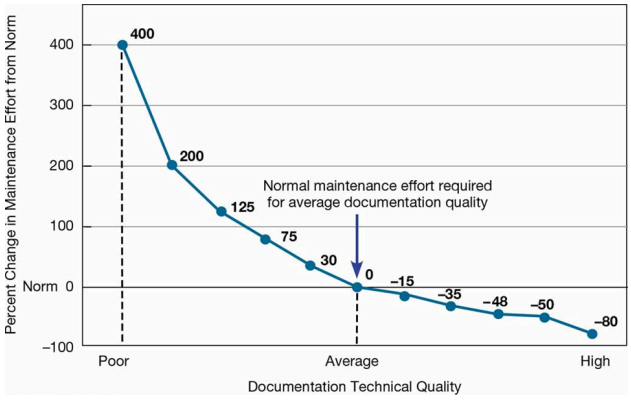
The Cost of Maintenance

- Many organizationsallocate60-80%ofinformationsystems budget to maintenance
  - This is because theyhavemoreandmoreolderso-calledlegacysystemsthatrequire more and more maintenance



New Development Versus Maintenance as a Percentage of the Software Budget over the Years

Quality Documentation Eases Maintenance



Managing Maintenance Personnel

- Traditionally, maintenance and development were **separately** staffed
- Organizations are rethinking this. Maybe **combine** development and maintenance into one role?
- Another possibility: spread maintenance personnel in different **functional**units (marketing, accounting, human resources, etc.)