Chapter 16 – Input Design and Prototyping

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INPUT DESIGN AND PROTOTYPING

• Define the appropriate format and media for a computer input.
• Explain the difference between data capture, data entry, and data input.
• Identify and describe several automatic data collection technologies.
• Apply human factors to the design of computer inputs.
• Design internal controls for computer inputs.
• Select proper screen-based controls for input attributes that are to appear on a GUI input screen.
• Design a web-based input interface.

Data capture – the identification and acquisition of new data (at its source).
– Source documents – forms used to record business transactions in terms of data that describe those transactions.

Data entry – the process of translating the source data or document (above) into a computer readable format.

Data processing is all processing that occurs on the data after it is input from a machine readable form.
– In batch processing, the entered data is collected into files called batches and processed as a complete batch.
– In on-line processing, the captured data is processed immediately
– In remote batch processing, data is entered and edited on-line, but collected into batches for subsequent processing.

Input Implementation Methods
• Keyboard
• Mouse
• Touch Screen
• Point-of-sale terminals
• Sound and speech
• Automatic data capture
  – Optical mark recognition (OMR)
  – Bar codes
  – Optical character recognition (OCR)
  – Magnetic Ink
  – Electromagnetic transmission
  – Smart cards
  – Biometric
### Source Document / Form Design Guidelines

- When possible use designs based on known metaphors.
- Data to be entered (keyed) should be sequenced top-to-bottom and left-to-right.
- Minimize the amount of handwriting.
- Include instructions for completing the form.
- Do not capture data that can calculated or stored in computer programs as constants.
- Extended Price, Federal Withholding, etc.
- Use codes for appropriate attributes.

### Taxonomy for Computer Inputs

<table>
<thead>
<tr>
<th>Process Method</th>
<th>Data Capture</th>
<th>Data Entry</th>
<th>Data Processing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keyboard</td>
<td>Data is usually captured on a business form that becomes the source document for input. Data can be collected real-time.</td>
<td>Same as above. Used in conjunction with keyboard to simplify data entry. Mouse serves as a pointing device for a screen.</td>
<td>Same as above, but the use of a mouse is most commonly associated with online and real-time computing.</td>
</tr>
<tr>
<td>Mouse</td>
<td>Same as above. Used in conjunction with keyboard to simplify data entry. Mouse serves as a pointing device for a screen.</td>
<td>Same as above, but the use of a mouse is most commonly associated with online and real-time computing.</td>
<td>Same as above, but the use of a mouse is most commonly associated with online and real-time computing.</td>
</tr>
<tr>
<td>Touch Screen</td>
<td>Same as above. Data is entered via keyboard. This is the most common input method but also the most prone to errors.</td>
<td>Same as above, but the use of a mouse is most commonly associated with online and real-time computing.</td>
<td>Same as above, but the use of a mouse is most commonly associated with online and real-time computing.</td>
</tr>
<tr>
<td>Point of Sale</td>
<td>Data is captured as close to the point of sale as possible. No source document.</td>
<td>Same as above, but the use of a mouse is most commonly associated with online and real-time computing.</td>
<td>Same as above, but the use of a mouse is most commonly associated with online and real-time computing.</td>
</tr>
</tbody>
</table>

### Automatic Identification: Bar Codes

- Bar codes are read by a human. No source document is needed to process the data. Data is usually prerecorded and is much less reliable and limited input options.
- This technology is not as mature and is much less reliable and limited input options.
- Data (and commands) is spoken. This technology is not as mature and is much less reliable and limited input options.
- Data is entered using touch-tap, (typically from a telephone). Data is almost always processed as a transaction or inquiry.
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### Magnetic Ink

- A magnetic ink reader reads the magnetic data. The customer-added data must be entered using another input method.
- Data is captured on a magnetic ink stripe. The customer-added data must be entered using another input method.
- Data is almost always processed as a batch.
- Data is almost always processed as a batch.
Good Flow in a Form

Bad Flow in a Form

Internal Controls for Inputs

- The number of inputs should be (to minimize risk of lost transactions).
  - For batch processing
    - Use batch control slips
    - Use one-for-one checks against post-processing detail reports
  - For on-line systems
    - Log each transaction as it occurs to a separate audit file
- Validate all data
  - Existence checks
  - Data-type checks
  - Domain checks
  - Combination checks
  - Self-checking digits
  - Format checks

Repository-Based Prototyping and Development

Define properties and constraints for a reusable field

Define data validation code for a field
Common GUI Controls (Windows and Web)

- Text boxes
- Radio buttons
- Check boxes
- List boxes
- Drop down lists
- Combination boxes
- Spin boxes
- Buttons

Common GUI Controls Uses

- Text boxes
  - When the input data values are unlimited in scope
- Radio buttons
  - When data has limited predefined set of mutually exclusive values
- Check boxes
  - When value set consists of a simple yes or no value
- List boxes
  - When data has a large number of possible values
- Drop down lists
  - When data has large number of possible values and screen space is too limited for a list box
- Combination boxes
  - When need to provide the user with option of selecting a value from a list or typing a value that may or may not appear in the list
- Spin boxes
  - When need to navigate through a small set of choices or directly typing a data value

Advanced Controls (mostly Windows interfaces)

- Drop down calendars
- Slider edit controls
- Masked edit controls
- Ellipsis controls
- Alternate numerical spinners
- Check list boxes
- Check tree boxes

Automated Tools for Input Design and Prototyping

- Old Tools
  - Record Layout Charts
  - Display Layout Charts
- Newer Prototyping Tools
  - Microsoft Access
  - CASE Tools
  - Visual Basic
  - Excel
  - Visio

Input Design Process

1. Identify system inputs and review logical requirements.
2. Select appropriate GUI controls.
3. Design, validate and test inputs using some combination of:
   a) Layout tools (e.g., hand sketches, spacing charts, or CASE tools).
   b) Prototyping tools (e.g., spreadsheet, PC DBMS, 4GL)
4. As necessary design source documents.
A Logical Data Structure for Input Requirements

ORDER = ORDER NUMBER + ORDER DATE + CUSTOMER NUMBER + CUSTOMER NAME + CUSTOMER SHIPPING ADDRESS = ADDRESS > + (CUSTOMER BILLING ADDRESS = ADDRESS > ) + 1 (PRODUCT NUMBER + QUANTITY ORDERED) n + (DEFAULT CREDIT CARD NUMBER)

ADDRESS = (POST OFFICE BOX NUMBER) + STREET ADDRESS + CITY + STATE + POSTAL ZONE

Input Prototype for Video Title Maintenance

Input Prototype for Member Order

Input Prototype for Member Shopping

Input Prototype for Web Shopping Cart

Input Prototype for Web Interface