Systems Design **8 Hrs.**

The Processes and Stages of System Design

Information systems design is defined as those tasks that focus on the specification of a detailed computer-based solution. It is also called **physical design**. Hence, systems design focuses on the technical or implementation concerns of the information system.

The purpose of design is to transform the requirements represented in analysis phase into physical design specifications that will guide system construction. The design specification is used to write computer programs during implementation phase. In other words, the design phase addresses how technology will be used in the new system. Design process represents a specific technical solution of the information system. The design phase is concerned with designing **files and databases**, **forms and reports**, **dialogues and interfaces** and **system and program structure**.

Designing Forms and Reports

Forms are used to present or collect information on a single item such as a customer, product, or event. Forms can be used for both input and output. **Reports**, on the other hand, are used to convey information on a collection of items. Forms and report design is a key ingredient for successful systems. As users often equate the quality of a system to the quality of its input and out methods, the design process of for forms and reports is an especially important activity.

Forms and reports are identified during requirements structuring. The kinds of forms and reports the system will handle are established as a part of the design strategy formed at the end of the analysis phase of the system development process. Forms and reports are integrally related to various diagrams developed during requirements structuring. For example, every input form will be associated with a data flow entering a process on a DFD, and every output form or report will be a data flow produced by a process on a DFD. Further, the data on all forms and reports must consists of data elements on data stores and on the E-R data model for the application, or must be computed from these data elements.

The Process of Designing Forms and Reports

Designing forms and reports is a user-focused activity that typically follows a prototyping approach. First, you must gain an understanding of the intended user and task objectives by collecting initial requirements during requirements determination. During this process, several questions must be answered. These questions attempt to answer the "who, what, when, where, and how" related to the creation of all forms and reports as given below.

1. Who will use the form or report?
2. What is the purpose of the form or report?
3. When is the form or report needed or used?
4. Where does the form or report need to be delivered and used?
5. How many people need to use or view the form or report?

Gaining an understanding of these questions is a required first step in the creation of any form or report.

After collecting the initial requirements, you structure and refine this information into an initial prototype. Structuring and refining the requirements are completely independent of the users, although you may need to occasionally contact users in order to clarify some issue overlooked during analysis. Finally, you ask users to review and evaluate the prototype. After reviewing the prototype, users may accept the design or request that changes be made. If changes are needed, you will repeat the construction-evaluate-

refinement cycle until the design is accepted. Usually, several iterations of this cycle occur during the design of a single form or report. As with any prototyping process, you should make sure that these iterations occur rapidly in order to gain the greatest benefits from this design approach.

The initial prototype may be constructed in numerous environments. The obvious choice is to use CASE tool or the standard development tools used within your organization. Often, initial prototypes are simply mock screens that are not working modules or systems. Mock screens can be produced from a word processor, computer graphics design package, or electronic spreadsheet.

Deliverables and Outcomes

Design specifications are the major deliverables and are inputs to the system implementation phase. Design specifications have three sections:

1. **Narrative overview** – This section contains general overview of the characteristics of the target users, tasks, system, and environmental factors in which the form or report will be used. The purpose is to explain to those who will actually develop the final form, why this form exists, and how it will be used so that they can make the appropriate decisions.
2. **Sample design** – This section provides a sample design of the form. This design may be hand drawn using a coding sheet although, in most instances, it is developed using CASE or standard development tool. Using actual development tools allows the design to be more thoroughly tested and assessed.
3. **Testing and usability assessment** – This section provides all testing and usability assessment information. Assessing usability depends on speed, accuracy, and satisfaction.

Formatting Forms and Reports

A wide variety of information can be provided to users of information systems and, as technology continues to evolve, a greater variety of data types will be used. There are numerous guidelines for formatting information.

General Formatting Guidelines

Over the past several years, industry and academic researchers have spent considerable effort investigating how information formatting influences individual task, performance, and perceptions of usability. Through this work, several guidelines for formatting information have emerged as given below:

1. **Meaningful titles** – Titles should be clear and specific describing content and use. They should include version information and current date.
2. **Meaningful information** – Forms should include only necessary information with no need to modification.
3. **Balance of layout** – Adequate spacing and margins should be used. All data and entry fields should be clearly labeled.
4. **Easy navigation system** – Clearly show how to move forward and backward. Clearly show where you are (e.g., page 1 of 3) currently. Notify the user when on the last page of a multipaged sequence.

Highlighting Information

As the display technologies continue to improve, there will be a greater variety of methods available to you for highlighting information. Most commonly used methods for highlighting information are:

1. Blinking and audible tones

2. Color differences
3. Intensity differences
4. Size differences
5. Font differences
6. Reverse video
7. Boxing
8. Underlining
9. All capital letters
10. Offsetting the position of nonstandard information

There are several situations when highlighting can be a valuable technique for conveying special information:

1. Notifying users of errors in data entry or processing
2. Providing warnings to users regarding possible problems such as unusual data values or an unavailable device
3. Drawing attention to keywords, commands, high priority messages, and data that have changed or gone outside normal operating ranges

Color versus No-color

Color is a powerful tool for the designer in influencing the usability of a system. When applied appropriately, color provides many potential benefits to forms and reports as given below:

1. Soothes and strikes the eye
2. Accents an uninteresting display
3. Facilitates subtle discriminations in complex displays
4. Emphasizes the logical organization of information
5. Draws attention to warnings
6. Evokes more emotional reactions

Color also provides problems as given below:

1. Color pairings may wash out or cause problems for some users (e.g., color blindness)
2. Resolution may degrade with different displays
3. Color fidelity may degrade on different displays
4. Printing or conversion to other media may not easily translate

Displaying Text

In business-related systems, textual output is becoming increasingly important. Some of the guidelines that have emerged from past research are:

1. **Case** – Display text in mixed upper and lower case and use conventional punctuations.
2. **Spacing** – Use double spacing if space permits. If not, place a blank line between paragraphs.
3. **Justification** – Left-justify text and leave a ragged right margin.
4. **Hyphenation** – Do not hyphenate words between lines.
5. **Abbreviations** – Use abbreviations and acronyms only when they are widely understood by users and are significantly shorter than the full text.

Designing Tables and Lists

The context and meaning of tables and lists are significantly derived from the format of the information. Consequently, the usability of information displayed in tables and alphanumeric lists is likely to be much more influenced by effective layout than most other types of information display. As with the display of textual information, tables and

lists can also be greatly enhanced by following a few simple guidelines.

1. **Use meaningful labels** – All columns and rows should have meaningful labels. Labels should be separated from other information by using highlighting. Re-display labels when the data extend beyond a single screen or page.
2. **Formatting columns, rows, and text** – Sort in a meaningful order (e.g., ascending, descending, or alphabetic). Place a blank line between every five rows in long columns. Similar information displayed in multiple columns should be sorted vertically (that is, read from top to bottom, not left to right). Columns should have at least two spaces between them. Allow white space on printed reports for user to write notes. Use a single typeface, except for emphasis. Use same family of typefaces within and across displays and reports. Avoid overly fancy fonts.
3. **Formatting numeric, textual, and alphanumeric data** – Right justify numeric data and align columns by decimal points or other delimiter. Left justify textual data. Use short line length, usually 30 to 40 characters per line. Break long sequences of alphanumeric data into small groups of three to four characters each.

When you design the display of numeric information, you must determine whether a table or a graph should be used. A considerable amount of research focusing on this topic has been conducted. In general, tables are best when the user's task is related to finding an individual data value from a larger data set whereas line and bar graphs are more appropriate for an understanding of data changes over time. Some guidelines for selecting tables versus graphs are given below:

Use tables for
- Reading individual data values

Use graphs for
- Providing quick summary of data
- Displaying trends over time
- Comparing points and patterns of variables
- Forecasting activities
- Reporting of vast amounts of information when relatively simple impressions are to be drawn

Paper versus Electronic Reports

When a report is produced on paper rather than on a computer display, you must consider type of printer to use. For example, laser printers (especially color laser printers) and ink jet printers allow you to produce a report that looks exactly as it does on the display printer. However, other types of printers are not able to closely reproduce the display screen image onto paper. For example, many business reports are produced using high spend impact printers that produce characters and a limited range of graphics by printing a fine pattern of dots.