Objectives Overview

- Define system development and list the system development phases
- Identify the guidelines for system development
- Discuss the importance of project management, feasibility assessment, documentation, and data and information gathering techniques
- Discuss the purpose of and tasks conducted in each system development phase

See Page 510 for Detailed Objectives
Objectives Overview

Differentiate between low-level languages and procedural languages

List other programming languages and application development tools

Identify the benefits of object-oriented programming languages and application development tools

Describe various ways to develop webpages

See Page 510 for Detailed Objectives
System development is a set of activities used to build an information system. System development activities are grouped into phases, and is called the system development life cycle (SDLC).
System Development

• System development should follow three general guidelines:

  - Group activities or tasks into phases
  - Involve users
  - Define standards
System Development

- System development should involve representatives from each department in which the proposed system will be used.
System Development

- **Project management** is the process of planning, scheduling, and then controlling the activities during system development.

- To plan and schedule a project efficiently, the project leader identifies the following elements:
  - Project scope
  - Required activities
  - Time estimates for each activity
  - Cost estimates for each activity
  - Order of activities
  - Activities that can take place at the same time
Popular tools used to plan and schedule the time relationships among project activities are Gantt and PERT charts.
**System Development**

- **Feasibility** is a measure of how suitable the development of a system will be to the organization
System Development

- **Documentation** is the collection and summarization of data, information, and deliverables.
- Maintaining up-to-date documentation should be an ongoing part of system development.
System Development

- During system development, members of the project team gather data and information using several techniques:
  - Review documentation
  - Observe
  - Survey
  - Interview
  - JAD Sessions
  - Research
System Development

- The **planning phase** for a project begins when the steering committee receives a project request
- Four major activities are performed:
  - Review and approve the project requests
  - Prioritize the project requests
  - Allocate resources
  - Form a project development team
System Development

- The **analysis phase** consists of two major activities:

  - **Conduct a preliminary investigation**
    - Determines and defines the exact nature of the problem or improvement
    - Interview the user who submitted the request

  - **Perform detailed analysis**
    - Study how the current system works
    - Determine the users’ wants, needs, and requirements
    - Recommend a solution
MEMORANDUM

HICKORY COMMUNITY COLLEGE

The System Development

Date: December 24, 2004

Subject: Feasibility Study of Book Ordering System

Following is the feasibility study in response to the request for a modification to the book ordering system. Your approval is necessary before the next phase of the project will begin.

Introduction

The purpose of this feasibility report is to determine whether it is beneficial for Hickory Community College to continue using the book ordering system. The bookstore manager has indicated that bookstore staff spend too much time entering and verifying book orders. This project would affect the bookstore and instructors.

Ordering System

Background

Currently, the bookstore requires that instructors manually fill in book order forms. On those forms, the instructions fill in the course title, course section, required coursework, and ISBN. If the book is required, whether the textbook is required or optional. As instructors use the completed book order forms, bookstore staff enters each instructor’s book order into bookstore’s database program. After book orders are entered, a separate set of bookstore staff compares the original forms with the entered orders to check for any errors that may have occurred during the data entry process. After all orders are verified, they are processed and sent to the book publishers.

Problems

The following problems have been identified with the current book ordering system at Hickory Community College:

- Bookstore staff spends too much time entering and verifying book orders.
- During the check for errors of entered book orders, staff has been finding an excessive number of data entry errors.

Benefits of a New or Modified System

Following is a list of benefits that could be realized if the book ordering system at Hickory Community College were modified to enable instructors to enter online book order forms, where instructors enter their book orders directly into the bookstore database:

- Data entry errors of book orders by bookstore staff would be eliminated.
- Cost of supplies, such as paper and ink, would be reduced by 10 percent.
- Through a more efficient use of bookstore staff time, the college could achieve a 25 percent reduction in temporary assistants in the bookstore.

Feasibility Study

Operational

A modified book ordering system will require instructors enter all book orders online.

Technical

Hickory Community College already has a functional database and server. To handle the increased volume and usage of data, however, it may be required to purchase a larger database server.

Economic

A detailed summary of the costs and benefits, including all assumptions, is available on our FTP server. The potential costs of the proposed solution could range from $5,000 to $10,000. The estimated savings in temporary staff and supplies will assist $3,000.

If you have any questions about the detailed cost/benefit summary or require further information, please contact me.

Recommendation

Based on the findings presented in this report, we recommend a constrained study of the book ordering system.
System Development

• The system proposal assesses the feasibility of each alternative solution
• The steering committee discusses the system proposal and decides which alternative to pursue

- Modify existing system
- Buy retail software
- Use web apps
- Build custom software
- Outsource
System Development

- The **design phase** consists of two major activities:
  - Acquire hardware and software
  - Develop all of the details of the new or modified information system
System Development

- To acquire the necessary hardware and software:
  1. Identify technical specifications
  2. Solicit vendor proposals
  3. Test and evaluate vendor proposals
  4. Make a decision
System Development

- The next step is to develop detailed design specifications

- Database design
- Input and output design
- Program design
System Development

- Systems analysts typically develop two types of designs for each input and output.

Mock-up

Layout chart
System Development

- A **prototype** (proof of concept) is a working model of the proposed system’s essential functionality
  - Prototypes have inadequate or missing documentation
  - Users tend to embrace the prototype as a final system
  - Should not eliminate or replace activities
A prototype (proof of concept) is a working model of the proposed system’s essential functionality.

Computer-aided software engineering (CASE) tools are designed to support one or more activities of system development.
System Development

• The purpose of the implementation phase is to construct the new or modified system and then deliver it to users.

- Develop programs and apps
- Install and test the new system
- Train users
- Convert to the new system
System Development

• Various tests should be performed on the new system

<table>
<thead>
<tr>
<th>Test Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit test</td>
<td>Verifies that each individual program or object works by itself</td>
</tr>
<tr>
<td>Systems test</td>
<td>Verifies that all programs in an application work together properly</td>
</tr>
<tr>
<td>Integration test</td>
<td>Verifies that an application works with other applications</td>
</tr>
<tr>
<td>Acceptance test</td>
<td>Checks the new system to ensure that it works with actual data</td>
</tr>
</tbody>
</table>
System Development

• **Training** involves showing users exactly how they will use the new hardware and software in the system
  – One-on-one sessions
  – Classroom-style lectures
  – Web-based training
System Development

- One or more of four conversion strategies can be used to change from the old system to the new system
  - Direct conversion
  - Parallel conversion
  - Phased conversion
  - Pilot conversion
The purpose of the **support and security phase** is to provide ongoing assistance for an information system and its users after the system is implemented.

- Perform maintenance activities
- Monitor system performance
- Assess system security
A **programming language** is a set of words, abbreviations, and symbols that enable a software developer to communicate instructions to a computer or mobile device.

- Low-level language
- High-level language
Application Development Languages and Tools

• **Machine language** is the first generation of programming languages

• Only language the computer directly recognizes
Assembly language is the second generation of programming languages.

Programmer writes instructions using symbolic instruction codes.

A source program contains the language instructions, or code, to be converted into machine language.
Application Development Languages and Tools

• In a **procedural language**, the programmer writes instructions that tell the computer what to accomplish and how to do it.
Application Development Languages and Tools

• The C programming language is used to write many of today’s programs

```c
/* Compute Regular Time Pay */
rt_pay = rt_hrs * pay_rate;

/* Compute Overtime Pay */
if (ot_hrs > 0) {
  ot_pay = ot_hrs * 1.5 * pay_rate;
} else {
  ot_pay = 0;
}

/* Compute Gross Pay */
gross = rt_pay + ot_pay;

/* Display Gross Pay */
printf("The gross pay is %d\n", gross);
```
A compiler translates an entire program before executing it.

An interpreter converts and executes one code statement at a time.
Application Development Languages and Tools

Compiler

```
/* Compute Regular Time Pay */
rt_pay = rt_hrs * pay_rate;

/* Compute Overtime Pay */
if (ot_hrs > 0)
  ot_pay = ot_hrs * 1.5 * pay_rate;
else
  ot_pay = 0;

/* Compute Gross Pay */
gross = rt_pay + ot_pay;

/* Display Gross Pay */
printf("The gross pay is %d\n", gross);
```

Interpreter

```
Source program
```

```
Data
```

```
Interpreter
```

```
Results
```
Application Development Languages and Tools

- An **object-oriented programming (OOP) language** allows programmers the ability to reuse and modify existing objects.
- Other advantages include:
  - Objects can be reused
  - Programmers create applications faster
  - Most object-oriented application development tools are IDEs
Application Development Languages and Tools

- **Java** is an object-oriented programming language developed by Sun Microsystems.
- The Just-in-time (JIT) compiler to convert the machine-independent code into machine-dependent code.

```java
public class BodyMassApplet extends Applet implements ActionListener {
    // declare variables
    // declare an image object
    int inches, pounds;
    double meters, kilograms, index;

    // construct components
    Label companyLabel = new Label("THE SUN FITNESS CENTER BODY MASS INDEX CALCULATOR");
    Label inputLabel = new Label("Enter your height to the nearest inch ");
    TextField heightField = new TextField(10);
    Label weightLabel = new Label("Enter your weight to the nearest pound ");
    TextField weightField = new TextField(10);
    Button calculateButton = new Button("Calculate");
    LabeloutputLabel = new Label("Click the Calculate Button to see your Body Mass Index.");
    inches = Integer.parseInt(heightField.getText());
    pounds = Integer.parseInt(weightField.getText());
    meters = inches / 19.8;
    kilograms = pounds / 2.2;
    index = kilograms / Math.pow(meters, 2);
    outputLabel.setText("YOUR BODY MASS INDEX IS " + Math.round(index) + ".");
}
```

Figure 12-17
Application Development Languages and Tools

• **C++** is an extension of the C programming language
  – Additional features for working with objects

• **Visual Studio** is Microsoft’s suite of object-oriented application development tools that assists software developers in building programs and apps for Windows or any operating system that supports the Microsoft .NET Framework
Application Development Languages and Tools

Creating a Visual Basic Desktop App

Step 1
The software developer designs the user interface, such as for the desktop app shown here. Enter Weight Loss is a button that, when tapped or clicked, displays a dialog box into which the user enters a weight loss value. The app then displays all weight loss values that the user enters in a list box, along with the team’s average weight loss in a label. An image and label for the app’s title (Fitness Challenge Team Weight Loss) adds visual appeal to the user interface.

Step 2
The software developer assigns properties to each object. Objects include text boxes, list boxes, images, buttons, labels, and the form itself.

Step 3
The software developer writes code to define the action of each event that the user triggers, such as clicking a button or entering a value.

Step 4
The software developer tests the app. After the user enters a weight loss value, the app displays the value below any other values in the list box, calculates the average of the weight loss values shown in the list box, and displays the average in the Average Weight Loss label.
Application Development Languages and Tools

• A **4GL** (fourth-generation language) is a nonprocedural language that enables users and programmers to access data in a database
  – One popular 4GL is SQL
Application Development Languages and Tools

- Classic programming languages include:

  - Ada
  - ALGOL
  - APL
  - BASIC
  - COBOL
  - Forth
  - FORTRAN
  - HyperTalk
  - LISP
  - Logo
  - Modula-2
  - Pascal
  - PILOT
  - PL/1
  - Prolog
  - RPG
  - Smalltalk
Application Development Languages and Tools

- An application generator is a program that creates source code or machine code from a specification of the required functionality
  - Often bundled as part of a DBMS
- A **macro** is a series of statements that instructs an application how to complete a task
- You usually create the macro in one of two ways:
  - Record the macro with a macro recorder
  - Write the macro
Application Development Languages and Tools

Figure 12-19

My Loan Calculator

<table>
<thead>
<tr>
<th>Date</th>
<th>April-13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car model</td>
<td>Lexus</td>
</tr>
<tr>
<td>Price</td>
<td>$82,000.00</td>
</tr>
<tr>
<td>Down Payment</td>
<td>$12,750.00</td>
</tr>
<tr>
<td>Loan Amount</td>
<td>$69,250.00</td>
</tr>
<tr>
<td>Interest Rate</td>
<td>8.58%</td>
</tr>
<tr>
<td>Years</td>
<td>6</td>
</tr>
<tr>
<td>Monthly Payment</td>
<td>$975.59</td>
</tr>
<tr>
<td>Total Interest</td>
<td>$13,792.15</td>
</tr>
<tr>
<td>Total Cost</td>
<td>$75,792.15</td>
</tr>
</tbody>
</table>

New Loan button

First of series of dialog boxes that user fills in

Figure 12-19
• **HTML** is a special formatting language that programmers use to format documents for display on the web.
Application Development Languages and Tools

- **XML** allows web developers to create tags that describe how information is displayed
  - WML is a subset of XML and is used to design pages specifically for microbrowsers
Application Development Languages and Tools

- Software developers write scripts, applets, servlets, or ActiveX controls using a variety of languages

JavaScript  Perl  PHP
Ruby on Rails provides technologies for developing object-oriented, database-driven websites.
System development phases

Guidelines for system development

Activities that occur during system development

Various programming languages and program development tools

Web development tools