

## Chapter Eleven

# Information System Development and Programming Languages

**Discovering Computers  
Fundamentals,  
2010 Edition**

**Living in a Digital World**



# Objectives Overview

Discuss the importance of project management, feasibility assessment, documentation, and data and information gathering techniques

Discuss the purpose of each system development phase

Differentiate between low-level languages and procedural languages

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

# Objectives Overview

List other programming languages and other program development tools

Describe various ways to develop Web pages

List the six program development steps

Explain the basic control structures used in designing solutions to programming problems

# System Development

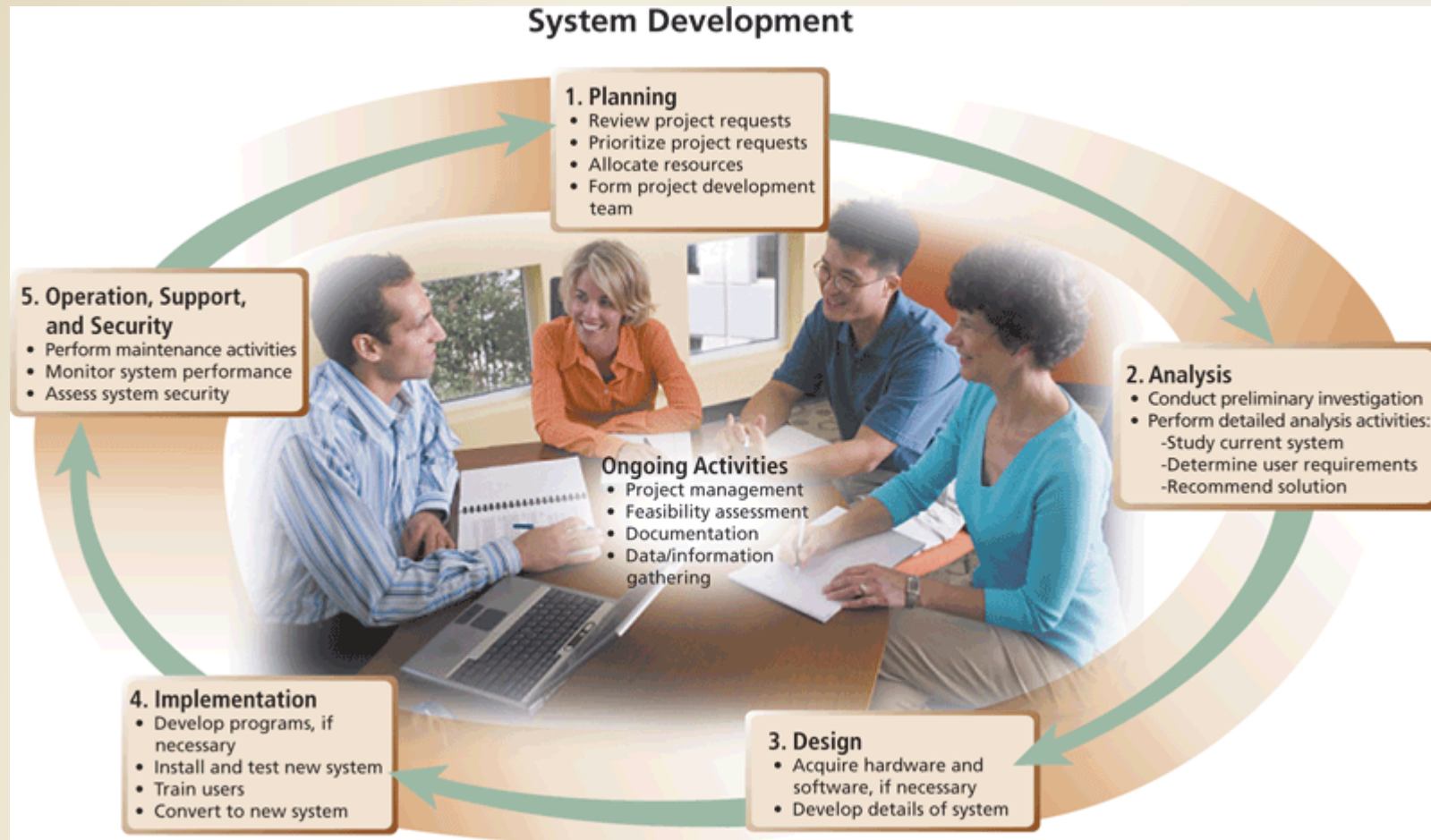
**System development** is a set of activities used to build an information system

A **system** is a set of components that interact to achieve a common goal

An **information system (IS)** is a collection of hardware, software, data, people, and procedures that work together to produce quality information

System development activities are grouped into **phases**, and is called the **system development life cycle (SDLC)**

# System Development



# System Development

- System development should follow three general guidelines:

Group activities or tasks into phases

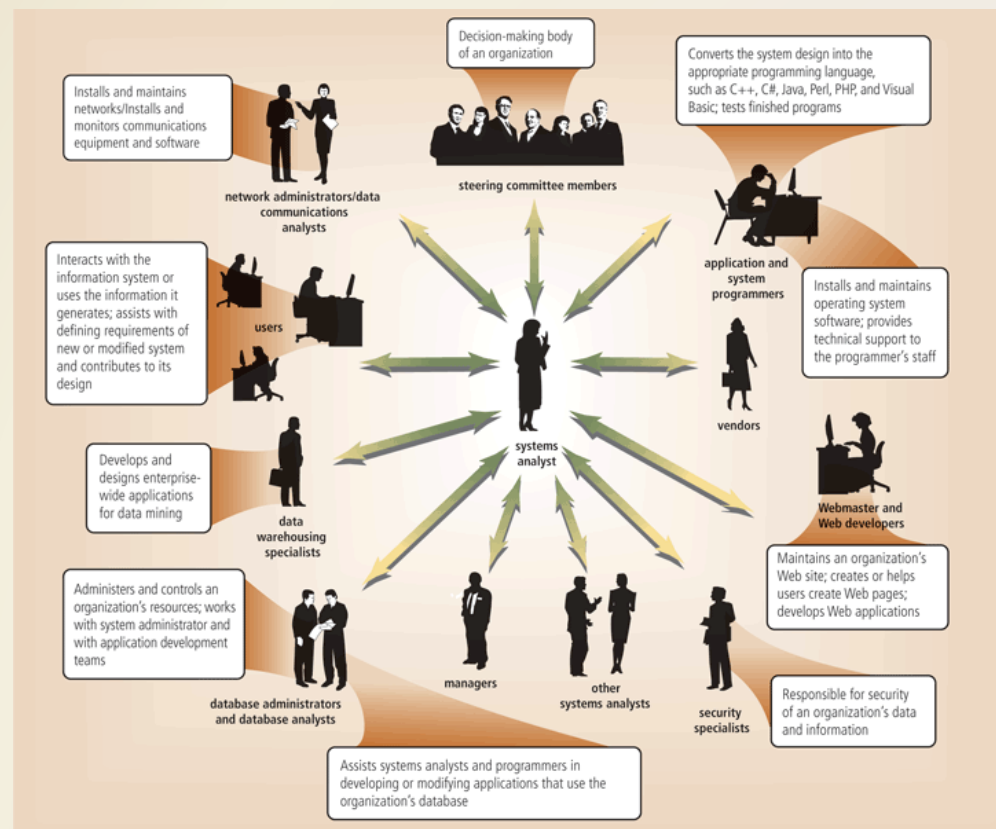
Involve users

Define standards



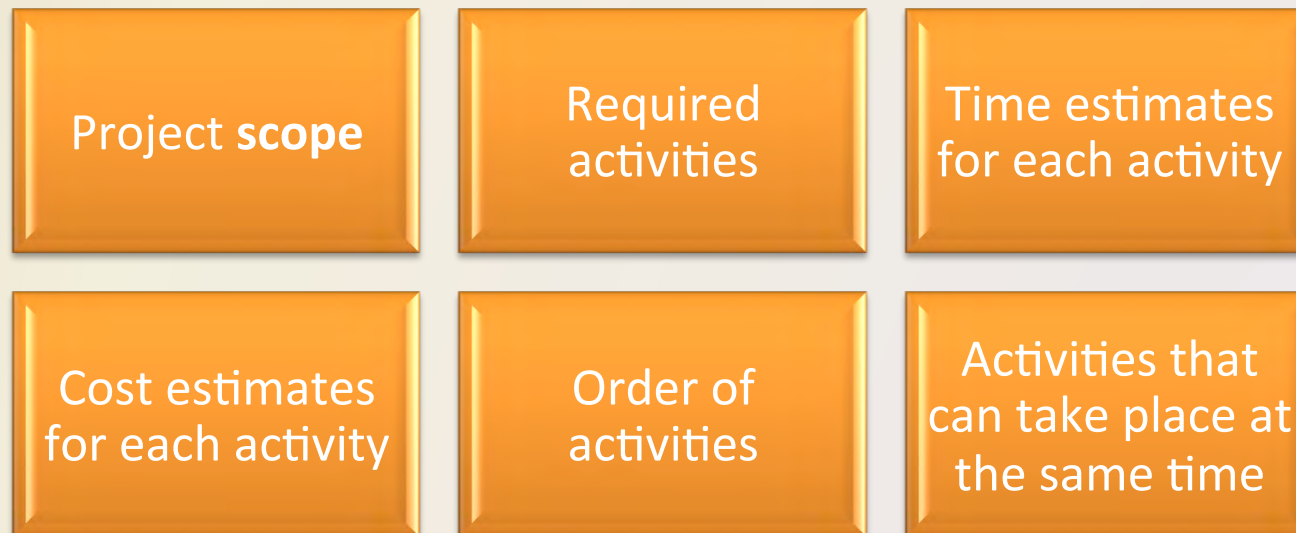
# System Development

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



# System Development

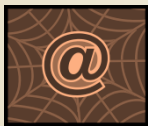
- **Project management** is the process of planning, scheduling, and then controlling the activities during system development
- To plan and schedule a project efficiently, the project leader identifies:





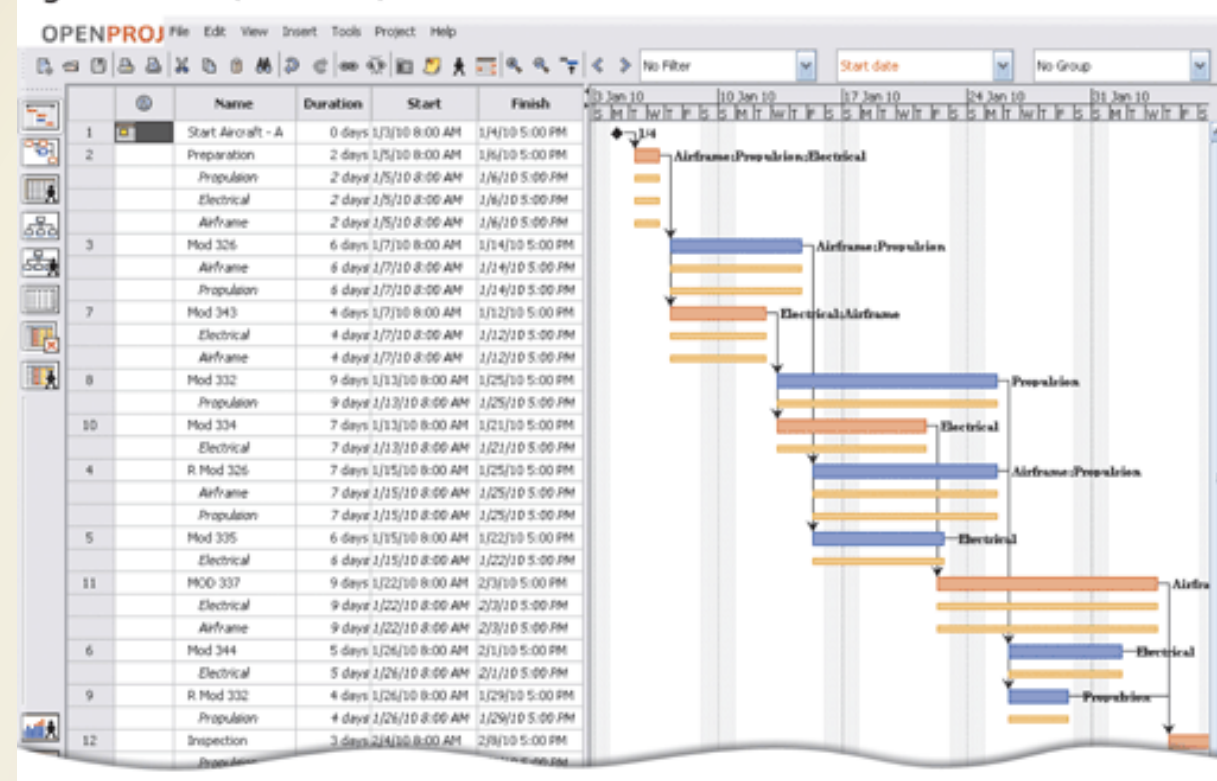
# System Development

A popular tool used to plan and schedule the time relationships among project activities is a Gantt chart



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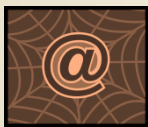
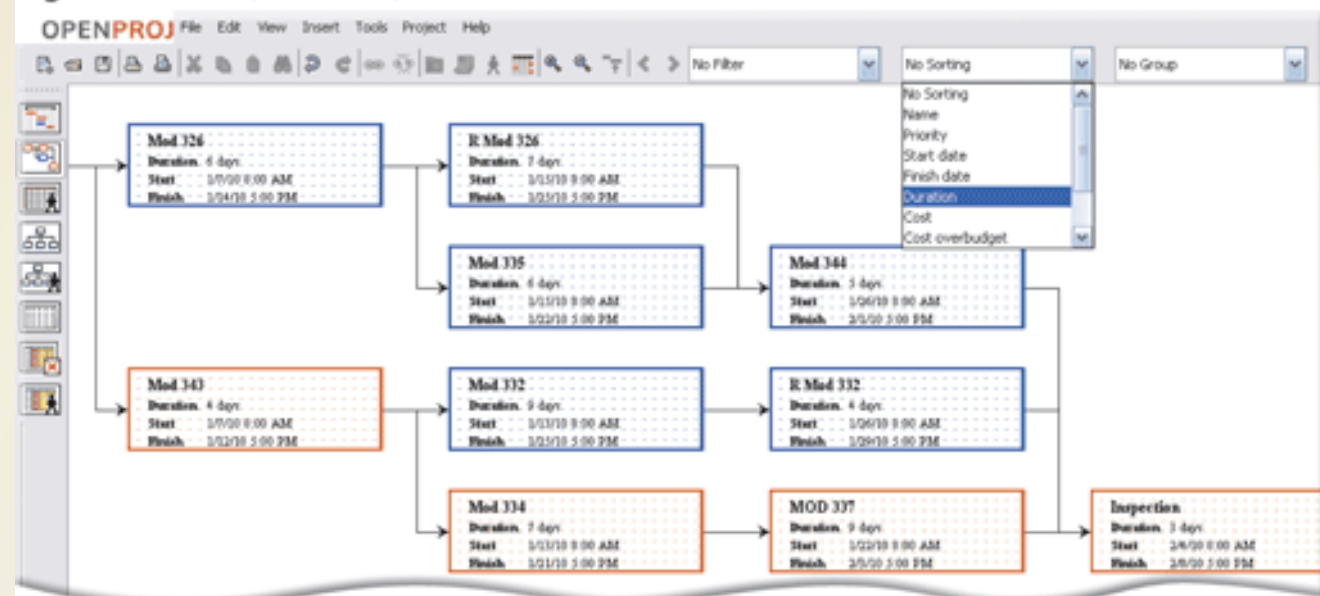
Figure 11-3a (Gantt chart)



# System Development

A PERT chart  
also can be  
used for  
planning and  
scheduling time

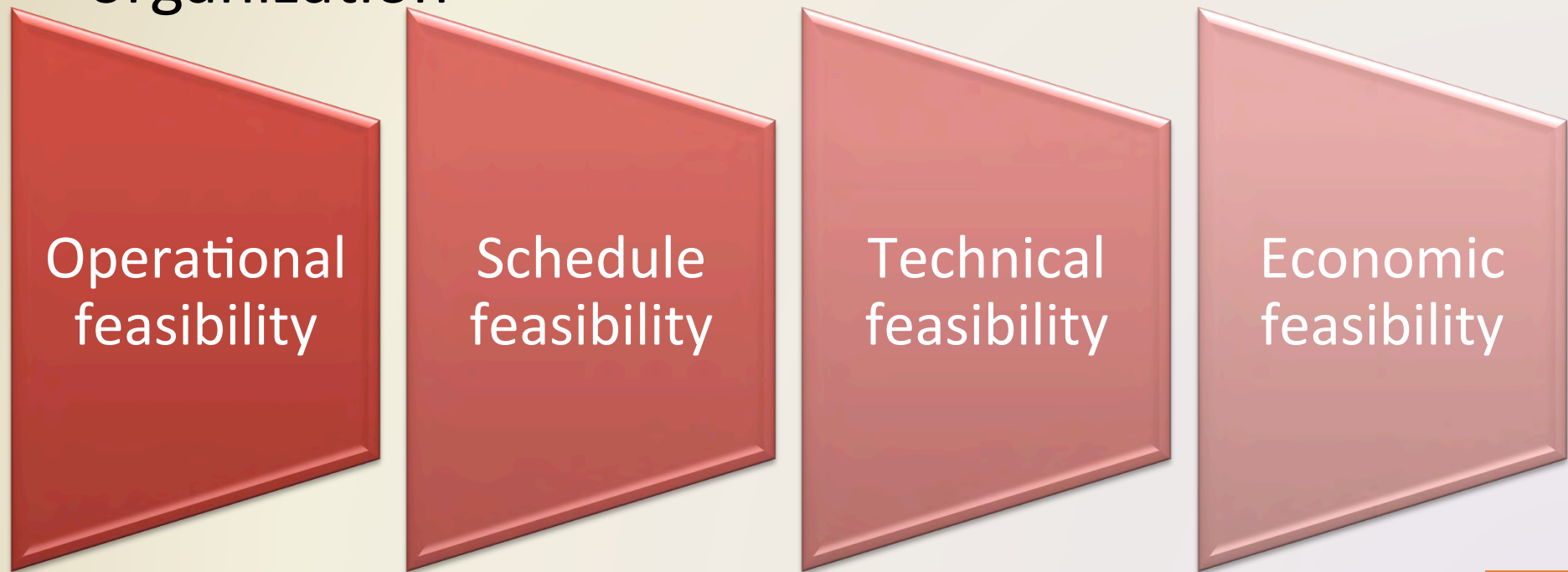
Figure 11-3b (PERT chart)



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then click PERT Charts below  
Chapter 11

# 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 and information and includes:
  - Reports
  - Diagrams
  - Programs
  - Other information generated during 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

A user may request a new or modified system

Organizations may want to improve hardware, software, or other technology

Situations beyond an organization's control might require a change

Management might mandate a change

A user may request a new or modified information system using a request for system services or a **project request**



# System Development

Figure 11-5a (informal project request)

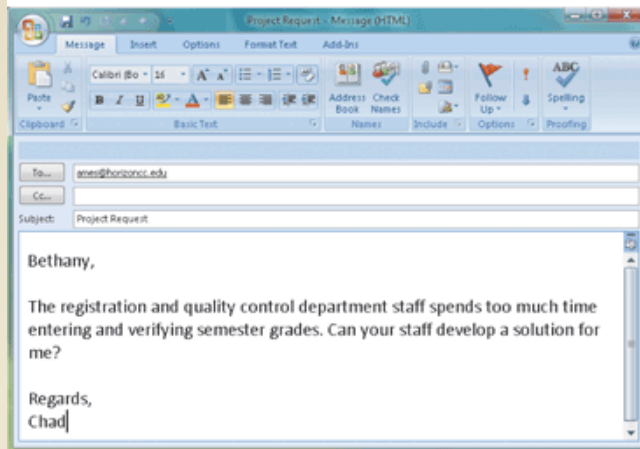


Figure 11-5b (formal project request)

*Horizon Community College*  
**REQUEST FOR SYSTEM SERVICES**  
Form IT-102A

SUBMITTED BY: Chad Goldstein  
DEPARTMENT: Registration  
DATE: 12-15-2010

TYPE OF REQUEST:  
☒ New System  
☒ Existing System Enhancement  
☐ Existing System Modification

BRIEF STATEMENT OF PROBLEM:  
The registration and quality control department staff spends too much time entering and verifying semester grades.

BRIEF STATEMENT OF EXPECTED SOLUTION:  
Modify our current grade reporting system to enable instructors to use an online grade book, so that semester report cards could be printed directly from each instructor's online grade book.

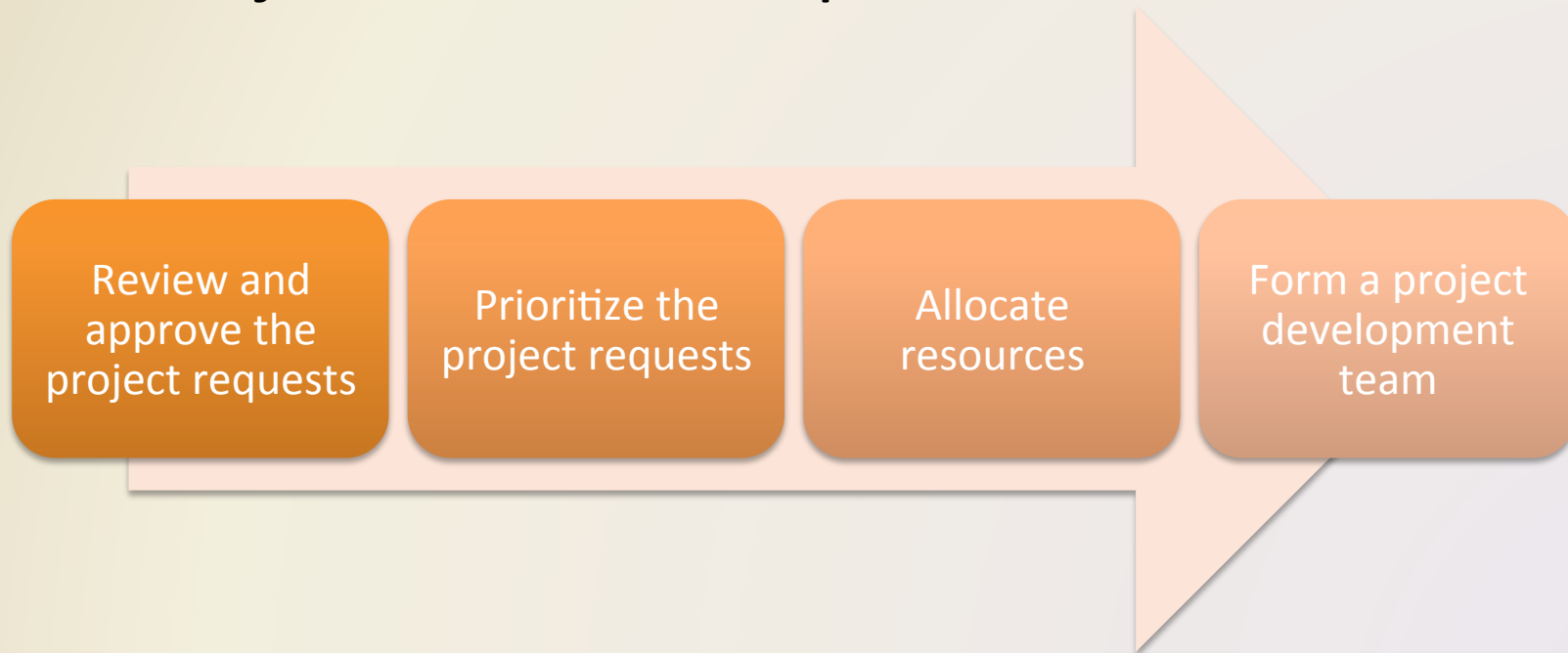
ACTION (to be completed by steering committee member):

<input type="checkbox"/> Request Approved	Analyst Assigned: _____
<input type="checkbox"/> Request Delayed	Start Date: _____
<input type="checkbox"/> Request Rejected	Until: _____
	Reason: _____

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

# System Development

- The **planning phase** for a project begins when the steering committee receives a project request
- Four major activities are performed:



# 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

# System Development

# Horizon Community College

## MEMORANDUM

**To:** Steering Committee

**From:** Karl Schmidt, Project Leader

**Date:** December 29, 2010

**Subject:** Feasibility Report of Grade Reporting System

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Following is the feasibility report in response to the request for a modification to our Grade Reporting 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 Horizon Community College to continue studying the Grade Reporting System. The registrar has indicated registration and quality control department staff spends too much time entering and verifying semester grades. This project would affect the registration department, quality control, and instructors. Students also will notice a change.

Existing System

**Background**

Currently, instructors use their own method for recording assignment grades and calculating semester grades. At semester end, the registration department distributes via e-mail a class semester grade form, which contains a list of all students in a class and an area for the instructor to record each student's final semester grade. As instructors send in their class semester grade forms, registration clerks enter each student's grade using the school's database. After grades are entered, the quality control group compares the original semester grade forms with the entered grades to check for any errors that may have occurred during the data entry process. Then, report cards are printed and mailed to students.

**Problems**

As the number of enrolled students continues to rise, the following problems have been identified with the current Grade Reporting System at Horizon Community College:

- Registration clerks and quality control spend too much time entering semester grades and verifying entered grades.
- Quality control has been finding an excessive number of data entry errors in part due to the increased workload on the registration clerks.

FEASIBILITY REPORT  
Page 2

Benefits of a New or Modified System

Following is a list of benefits that could be realized if the Grade Reporting System at Horizon Community College were modified to enable instructors to use an online grade book, so that report cards could be printed directly from each instructor's grade book:

- Data entry errors of semester grades by registration clerks would be eliminated.
- Cost of supplies, such as paper and ink, would be reduced by 10 percent.
- Through a more efficient use of registration and quality control staff time, the college could achieve a 50 percent reduction in temporary clerks in the registration department.

Feasibility of a New or Modified System

**Operational**

A modified Grade Reporting System will require instructors enter all semester grades online. In addition to report cards being generated automatically from each instructor's grade book, students will be able to check their class progress throughout the semester.

**Schedule**

The established deadline for the Grade Reporting System is reasonable.

**Technical**

Horizon Community College already has a functional database and server. To handle the increased volume and usage of data, however, it will need 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 \$15,000 to \$20,000. The estimated savings in temporary clerks and supplies will exceed \$30,000.

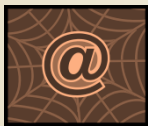
If you have any questions about the detailed cost/benefit summary or require further information, please contact me.

Recommendation

Based on the findings presented in this report, we recommend a continued study of the Grade Reporting 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



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Software below Chapter 11

# System Development

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- The **design phase** consists of two major activities



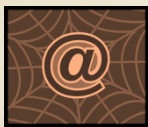
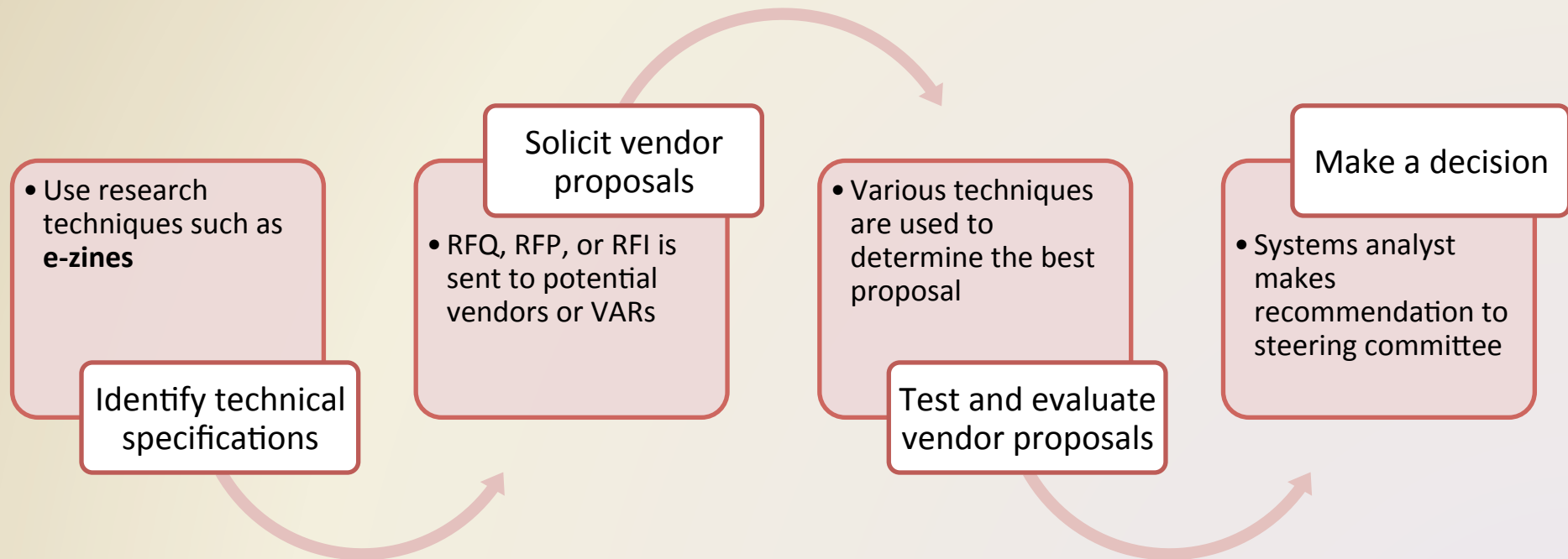
Acquire hardware  
and software

Develop all of the  
details of the new  
or modified  
information system



# System Development

- To acquire the necessary hardware and software:



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Chapter 11

# System Development

- The next step is to develop detailed design specifications
  - Sometimes called a physical design



Database  
design

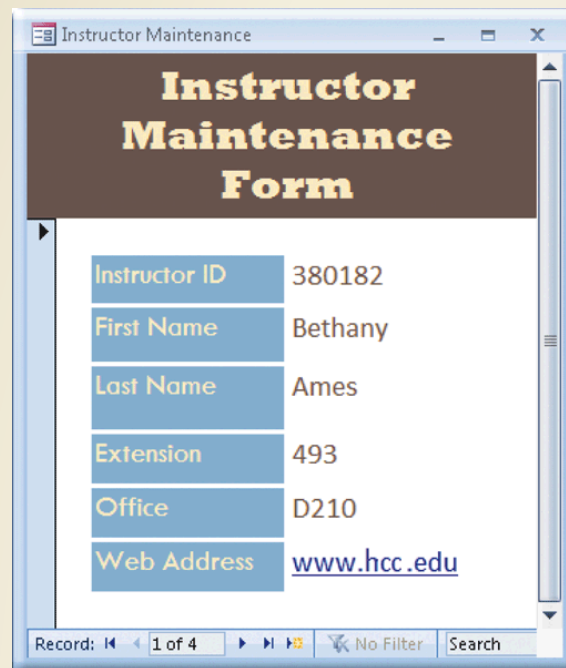
Input and  
output  
design

Program  
design

# System Development

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

Mockup

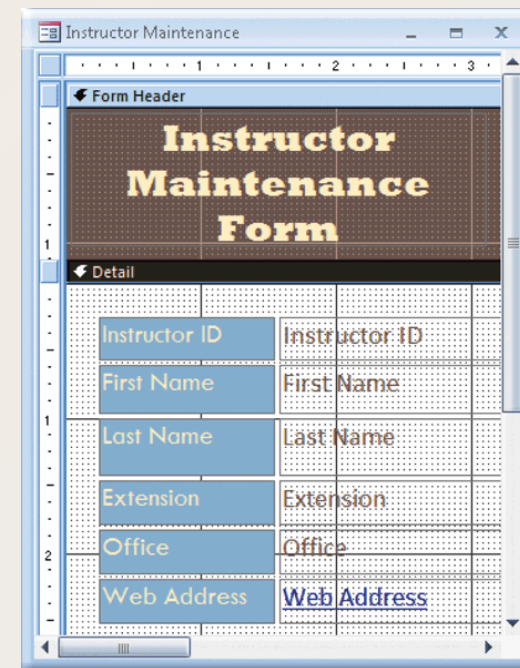


The mockup shows a window titled "Instructor Maintenance" containing a form titled "Instructor Maintenance Form". The form has the following fields and values:

Instructor ID	380182
First Name	Bethany
Last Name	Ames
Extension	493
Office	D210
Web Address	<a href="http://www.hcc.edu">www.hcc.edu</a>

At the bottom of the window, there is a status bar with the text "Record: 1 of 4", a "No Filter" button, and a "Search" button.

Layout chart



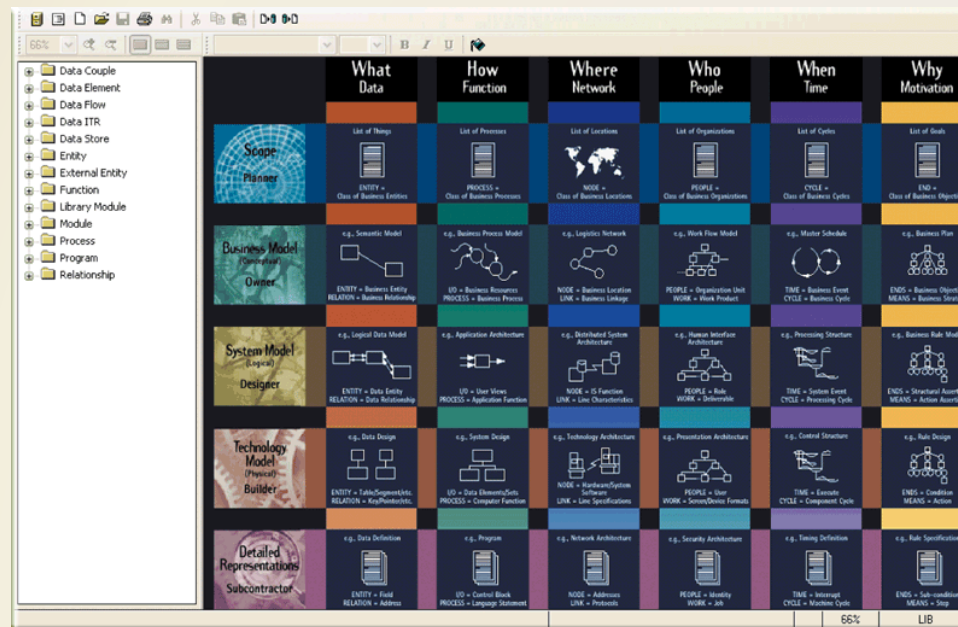
The layout chart shows the same "Instructor Maintenance Form" but with a grid overlay indicating the layout structure. The grid is divided into two main sections: "Form Header" and "Detail". The "Form Header" section contains the title "Instructor Maintenance Form". The "Detail" section contains the form fields arranged in a grid. The fields are arranged in two columns: "Instructor ID", "First Name", "Last Name", "Extension", "Office", and "Web Address" in the first column, and "Instructor ID", "First Name", "Last Name", "Extension", "Office", and "Web Address" in the second column. The grid lines are shown as dotted lines.

# System Development

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

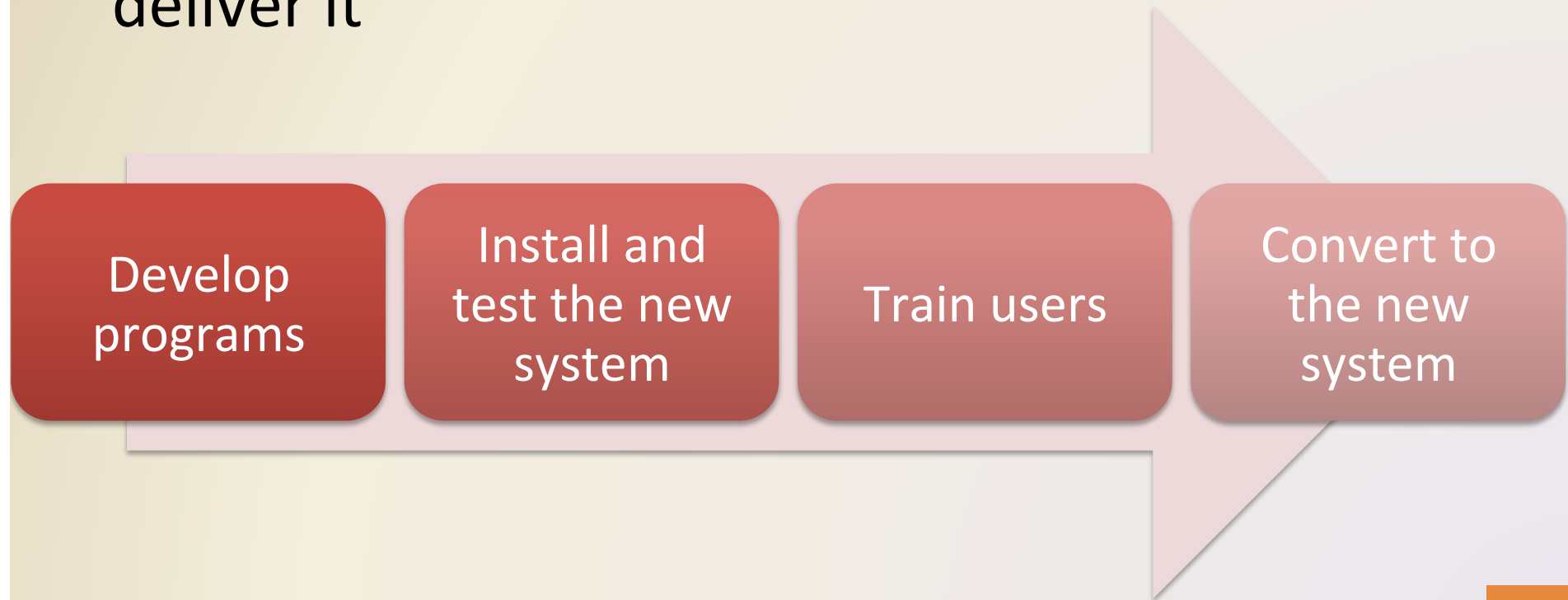
# System Development

- **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





# System Development

- Various tests should be performed on the new system

## Unit test

- Verifies that each individual program or object works by itself

## Systems test

- Verifies that all programs in an application work together properly

## Integration test

- Verifies that an application works with other applications

## Acceptance test

- Checks the new system to ensure that it works with actual data

# 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


# System Development

- The purpose of the **operation, support, and security phase** is to provide ongoing assistance for an information system and its users after the system is implemented



# System Development

- A **computer security plan** should do the following:



Identify all  
information  
assets of an  
organization

Identify all  
security risks  
that may cause  
an information  
asset loss

For each risk,  
identify the  
safeguards that  
exist to detect,  
prevent, and  
recover from a  
loss

# Programming Languages and Program Development Tools

- A **computer program** is a series of instructions that directs a computer to perform tasks
  - Created by a **programmer** using a **programming language**



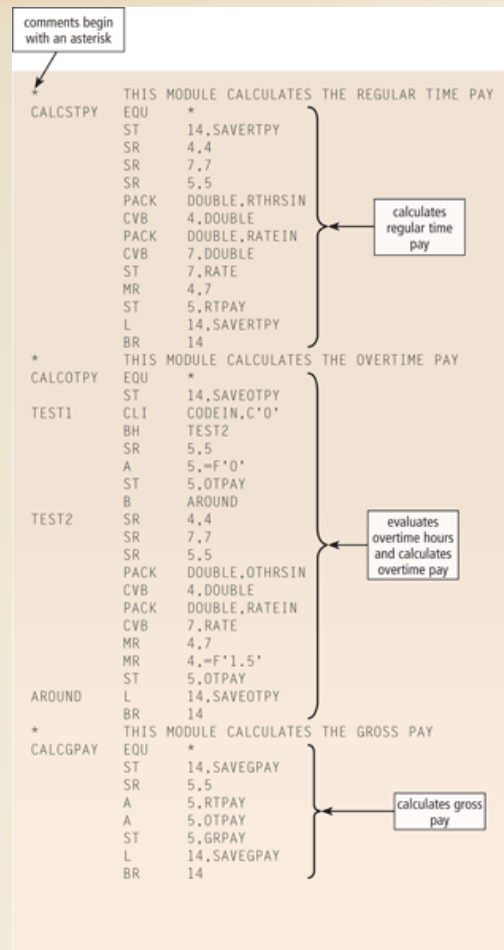


# Programming Languages and Program Development Tools

- Machine language is the first generation of programming languages
- Only language the computer directly recognizes

0000DE	5A50	35AA			015AC
0000E2	47F0	2100		00102	
000102	1B77				
000104	5870	304E			01050
000108	1C47				
00010A	4E50	30D6			010D8
00010E	F075	30D6	003E	010D8	0003E
000114	4F50	30D6			010D8
000118	5050	3052			01054
00011C	58E0	30B6			010B8
000120	07FE				
					00122
000122	50E0	30BA			010BC
000126	1B55				
000128	5A50	304E			01050
00012C	5B50	3052			01054
000130	5050	305A			0105C
000134	58E0	30BA			010BC
000138	07FE				

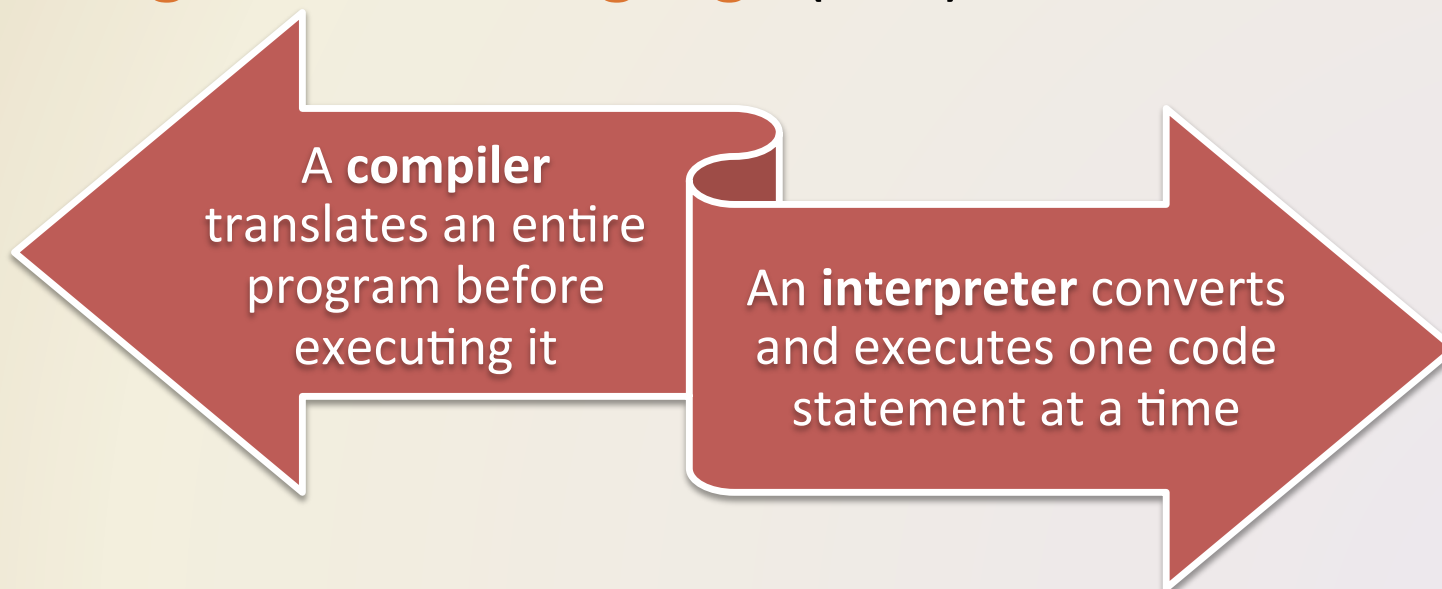
# Programming Languages and Program Development Tools



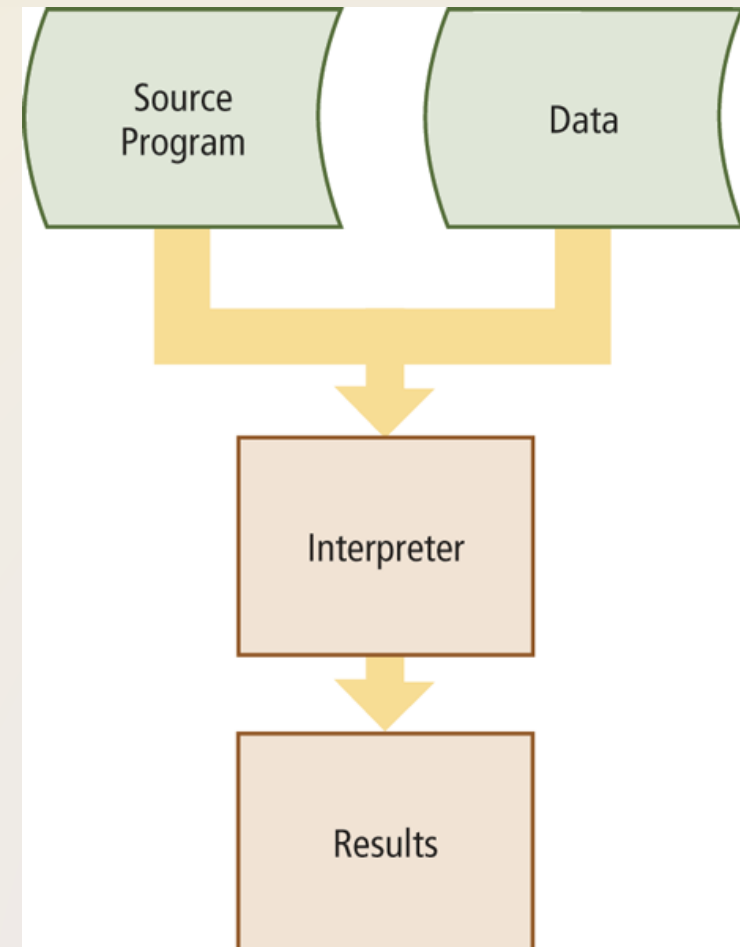
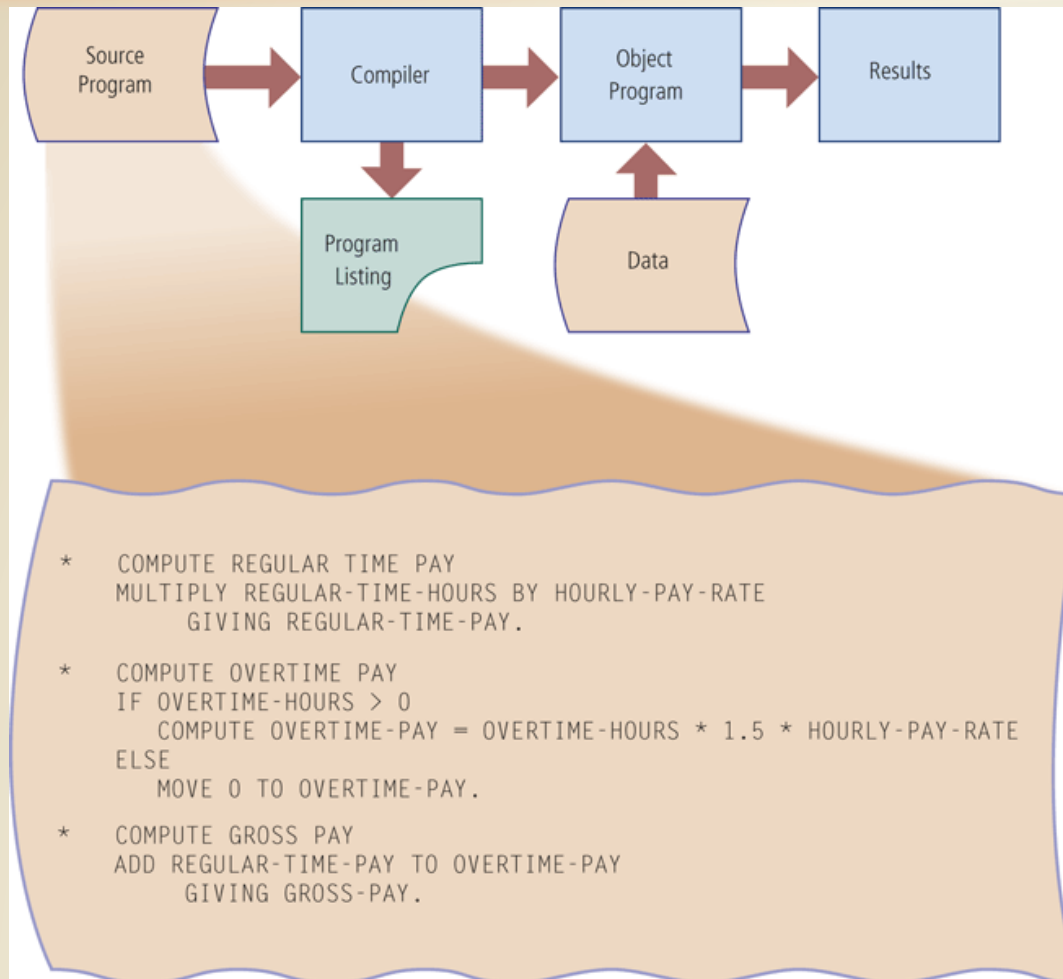
- **Assembly language** is the second generation of programming languages
- Programmer writes instructions using symbolic instruction codes
- A **source program** contains the code to be converted to machine language

# Programming Languages and Program Development Tools

- In a **procedural language**, the programmer writes instructions that tell the computer what to accomplish and how to do it
  - **Third-generation language (3GL)**

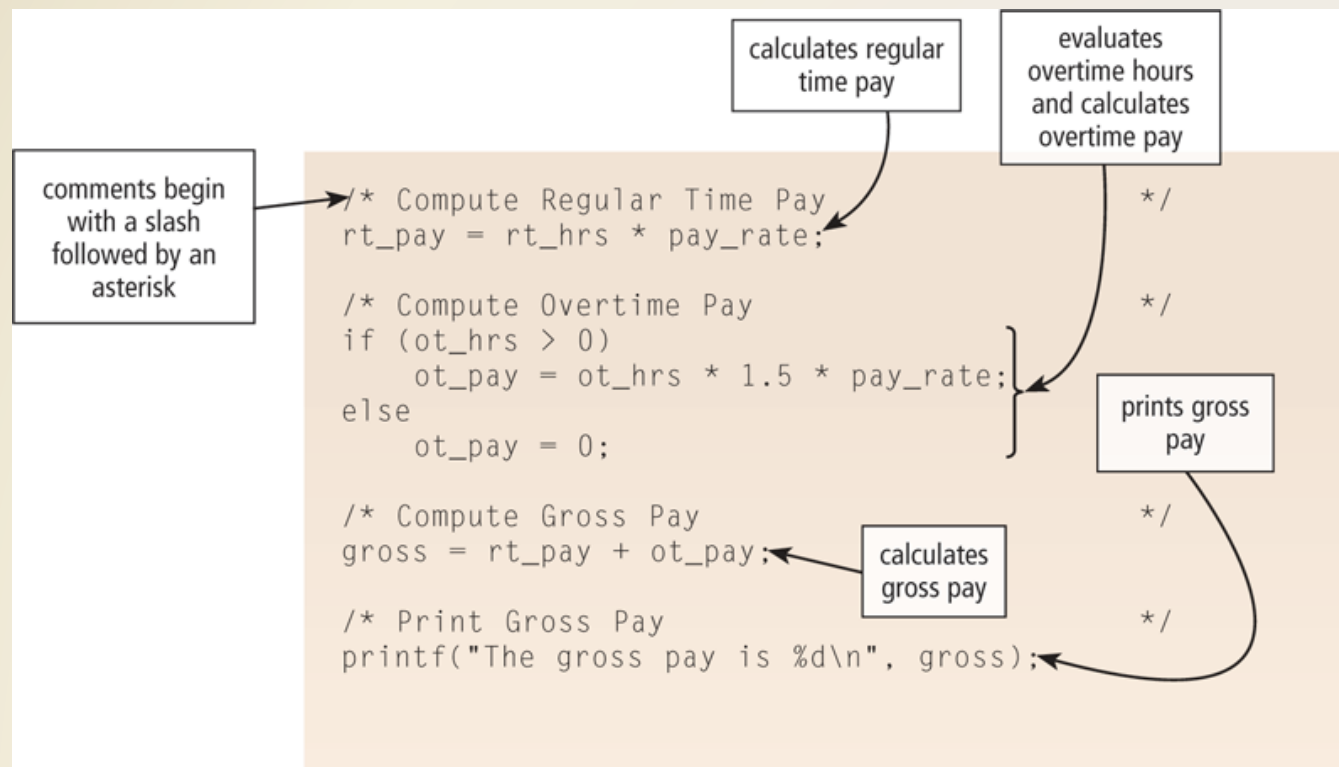


# Programming Languages and Program Development Tools



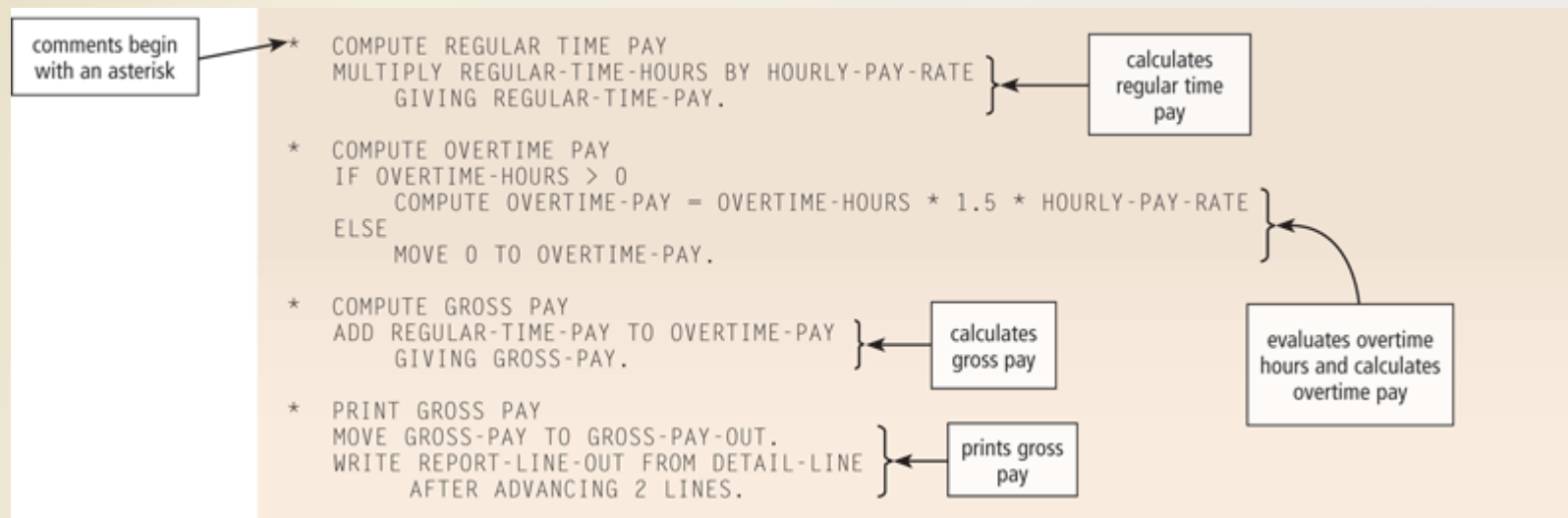
# Programming Languages and Program Development Tools

- The **C** programming language is used to write many of today's programs



# Programming Languages and Program Development Tools

- **COBOL (COmmon Business-Oriented Language)** is designed for business applications, but easy to read because of the English-like statements



# Programming Languages and Program Development 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

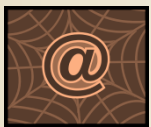
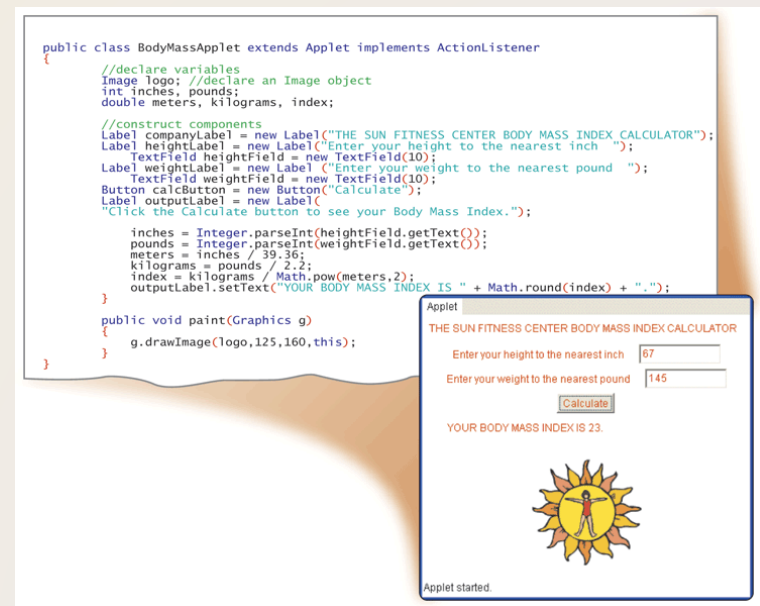
Work well in a **RAD** environment

Most program development tools are **IDEs**



# Programming Languages and Program Development Tools

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



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navigation, then click  
Java Platforms  
below Chapter 11

# Programming Languages and Program Development Tools

- The Microsoft **.NET** Framework allows almost any type of program to run on the Internet or an internal business network, as well as computers and mobile devices

# Programming Languages and Program Development Tools

- **C++** is an extension of the C programming language
  - Additional features for working with objects, classes, events, and other object-oriented concepts
- **C#** is based on C++ and was developed by Microsoft

# Programming Languages and Program Development Tools

**Visual Studio** is Microsoft's suite of program development tools

Visual Basic is based on the BASIC programming language

Visual C++ is based on C++

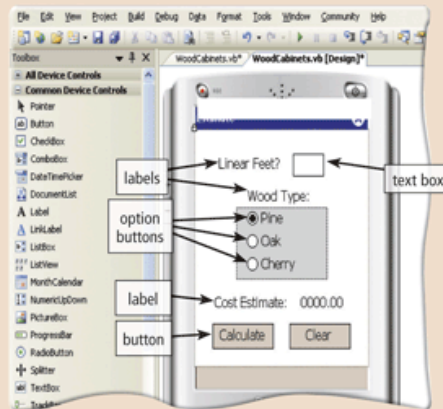
Visual C# combines the programming elements of C++ with an easier, rapid-development environment

# Programming Languages and Program Development Tools

## Creating a Visual Basic Program

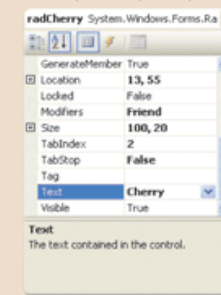
### Step 1

The developer designs the user interface, such as for the mobile device shown here. Linear Feet is a text box in which the user enters data. Pine, Oak, and Cherry are option buttons the user can click to choose the wood type. Calculate and Clear are buttons. All other objects are labels.



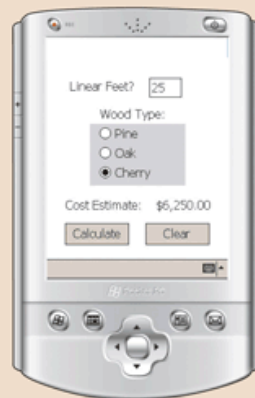
### Step 2

The developer assigns properties to each object. Objects include text boxes, option buttons, buttons, labels, and the form itself.



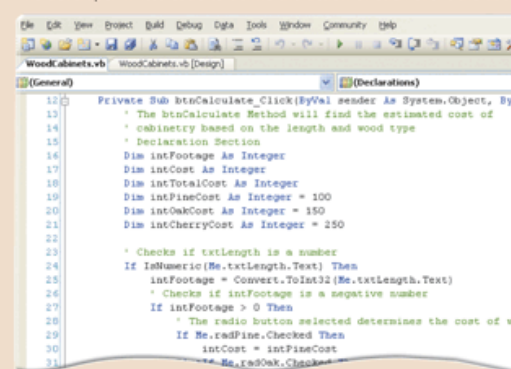
### Step 4

The developer tests the program. The Cost Estimate is displayed after the user clicks the Calculate button.



### Step 3

The developer writes code to define the action of each event the user triggers.



# Programming Languages and Program Development Tools

A **visual programming language** is a language that uses a visual or graphical interface for creating all source code

Borland's **Delphi** is a powerful program development tool that is ideal for building large-scale enterprise and Web applications in a RAD environment

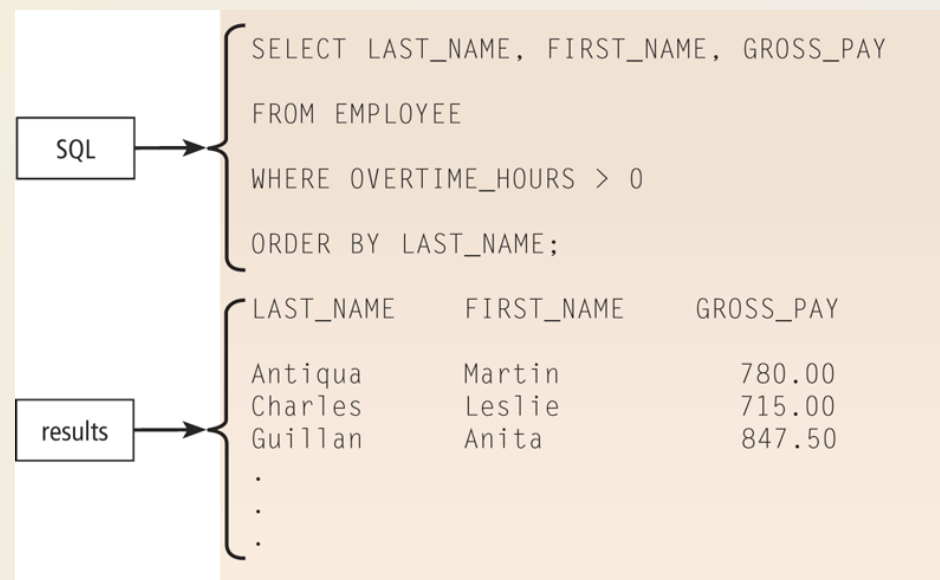
# Programming Languages and Program Development Tools

- **PowerBuilder** is a powerful program development RAD tool
- Best suited for Web-based, .NET, and large-scale enterprise object-oriented applications



# Programming Languages and Program Development 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**



# Programming Languages and Program Development Tools

- Classic programming languages include:

Ada	ALGOL	APL	BASIC
Forth	FORTTRAN	HyperTalk	LISP
Logo	Modula-2	Pascal	PILOT
PL/1	Prolog	RPG	Smalltalk

# Programming Languages and Program Development Tools

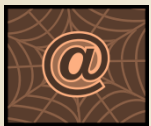
- An **application generator** is a program that creates source code or machine code from a specification of the required functionality
  - Often bundled as part of a DBMS

The image displays two screenshots of a web-based 'Employee Form' application. The left screenshot shows the form with empty input fields for General, Phone Numbers, and Address sections. The right screenshot shows the form filled out with data for an employee named Kara Bergner. The form includes fields for First Name, Last Name, Company, Job Title, E-mail, Web Page, Business Phone, Home Phone, Mobile Phone, Fax Number, Street, City, State/Province, Zip/Postal Code, and Country/Region. The right screenshot also shows a profile picture and a Notes section.

Section	Field	Value
General	First Name	Kara
	Last Name	Bergner
	Company	Western Electronics
	Job Title	Sales Representative
	E-mail	bergner@earth.net
Phone Numbers	Business Phone	309-555-2020
	Home Phone	309-555-1828
	Mobile Phone	309-555-9898
	Fax Number	309-555-9899
Address	Street	50 Spencer Boulevard
	City	Highland
	State/Province	IL
	Zip/Postal Code	60604
	Country/Region	USA

# Programming Languages and Program Development Tools

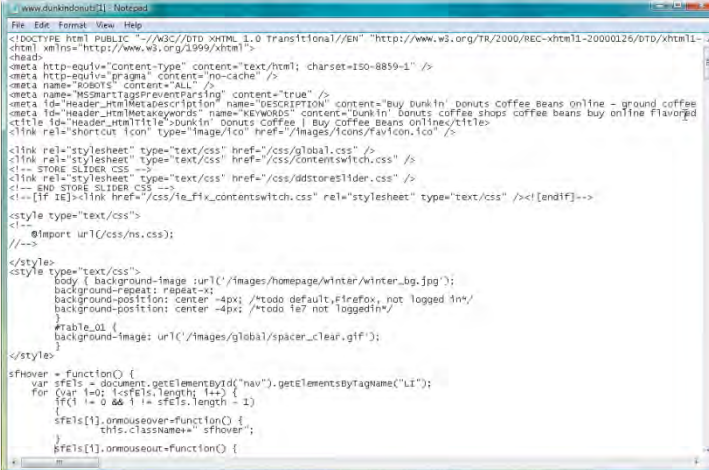
- A **macro** is a series of statements that instructs an application how to complete a task
- You usually create the macro in one of two ways:
  - Record the macro with a macro recorder
  - Write the macro



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Macros below Chapter 11

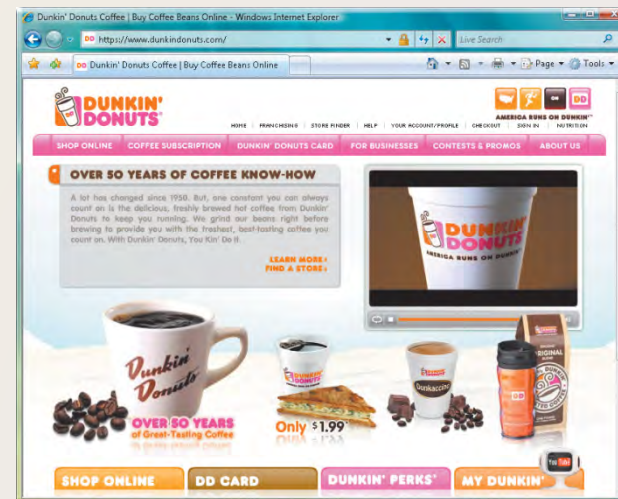
# Programming Languages and Program Development Tools

- **HTML** is a special formatting language that programmers use to format documents for display on the Web
- **XHTML** is a markup language that allows Web sites to be displayed more easily on mobile devices



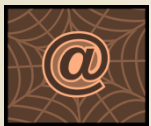
```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/2000/REC-xhtml1-20000126/DTD/xhtml1-
html.xml" [http://www.w3.org/2000/01/26/xhtml1-
<html xmlns="http://www.w3.org/2000/01/26/xhtml1-
<head>
<meta http-equiv="content-type" content="text/html; charset=ISO-8859-1" />
<meta http-equiv="pragmas" content="no-cache" />
<meta name="robots" content="ALL" />
<meta name="viewport" content="width=device-width, height=device-height" />
<meta id="Header_htmlMetaDescription" name="description" content="Buy Dunkin' donuts coffee beans online - ground coffee
<meta id="Header_htmlMetaKeywords" name="keywords" content="Dunkin' donuts coffee shops coffee beans buy online flavored
<title id="Header_htmlTitle">Dunkin' Donuts Coffee | Buy Coffee Beans Online</title>
<link rel="shortcut icon" type="image/ico" href="/images/icons/favicon.ico" />
<link rel="stylesheet" type="text/css" href="/css/global.css" />
<link rel="stylesheet" type="text/css" href="/css/contentswitch.css" />
<!-- STORE SLIDER CSS -->
<link rel="stylesheet" type="text/css" href="/css/ddstoreslider.css" />
<!-- END STORE SLIDER CSS -->
<!-- [if IE]><link href="/css/ie_Fix_contentswitch.css" rel="stylesheet" type="text/css" /><![endif]>-->
<style type="text/css">
<!--
@import url(/css/hs.css);
//-->
</style>
<style type="text/css">
<style>
body { background-image: url(/images/homepage/winter/winter_bg.jpg);
background-repeat: repeat-x;
background-position: center -4px; /*todo default,firefox, not logged in*/
background-position: center -4px; /*todo ie7 not logged in*/
}
#table_01 {
background-image: url(/images/global/spacer_clear.gif);
}
</style>
<script>
function sfHover = function() {
var sFels = document.getElementsByTagName("nav").getElementsByTagName("li");
for (var i=0; i<sFels.length; i++) {
if (i % 2 == 0 && i != sFels.length - 1) {
sFels[i].onmouseover=function() {
this.className+=" sfHover";
}
sFels[i].onmouseout=function() {

```



# Programming Languages and Program Development Tools

- **XML** allows Web developers to create customized tags and use predefined tags to display content appropriately on various devices
  - **WML** is a subset of XML and is used to design pages for microbrowsers
- Two applications of XML are **RSS 2.0** and **ATOM**



Click to view Web Link,  
click Chapter 11, Click  
Web Link from left  
navigation, then click  
XML below Chapter 11

# Programming Languages and Program Development Tools

- Web browsers can execute short programs to add interactive elements to Web pages
- To send and receive information between your computer and a Web server, these programs use the CGI (common gateway interface)

**Scripts**

**Applets**

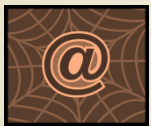
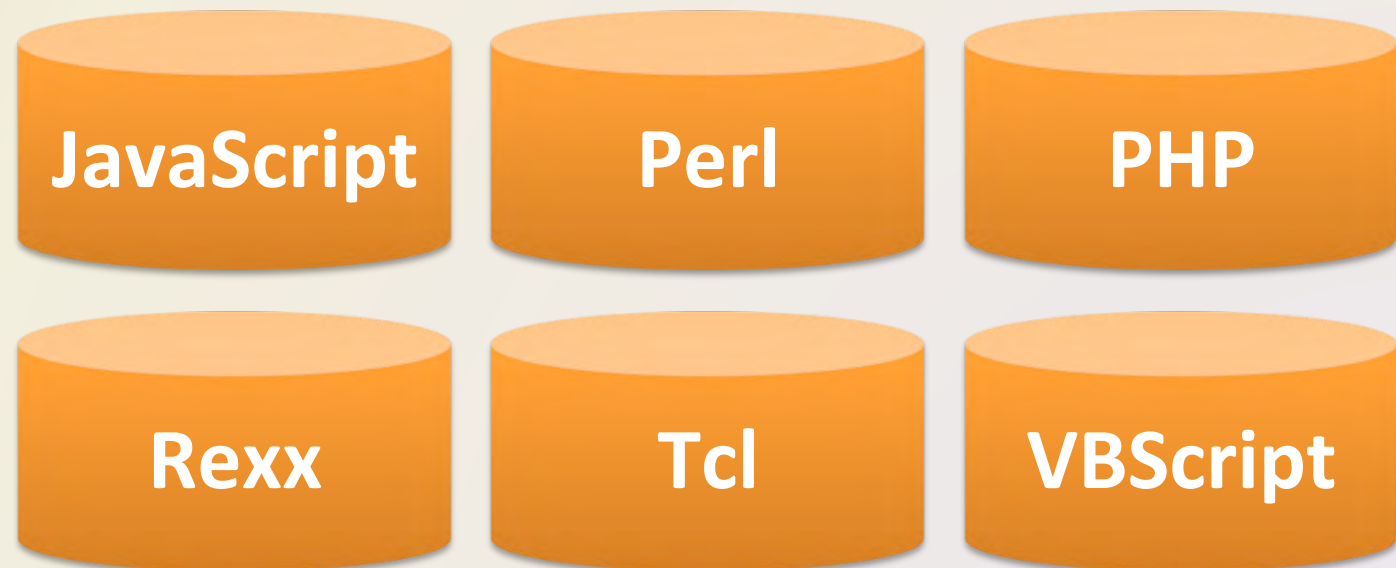
**Servlets**

**ActiveX  
controls**



# Programming Languages and Program Development Tools

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



Click to view Web Link,  
click Chapter 11, Click  
Web Link from left  
navigation, then click  
PHP below Chapter 11

# Programming Languages and Program Development Tools

**Dynamic HTML (DHTML)** allows Web developers to include more graphical interest and interactivity

**Ruby on Rails (RoR)** provides technologies for developing object-oriented, database-driven Web sites

# Programming Languages and Program Development Tools

- Web 2.0 allows Web sites to provide a means for users to:

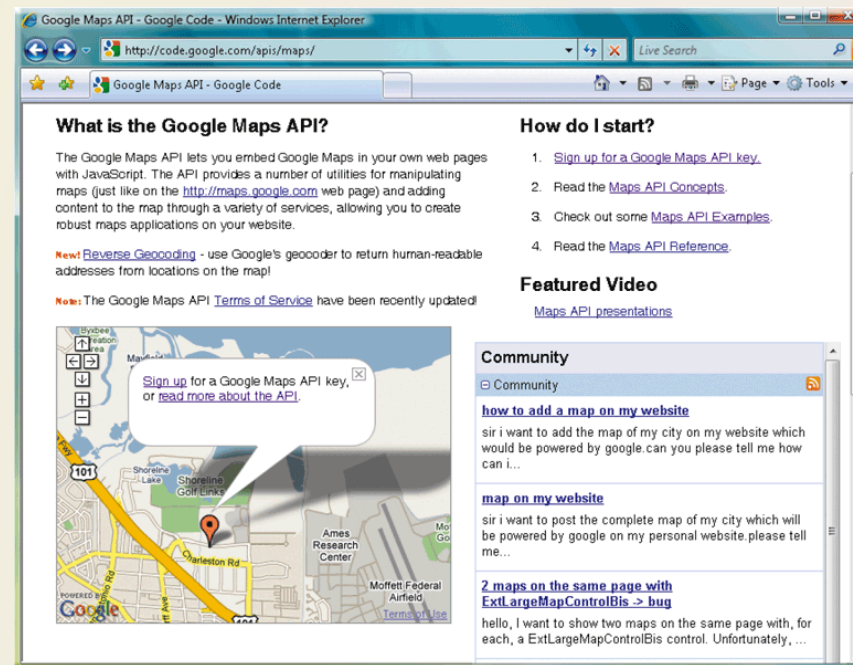
Share personal  
information

Allow users to  
modify Web site  
content

Have application  
software built  
into the site

# Programming Languages and Program Development Tools

- Most Web 2.0 sites use **APIs**
  - An API enables programmers to interact with an environment such as a Web site or operating system



# Programming Languages and Program Development Tools

- **Web page authoring software** can create sophisticated Web pages that include images, video, audio, animation, and other effects

Dreamweaver

Expression  
Web

Flash

SharePoint  
Designer

# Programming Languages and Program Development Tools

- **Multimedia authoring software** allows programmers to combine text, graphics, animation, audio, and video in an interactive presentation

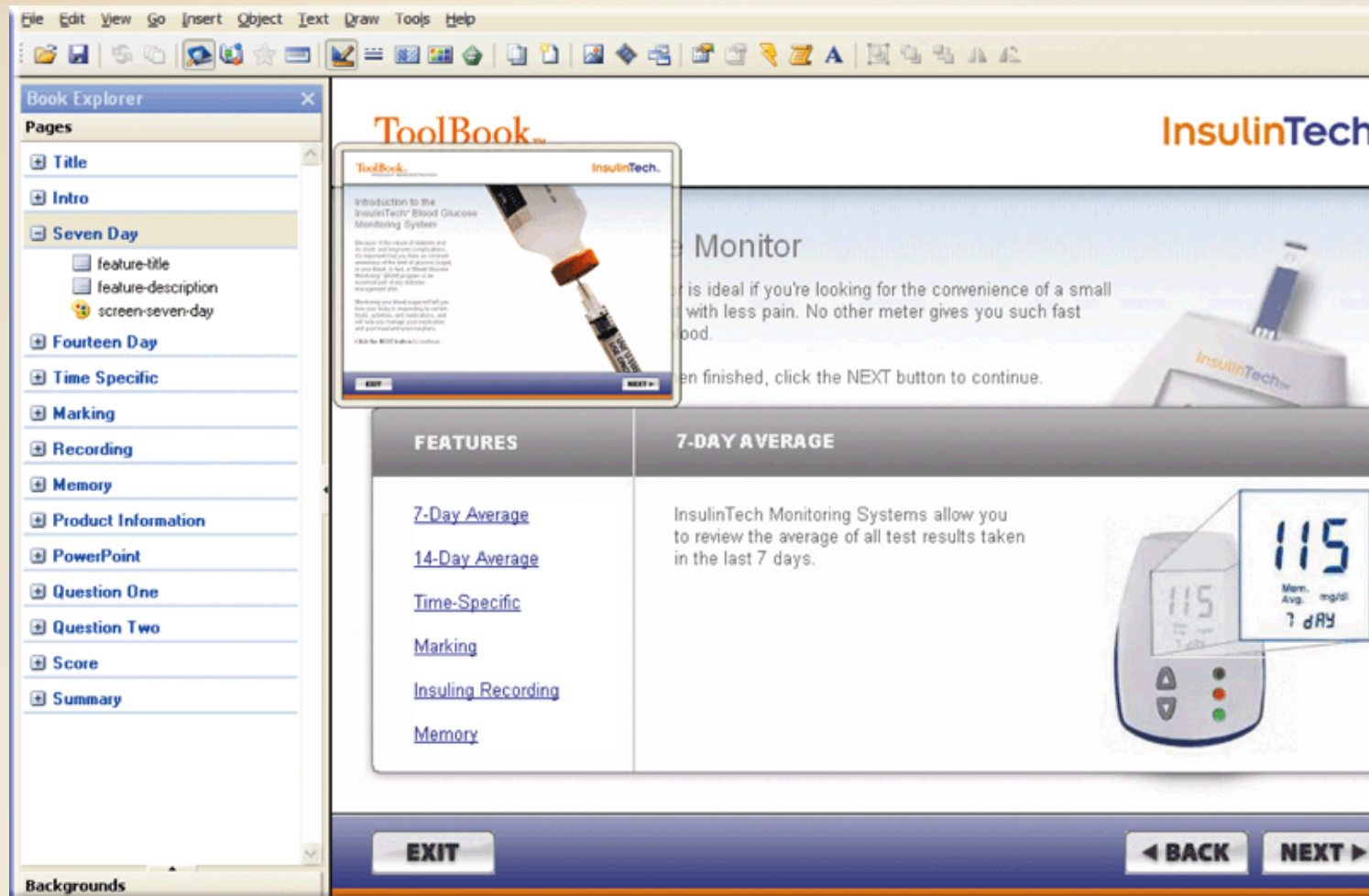


ToolBook



Director

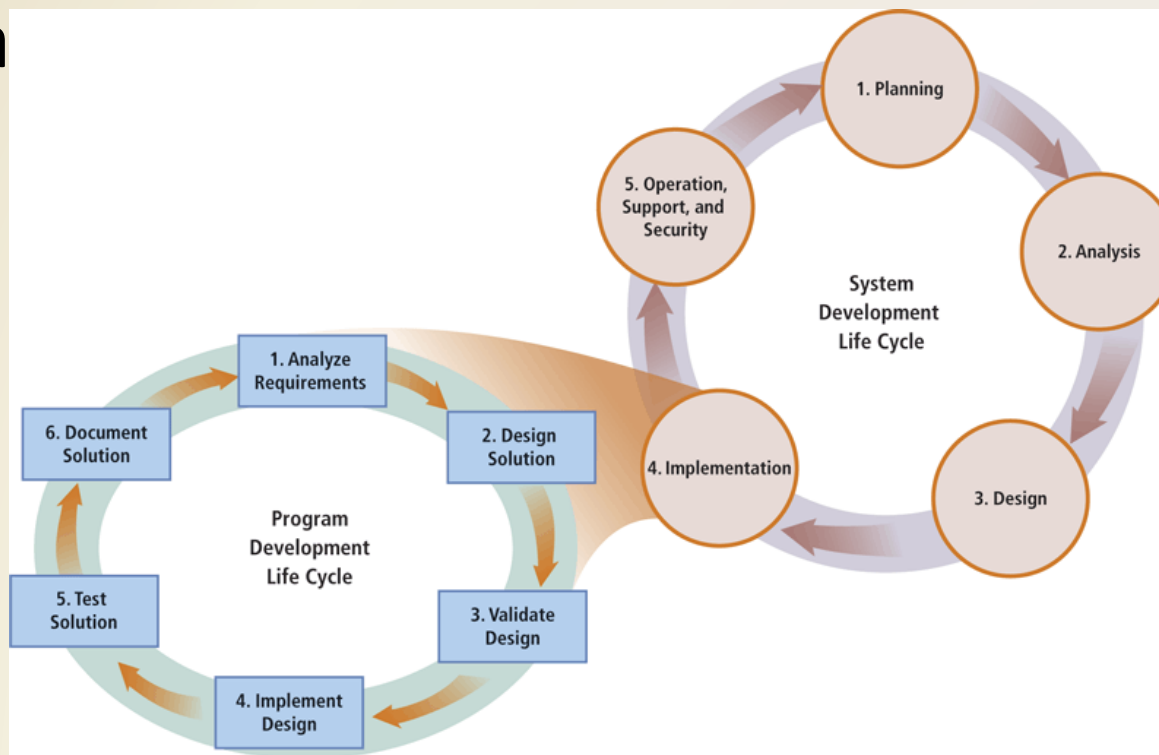
# Programming Languages and Program Development Tools





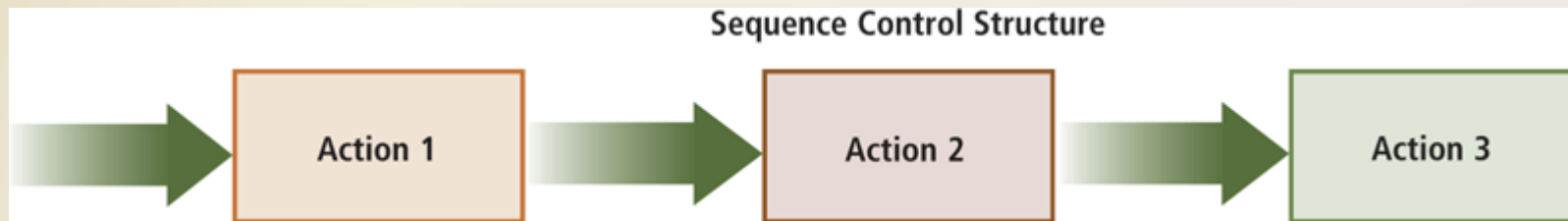
# Program Development Cycle

- **Program development** consists of a series of steps programmers use to build computer programs

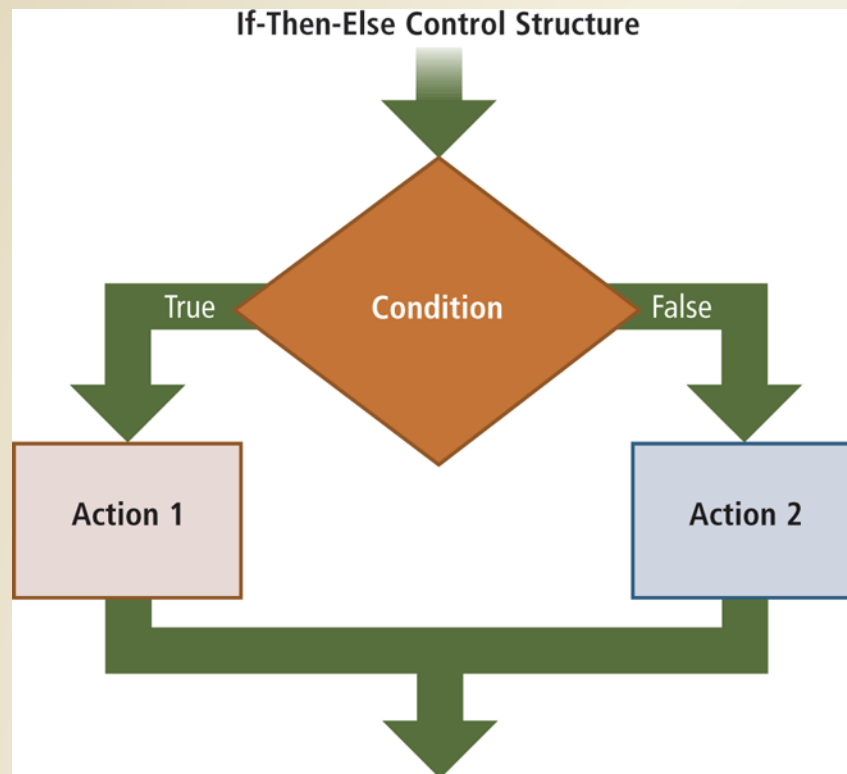


# Program Development Cycle

- The **sequence control structure** shows one or more actions following each other in order

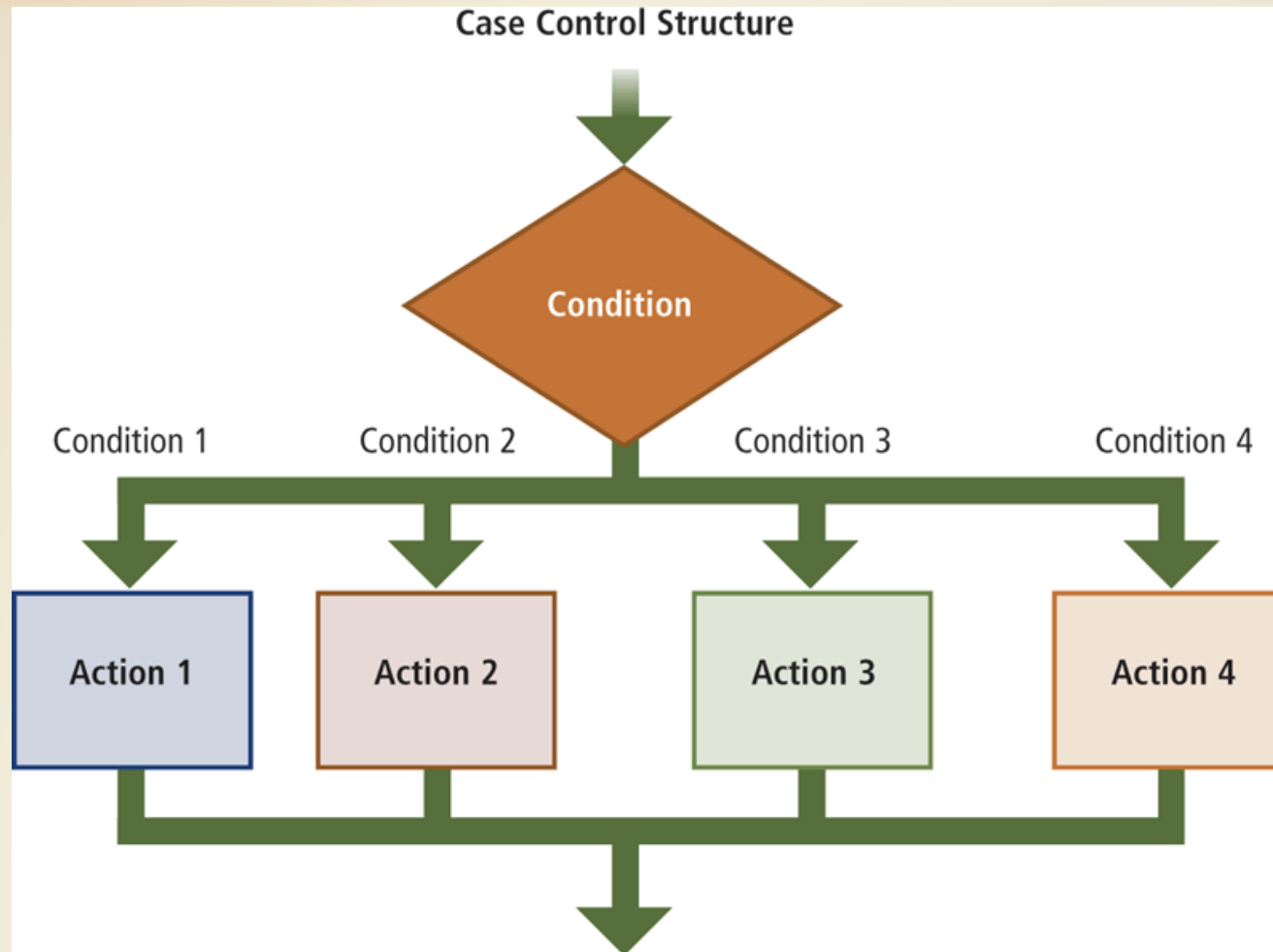


# Program Development Cycle



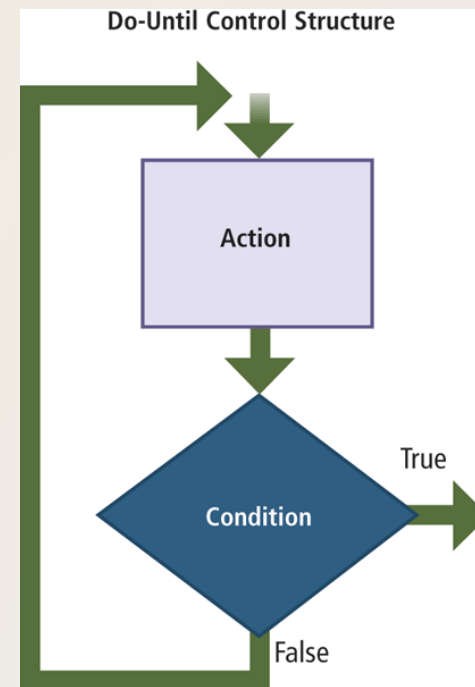
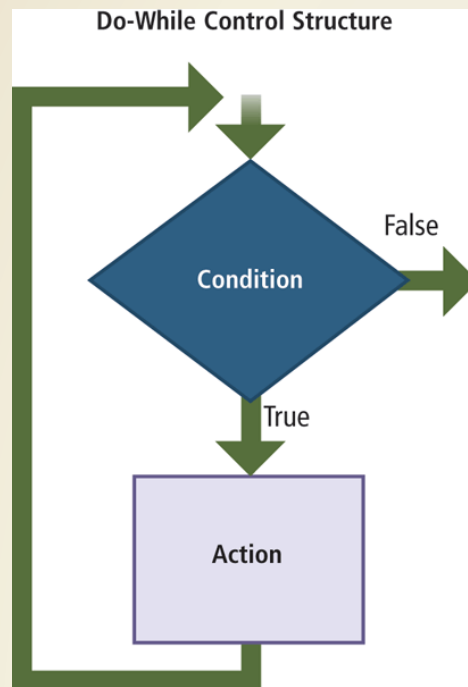
- The **selection control structure** tells the program which action to take, based on a certain condition
  - If-then-else
  - Case

# Program Development Cycle



# Program Development Cycle

- The **repetition control structure** enables a program to perform one or more actions repeatedly as long as a certain condition is met



# Video: Electronic Arts Going Mobile



[CLICK TO START](#)

# Summary

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System development  
phases

Guidelines for system  
development

Activities that occur  
during system  
development

Various programming  
languages and  
program  
development tools

Web development  
and multimedia  
development tools

Program  
development and the  
tools used in this  
process



## Chapter Eleven

# Information System Development and Programming Languages

**Discovering Computers  
Fundamentals,  
2010 Edition**

**Living in a Digital World**

**Chapter 11 Complete**

