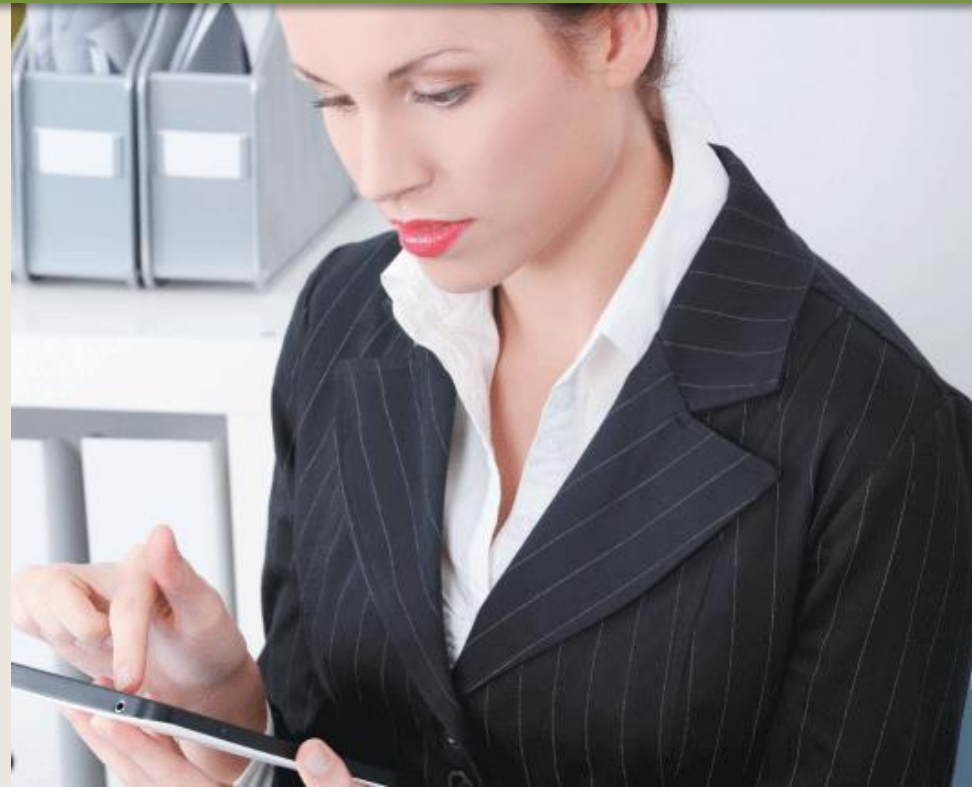


Discovering Computers

Technology in a World of Computers,
Mobile Devices, and the Internet

Chapter 12

Information Systems and Program Development



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

Objectives Overview

Differentiate between low-level languages and procedural languages

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

List other programming languages and application development tools

Describe various ways to develop webpages

System Development

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

- System development should follow three general guidelines:

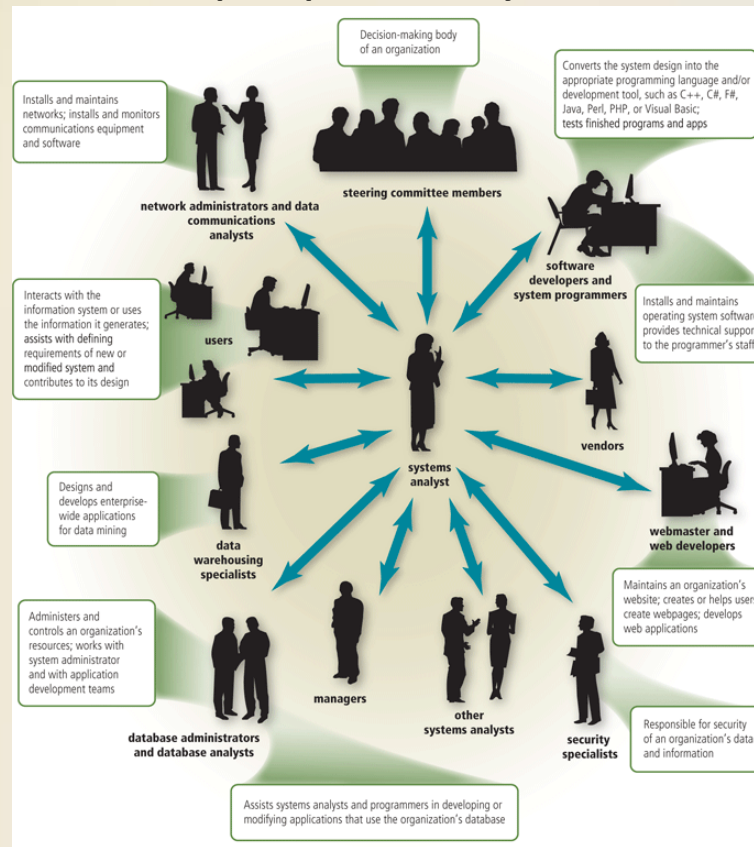
Group activities or tasks into phases

Involve users

Define standards

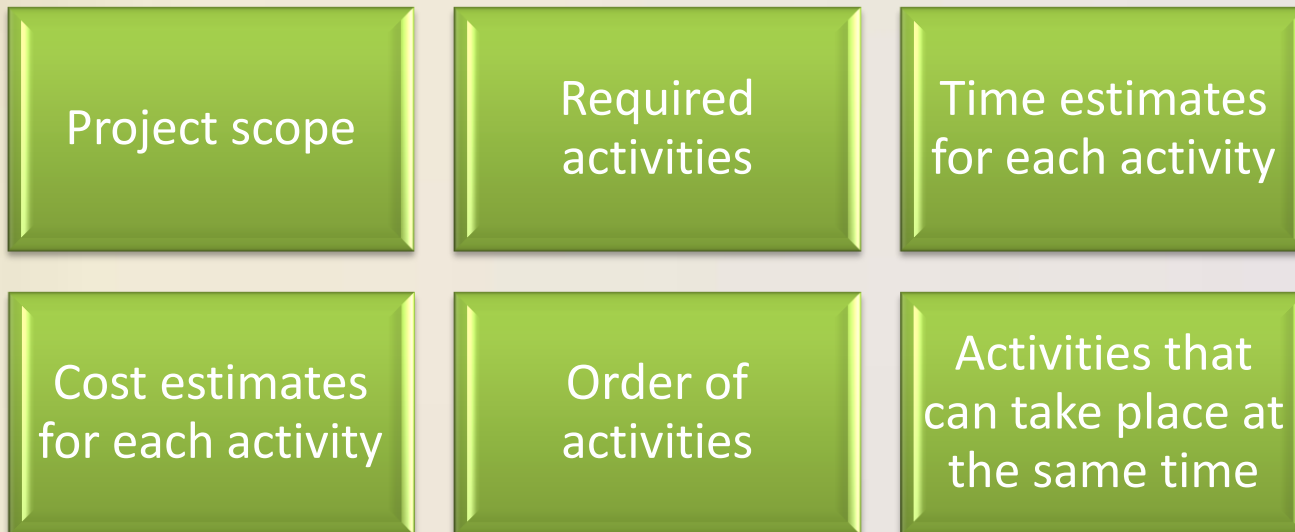
System Development

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



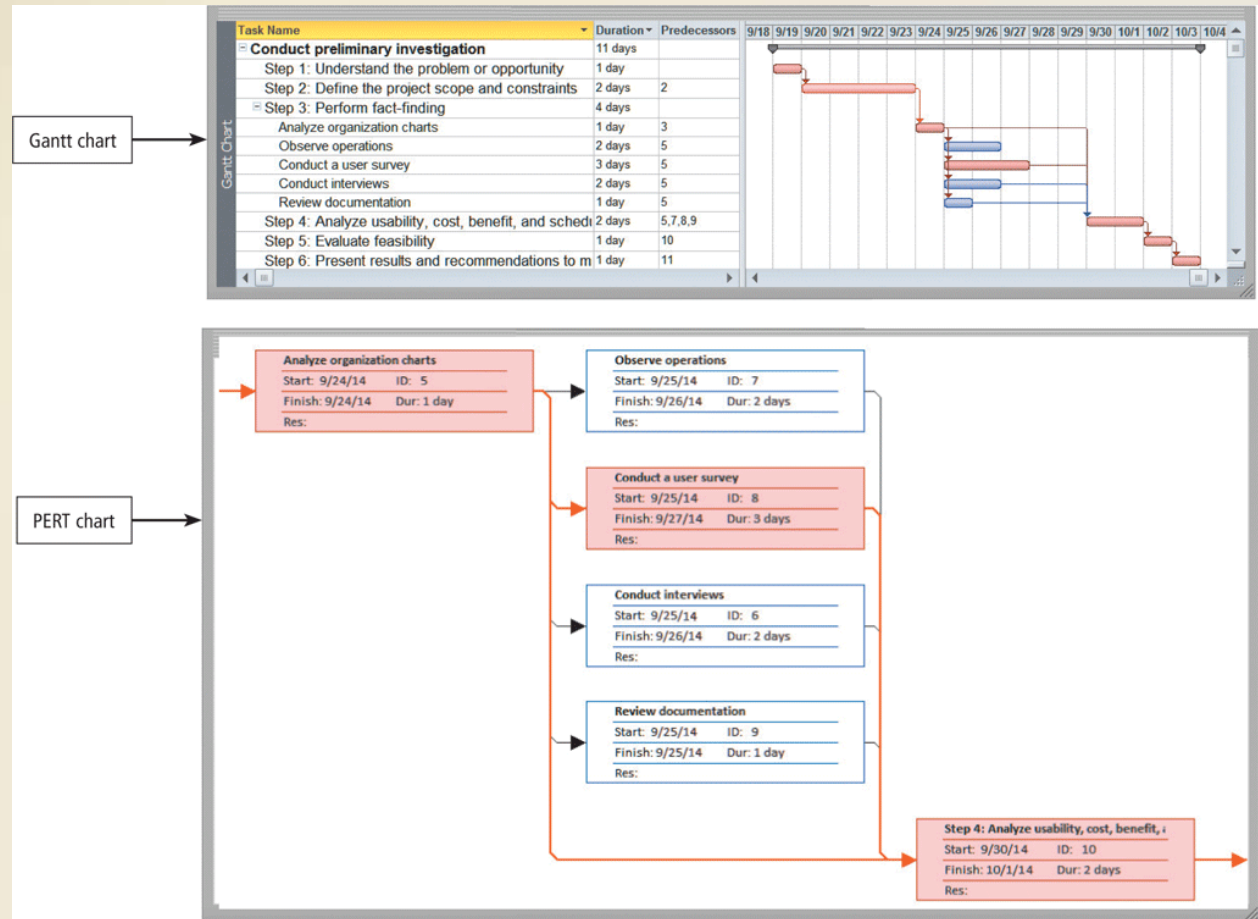
System Development

- **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:



System Development

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



Operational
feasibility

Schedule
feasibility

Technical
feasibility

Economic
feasibility

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

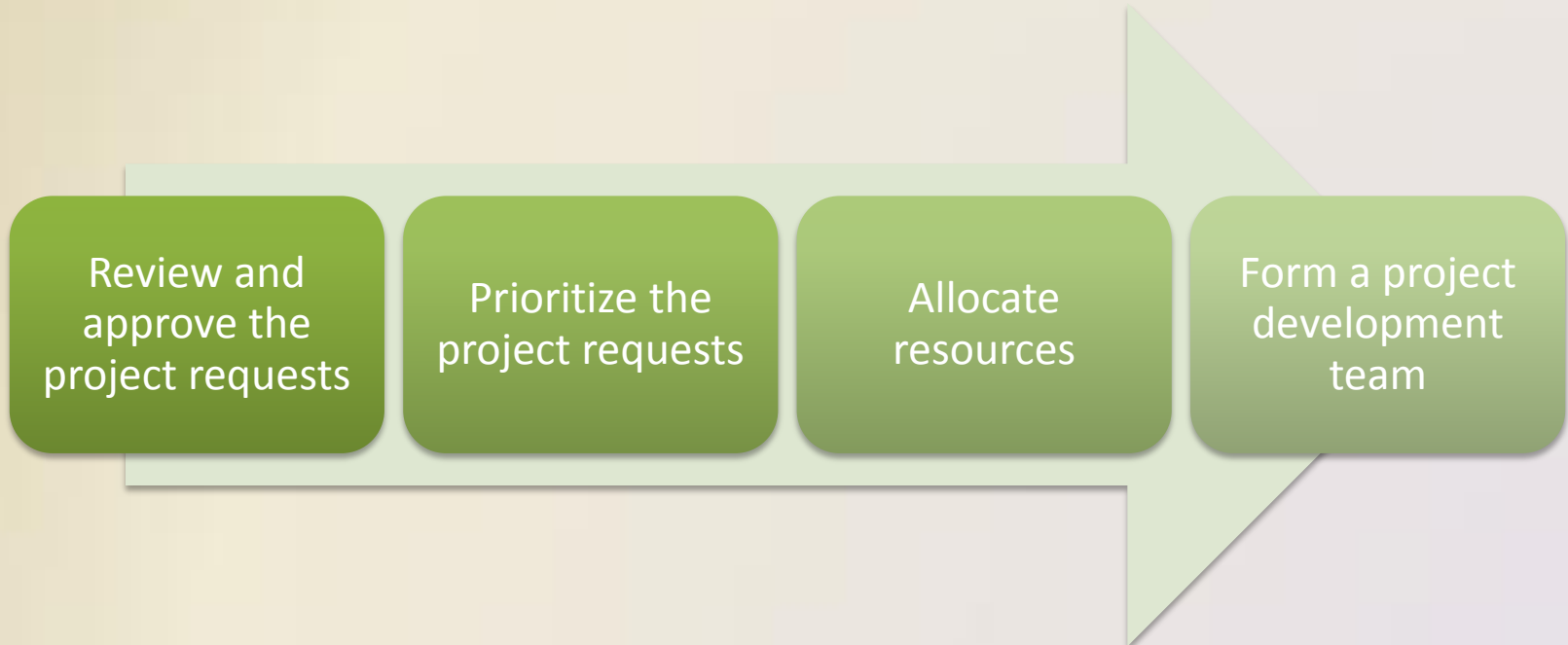
JAD Sessions

Research



System Development

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



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

HICKORY COMMUNITY COLLEGE MEMORANDUM

To: Steering Committee
From: Karl Schmidt, Project Leader
Date: December 29, 2014
Subject: Feasibility Study of Book Ordering System

Following is the feasibility study in response to the request for a modification to our 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 studying the book ordering system. The bookstore manager has indicated bookstore staff spends too much time entering and verifying book orders. This project would affect the bookstore and instructors.

Existing System

Background

Currently, the bookstore requires that instructors manually fill in book order forms. On these forms, the instructors fill in the course ID, course section, expected enrollment, and ISBN of the book, indicating whether the book is required or supplemental. As instructors send in their 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.

FEASIBILITY STUDY Page 2

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 use an online book order form, 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 of a New or Modified System

Operational

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

Schedule

The established deadline for the book ordering system is reasonable.

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 \$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 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




System Development

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



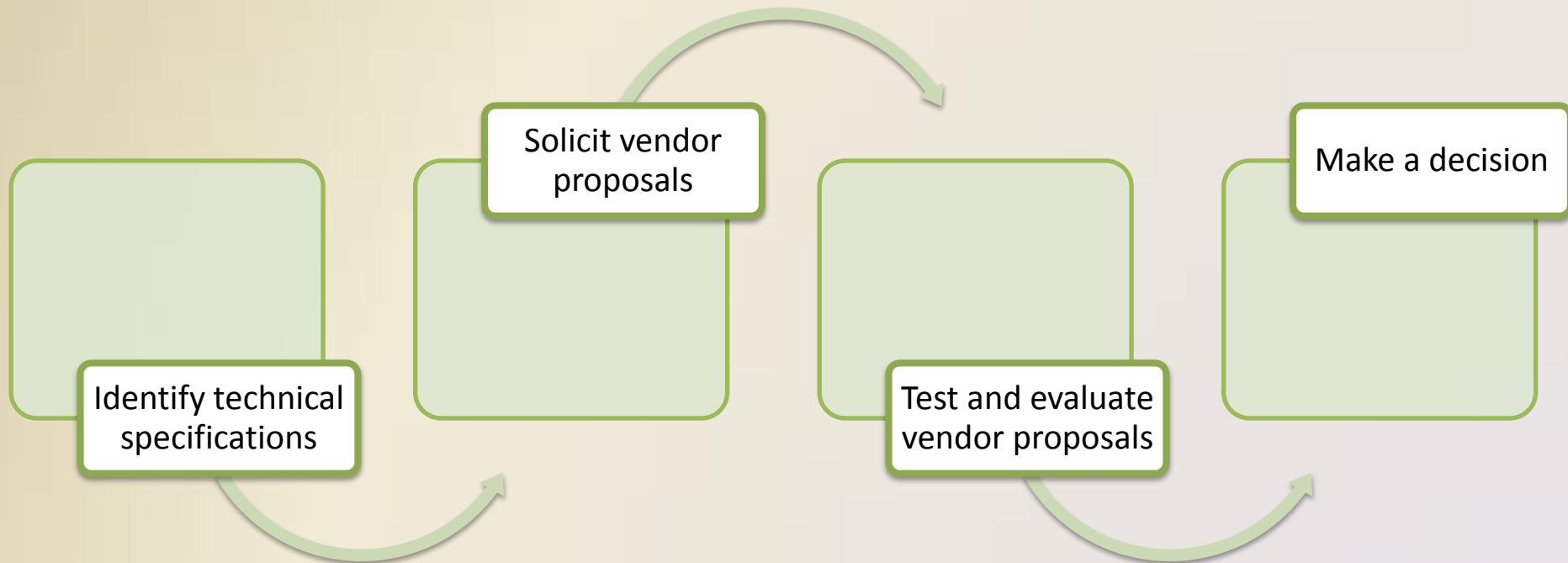
Acquire hardware
and software



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

System Development

- To acquire the necessary hardware and software:



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

Instructor Maintenance

Instructor Maintenance Form

Instructor ID 380182

First Name Bethany

Last Name Ames

Extension 493

Office D210

Email Address b.ames@hickory.edu

Record: 1 of 4 No Filter Search

Layout chart

Instructor Maintenance

Instructor Maintenance Form

Detail

Instructor ID	Instructor ID
First Name	First Name
Last Name	Last Name
Extension	Extension
Office	Office
Email Address	Email Address

Record: 1 of 4 No Filter Search

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

System Development

- 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

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 **support and security phase** is to provide ongoing assistance for an information system and its users after the system is implemented



Application Development Languages and Tools

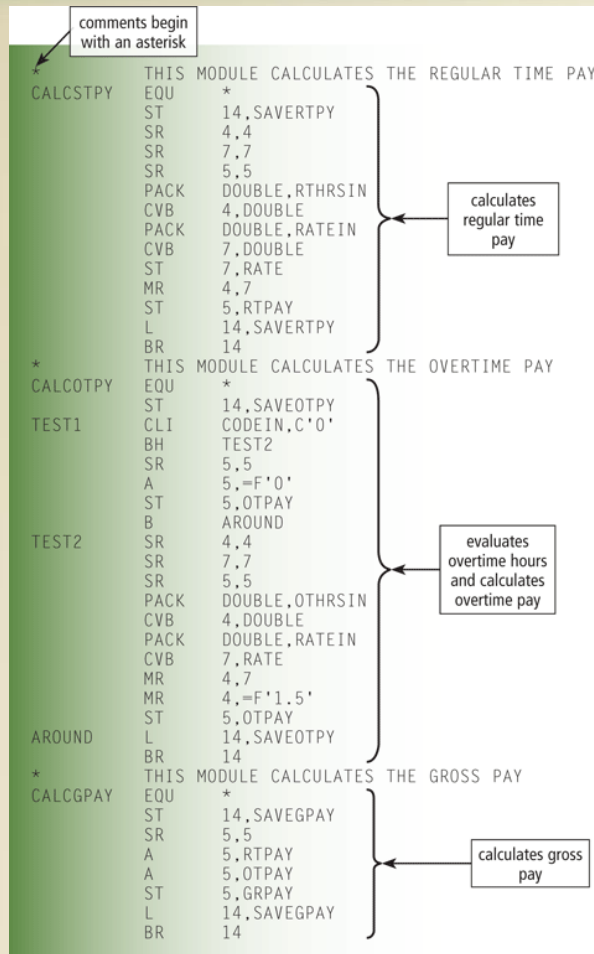
- A **programming language** is a set of words, abbreviations, and symbols that enable a software developer to communicate instructions to a computer or mobile device
 - Low-level language
 - High-level language

Application Development Languages and Tools

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

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				

Application Development Languages and Tools



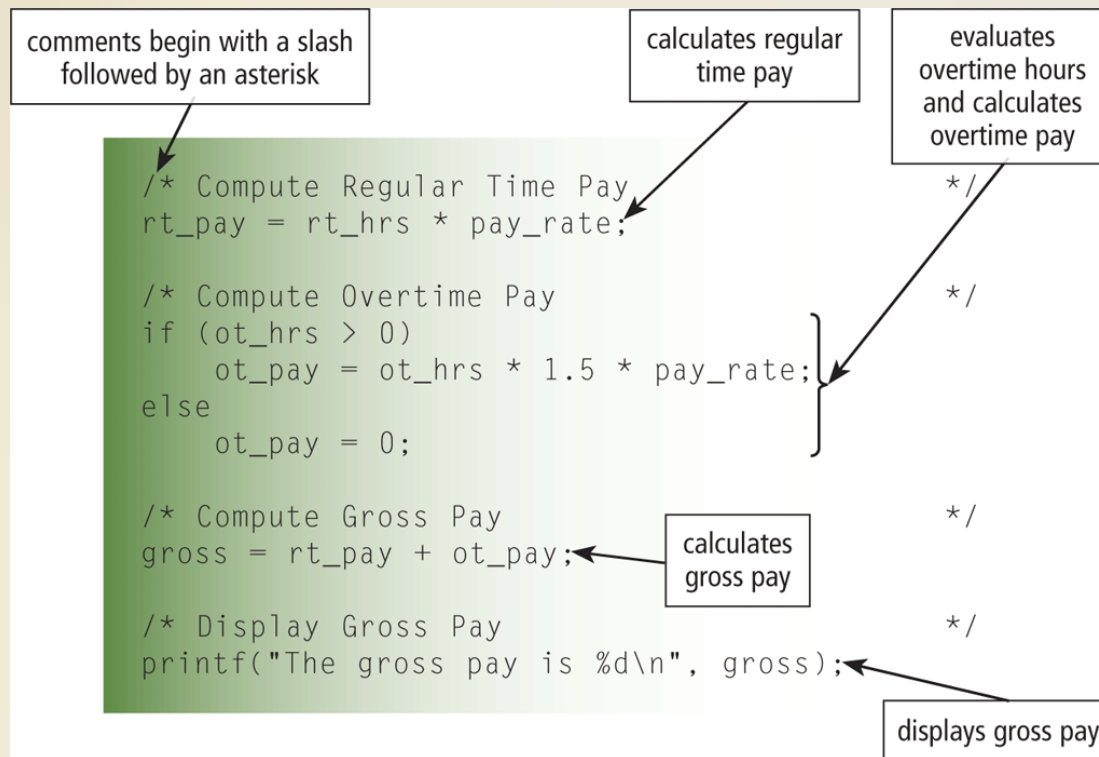
- **Assembly language** is the second generation of programming languages
- Programmer writes instructions using symbolic instruction codes
- A source program contains the language instructions, or code, to be converted into machine language

Application Development Languages and Tools

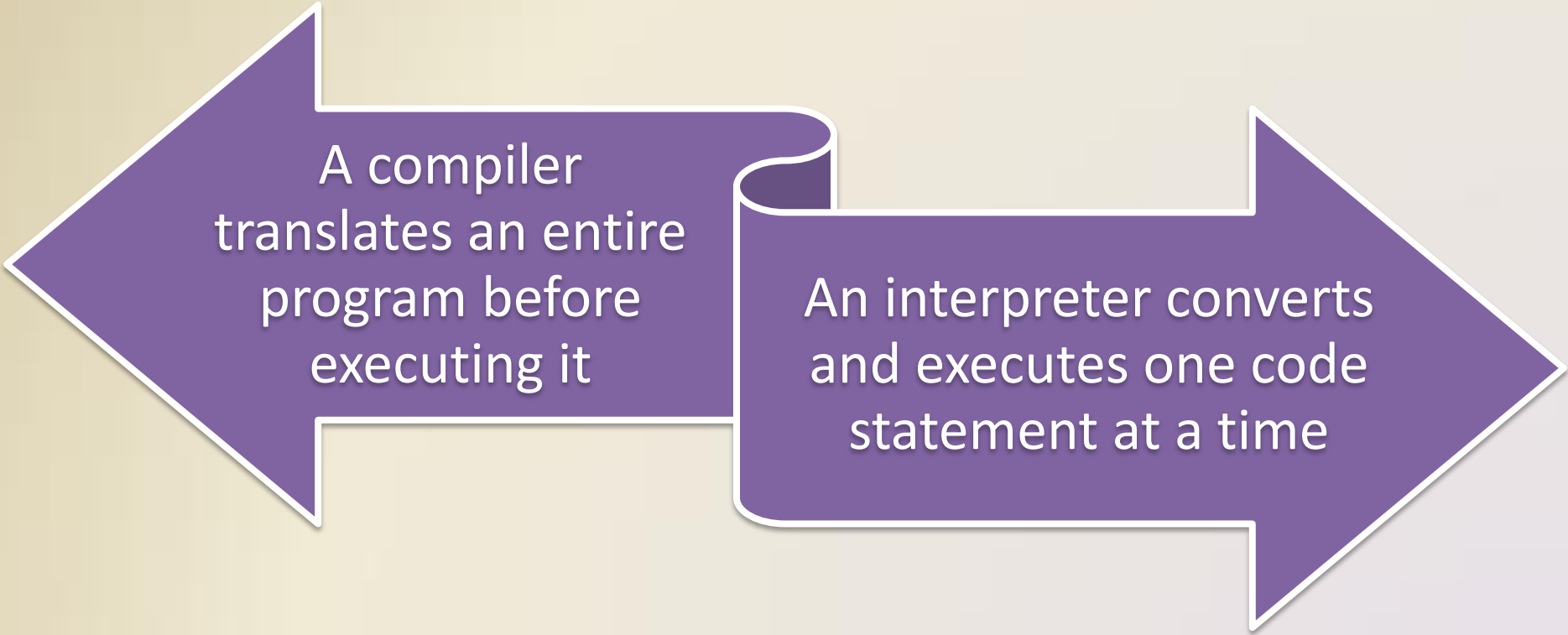
- In a **procedural language**, the programmer writes instructions that tell the computer what to accomplish and how to do it

Application Development Languages and Tools

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



Application Development Languages and Tools



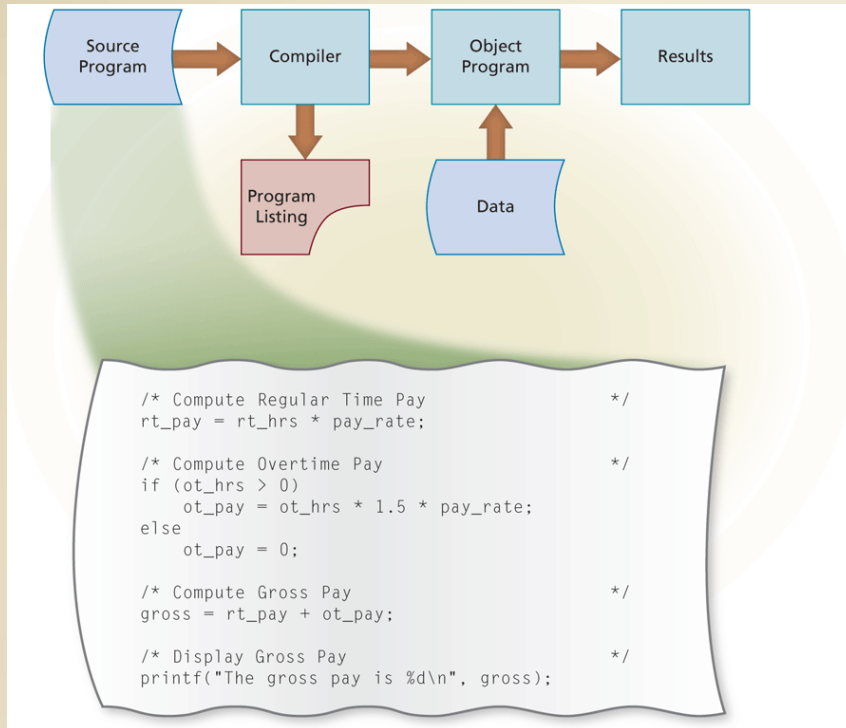
A diagram consisting of two purple arrows pointing in opposite directions, connected at their tails. The left arrow points left and contains text about compilers. The right arrow points right and contains text about interpreters. The arrows are connected at their tails, which meet in the center, and they have a white outline.

A compiler translates an entire program before executing it

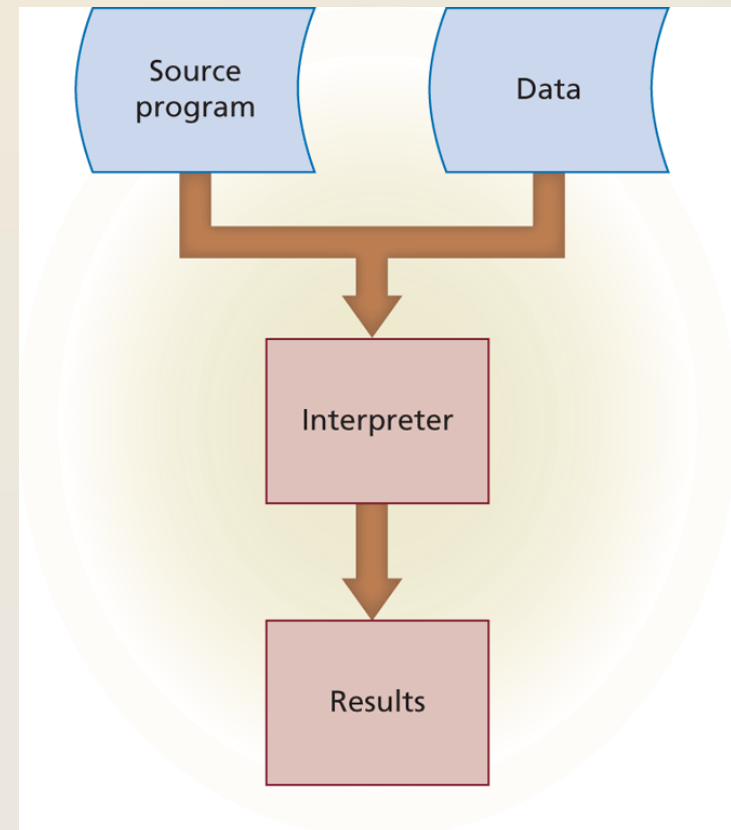
An interpreter converts and executes one code statement at a time

Application Development Languages and Tools

Compiler



Interpreter



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

```
public class BodyMassApplet extends Applet implements ActionListener
{
    //declare variables
    Image logo; //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 heightLabel = 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 calcButton = new Button("Calculate");
    Label outputLabel = new Label(
        "Click the Calculate button to see your Body Mass Index.");

    inches = Integer.parseInt(heightField.getText());
    pounds = Integer.parseInt(weightField.getText());
    meters = inches / 39.36;
    kilograms = pounds / 2.2;
    index = kilograms / Math.pow(meters,2);
    outputLabel.setText("YOUR BODY MASS INDEX IS " + Math.round(index) + ".");
}

public void paint(Graphics g)
{
    g.drawImage(logo,125,160,this);
}
}
```

Application Development Languages and Tools

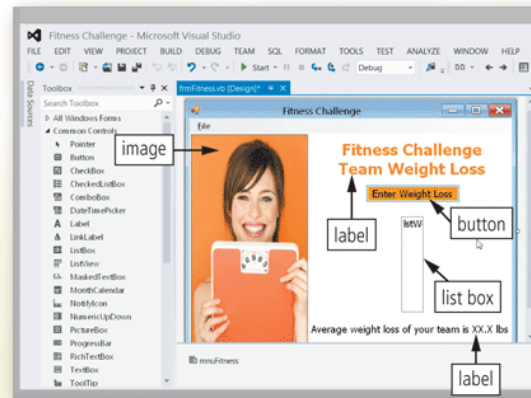
- **C++** is an extension of the C programming language
 - Additional features for working with objects
- **Visual Studio** is Microsoft's suite of object-oriented application development tools that assists software developers in building programs and apps for Windows or any operating system that supports the Microsoft .NET Framework

Application Development Languages and Tools

Creating a Visual Basic Desktop App

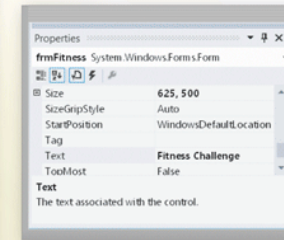
Step 1

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 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.



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.

```
29
30
31 Dim strCancelClicked As String = ""
32 Dim intMaxNumberOfEntries As Integer = 8
33 Dim intNumberOfEntries As Integer = 1
34
35 ' This loop allows the user to enter the weight loss of up to 8 team members.
36 ' The loop terminates when the user has entered 8 weight loss values or the user
37 ' taps or clicks the Cancel button or the Close button in the InputBox
38
39 strWeightLoss = InputBox(strInputMessage & intNumberOfEntries, strInputHeading, "")
40
41 Do Until intNumberOfEntries > intMaxNumberOfEntries Or strWeightLoss = strCancelClicked
42
43     If IsNumeric(strWeightLoss) Then
44         decWeightLoss = Convert.ToDecimal(strWeightLoss)
45         If decWeightLoss > 0 Then
46             lstWeightLoss.Items.Add(decWeightLoss)
47             decTotalWeightLoss += decWeightLoss
48             intNumberOfEntries += 1
49             strInputMessage = strNormalMessage
50         Else
51             strInputMessage = strNegativeError
52         End If
53     End If
54 End Do
```

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

Macro Code:

```
CommandButton1_Click
Click
' New Auto Loan Button Macro
' Date Created: 10/16/2014
' Run from: Loan Analysis Sheet by clicking button labeled New Auto Loan
' Function: When executed, this macro accepts loan data which causes Excel to calculate a new
' monthly payment and other loan information.
Private Sub CommandButton1_Click()
Range("C3:C8").Select
Selection.ClearContents
Range("C3").Value = InputBox("Car model?", "Enter")
CarPrice = InputBox("Price of car?", "Enter")
Do While CarPrice < 12000 Or CarPrice > 80000
CarPrice = InputBox("Price of car must be >= $12,000 and <= $80,000.", "Enter")
Loop
Range("C4").Value = CarPrice

DownPayment = InputBox("Down Payment?", "Enter")
Do While DownPayment < 1500 Or DownPayment > 55000
DownPayment = InputBox("Down Payment must be >= $1,500 and <= $55,000.", "Enter")
Loop
Range("C5").Value = DownPayment

Range("C6").Value = InterestRate = InputBox("Interest Rate?", "Enter")
Do While InterestRate < 0 Or InterestRate > 0.1
InterestRate = InputBox("Interest Rate must be >= 0% and <= 10%.", "Enter")
Loop
Range("C7").Value = TimeinYears = InputBox("Time in Years?", "Enter")
Do While TimeinYears < 1 Or TimeinYears > 10
TimeinYears = InputBox("Time in Years must be >= 1 and <= 10.", "Enter")
Loop
Range("C8").Value = TotalInterest
Range("C13").Select
End Sub
```

My Loan Calculator	
Date	April-13
Car model	Lexus
Price	\$62,000.00
Down Payment	\$12,750.00
Loan Amount	\$49,250.00
Interest Rate	8.50%
Years	6
Monthly Payment	\$875.59
Total Interest	\$13,792.15
Total Cost	\$75,792.15

Dialog Box: Enter (Car model?)

Buttons: New Loan

Application Development Languages and Tools

- **HTML** is a special formatting language that programmers use to format documents for display on the web

The image shows a side-by-side comparison of HTML code and its rendered output. On the left, a text area displays raw HTML code for a page header and navigation section. On the right, the browser displays the rendered page, which is the CengageBrain website. The website features a blue header with the CengageBrain logo and navigation links. Below the header is a promotional banner for 'Help students SAVE 10% at CengageBrain.com' with icons for Textbooks, Rentals, and E-Books. The main content area includes a 'Welcome to CengageBrain Extra Credit' section with a call to action to donate to charity, and a 'Join today' form with input fields for first name, last name, and email address. A footer contains three numbered buttons: '1 Share Your Coupon', '2 Support a Cause', and '3 See Your Impact'.

```
</div>
<div class="col one" style="min-height: 340px;">
<div id="ctl00_homecontentintro" class="col one textcolorbasedark">
<div id="ctl00_ctl18_divIntroText"><p></p>
<h3 style="font-size: 16pt; color: #2d86aa; text-align: left;"><span style="font-size: 18pt;">Welcome to CengageBrain</span></h3>
<h2 style="font-size: 24pt; color: #2d86aa; text-align: right;">
<p style="margin: 0px; text-align: left;"><span style="font-size: 36pt;"><br />
</span></p>
<p style="margin: 0px; text-align: left;"><span style="font-size: 36pt;">Extra Credit</span></p>
<p style="margin: 0px; text-align: left;"><br />
</p></h2>
<p style="margin: 0px; text-align: left;"></p>
<p style="color: #404040; font-family: verdana,sans-serif; font-size: 13px; font-weight: normal;"><span style="font-size: 12.5pt;
line-height: 16px; font-family: arial,sans-serif; color: #555555; font-weight: bold;">Donate to the charity of your choice, either
charity: water or Student Conservation Association, by helping college students save on textbooks! It's as easy as...</span><br />
</p>
<p></p>
<div class="col cta" style="color: #404040; font-family: verdana,sans-serif; font-size: 13px; font-weight: normal;">
<div class="textcolor2wo steppnumber" style="text-align: center;"></div>
<p style="margin: 0px; text-align: l
<h3 class="textcolor2wo" style="text
<p style="margin: 0px; text-align: l
<p>Help your friends, family, and cl
utm_source=CE&utm_medium=SP&utm_
</p></div>
<div class="col cta" style="color: #
<div class="textcolor2wo steppnumber"
<p style="margin: 0px; text-align: c
<h3 class="textcolor2wo" style="text
<p style="margin: 0px; text-align: c
```

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

Application Development Languages and Tools

Ruby on Rails provides technologies for developing object-oriented, database-driven websites

Summary

System development
phases

Guidelines for system
development

Activities that occur
during system
development

Various programming
languages and
program
development tools

Web development
tools

Discovering Computers

Technology in a World of Computers,
Mobile Devices, and the Internet

Chapter 12

Information Systems and Program Development

Chapter 12 Complete

