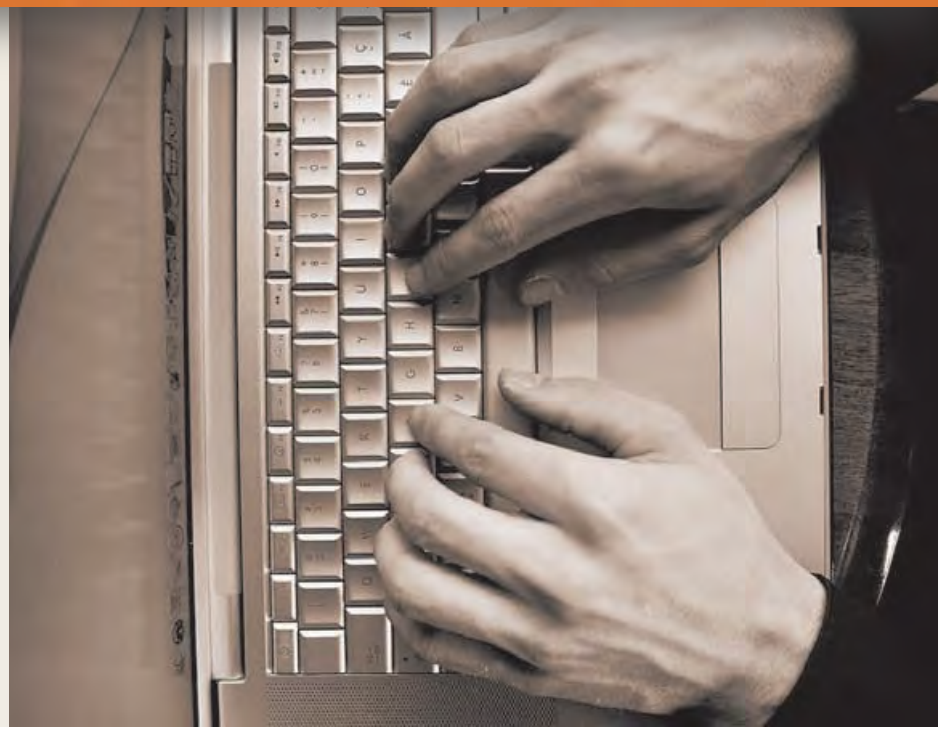
Chapter Eleven

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

See Page 417
for Detailed Objectives

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

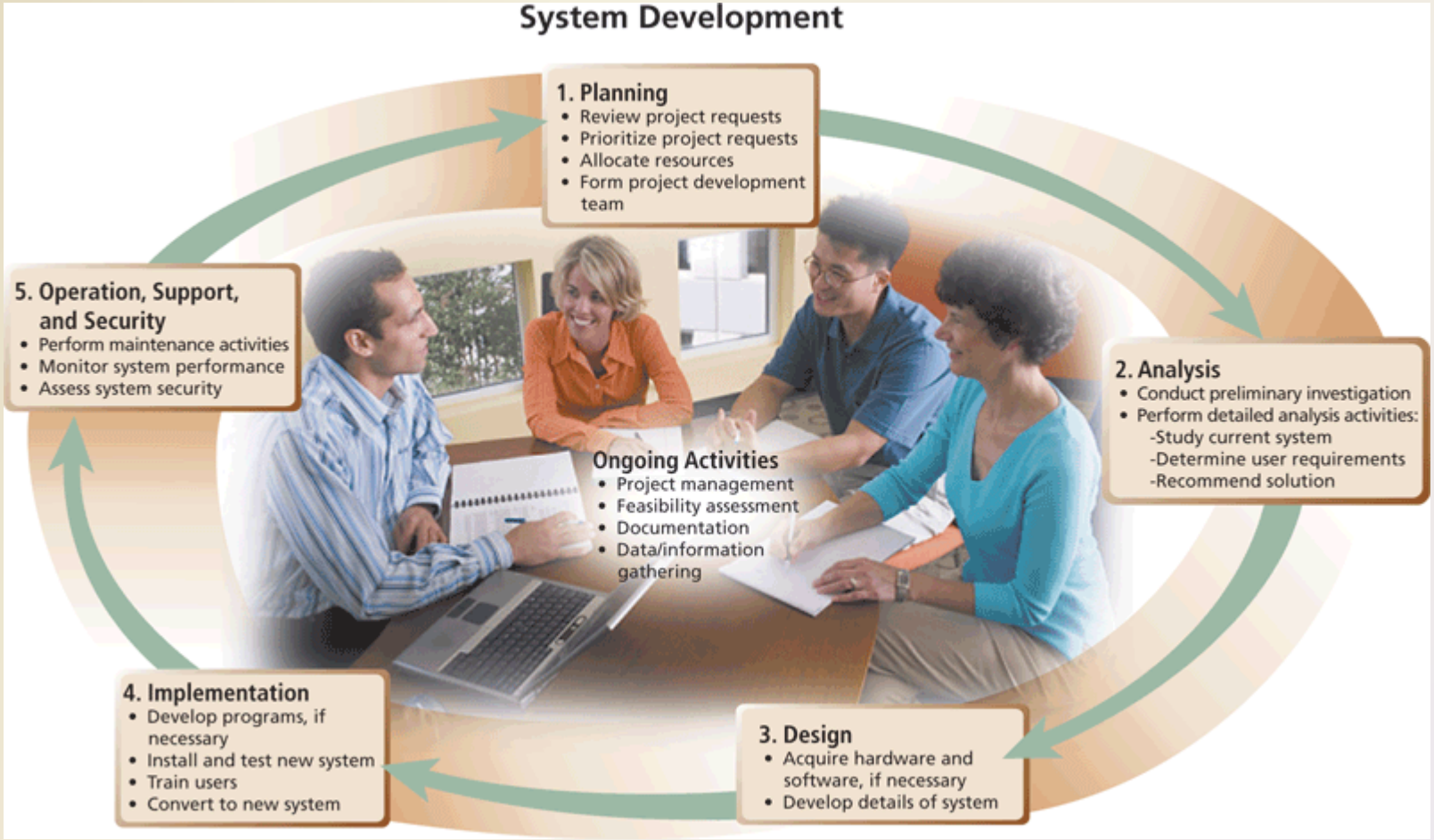
See Page 417
for Detailed Objectives

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:

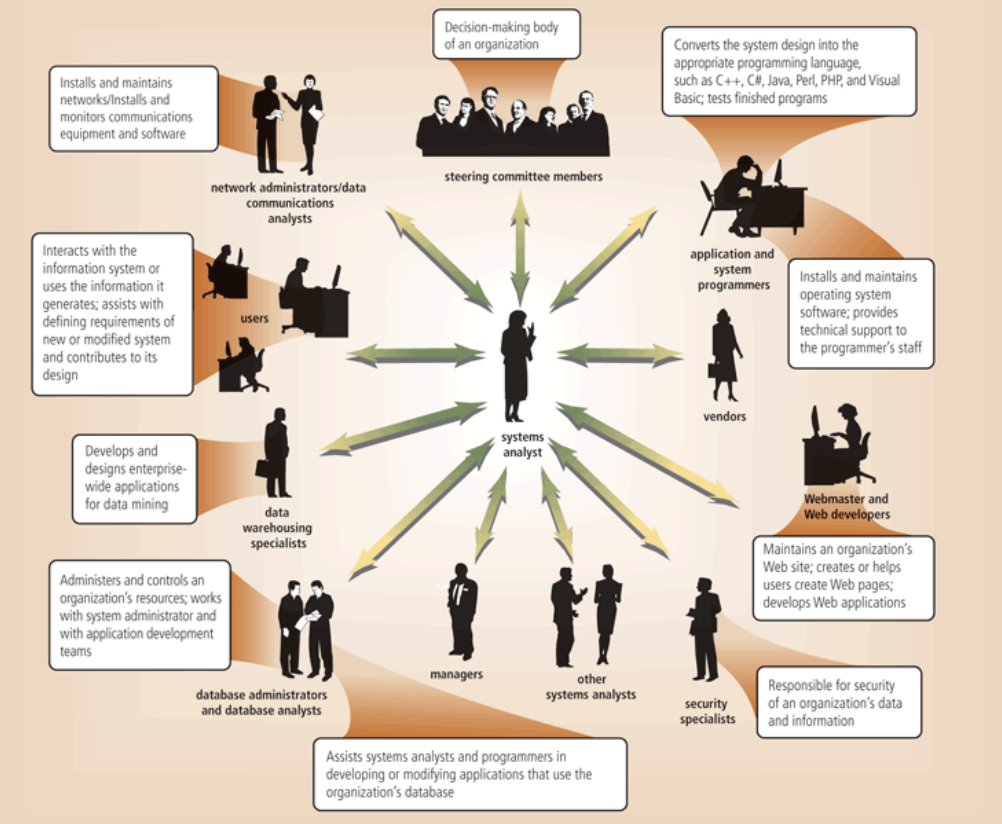
Group activities or tasks into phases

Involve **users**

Define **standards**

System Development

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



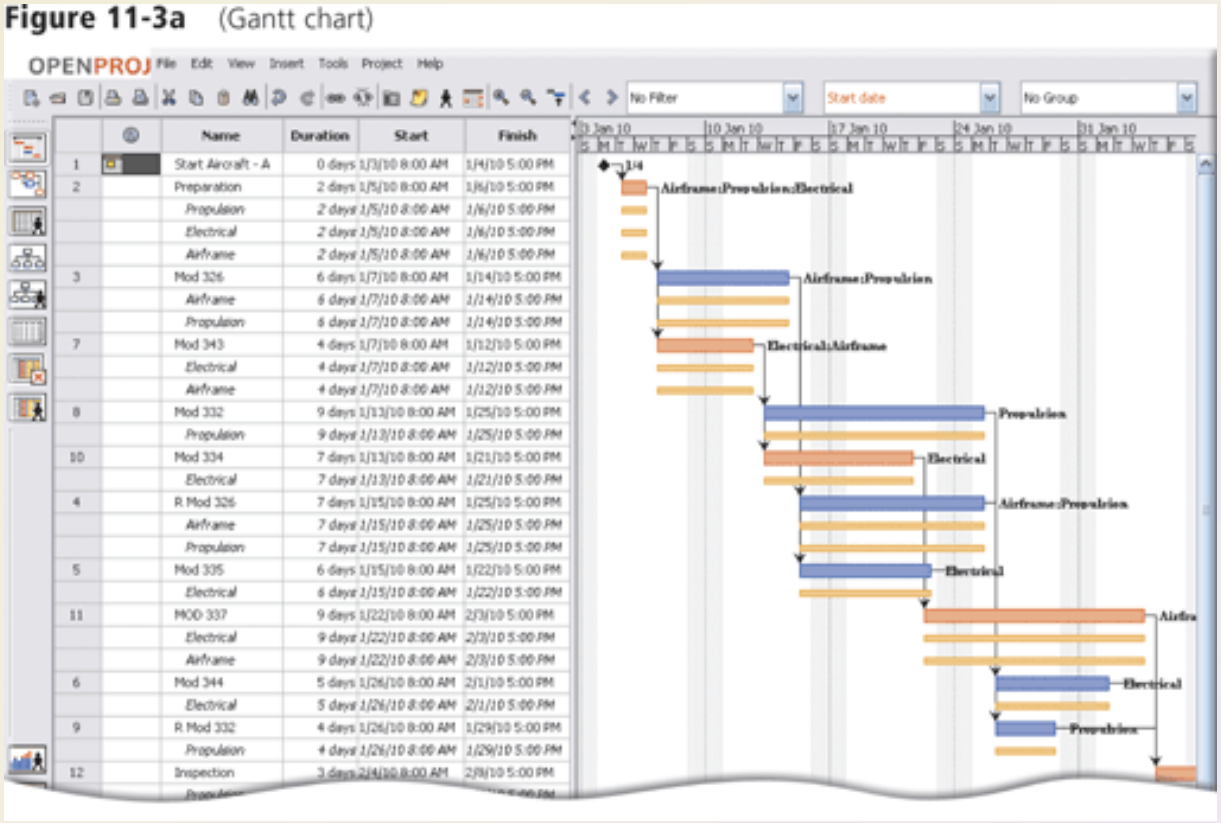
System Development

- **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

Figure 11-3a (Gantt chart)



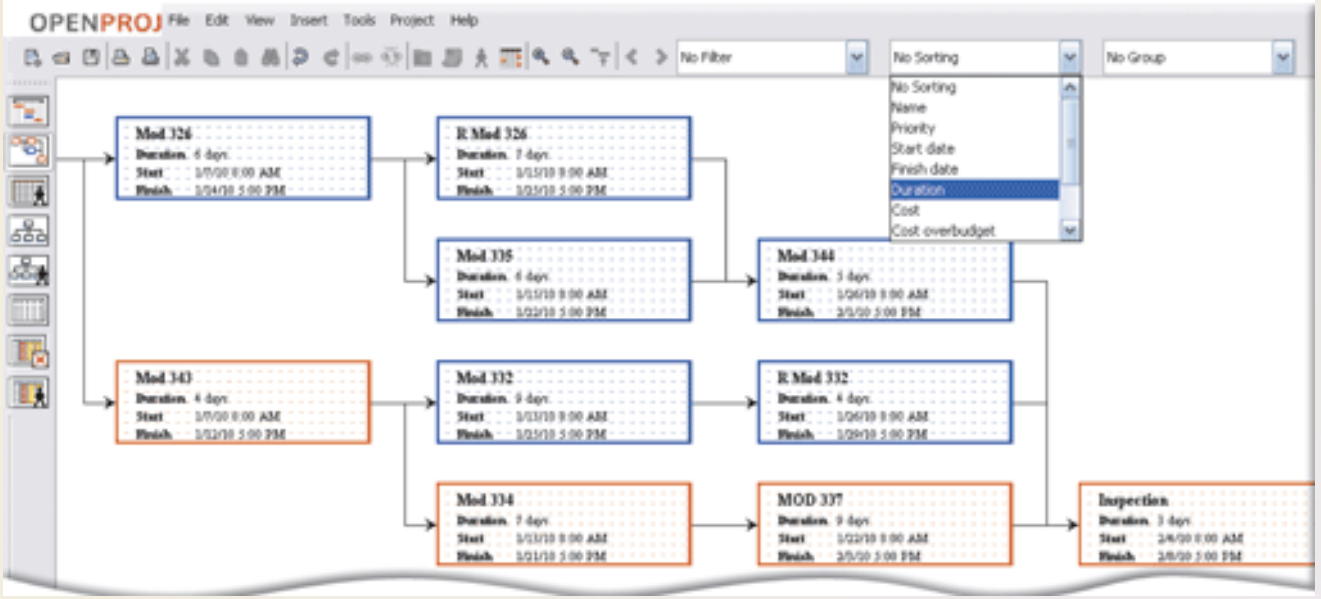
Click to view Web Link, click Chapter 11, Click Web Link from left navigation, then click Gantt Charts below Chapter 11

Pages 420 - 421
Figure 11-3a

System Development

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

Figure 11-3b (PERT chart)



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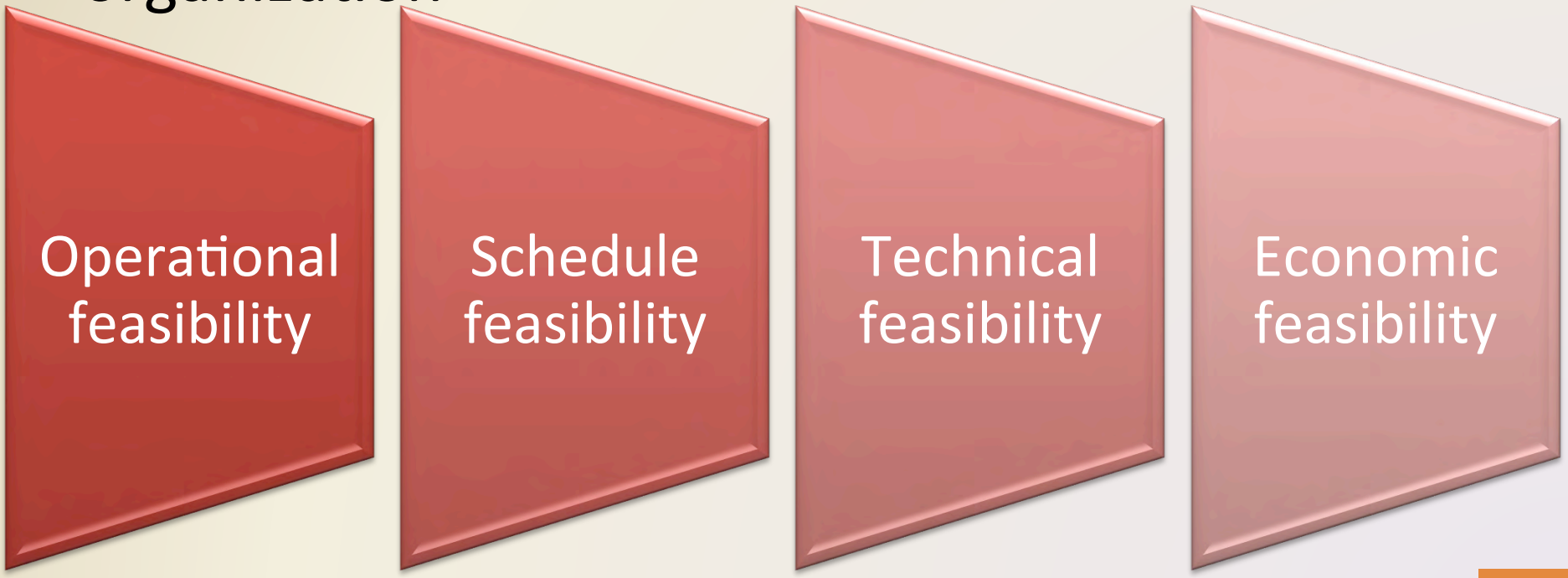
System Development

- **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)

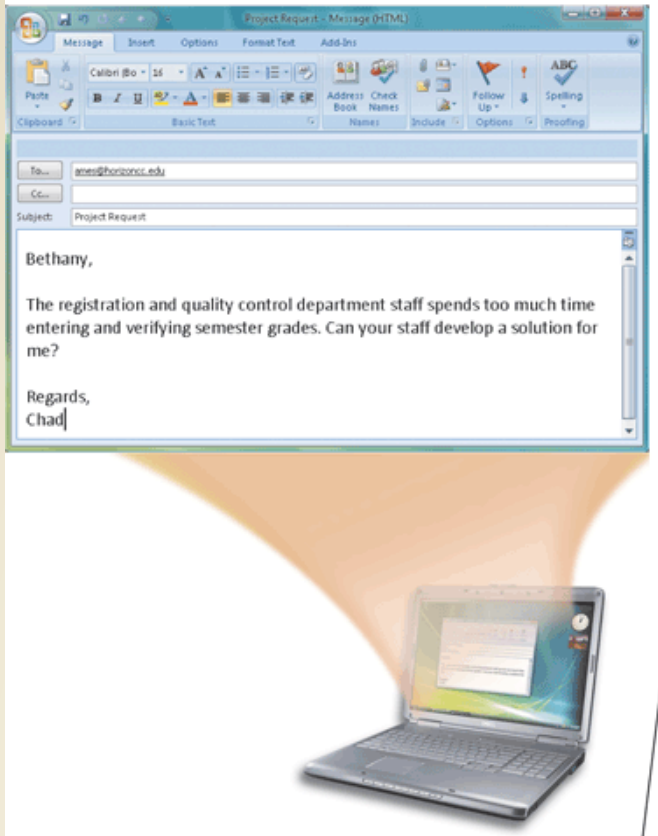
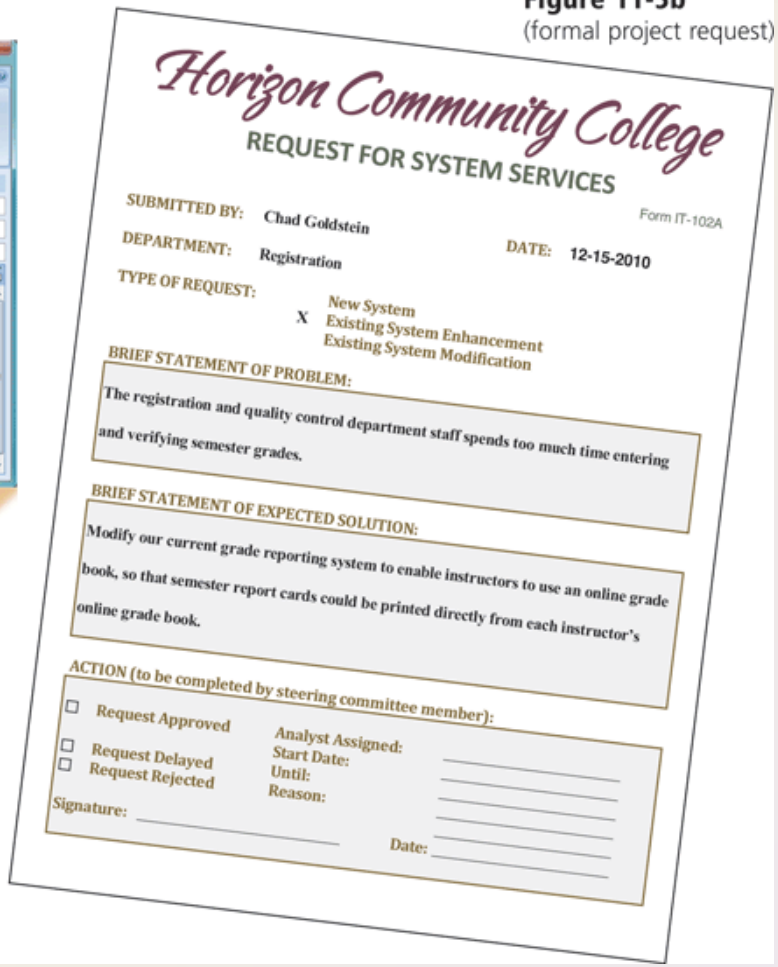
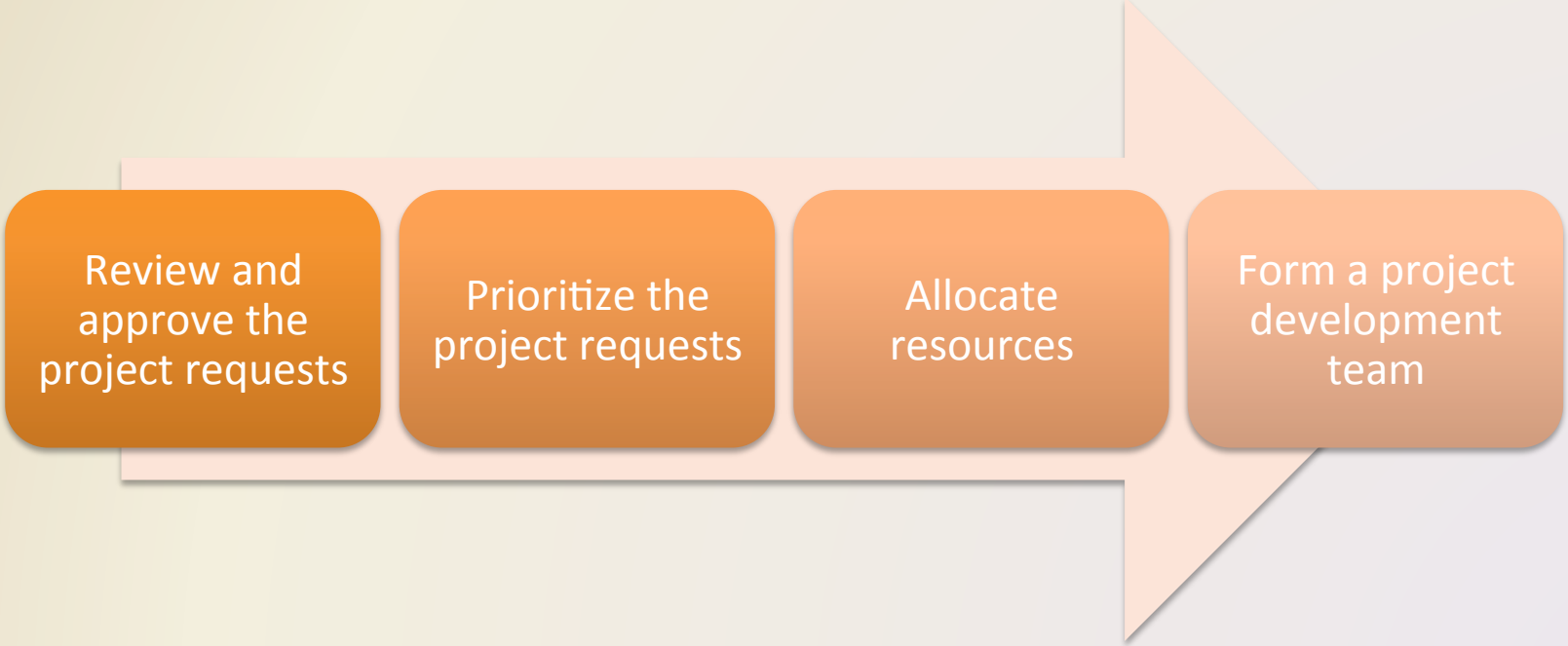


Figure 11-5b
(formal project request)



System Development

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

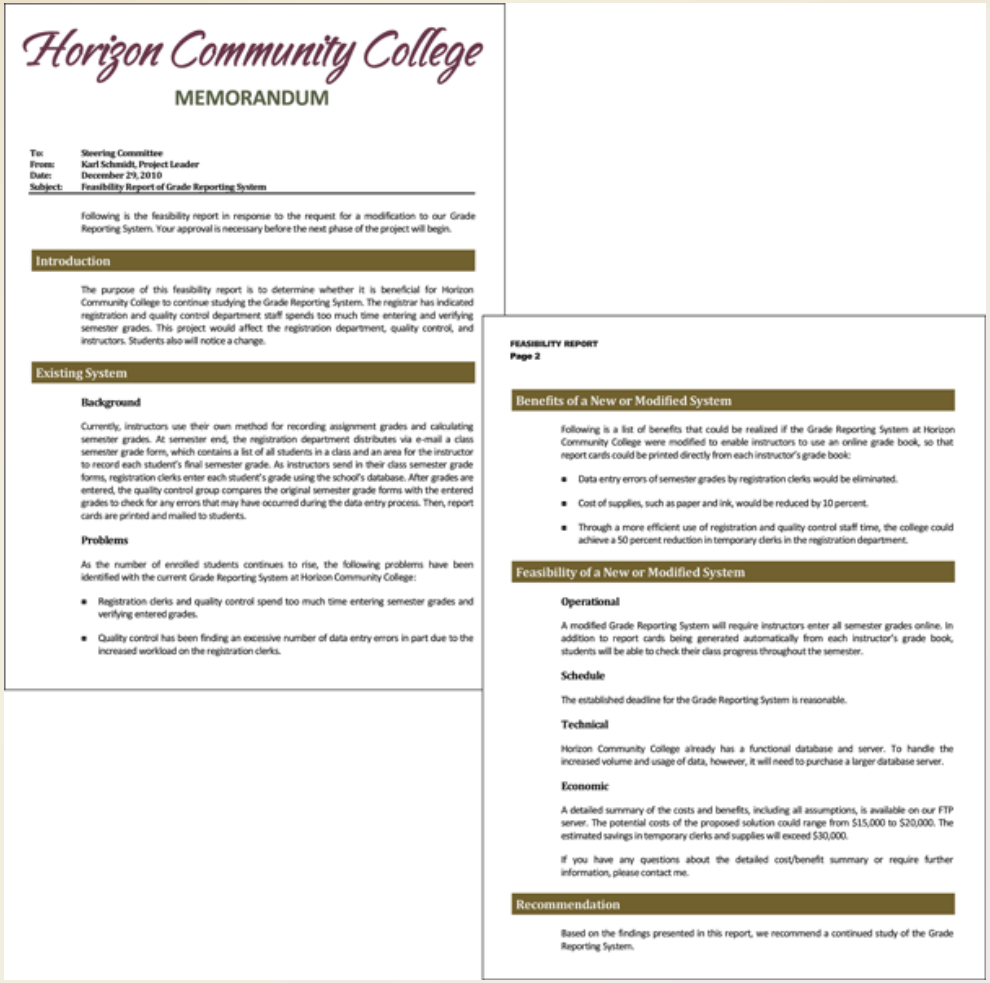


System Development

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

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

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

Packaged software

Custom software

Outsourcing

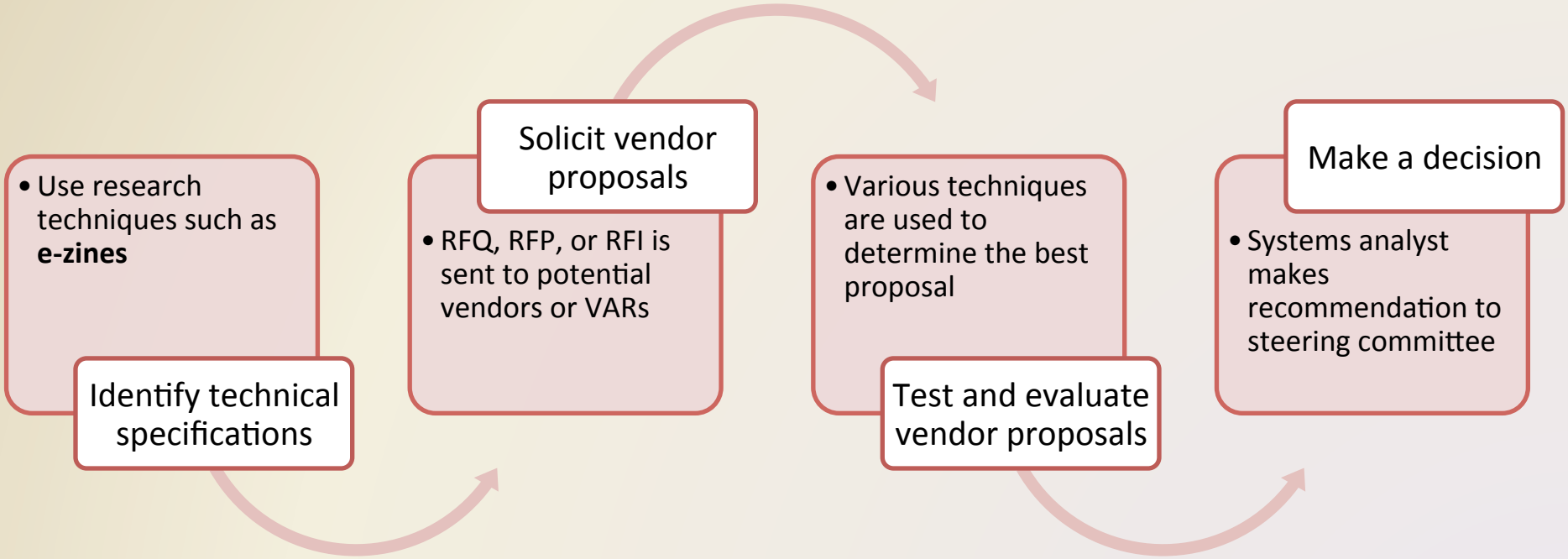
Click to view Web Link, click Chapter 11, Click Web Link from left navigation, then click Vertical Market Software below Chapter 11

System Development

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

System Development

- To acquire the necessary hardware and software:



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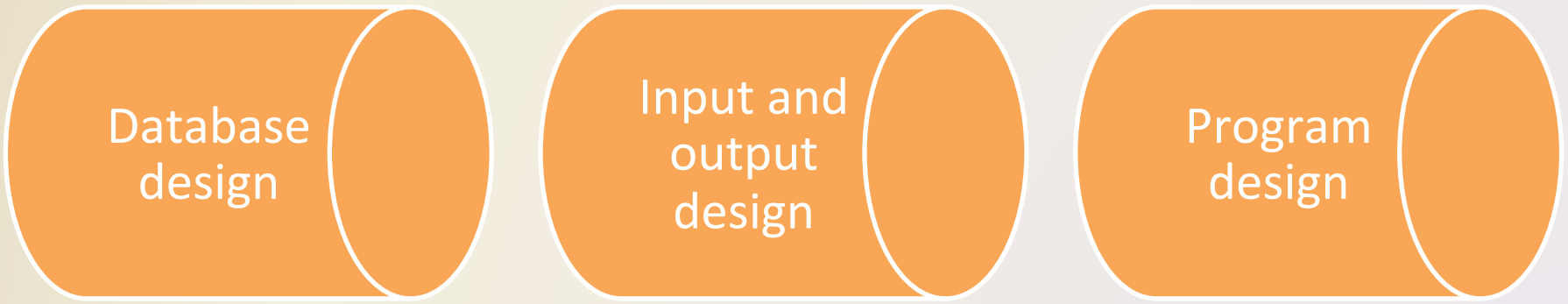
System Development

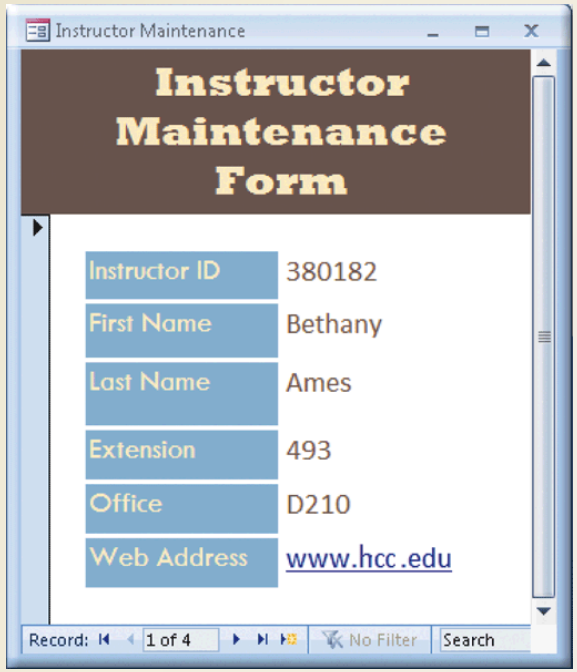
- The next step is to develop detailed design specifications
  - Sometimes called a physical design



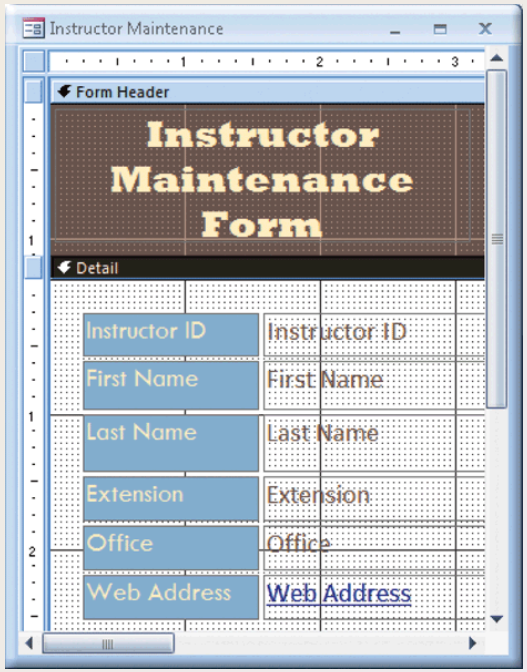
System Development

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

Mockup



Layout chart

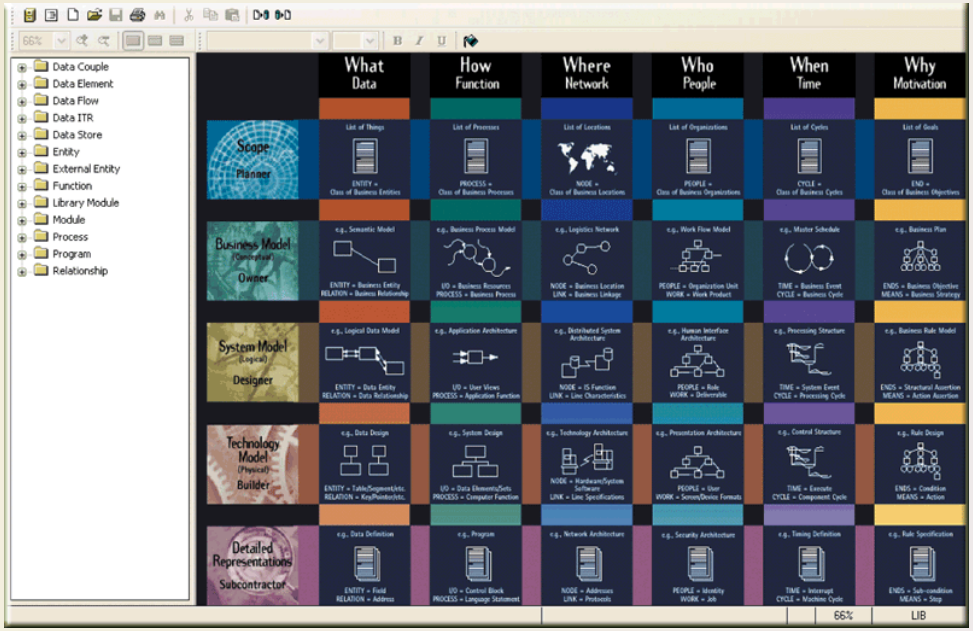


System Development

- 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

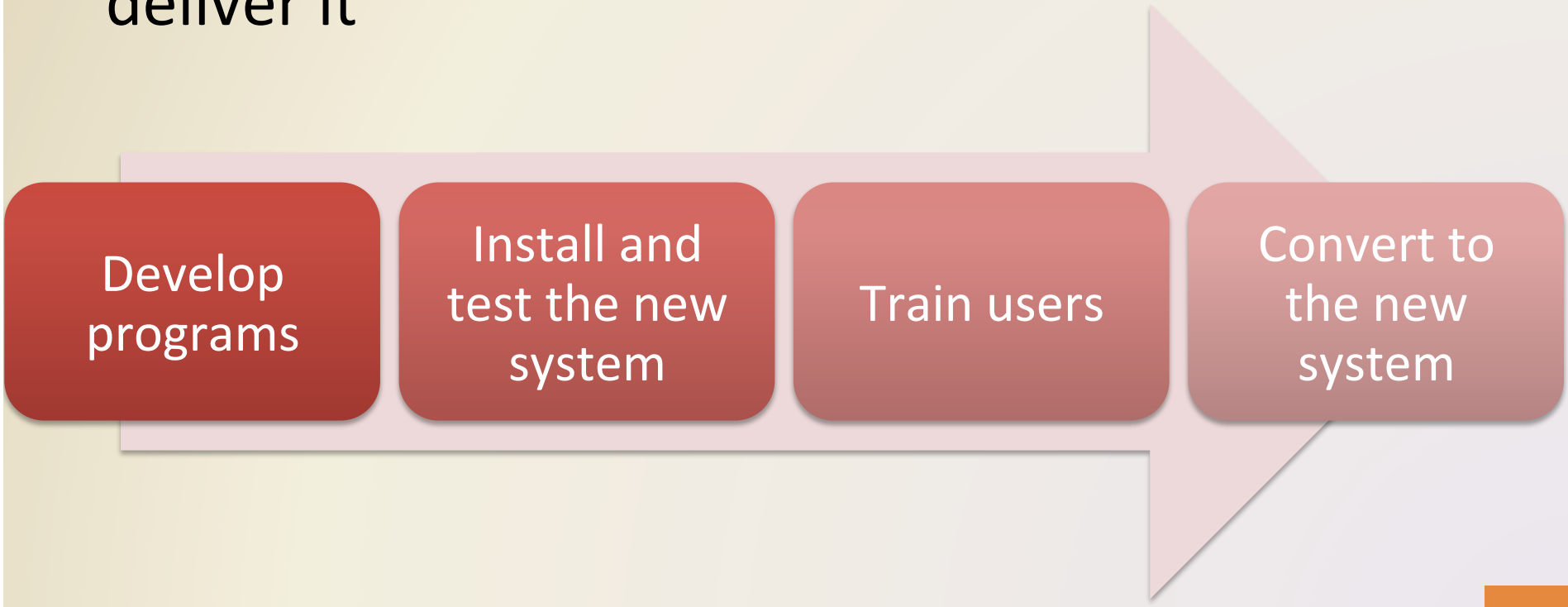
System Development

- **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	Systems test	Integration test	Acceptance test
• Verifies that each individual program or object works by itself	• Verifies that all programs in an application work together properly	• Verifies that an application works with other applications	• 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:

Programming Languages and Program Development Tools

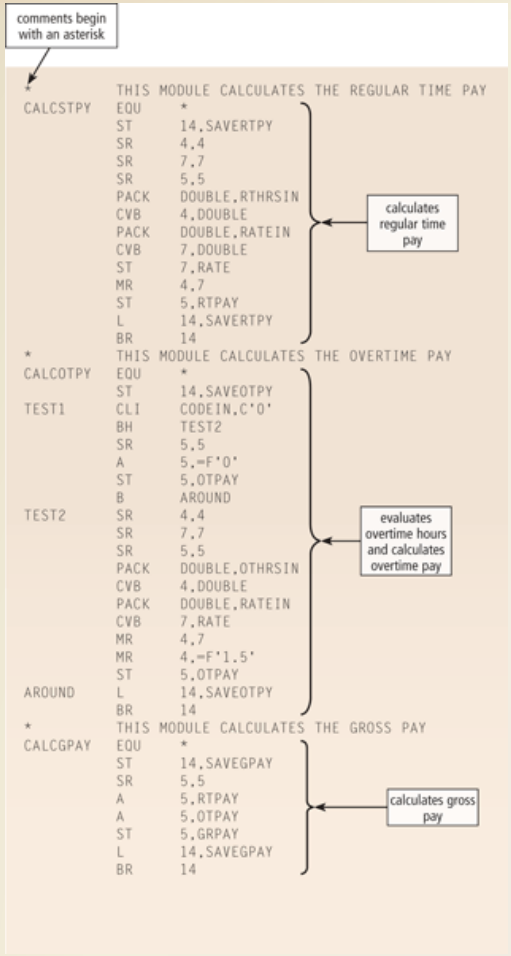
- A **computer program** is a series of instructions that directs a computer to perform tasks
  - Created by a **programmer** using a **programming language**

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

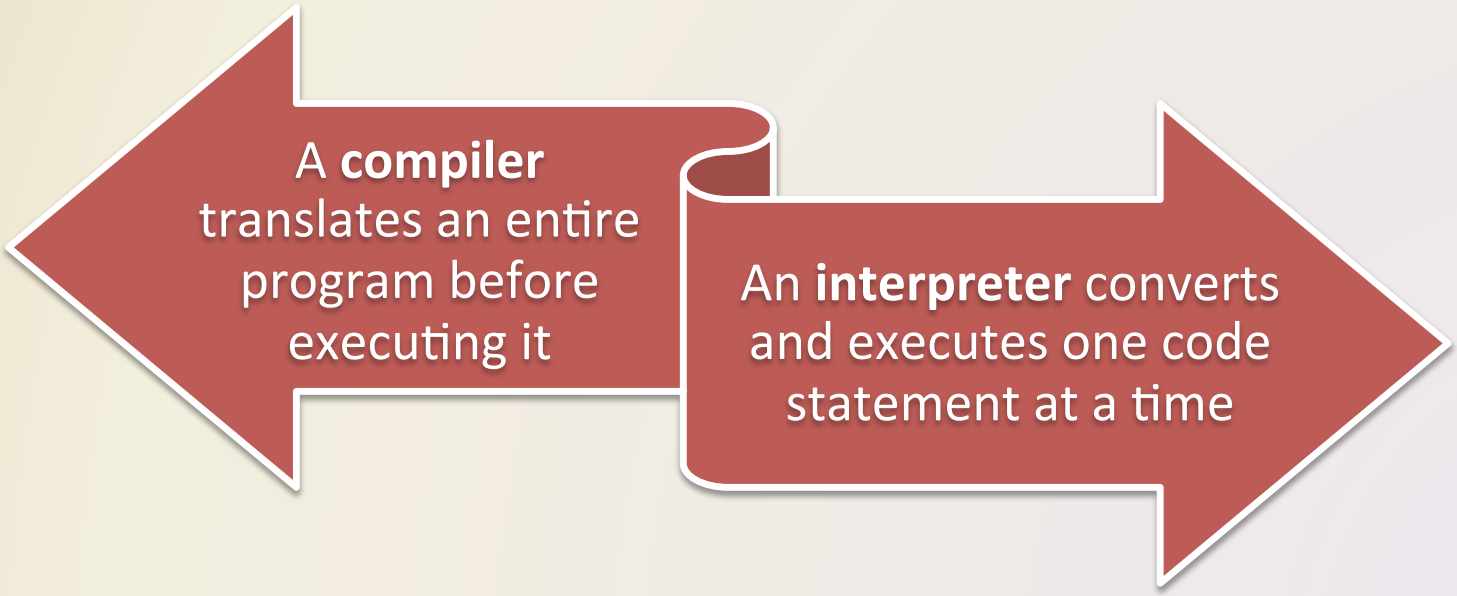



```
*        THIS MODULE CALCULATES THE REGULAR TIME PAY
CALCSTPY EQU     *
         ST      14,SAVERTPY
         SR      4,4
         SR      7,7
         SR      5,5
         PACK    DOUBLE,RTHRSIN
         CVB     4,DOUBLE
         PACK    DOUBLE,RATEIN
         CVB     7,DOUBLE
         ST      7,RATE
         MR      4,7
         ST      5,RTPAY
         L       14,SAVERTPY
         BR      14
*        THIS MODULE CALCULATES THE OVERTIME PAY
CALCOTPY EQU     *
         ST      14,SAVEOTPY
TEST1    CLI     CODEIN,C'O'
         BH      TEST2
         SR      5,5
         A       5,=F'0'
         ST      5,OTPAY
         B       AROUND
TEST2    SR      4,4
         SR      7,7
         SR      5,5
         PACK    DOUBLE,OTHRSIN
         CVB     4,DOUBLE
         PACK    DOUBLE,RATEIN
         CVB     7,RATE
         MR      4,7
         MR      4,=F'1.5'
         ST      5,OTPAY
AROUND   L       14,SAVEOTPY
         BR      14
*        THIS MODULE CALCULATES THE GROSS PAY
CALCGPAY EQU     *
         ST      14,SAVEGPAY
         SR      5,5
         A       5,RTPAY
         A       5,OTPAY
         ST      5,GRPAY
         L       14,SAVEGPAY
         BR      14
```

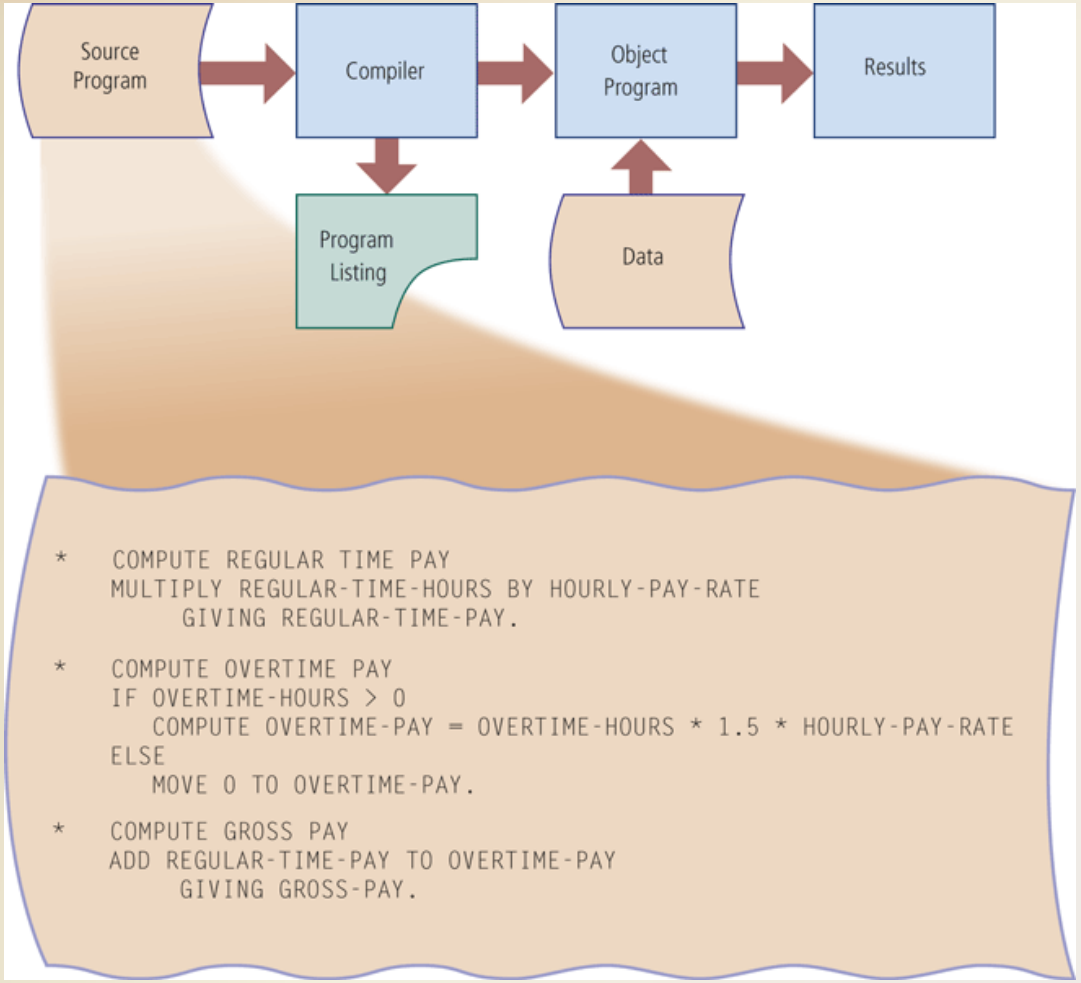
- **Assembly language** is the second generation of programming languages
- Programmer writes instructions using symbolic instruction codes
- A **source program** contains the code to be converted to machine language

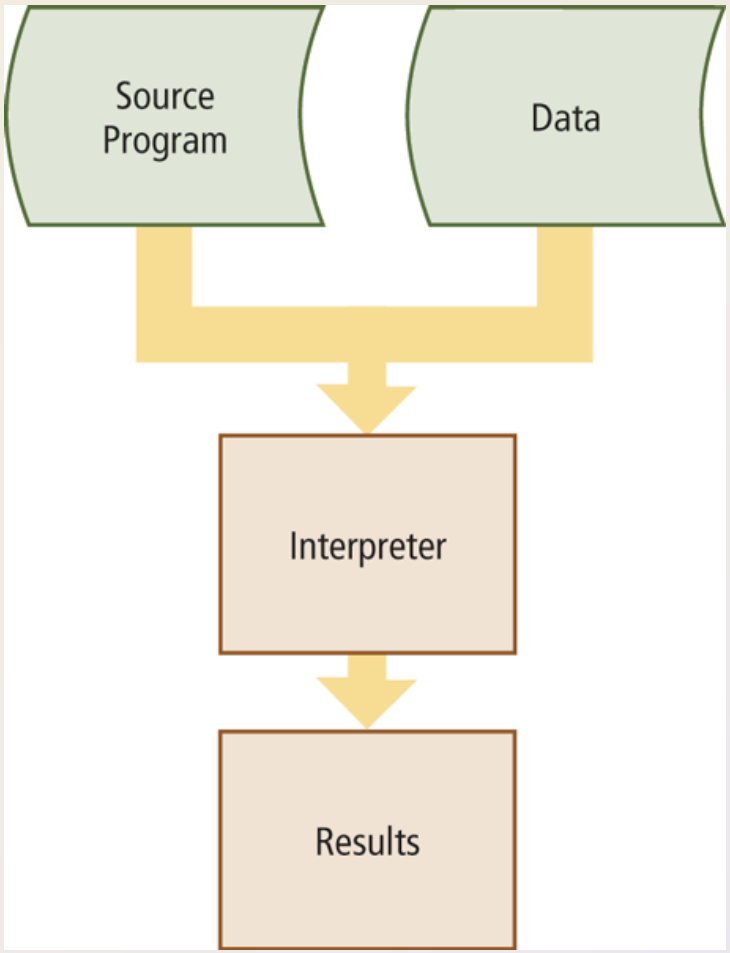
Programming Languages and Program Development Tools

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



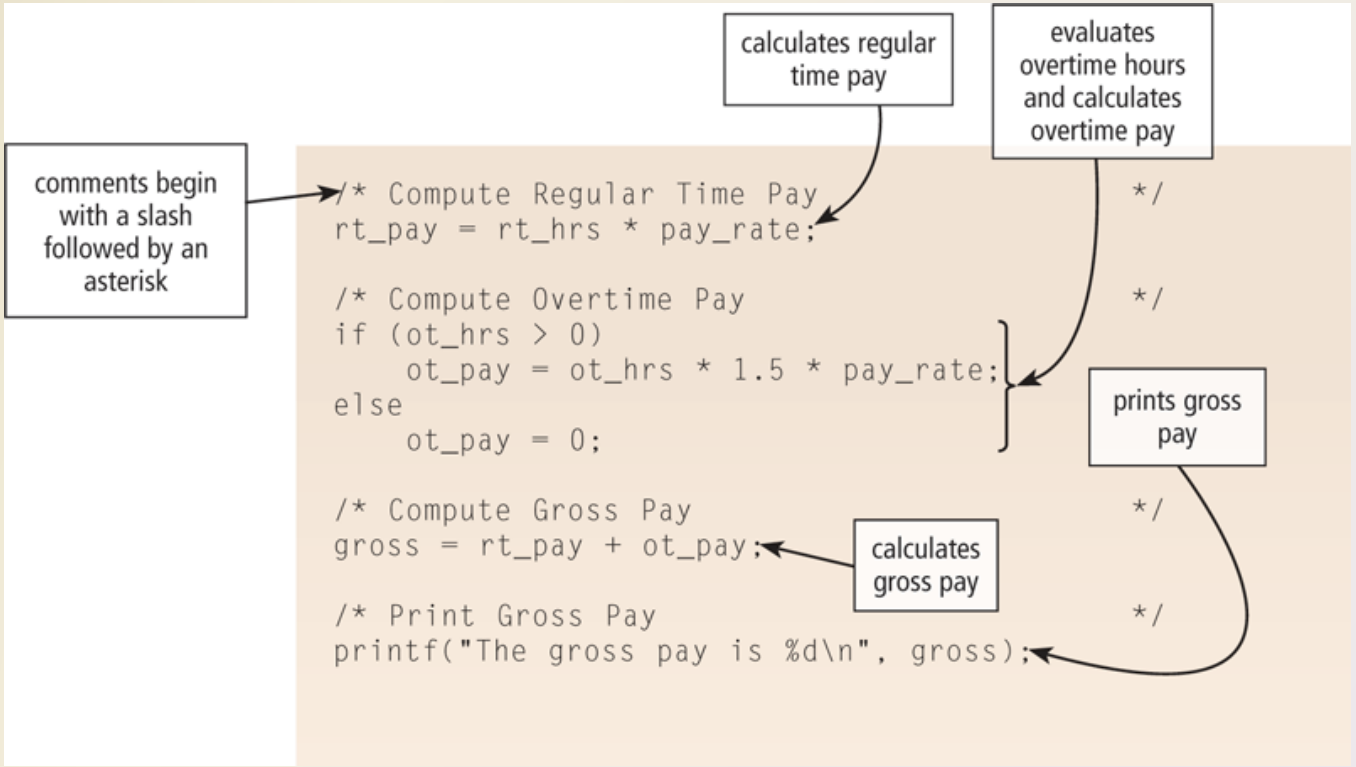
Programming Languages and Program Development Tools





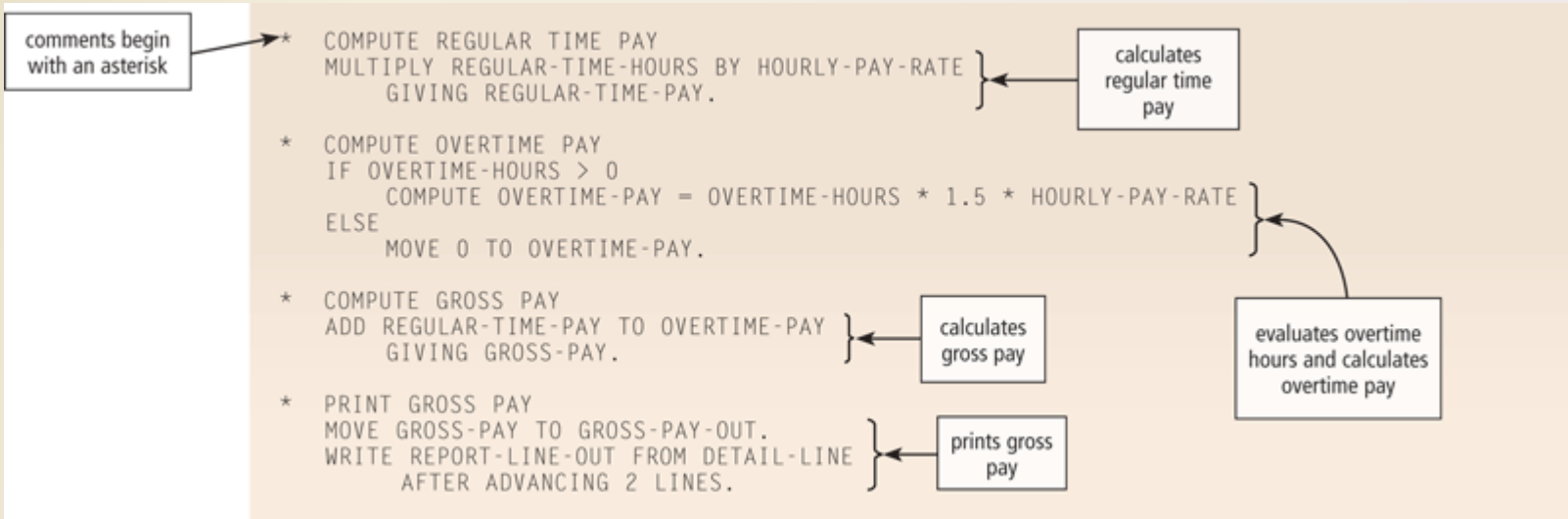
Programming Languages and Program Development Tools

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



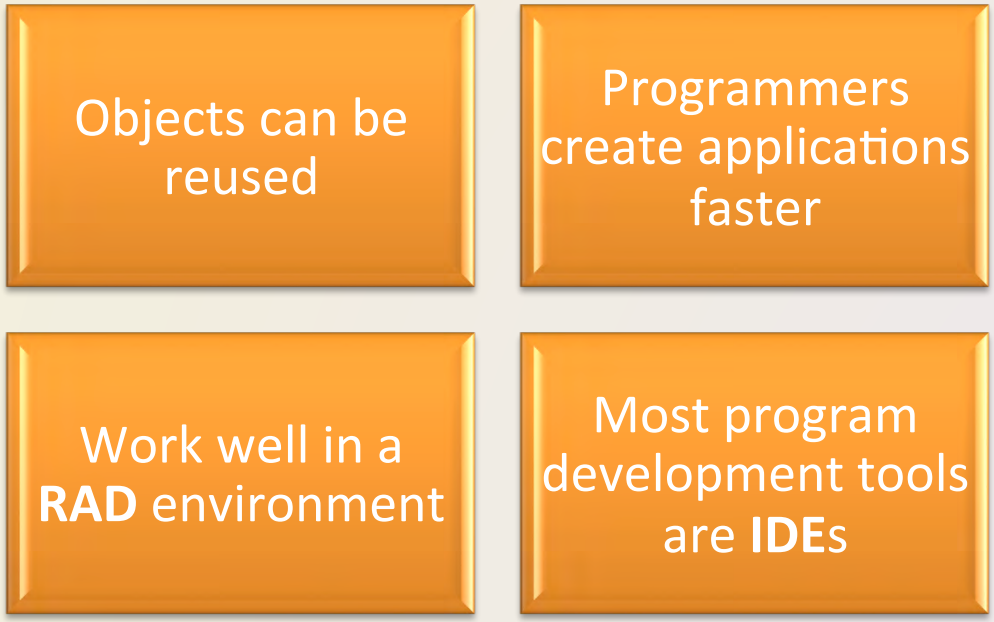
Programming Languages and Program Development Tools

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



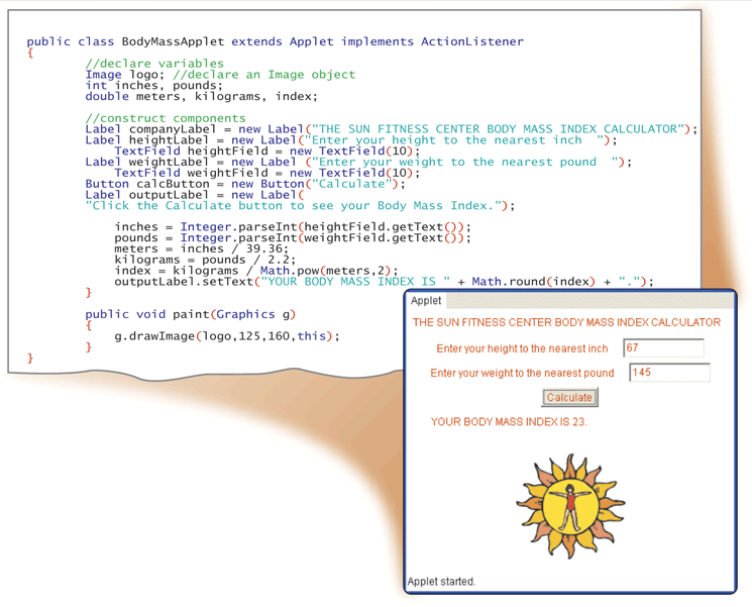
Programming Languages and Program Development Tools

- An **object-oriented programming** (**OOP**) **language** allows programmers the ability to reuse and modify existing objects
- Other advantages include:



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



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

Pages 440 - 441
Figure 11-19

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

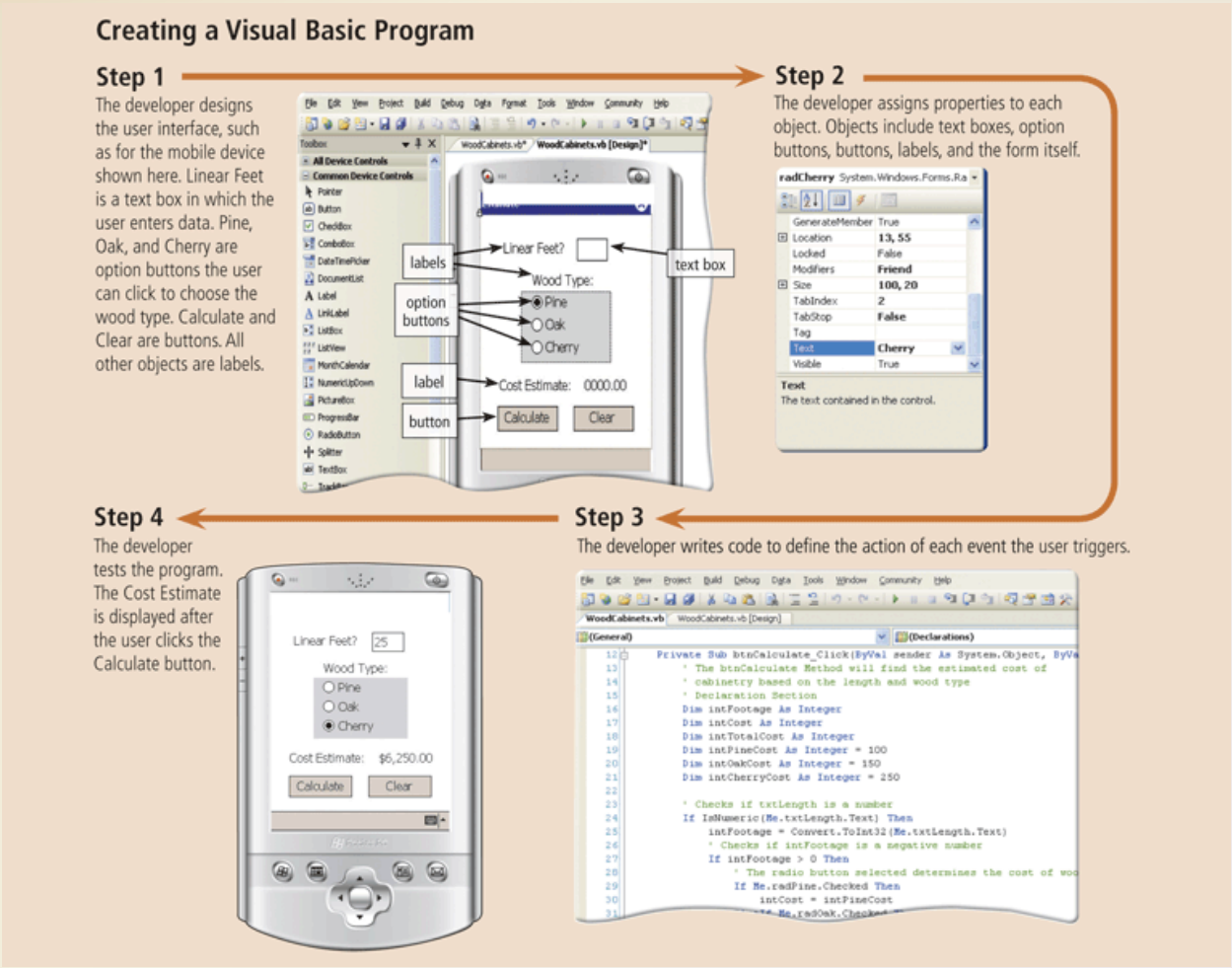
- **C++** is an extension of the C programming language
  - Additional features for working with objects, classes, events, and other object-oriented concepts
- **C#** is based on C++ and was developed by Microsoft

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



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

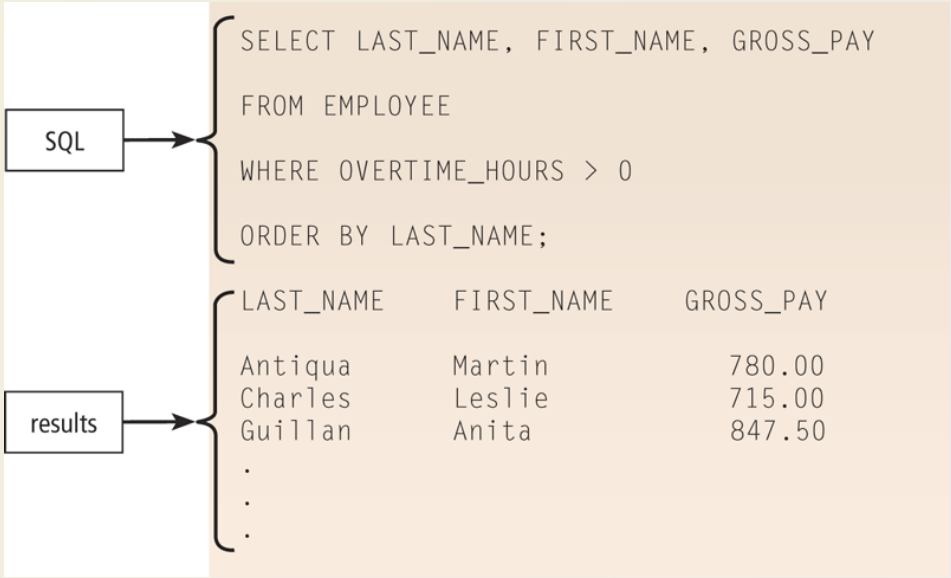
Borland's **Delphi** is a powerful program development tool that is ideal for building large-scale enterprise and Web applications in a RAD environment

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**



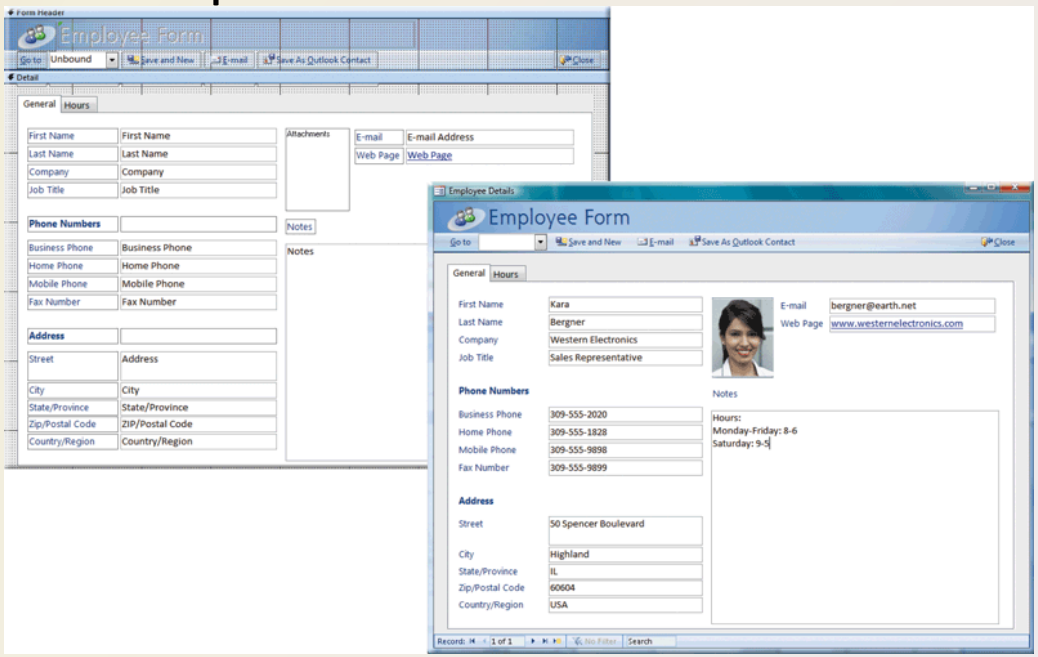
Programming Languages and Program Development Tools

- Classic programming languages include:

Ada	ALGOL	APL	BASIC
Forth	FORTRAN	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



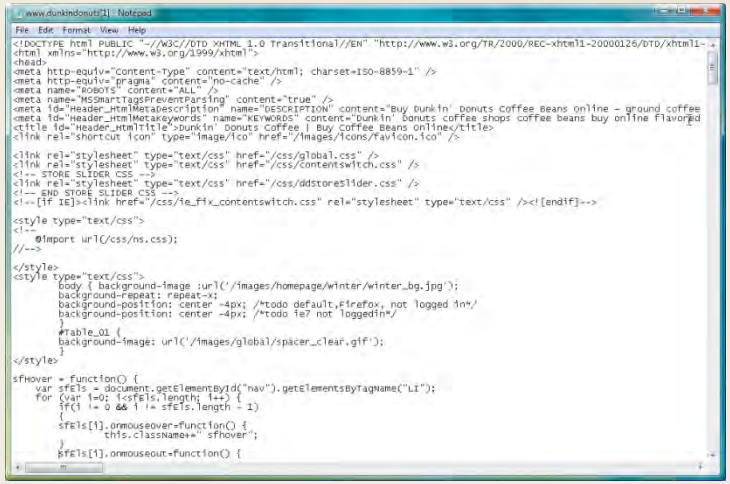
Programming Languages and Program Development Tools

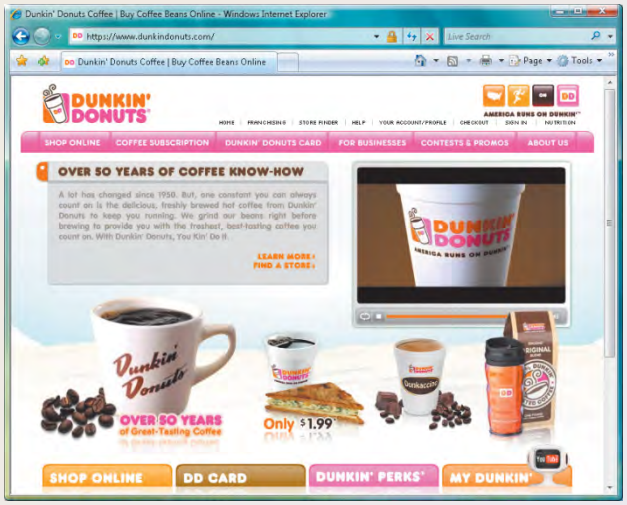
- A **macro** is a series of statements that instructs an application how to complete a task
- You usually create the macro in one of two ways:
  - Record the macro with a macro recorder
  - Write the macro

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





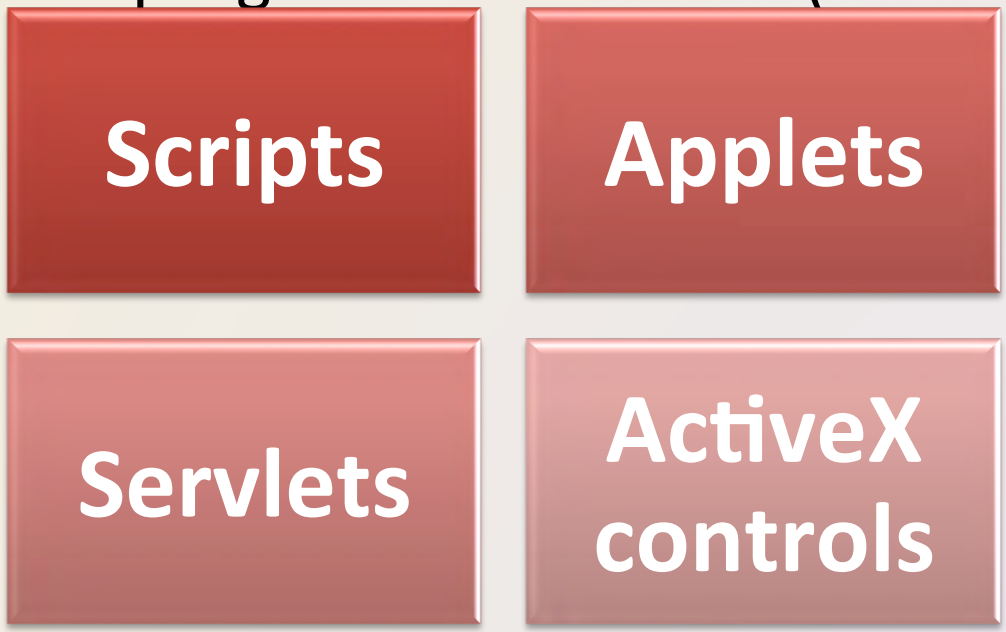
Programming Languages and Program Development Tools

- **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

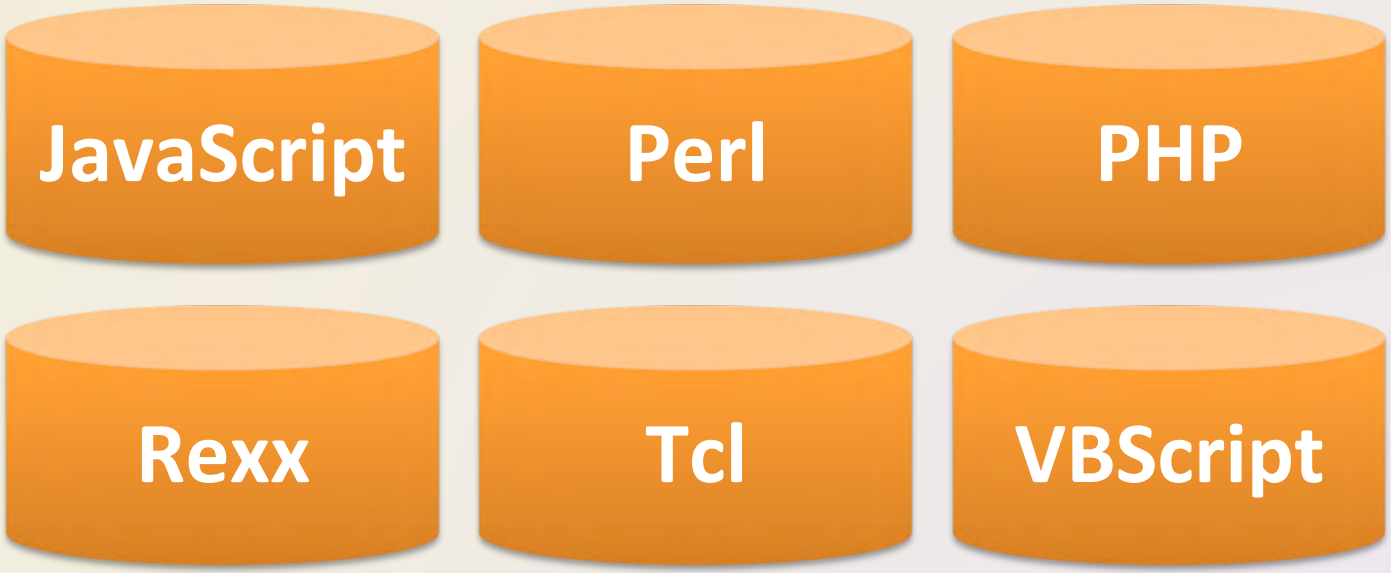
Programming Languages and Program Development Tools

- 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)



Programming Languages and Program Development Tools

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



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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:

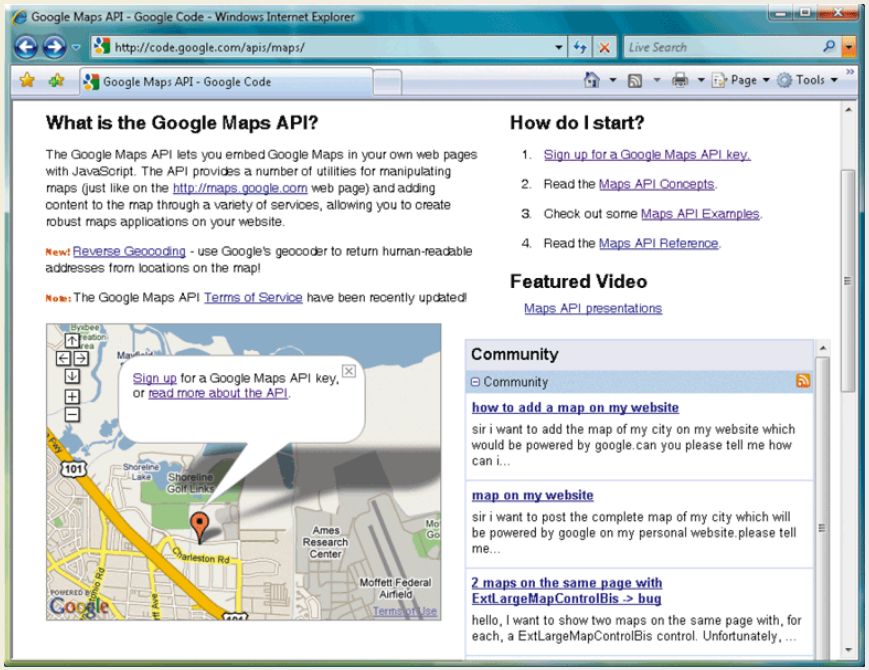
Share personal information

Allow users to modify Web site content

Have application software built into the site

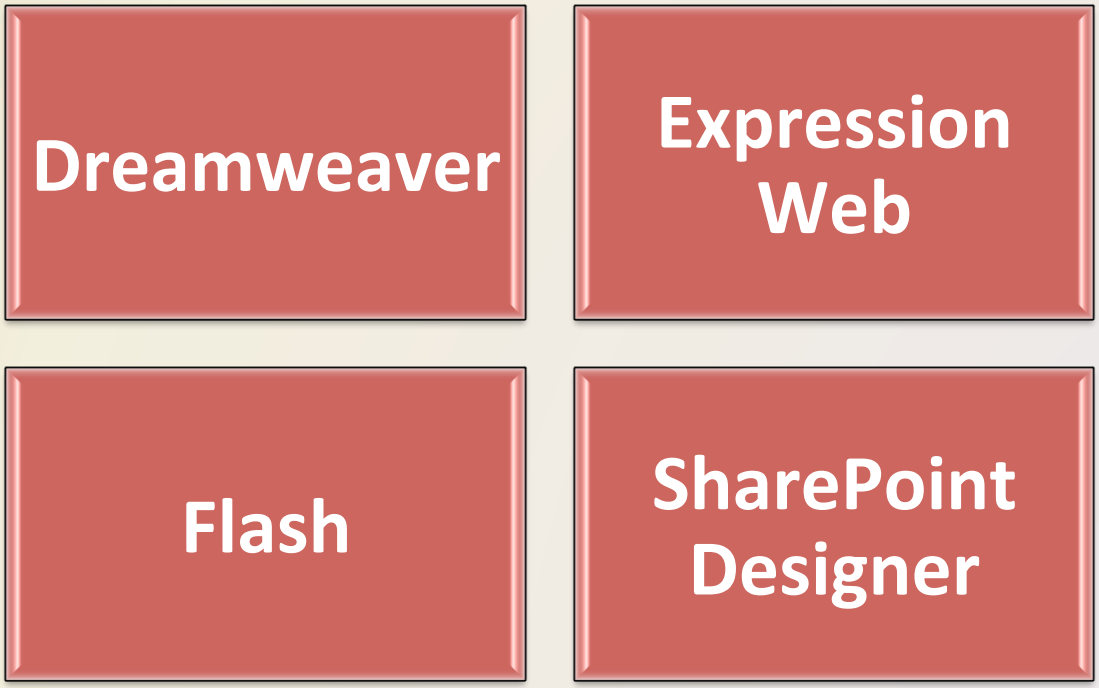
Programming Languages and Program Development Tools

- 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

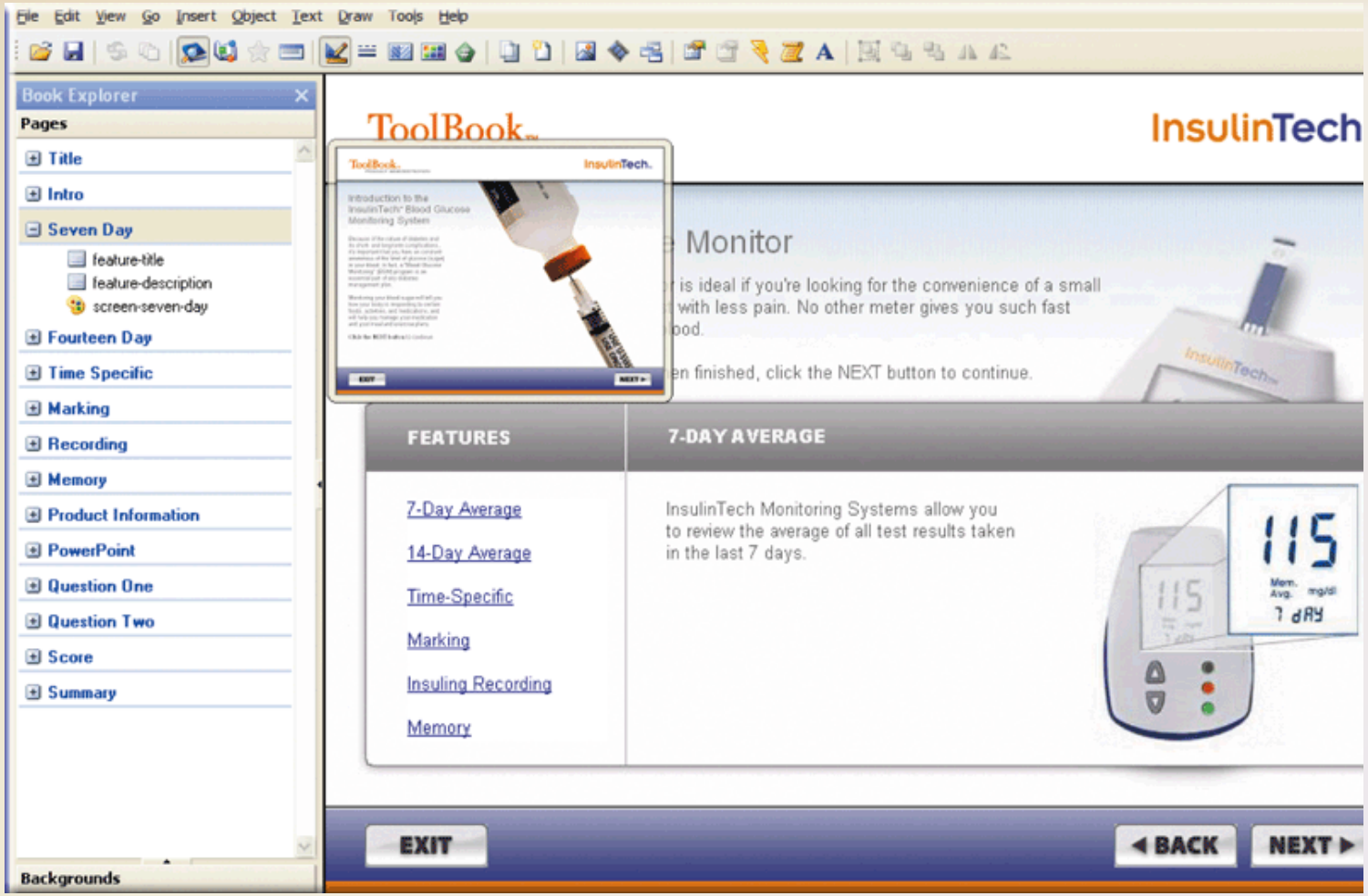
- **Web page authoring software** can create sophisticated Web pages that include images, video, audio, animation, and other effects



Programming Languages and Program Development Tools

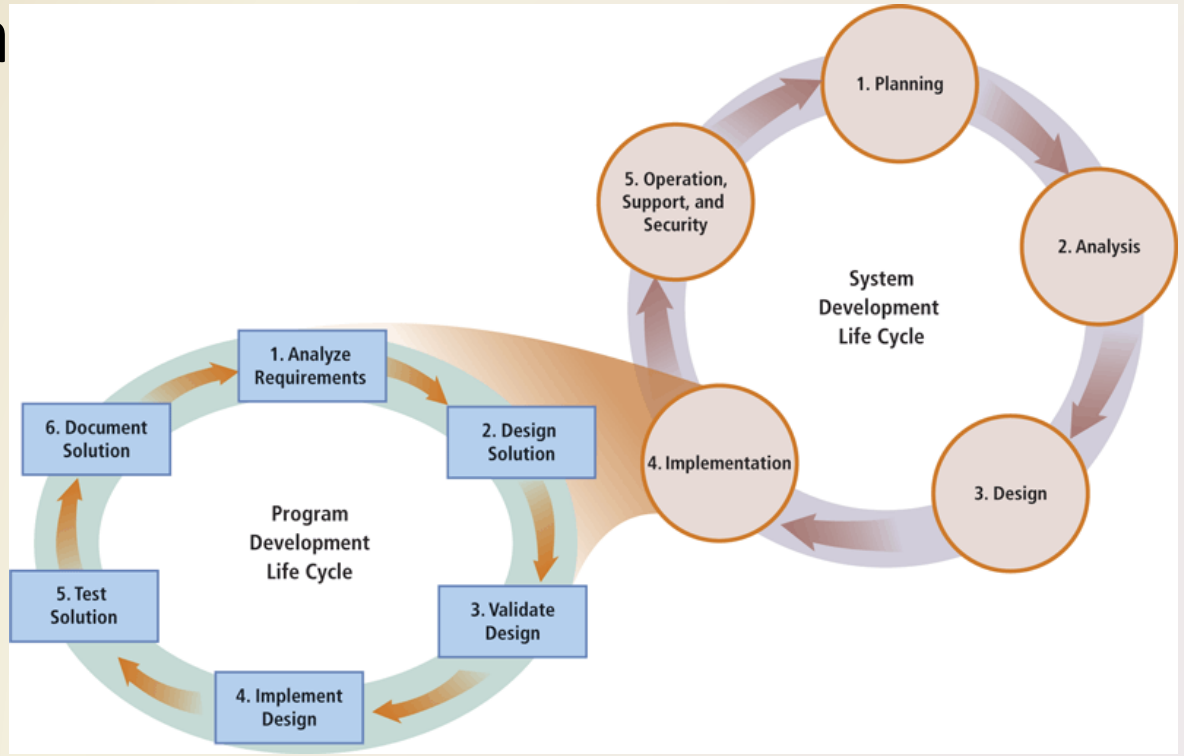
- **Multimedia authoring software** allows programmers to combine text, graphics, animation, audio, and video in an interactive presentation

Programming Languages and Program Development Tools



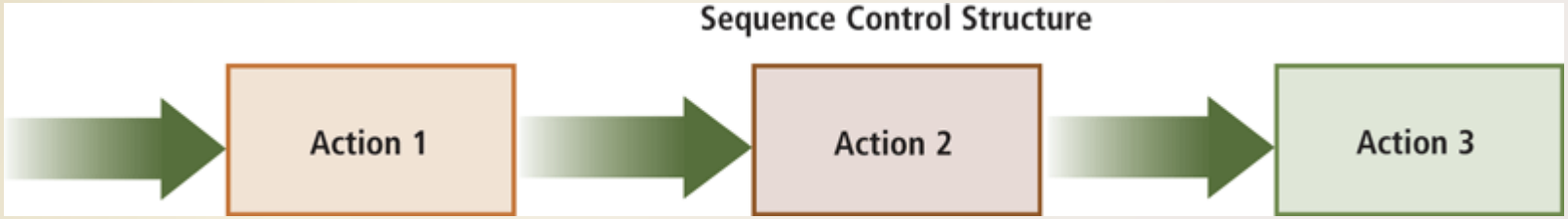
Program Development Cycle

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

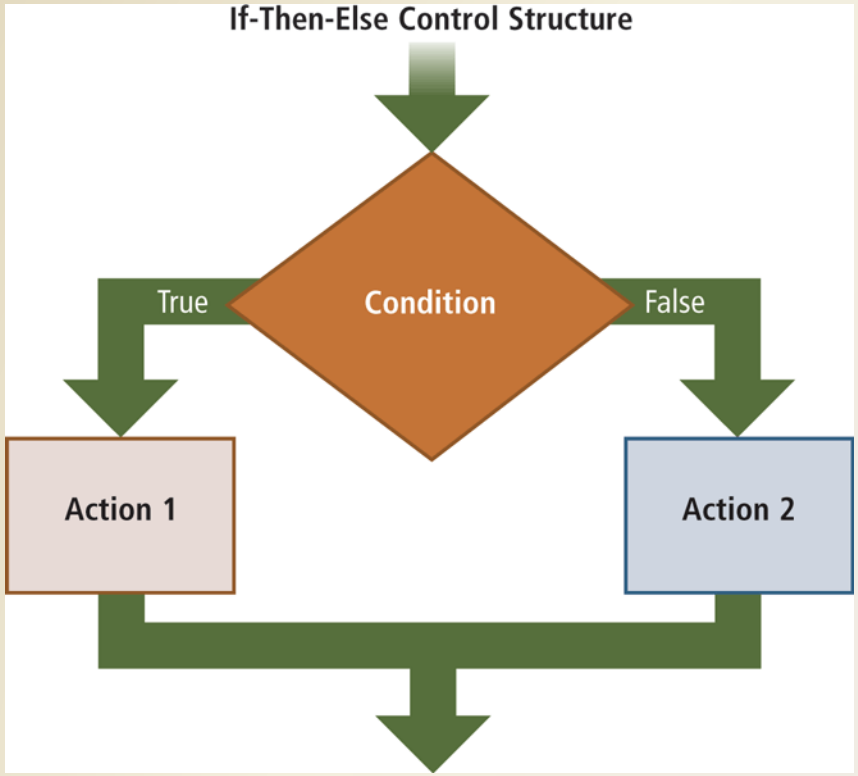


Program Development Cycle

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

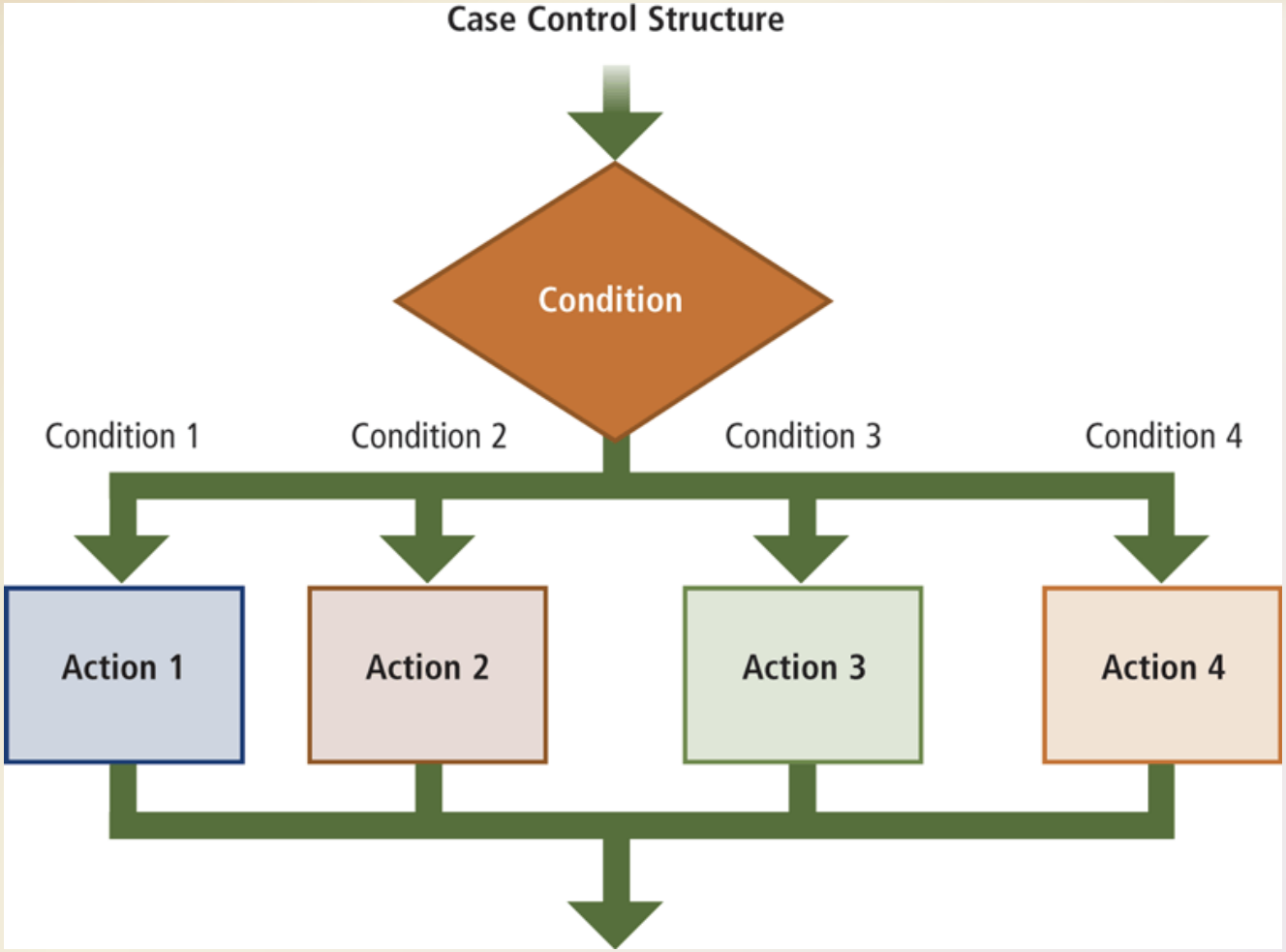


Program Development Cycle



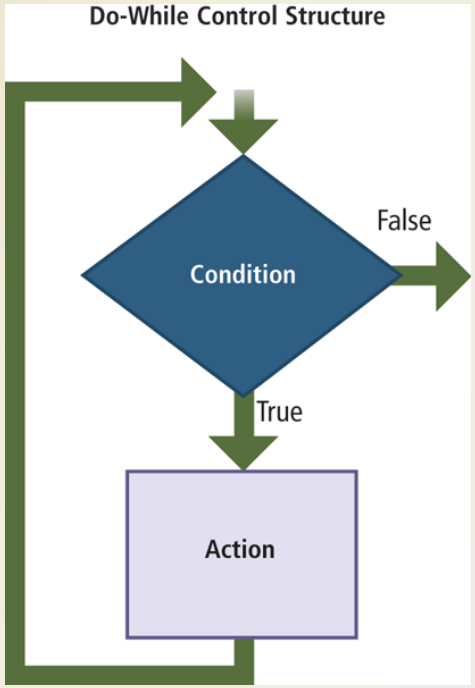
- The **selection control structure** tells the program which action to take, based on a certain condition
  - If-then-else
  - Case

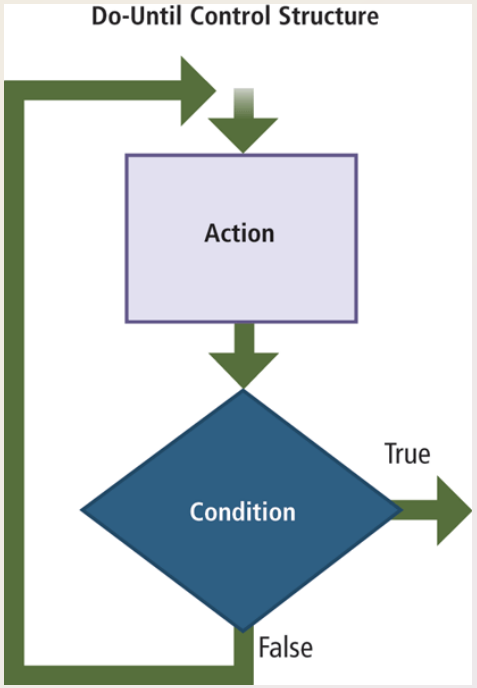
Program Development Cycle



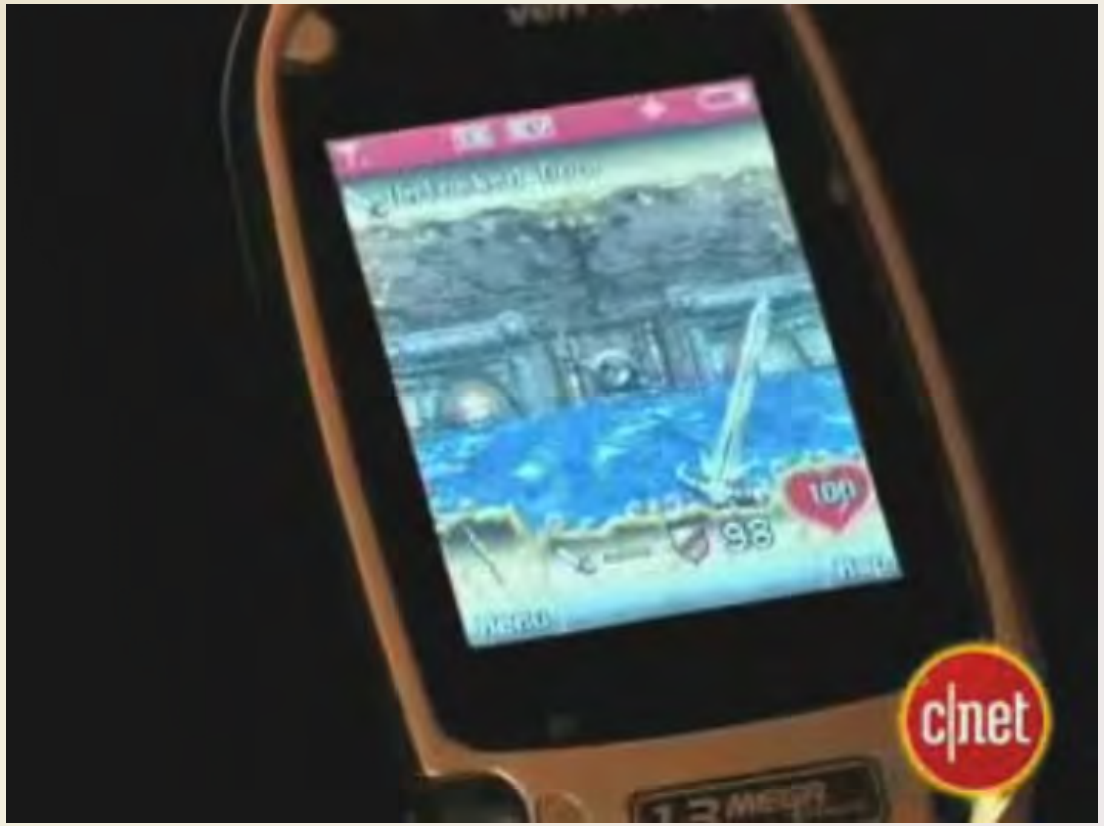
Program Development Cycle

- 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

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