Software's Importance

- Hardware is the engine and software is the gas that makes it run.
- To understand software concepts is to understand how real work gets done on computer-based systems within a business.
- To understand software is to appreciate the specific details that must be addressed for a new computer-based application to be implemented.

Software Categories

Key Software Terms

- Program
- Stored Program
- Programming Language
- Compilation or Interpretive
- Source Code
- Object Code

Software Categories (continued)

“Computer Intelligence”

A computer isn’t smart enough to make a mistake!

Without our help.
Software Categories (continued)

General-Purpose Applications

- Electronic Mail
- Word Processing
- Presentation Graphics
- Multimedia
- Personal Information Manager
- Groupware

Software Categories (continued)

Software Suites

- MS Office: Word Processor, Excel, Powerpoint and Access
- SAP Manufacturing Systems
- Oracle Supply Chain Management
- Personal Information Manager
- Groupware

Software Categories (continued)

Trends in Computer Software

First Generation
- User-Written Programs
- Machine Languages

Second Generation
- Packaged Programs
- Symbolic Languages

Third Generation
- Operating Systems
- High-Level Languages

Fourth Generation
- DBMS
- Fourth-Generation Languages
- Microcomputer Packages

Fifth Generation
- Natural & Object-Oriented Languages
- Multipurpose Packages
- Network-enabled Expert-Assisted Packages

Trend: Toward Easy-to-Use Multipurpose Network-Enabled Application Packages for Productivity and Collaboration

Trend: Toward Visual or Conversational Programming Languages and Tools

Software Categories (continued)

Word Processing

Create and Edit Documents

Add, Change, Delete, or Move Text

Import Text from Other Documents

Storage, Retrieval, and Formatting

Key Aspects of Electronic Word Processing

Spell- and Grammar-Checking

Software Categories (continued)

Enterprise Application Software

Accounting and Financial Management

Customer Relationship Management

Business Decision Support

Human Resource Management

Enterprise Resource Planning

Supply Chain Management
Software Categories (continued)

Web Browsers

- Discussion Groups
- Surf the Net
- Launch Information Searches

Typical uses of a Web Browser in Internet, Intranet, and Extranet Environments

- Multimedia File Transfer
- E-Mail

Operating Systems

The detailed instructions that control the operation of a computer system.

1. Provide tools to people.
2. Intermediary between people and data.
3. Manage the computer resources.
4. The basis for standardization of application software. (the platform)

Operating Systems (continued)

- Allocation and Assignment of Jobs (traffic cop)
  - Specific assignment of resources.
- Scheduling
  - Jobs that have been submitted. (priority sequence)
  - Use of input/output devices.
- Monitoring and Control
  - Keeps track of each job
  - Keeps system statistics
  - Restart/Recovery capabilities

Operating Systems (continued)

- Multiprogramming - executing two or more programs concurrently using the same computer.
- Multiprocessing - executing two or more instructions simultaneously in a single computer by using multiple central processing units.
- Graphical User Interface (GUI) - part of the operating system that uses graphic icons to issue commands and make selections.

Software Categories (continued)

Web Browsers Marketplace

- Microsoft IE 5.x 24.9%
- Microsoft IE 4.x 44.7%
- Microsoft IE 3.x 3.6% 73.2%
- Netscape Navigator 4.x 22.0%
- Netscape Navigator 3.x 2.3%
- MS Web TV 1.4%
- Other 1.1%

Operating Systems (continued)

Functions

- User Interface

<table>
<thead>
<tr>
<th>Resource Management</th>
<th>Task Management</th>
<th>File (Data) Management</th>
<th>Utilities and Other Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of hardware resources</td>
<td>Managing the accomplishment of tasks</td>
<td>Managing Data and Program Files</td>
<td>Sort, Merge, Performance, etc.</td>
</tr>
</tbody>
</table>
Virtual Memory
An approach under the control of the operating system that manages the use of primary memory.
What does virtual mean?
Virtual memory is accomplished by rolling the programs being executed between primary memory and secondary storage (disk files) to allow execution of multiple programs that exceed the actual memory capacity of the computer.

Virtual Memory (another view)
Or as a bright young IBM System Engineer once said:
“Virtual Memory is not knowing where your next byte is coming from!”

Are all operating systems the same?
• Features and functions.
• Advantages and benefits.

From Personal Computers to Mainframes?

Popular Operating Systems
• DOS
• Windows .X
• Windows NT
• UNIX
• Linux
• AIX
• OS/2
• Mac OS
• IBM MVS, VM

Summary
Operating systems are the foundation of a computer operation.
Operating systems benefits include better resource utilization, better system performance, gains in cost-effectiveness and better overall management of the entire system.
Without operating systems with advanced features and functions, computing would still be in its very early stages.

Think of a computer as a robot.
What do you want it to do?
Application Programs (continued)

Functions of an Application Program
1. Read input data from source documents or secondary storage.
2. Process the data.
3. Display the results.
4. Print the results.
5. Store the results.
6. Transmit the results.
7. Protect itself and the data.
8. Keep track of things that it is doing to restart.
10. Do multiple things at the same time.

Application Programs (continued)

Programming Languages

<table>
<thead>
<tr>
<th>Machine Languages</th>
<th>High Level Languages</th>
<th>Markup Languages</th>
</tr>
</thead>
</table>
| Use binary coded instructions 1001 1001 1100 1110 1101 | Use brief statements Compute $X = Y + Z$ | Use embedded control codes 
|                  |                      | <H1>First heading</H1> 
|                  |                      | <ELEMENT Product Item manuf> |
| Assembler Languages | Fourth Generation Languages | Object-Oriented Languages |
| Use symbolic coded instructions LOD Y ADD Z | Use natural statements SUM THE FOLLOWING NUMBERS | Define objects that contain data and actions Document.write ("Hi There") |

Application Programs (continued)

Programming Language Translation

- Compiler
- Interpreter
- Assembler

IF A := B THEN

Source Program

Written in BASIC, COBOL, etc.

Language Translator Program

1001101
1110101
0010110

Language Translation Process

Machine Language Object Program

Application Programs (continued)

The Joys of Programming
1. The sheer joy of making things.
2. The pleasure of making things that are useful to other people.
3. The fascination of fashioning complex, puzzle-like objects of interlocking moving parts and watching them work.
4. The joy of always learning which springs from the non-repeating nature of the task.
5. Working in such a medium that is only slightly removed from pure thought levels.

Application Programs (continued)

There are over two thousand known computer programming languages.

Which flavor do you like?
Object-Oriented Programming

An approach to software development that combines (encapsulates) data and procedures (method) into a single object (or module).

A message gets sent to perform a procedure that is embedded in an object (object a to execute code in object b).

Java

- Object-oriented language that produce applets.
- Developed by Sun Microsystems.
- Runs on multiple (all?) platforms.
- Developed for use on the Internet.

Application Programs (continued)

• Created by Sun Microsystems in 1995
• Object-oriented programming (OOP) language.
  - Programming model in which data and functions are encapsulated into objects.
    - Other examples include C++, Objective C, and Microsoft’s Visual Basic
    - Fundamentally different than procedural languages in which data and functions are not necessarily linked.
• Java is an interpreted language.
  - Allows Java applications and applets to run on many platforms with little or no modification.

What is HTML?

HTML (Hyper Text Markup Language)

- A protocol language used to describe World Wide Web (WWW) pages.
- HTML content is displayed within a web browser.
- Can contain or “embed”:
  - Hypertext links to other pages.
  - Text and graphics
  - Video, sound, and other rich media content through the use of helper applications or plug-ins.
  - Applications using Java (applets).

Application Programs (continued)

Database Management Packages

- A Database Management System (“DBMS”)
- A relational data definition language.
- A data query/manipulation language.
- A data dictionary (an automated or manual tool about data maintained in the database).
Application Programs (continued)

Related Database Products

• Data Warehousing
• Data Mining
• Online Application Processing (OLAP)

Application Programs (continued)

How do you get it?

1. Create it yourself.  
2. Buy software packages.  
3. Contract for it.  
4. Rent it or click rate.  

Therefore: make or buy?

Application Programs (continued)

Make Versus Buy Considerations

Make Arguments  
Buy Arguments

• Special Needs  
• Faster Implementation
• Competitive Advantage  
• Lower Cost
• Minimize Dependency  
• Faster Payback
• Compatibility  
• Less IT Skills Required
• Can’t Find a Package  
• Use Tested By Others
• NIH (Not invented here!)  
• Ease of Use (Documentation)

Application Programs (continued)

Software Vendors

30,000 Software Vendors Worldwide

5 in and out of business every working day.

Application Programs (continued)

<table>
<thead>
<tr>
<th>Fit</th>
<th>Price</th>
<th>Cost</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Requirements</td>
<td>• Payment</td>
<td>• Price</td>
<td>• During Install</td>
</tr>
<tr>
<td>• Outputs</td>
<td>• Source Code</td>
<td>• Modifications</td>
<td>• Onsite/800 #</td>
</tr>
<tr>
<td>• Inputs</td>
<td>• Documentation</td>
<td>• Support</td>
<td>• Training</td>
</tr>
<tr>
<td>• Procedures</td>
<td>• Install Support</td>
<td>• Hardware</td>
<td>• Modification</td>
</tr>
<tr>
<td>• File Layouts</td>
<td>• Enhancements</td>
<td>• Software</td>
<td>• Responsiveness</td>
</tr>
<tr>
<td>• Compatibility</td>
<td>• Corrections</td>
<td>• Growth</td>
<td>• Free/ Fee</td>
</tr>
<tr>
<td>• Security</td>
<td>• Test Period</td>
<td>• Other Alter.</td>
<td></td>
</tr>
<tr>
<td>• Back-up, Recovery</td>
<td></td>
<td>• Risks</td>
<td></td>
</tr>
</tbody>
</table>
### Application Programs (continued)

#### Software Industry

$150 Billion market

By 2005 66% will be distributed over the Internet compared to 12% today.

Global piracy rate in 2000 was 36%.

### Application Programs (continued)

#### Hershey Direct and Norm Thompson: Evaluating Online Software Services

Major message: In addition to developing your own application software or purchasing it directly from software vendors there is a third option of paying for online application services delivered over the Internet.

### Application Programs (continued)

#### Market Share

<table>
<thead>
<tr>
<th>Software Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microsoft Word</td>
<td>62%</td>
</tr>
<tr>
<td>Microsoft Office</td>
<td>79%</td>
</tr>
<tr>
<td>Corel Word Perfect</td>
<td>34%</td>
</tr>
<tr>
<td>Corel Office</td>
<td>16%</td>
</tr>
<tr>
<td>Lotus WordPro</td>
<td>3%</td>
</tr>
<tr>
<td>Lotus SmartSuite</td>
<td>4%</td>
</tr>
<tr>
<td>Microsoft Excel</td>
<td>60%</td>
</tr>
<tr>
<td>Microsoft Access</td>
<td>44%</td>
</tr>
<tr>
<td>Lotus 1-2-3</td>
<td>35%</td>
</tr>
<tr>
<td>Claris</td>
<td>37%</td>
</tr>
<tr>
<td>Other</td>
<td>5%</td>
</tr>
<tr>
<td>Borland</td>
<td>8%</td>
</tr>
<tr>
<td>Other</td>
<td>11%</td>
</tr>
</tbody>
</table>

### Application Programs (continued)

#### Volume by Type

<table>
<thead>
<tr>
<th>Year</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>ERP</td>
<td>$66.6B</td>
</tr>
<tr>
<td></td>
<td>CRM</td>
<td>16.8B</td>
</tr>
<tr>
<td></td>
<td>Entertainment</td>
<td>5.8B</td>
</tr>
<tr>
<td></td>
<td>Internet Security</td>
<td>1.85B</td>
</tr>
</tbody>
</table>

### Application Programs (continued)

#### Hershey Argument in Favor

Why pay millions of dollars upfront for software and hardware (and people) and then have the added expense to maintain and update the software?

Hershey says they are saving at least 20% per year on software management costs.
A New Application Alternative

Application Service Provider -- ASP

If it is a well-known application software you can find an ASP that will sell you the service.

Arguments Against ASP

- Inertia—difficult to get people to change how they do things.
- IS managers are reluctant to give up control of their computing systems.
- Concern about Internet security.
- Concern about remote online performance.
- Ends up costing more than doing it yourself.

ASP Competitors

Software companies are competing with the ASPs.

- Oracle is a good example of a software vendor aggressively pursuing online software service business.
- Oracle quote: “If software companies don’t do this—maybe not today, but somewhere down the line—they are going to die.

Brook’s Law

Adding manpower to a late software project makes it later.

The man-month is a fallacious and dangerous myth for it implies that men and machines are interchangeable.

The Mythical Man-Month

- Why has this book persisted?
- Why after twenty years is it still seen as relevant to current day software practices?
- Have software development disciplines not changed during the space of twenty years?
- Is it because it is only incidentally about software but primarily about how people in teams make things?

Software Development Rule of Thumb

- 1/3 of the schedule for analysis and design.
- 1/6 for coding.
- 1/4 for component testing.
- 1/4 for system testing.
First Exam

Terms in two parts -- 10 of 13 terms = 40 pts.
Single topic questions – 4 of 9 pts = 40 pts.
Essay questions – 1 of 2 = 20 pts.

You will have the entire class to complete the exam.

I will provide paper.

First Exam Prep Clinic

Today – 4:30 to 5:30
Baskin Conference Room 330
Melissa Chan