Outline For Today

- Class Announcements
- Student Presentations
- IT History (Hand out from last time)
- Information Access (Messerschmitt)
- Systems Concepts (O'Brien Ch1)
Class announcements

- **Class webpage**
  
  http://www.soe.ucsc.edu/classes/ism050/Spring05/

- News Folio Requirement reduced to 3 articles
- Full presentation schedule will be put on webpage tonight

  - **Wednesday March 30:** Vladimirsky, Paul Boris (News)
    Mehta, Rishi Pal (News)
  - **Monday April 4th:** Steve Tang (News),
    Bradley-Jungemann, Roger (News)
  - **Wednesday April 6th:** Dea, Jason Alexander (Cisco ERP)
    Jergenson, Eric James (News)
Where are we, and how did we get here?

- Let’s survey the history of IT over the past few decades!

The History of IT from 1960-2000
Today’s Student Talks!
The author (Nolan) breaks down history into 3 eras
- Data Processing Era
- Micro Era
- Network Era

A logical division, but not universal
- Messerschmitt divides into 4 phases
  - Centralized, Time shared, de-centralized, networked
The Data Processing Era (1960-1980)

- By 1960 economy dominated by large, multi-divisional, hierarchical businesses
  - Corporate Office
  - Divisional operating units in different markets
  - Example: GE
    - Corporate office in Connecticut
    - Lighting in Cleveland
    - Locomotives in Erie
    - Power Systems in Schenectady
    - Etc.
The Data Processing (DP) Era (1960-1980)

- Needed to keep track of massive amounts of data for
  - Payroll
  - Payments to customers and suppliers,
  - etc.
The Data Processing (DP) Era (1960-1980)

- Meanwhile computers were developed for scientific and defense purposes
The Data Processing (DP) Era (1960-1980)

- These large companies purchased mainframe computers
  - to manage the data processing.
  - They were slow, enormous, and expensive, by today’s standards.
  - But, they did make it possible to process the enormous volume of data, and transactions in a huge corporation
DP Era (1960-1980)

- Commercial computing evolved...
- 1954 -- IBM 650 dominates commercial market
  - Leased for $3,250 per month (over $22,000 per month in today's dollars!)
IBM 360

1964 - IBM 360,

- Interoperable peripheral and computer family
- Great improvement over previous generation
- A massive development effort by IBM
- Ensured IBM's dominance in the 60s and 70s
Data Processing Era (1960-1980)

- “You never got fired for buying IBM.”
- Average market share of 68% in the 70s.

Meanwhile
- Digital introduces the mini-computer (1960s)
- UNIX operating system developed (1969)
- Bob Metcalfe invents Ethernet (1973)
DP Era (1960-1980)

- Technology Evolution
  - First - Stand Alone Mainframes
  - Next - Dumb terminals attached to mainframe
  - ("Time-Shared" Phase in Messerschmitt's terminology)
The information resource manager was known as the *Data Processing (DP)* manager.

- Charged with supporting the business
- *Not* with changing how the business was run
DP Era (1960-1980)

- IS evolved from supporting lower functions to higher level functions
  - Low: Inventory, Purchasing, Scheduling
  - Medium: Productions Operations Management
  - High: Corporate wide planning
DP Era (1960-1980) -- Annual Budgeting

- Budgeting was an important function made easier by computers

- Accounting of
  - Revenues, Expenditures, Assets, Liabilities
  - Generate Profit and Loss Statement

- Before computers
  - Was difficult to do once a year

- After computers,
  - Could “close the books” more often
  - Could break down profits and losses to each level of the corporate hierarchy
Capital Budgeting

- Analyze return and risk of expenditures intended to generate revenue over multiple accounting periods
  - Examples: New building, or factory
- Before computer
  - Calculations could become complicated
- After computer
  - Very easy
- Consequence: Every level of the organization could be held accountable for their ROI
Aside: Budgeting Terms

- What would you pay now to get $1 next year?
  - Say 0.90
  - Discount Factor 10%

- What is it worth to you to have $1 a year forever?
  - $ = 1 + (1-0.10) + (1-0.10)^2 + ... = \frac{1}{0.10} = $10

- When the discount factor is 10%, a cash flow of $1 per year forever is said to have an Net Present Value (NPV) of $10.
Aside: Budgeting Terms

If you invested $10 today, and it resulted in you earning $2 of benefit a year forever, what is the ROI?

- Answer 20%

Equivalently you are finding the discount factor \((d)\) such that

- \(10 = 2 \times (1-d) + 2 \times (1-d)^2 + 2 \times (1-d)^3 + \ldots\)
- \(= 2 \times \frac{1}{d}\)
- \(d = 0.20\)
Budgeting

Better budgeting and resulting accountability lead to consistent earnings growth.
Build up to Micro Era

- 1974 - Xerox PARC develops first computer with a mouse. They don't commercialize it!
- 1974 - Altair PC for hobbyists
- 1975 - Bill Gates and Paul Allen Found Microsoft
Build up to the Micro Era

- 1977 - Apple introduces a successful microcomputer

- 1981 - IBM introduces its PC!
  - Intel develops CPU
  - Microsoft develops operating system

- IBM PCs were rapidly adopted by the commercial market.

- **PCs threatened** the DP manager
  - Easier to manage one central mainframe than a PC on every employee's desktop!
  - Data not Centralized.
    - The numbers on my PC are right, the ones on your PC are wrong!
  - Security Risks.

- DP managers put restrictions on PCs
  - Users defied them!

- Users wanted the convenience of word processing, CAD, etc...
- Vendors marketed direct to the users instead of the DP managers.

Management realized the importance of bringing order to the chaos
- Coined the term Chief Information Officer (CIO) in the 80s
Beginning of Internet

- 1969 - ARPANET linked scientists
- 1977 - TCP/IP used to link networks to ARPANET
- 1984 - the term Internet comes into use
- 1985 - NSF takes over management of Internet Backbone
- 1990 - WWW (Tim Berners-Lee at CERN)
- 1991 - HTML
- 1993 - Mosaic Browser (Marc Andreesen and Eric Bina)
The Network Era (1995 - ?)

- After chaos of Micro Era, organizations converged on Client Server networked architectures
  - Client PC allowed user to have direct access to her own computer
  - Server housed organizational data
- Because of Success of Internet technologies...:
  - UNIX, HTML, TCP/IP
- ... IT managers used these technologies for internal networks - “intranets”
The Network Era (1995 - ?) - Internet Phenomenon

- **Internet built on open standards**
  - Different than control-oriented development philosophy
  - Benefits: Scalable, Extensible, ...

- **Lots of vendors selling Interoperable equipment**
  - More decisions to make than the DP manager of the 1960s!
The network era permitted new ways of doing business

- Employees could check on their benefits with a web browser
- Customers could “self-serve” themselves
  - In 1998, 70% of Cisco’s $800 million of service revenue was provided over Internet, by allowing customers to access their intranet.
- Wal-Mart used point of sale data to drive supplier replenishment (CRP)
The network era

- Amazon sold books with minimal inventories.
- Levi Strauss used geo-demographic database to match supply and demand in each store.
- ...and many more examples!
Information Resource Management

- Strategic realization
  - *Information* is the resource to be managed not just *data*.
  - Need to get information into the hands of workers, so workers can be more productive.
## Result: Organizational Performance Improvement

<table>
<thead>
<tr>
<th>Market Value Rank</th>
<th>Company Name</th>
<th>1978</th>
<th>1986</th>
<th>1997</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>General Electric</td>
<td>$49,012</td>
<td>$98,081</td>
<td>$320,797</td>
</tr>
<tr>
<td>16</td>
<td>Coca-Cola</td>
<td>120,164</td>
<td>309,259</td>
<td>639,593</td>
</tr>
<tr>
<td>NA</td>
<td>Microsoft</td>
<td>NA</td>
<td>171,304</td>
<td>510,885</td>
</tr>
<tr>
<td>3</td>
<td>Exxon</td>
<td>464,112</td>
<td>685,176</td>
<td>1,503,490</td>
</tr>
<tr>
<td>17</td>
<td>Merck</td>
<td>69,040</td>
<td>134,492</td>
<td>439,348</td>
</tr>
<tr>
<td>27</td>
<td>Intel</td>
<td>36,690</td>
<td>69,506</td>
<td>393,564</td>
</tr>
<tr>
<td>27</td>
<td>Philip Morris</td>
<td>82,814</td>
<td>186,315</td>
<td>369,171</td>
</tr>
<tr>
<td>1</td>
<td>IBM</td>
<td>64,747</td>
<td>127,011</td>
<td>291,348</td>
</tr>
<tr>
<td>2</td>
<td>AT&amp;T</td>
<td>50,969</td>
<td>169,391</td>
<td>401,557</td>
</tr>
<tr>
<td>54</td>
<td>Pfizer</td>
<td>58,038</td>
<td>111,900</td>
<td>254,146</td>
</tr>
<tr>
<td>11</td>
<td>Procter &amp; Gamble</td>
<td>147,267</td>
<td>208,635</td>
<td>337,396</td>
</tr>
<tr>
<td>53</td>
<td>Bristol-Myers Squibb</td>
<td>75,167</td>
<td>138,564</td>
<td>311,586</td>
</tr>
<tr>
<td>467</td>
<td>Wal-Mart Stores</td>
<td>51,446</td>
<td>84,461</td>
<td>142,979</td>
</tr>
<tr>
<td>25</td>
<td>Johnson &amp; Johnson</td>
<td>52,199</td>
<td>90,829</td>
<td>250,044</td>
</tr>
<tr>
<td>70</td>
<td>American Int'l Group</td>
<td>11,026</td>
<td>315,842</td>
<td>762,217</td>
</tr>
</tbody>
</table>

Source: Standard & Poor’s Compustat. Market value ranks and SPE reflect calendar year-end values.
The Network Era (1995 - ?) - Internet Phenomenon

- For IT manager -- Enormous challenge to manage networks of thousands of computers!
The Network Era (1995 - ?) - Internet Phenomenon

“The Technology leader of Tomorrow must be a business leader with all of the management skills of any other senior executive...

The CIO has gone from being a corporate god in the 1980s to the chief blame taker in the 1990s when IT initiatives often have failed to deliver their promised productivity gains.”

1Sifonis and Goldberg, “Changing Role of the CIO,” Information Week, March 24 1997
The Network Era (1995 - ?) - Internet Phenomenon

- In 1996 the CIO turnover rate was 17.7%\(^1\)

- Take Away: Managing IT in the Network Era is difficult, but if you do it right the rewards can be huge!

\(^1\)Deloitte and Touche
Information access

by

David G. Messerschmitt
Copyright notice

©Copyright David G. Messerschmitt, 2000. This material may be used, copied, and distributed freely for educational purposes as long as this copyright notice remains attached. It cannot be used for any commercial purpose without the written permission of the author.

Adapted from slides for Understanding Networked Applications
By David G Messerschmitt. Copyright 2000. See copyright notice
A hierarchy

Data: numbers, character strings, etc.
Information: recognizable patterns organized so as to inform or influence us in some way
Knowledge: concepts, relationships, truths, principles
Wisdom: insight or judgement

Adapted from slides for Understanding Networked Applications
By David G Messerschmitt. Copyright 2000. See copyright notice
Classify these

- “XV”, “SF”, 34, “CN”, 16
- The 49-ers won Super Bowl XV by a score of 34 to 16.
- The National Football Conference wins 17 out of 20 Super Bowl’s on average.
- The best team usually wins.
- Football is a major cause of obesity because fans spend too much couch potato time in front of the boob tube.

Adapted from slides for *Understanding Networked Applications*
By David G Messerschmitt. Copyright 2000. See copyright notice
Roles in information access

User

Author or publisher

Indexer or organizer

Librarian or teacher or interpreter

Recommender

Adapted from slides for *Understanding Networked Applications* by David G Messerschmitt. Copyright 2000. See copyright notice.
Classify these

Relative to *A Streetcar Named Desire*:
- Tennessee Williams
- Actor
- Critic
- Playbill magazine

Relative to *Understanding Networked Applications*:
- D.G. Messerschmitt
- Morgan Kaufmann
- Amazon.com

Adapted from slides for *Understanding Networked Applications*
By David G Messerschmitt. Copyright 2000. See copyright notice
Exercise

User

Author or publisher

Indexer or organizer

Librarian or teacher

Recommender

How are these roles being changed by networked computing?

Adapted from slides for *Understanding Networked Applications* by David G Messerschmitt. Copyright 2000. See copyright notice.
Push vs. pull

Control over what is provided
Time when it is provided

User

Intermediate cases:
Notification
Subscription

Pull

Publisher

Push

Adapted from slides for *Understanding Networked Applications*
By David G Messerschmitt. Copyright 2000. See copyright notice
Proper roles of push and pull in a workgroup

<table>
<thead>
<tr>
<th>Pull: work</th>
<th>Push: attention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brainstorming</td>
<td>Notification of topic</td>
</tr>
<tr>
<td>Accessing documents</td>
<td>Notification of document availability</td>
</tr>
<tr>
<td></td>
<td>Reminder of deadlines</td>
</tr>
</tbody>
</table>

Adapted from slides for *Understanding Networked Applications*  
By David G Messerschmitt. Copyright 2000. See copyright notice
Question

What are some differences between push and pull with respect to:

- invasiveness on the user?
- refinement of the information received?
- timeliness with which information received?
Some modalities of information access

- **Pull**
  - Search,
  - navigate,
  - browse

- **Push**
  - Aggregate,
  - filter,
  - consolidate

- **Subscribe**

- **Intermediary**

- **Delegate**

- **Agent**

Adapted from slides for *Understanding Networked Applications* by David G Messerschmitt. Copyright 2000. See copyright notice.
Aids in finding useful information

Besides the information content itself, other aids:

- reference to related information: hyperlink
- list of content: index
- description of content: metadata
- judgment of content: recommendation
Give an example of the following functions in the context of movie rentals:

Hyperlink
Index
Metadata
Recommendation
Question

Comment on the following widely held beliefs (at their time):

- “the movie will displace legitimate theater”
- “television will displace movies”
- “remote learning will displace the university campus as we know it”

What does this suggest about networked applications?

Adapted from slides for *Understanding Networked Applications* by David G Messerschmitt. Copyright 2000. See copyright notice.