ISM 50 - Business Information Systems

Lecture 2

Instructors: Mary Doyle, Geoff Ryder
UC Santa Cruz
April 1, 2009
Reminder: Business Analysis Paper Preferences Due Monday!

- **As a group, turn in 3 things:**
  1. List of your proposed group members.
  2. List of companies you would like to study.

- If you don’t have someone in mind to work with, turn in the above 3 things as an individual.

- One of companies on list must be:
Another Reminder…

- Assignment 1 is due Wednesday!
  - Resume, and
  - Cover Letter.

- See class webpage for detailed instructions.

- Read:
  - Chapter 2 - Section I of O’Brien (reader pp 69-77)
  - Cash Flow Handout on class webpage
Review: Business Analysis Paper

- Choose companies you want to know more about
- Paper Should Have:
  - Industry Profile
  - Company Profile
  - Information Technology
  - Leadership
  - Market and Financial Performance
  - Trajectory
Review: Citing Sources

- Plagiarism is illegal and cheating and will not be tolerated!!

http://www.soe.ucsc.edu/classes/ism050/Spring09/cite.html

- More than thirty words verbatim must be cited.
- Any facts or figures that are not your own must be cited.
  - Ebay’s revenues in the US in 2002 were $1.39 billion [1].
“Semiconductors have found a place in virtually every electronic device in existence. This helps explain why the industry was able to reach $200 billion in sales before a slump brought the figure back down in 2001” [1].

Reference to end note in the body of the text!

END NOTE:

Review: Citing Sources

- The easiest way to lose points on your paper is to not cite sources!

- Guide on the class website will help you cite your sources correctly.

- Talk to the TA or Instructor if you have questions.
Review: Suggested sources of Information

- Company website
- 10K report
  - (This is the annual report public companies file with Security and Exchange Commission.)

- Article Databases
  - A database of articles from magazines like “Business Week” and economics journals.
  - Find it at: [http://library.ucsc.edu](http://library.ucsc.edu)
  - Click on “article database” on left margin.
  - Click on “LexisNexis Academic” or try “Business Source Premier from Ebsco Host”
  - Try this tonight! And let us know if you have problems on Thursday

- Industry specific publications
- Books
- Good Magazines (The Economist)
- Consulting groups: Forrester, Gartner, …
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 and beyond......
IT Mgmt from 1960-2000

- 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
Nolan’s Stages Theory of Organizational Learning

- Initiation
- Contagion
- Control
- Integration

These stages occur for each era and are overlapping as continual change occurs within the organization.
The Data Processing Era (1960-1980)

- By 1960 economy dominated by large, multi-divisional, hierarchical businesses (M-form)
  - Corporate Office
  - Divisional operating units in different markets
  - Example: GE
    - corporate office in Connecticut
    - Lighting in Cleveland
    - Locomotives in Erie
    - ...
  - Within each division many “functional departments”
    - Accounting, Finance, Engineering, etc.
The Data Processing (DP) Era (1960-1980)

- Needed to keep track of massive amounts of data for
  - Payroll
  - Payments to customers and suppliers,
  - Inventory
  - 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 IBMs 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)
Data Processing Era (1960-1980)

- The information resource manager was known as the \textit{Data Processing (DP) manager}.
  - Charged with supporting the business
  - \textit{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
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
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 employees 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.
- Example: Spreadsheets
Spreadsheet Example

- VisiCalc (1979)
  - First Spreadsheet
  - For Apple II computer

- Lotus 1-2-3 (1983)
  - Mimicked VisiCalc
  - For IBM PC

- Excel (1985)
  - Microsoft
  - Surpassed Lotus when Windows took off.

- 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 Andreessen 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!

- Many companies started and flourished.
Cisco

- 1984 Founded by Leonard Bosack and Sandra Lerner (Stanford IT Staff)
- Developed a Router
  - A device to forward data packets from one network to another
- By 2007, Cisco had a market value of $158 billion!¹

¹ Source: Fortune 500, March 2007
Netscape

- Founded by Marc Andreessen and Jim Clark
- Browser based on Original Mosaic
- IPO in 1995
  - First day went from $28 -> $75!
  - The company's revenues doubled every quarter in 1995!
- Excitement triggered the dot-com boom.
  - Hundreds of companies started, most didn't survive...by December 2007, Netscape was among the losers
The network era

The network era permitted new ways of doing business

- Employees could check on their benefits with a web browser
- Customers could “self-serve”
  - 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>1978</th>
<th>1986</th>
<th>1997</th>
<th>Company Name</th>
<th>Sales per Employee</th>
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<tr>
<td>5</td>
<td>3</td>
<td>1</td>
<td></td>
<td>General Electric</td>
<td>$49,012</td>
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<td>16</td>
<td>16</td>
<td>2</td>
<td></td>
<td>Coca-Cola</td>
<td>120,164</td>
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<tr>
<td>NA</td>
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<td>3</td>
<td></td>
<td>Microsoft</td>
<td>NA</td>
</tr>
<tr>
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<td>2</td>
<td>4</td>
<td></td>
<td>Exxon</td>
<td>464,112</td>
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<tr>
<td>17</td>
<td>9</td>
<td>5</td>
<td></td>
<td>Merck</td>
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<td>Bristol-Myers Squibb</td>
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<td>Wal-Mart Stores</td>
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<td>25</td>
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<td>Johnson &amp; Johnson</td>
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<td>70</td>
<td>41</td>
<td>15</td>
<td></td>
<td>American Int'l Group</td>
<td>11,026</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.”

---

1 Sifonis 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%!\textsuperscript{1}
- In 2007 the rate was around 9% \textsuperscript{2}

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

\textsuperscript{1}Deloite and Touche
\textsuperscript{2}Harvey Nash plc/KPMG, 2008
The Network Beyond...
The Value of Networks

From Nolan’s Case Study

Can we come up with a simple way to quantify the value of networks that would help us understand the explosive growth of the Internet during the Network Era?
Gilder proposed “Metcalf’s Law of the Telecosm” – now a widely accepted heuristic

- Interconnecting $N$ computers results in a potential value of $(N^2)$

- Can apply to other types of networks (roads, telephones, fax machines) as well as computer networks
**Metcalfe’s Law (Nolan, p. 17)**

<table>
<thead>
<tr>
<th># of computers</th>
<th># of bidirectional links</th>
<th>Value from Metcalfe’s Law</th>
</tr>
</thead>
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<tr>
<td><img src="" alt="Diagonal Links" /></td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td><img src="" alt="Triangle Links" /></td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td><img src="" alt="Square Links" /></td>
<td>6</td>
<td>16</td>
</tr>
</tbody>
</table>
**Metcalfes’s Law (Nolan, p. 17)**

- Count the number of links in a fully connected graph:
  \[ N \times (N - 1) / 2 = (N^2 / 2) - (N / 2) \]

- Metcalfes’s Law just observes the highest order term (quadratic) in the expression for the number of links

  ...gives the correct order of magnitude, and for large values of N, that by itself is useful
## Metcalfe’s Law and the Internet

<table>
<thead>
<tr>
<th># of users(^1)</th>
<th>Value from Metcalfe’s Law</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. 220M</td>
<td>4.8e16</td>
</tr>
<tr>
<td>China 300M</td>
<td>9e16</td>
</tr>
<tr>
<td>Entire Internet 1.6e9</td>
<td>2.56e18</td>
</tr>
</tbody>
</table>

Problems with Metcalfe’s Law

Any ideas?...

- Metcalfe’s Law only expresses the potential to communicate, not guaranteed communication. Language and cultural barriers, etc., limit communication.

- If such barriers are significant, the network should be split into smaller parts, and $N^2$ computed for the parts separately. (Open question: merge or split the U.S. and Chinese Internets in the calculation?)

- Doesn’t account for the bandwidth at each link. Are POTS networks (10Kbps/customer) and DSL networks (10 Mbps/customer) equal? No!
Intuition from Metcalf’s Law: the “Network Effect”

- We expect the value of a computer network to show increasing returns to scale
  - This gives positive feedback: large networks get larger, the rich get richer
  - Example: eBay grew because many people traded there, so more people wanted to trade there. A larger trading network is more valuable!
  - Be careful: some bad business models were formed to chase network effects! (Pets.com...)


Some Terminology from Messerschmitt
Definitions

- **An application**
  - a software program that provides direct and specific value to a user or organization

- **A networked application**
  - distributes programs across 2 or more computers which collaborate in realizing an application.
Definitions

- **Information Technology**
  - the suite of technologies that manage the storage, communication, and manipulation of information.

- **Infrastructure**
  - part of the information technology shared by many applications
    - Hardware - computers and the network
    - Software - operating system, middleware
Definitions - Messerschmitt

**Legacy Applications**

- Applications implemented in the technology of yesterday.

**Middleware**

software falling between the operating system and the application.
History of Computing

- **Centralized**
  - A few big mainframes to automate business functions such as payroll and accounting

- **Time-Shared**
  - Terminals added so many could access main frame

- **Decentralized**
  - PCs on every desk

- **Networked**
  - Applications could be geographically distributed
What is a Business?

An organization that provides a product and/or a service that satisfies a need for which people are willing to pay money.

Makes money if revenues exceed costs.
Why Does a Company Need to Make a Profit?

- An obligation to owners/shareholders
  - Owners and shareholders have invested money and time. They expect to see something in return.

- Survival requires continued investments
  - new product development.
  - facilities and equipment.
  - acquiring other companies.
  - Invest in employees (training and salary increases)

- Stakeholders want to see performance before investing in a company’s future.
Recall: What is a System?

System Definition: A group of interrelated components working toward the attainment of a common goal by accepting inputs and producing outputs in an organized transformation process

- Input
- Processing
- Output
- Feedback
- Control
**Business as a system**

A business is an organizational *system* where economic resources (input) are transformed by various organizational processes (processing) into goods and services (output).
A Business is a System

Helps to remember and to tie together:

• Some business basics while remembering the importance of making a profit.
• The understanding of business functions.
• The appreciation for the importance of business processes.
A business is an organizational system where economic resources (input) are transformed by various organizational processes (processing) into goods and services (output).

Information systems provide information (feedback) on the operations of the system to management for the direction and maintenance of the system as it exchanges inputs and outputs within its environment.
eCommerce Case: Cisco Reader, p. 51 (O’Brien I)

- Supply Chain Management (SCM)
Cisco coordinated its supply chain, saving $400 M per year in operating costs, and $1B in capital costs.
Important Things to Understand

Two terms:

1) business functions

2) business processes

Will be frequently used throughout this course.

It would be a good idea to make absolutely sure that you know what they are.
Function: A group of people with related skills (specialized) seems to be a good starting point in understanding functions---but this is a fairly loose definition.
Business Functions

Examples

- Design
- Engineering
- Sales
- Finance
- Marketing
- Etc...
What prompts the creation and justification of business functions?

- Specialization
- Size
- Efficiency
- More cost effective
Business functions are necessary; but they can sometimes get in the way!

- Case study from O’Brien: specialized IT skills cause a Management of Technology problem
Royal Carribean Case
Reader, p. 48 (O’Brien I)

- **Background**
  - Old IT group only focused on cost-cutting
  - Problem of Silos (what are those?)

- **Lessons**
  - Break up silos! (Special-interest technical fiefdoms)
  - R.C. obtained better results by using cross-functional teams
    - Hence the design of ISM 50 Project Teams!
Another Management of Technology problem

“A $112M ERP project blew up in the face of Hershey…”

What did they do wrong?

...Tried to introduce too many changes at once, during Halloween! Upgraded SAP’s finance applications, purchasing, materials management, and warehousing modules at the same time.
“These systems tie together in very intricate ways, and things that work fine in testing can turn out to be a disaster when you go live.”

Lesson: don’t change IT tools in the middle of a mission-critical project
“In the flush of Internet mania, most businesses spent wildly on all sorts of disparate software and systems. A lot of it still doesn’t work properly.”

“Employees were told this stuff would change their lives. Instead they’re screaming in frustration.”

Adoption of network-era IT is not sufficient by itself to improve performance or profits—you must delve into the details of the business process.

It makes Cisco’s smooth IT deployment seem more impressive, by comparison.
Business Processes

What is a business process?

- A designed succession of actions to the accomplish of some result in a business.

Example

  - Order Fulfillment
An Order Fulfillment Business Process

Customer
  | Order
  |   ↓
  | Sales
  |   | Take Order
  |   |   ↓
  |   | Finance
  |   |   | Enter Order
  |   |   |   ↓
  |   | Inventory Control
  |   |   | Credit Check
  |   |   |   ↓
  |   | Warehousing
  |   |   | Check Stock
  |   |   |   ↓
  |   | Business Functions
  |   |   | Print Packing list
  |   |   |   ↓
  |   |   | Find Goods
  |   |   |   ↓
  |   | Ship
  |   |   |   ↓
  |   |   | Tell Mfg. to make order
Cross Functional Process

- A business process that crosses over multiple functions

- Are all business processes cross functional?
Example: Channel Selection Process within Marketing function
Processes tend to be more simple at smaller organizations

Enrollment Process at a small, fictitious university...

- Fee Processing
- Financial Aid
- Housing
- Dinning
- Recreation Membership
- Health Insurance
- Class Registration
Processes tend to be more complex at larger organizations

Enrollment Process at UCSC...

- Billing
- Financial Aid
- Health Insurance
- Housing
- Dinning
- Class Reg.
- Rec center
Similarly, at small companies

Example: Capital Equipment Purchase Business Process...
Big company

Capital Equipment Purchase Business Process
So where do Information Systems Fit into this Story??

- Coordinates flow of information between functional departments carrying out a business process.
  - Increase Speed
  - Reduce Errors

- May reduce number of steps in a business process.
  - What examples can you recall from today’s readings?

- May even allow new processes that would not have been feasible before...
  - Examples?
TO DO:

By Monday (April 6th):
- Business Paper Preferences
  - (Group members, Companies)
  - Turn in as a group

By Wednesday (April 8th):
- Resume & Cover Letter
  - Turn in as an individual

By Monday (April 15th):
- Read “Frito-Lay Case” (93-103 + figs) in Reader