TIM 50 - Business Information Systems

Lecture 3

Instructor: Ram Akella

January 19, 2017
Announcements

• Read
  - Otis Case
    - Assignment about reading due Tuesday, 1/24
      - (On ecommons)
  - Begin Laudon & Laudon Ch 9
If you qualify for classroom accommodations because of a disability,

- Contact DRC at 831-459-2089 or by email at drc@ucsc.edu.
  - Get “accommodation authorization”
- Submit your Accommodation Authorization to me
  - office hours or after class
  - preferably within the first two weeks of the quarter
Tutor Available

Tutor: Information posted already on first day of class
Collaboration technologies can be classified in terms of whether they support interactions at the same or different time or place, and whether these interactions are remote or collocated.

**Figure 2-12**

<table>
<thead>
<tr>
<th>Same Time (Synchronous)</th>
<th>Different Time (Asynchronous)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Same Place (Colocated)</strong></td>
<td>Face to face interactions: decision rooms, single display groupware, shared table, wall displays, roomware, ...</td>
</tr>
<tr>
<td><strong>Different Place (Remote)</strong></td>
<td>Continuous task: team rooms, large public display, shift work groupware, project management, ...</td>
</tr>
<tr>
<td><strong>Communication + Coordination</strong></td>
<td>Email, bulletin boards, blogs, asynchronous conferencing, group calendars, workflow, version control, wikis, ...</td>
</tr>
<tr>
<td><strong>Remote Interactions</strong></td>
<td>Video conferencing, instance messaging, charts/MUDs/virtual worlds, shared screens, multi-user editors, ...</td>
</tr>
</tbody>
</table>
The Information Systems Department

- Programmers
- Systems analysts
  - Principle liaisons to rest of firm
- Information systems managers
  - Leaders of teams of programmers and analysts, project managers, physical facility managers, telecommunications managers, database specialists, managers of computer operations, and data entry staff
- Senior managers: CIO, CSO, CKO
- End users
- External specialists
Information Systems Services

- Services provided by the information systems department include:
  - Computing and telecommunications services
  - Data management services
  - Application software services
  - Physical facilities management services
  - IT management services
  - IT standards services
  - IT educational services
  - IT research and development services
Porter Competitive Model?

- **What is it?**
  - A model to help understand the competitive environment in which a company operates.

- **What are the “5 forces”?**
  - Intra-Industry Competition
  - Bargaining power of Suppliers
  - Bargaining power of Customers
  - Substitutes
  - Threat of New Entrants.
Porter Competitive Model
(Identify the Industry and the Specific Market Being Evaluated)

Potential New Entrants

Bargaining Power of Suppliers

Intra-Industry Rivalry
Strategic Business Unit

Bargaining Power of Buyers

Substitute Products and Services
Porter Model

- Example:
  - AT&T in the US Mobile Telephony Industry
Porter Competitive Model
US Mobile Telephony Industry

Potential New Entrants
- Foreign Telcos
- Change of strategy from player in another industry

Intra-Industry Rivalry
SBU: AT&T
Rivals: Verizon, Sprint-Nextel, T-Mobile

Bargaining Power of Buyers
- Retail Customers
- Corporate Customers

Bargaining Power of Suppliers
- Handset makers
- Equipment Manufacturers
- Employees

Substitute Products and Services
- VoIP services; VoIP over wifi
- Messaging, social-networks over wifi
Porter Model – Defining the industry

- Defining the industry is CRUCIAL
  - What is the product? Who are the buyers? Who are the natural competitors?
  - Companies often are in several industries!
Defining the industry

- Are these right?:
  - Southwest Airlines is in the Transportation industry. So is BART. Therefore BART and Southwest are competitors.
  - Southwest is in the Airline industry, therefore Southwest and Emirates are competitors.
Are these right? (cont’d):
- Southwest Airlines is in the North American Airline Industry.
  - American, Delta, Jet Blue and United are competitors
  - Driving is a substitute for many Southwest routes. It limits Southwest’s pricing power in many cases
  - Amtrak is a substitute for a small set of routes (mainly NE corridor)
Defining the industry

- Are these right?:
  - Walmart is in the Retail industry. So is Saks Fifth Avenue. Walmart and Saks are competitors.
  - Walmart is in the discount retail industry
    - Target and Costco are competitors
You must include a Porter Model in your Business Paper

- Figure
  - Make it look nice!

- Narrative analysis of the five forces
  - Identify the industry.
  - Identify the major buyers, suppliers, potential new entrants, substitutes, and intra-industry rivals.
  - Discuss if and why these players put strong or weak competitive pressures on your business.
Example: Usefulness of Porter Model

- Bob wants to start a dentist office
  - However, Bob did not go to dental school
  - Bob will hire the dentist and other staff
  - Is this a good model?

No! Dentist has too much bargaining power, she could always go into business for herself.
Example: Usefulness of Porter Model

- Suppose Alice, who is a dentist, opens an office

Suppliers
- Staff
- Hygienists

Intra-industry rivals
SBU: Alice’s Dentist Office
Other local dentist offices

New Entrants
- Dental School Graduates
- Dentists moving in from other regions

Substitutes
- Alternative Medicine?

Buyers
- Public in general
- Insurance companies
- Those wanting cosmetic dentistry
Porter Model Tips

- ** Buyers and Suppliers**
  - Mention biggest by name, smaller ones by category
  - (e.g. mention Lowe’s by name as a competitor to Home Depot..)
Porter Model Tips (cont’d)

• **Substitutes**
  - Put yourself in the shoes of a customer…
  - What alternatives would you actually take seriously?
  - Thought experiments…
    - I need to get from Manchester, UK to Bangalore. I will consider driving if Emirates is too expensive…
    - I need to get from San Jose to Orange County. I will consider driving if Southwest is too expensive…
Porter Model Tips

- **Analyzing power implications**
  - The more numerous there are of a buyer/supplier, the weaker they are.
  - The more alternative options a player has, the stronger they are.
  - If a player has a credible threat of making supply’s themselves (backward integration) or taking over buyer/distributor’s role (forward integration), they are more powerful.
Porter Model Tips

- **Power (cont’d)**
  - Barriers to entry strengthen a player’s position vs. new entrant threats
Porter Model Tips

- Thought experiments...
  - McDonald’s employees vs. McDonald’s
  - Airline pilot union vs. United Airlines
  - United Airlines vs. Travel agents
  - Apple vs. contract manufacturers
  - eBay vs. possible new entrants to online auction market
Porter Model in paper

• Analyze all the forces and their power relationships
  • Write text describing your reasoning. (Not enough to just say “strong” or “weak.”)
• Make an overall conclusion of competitive landscape
  • Can be subjective if some strong and weak forces...
“Primary” Porter Strategies

- In economics you will learn a market where
  - Product is a commodity
  - Firms all have the same production costs
  - New firms can enter market at no cost ("free entry")

profits are driven to zero.

- Consequently Firms need to
  - Differentiate and/or
  - Achieve Cost leadership
“Primary” Porter Strategies

**Differentiation**—customer values the differences that you provide in products, services or capabilities.

**Cost**—become the lowest cost provider. If this is the only primary strategy in the industry, over time there will only one ultimate winner.
Porter Supporting Strategies

- **Innovation**
  - Can reduce costs and or differentiate

- **Growth**
  - Help offset fixed costs
  - Establish reputable brand (differentiate)

- **Alliances**
  - Achieve more complete solution (differentiate)
  - Integration of each others technology may reduce costs
Rules Regarding Strategies

- Must pick at least one of the two primary strategies.

- Can pick any combination of supporting strategies.

Let’s test the logic of this using Dell and Wal-Mart Stores.
Apple (Computer Industry)

Primary Strategy:
  Differentiation

Supporting Strategies:
  Innovation
  Growth
Wal-Mart Strategies

Primary Strategy:
- Least Cost
- Differentiation

Supporting Strategies:
- Innovation
- Growth
- Alliances
Porter Model Tips

5. Be sure to address the power implications of both customers and suppliers. Power gets them what?

6. Identify buyers and suppliers by categories and mention major ones by names.

7. Summarize your Porter Model analysis.
What do Porter Models Have to do with IT?

Any ideas?
Porter Model and Information Systems:

1. Build **barriers** to prevent a company from **entering** an industry

2. Build in costs that would make it difficult for a customer to **switch** to another supplier

3. Change the basis for competition within the industry

4. Change the balance of power between a company and its customers or suppliers

5. Provide the basis for new products and services
Information System Strategies for Dealing with Competitive Forces

• **Low-cost leadership**
  - Use information systems to achieve the lowest operational costs and the lowest prices.
  - E.g. Wal-Mart
    - Inventory replenishment system sends orders to suppliers when purchase recorded at cash register.
    - Minimizes inventory at warehouses, operating costs.
    - Efficient customer response system.
Information System Strategies for Dealing with Competitive Forces

• **Product differentiation**
  - Use information systems to enable new products and services, or greatly change the customer convenience in using your existing products and services.
  - E.g., Google’s continuous innovations, Apple’s iPhone.
  - Use information systems to customize, personalize products to fit specifications of individual consumers.
    - E.g., Dell
Information System Strategies for Dealing with Competitive Forces

• Focus on market niche.
  • Use information systems to enable specific market focus, and serve narrow target market better than competitors.
    • Analyzes customer buying habits, preferences
    • Advertising pitches to smaller and smaller target markets
  • E.g., Hilton Hotel’s OnQ System
    • Analyzes data collected on guests to determine preferences and guest’s profitability
Information System Strategies for Dealing with Competitive Forces

- Strengthen customer and supplier intimacy.
  - Strong linkages to customers and suppliers increase switching costs and loyalty
  - **Toyota**: uses IS to facilitate direct access from suppliers to production schedules
    - Permits suppliers to decide how and when to ship suppliers to factories, allowing more lead time in producing goods.
  - **Amazon**: keeps track of user preferences for purchases, and recommends titles purchased by others
Some companies pursue several strategies at the same time.

- Dell emphasizes low cost plus customization of products.

Successfully using IS to achieve competitive advantage requires precise coordination of technology, organizations, and people.
The Internet’s Impact on Competitive Advantage

- **Existing competitors**: widens market, increasing competitors, reducing differences, pressure to compete on price

- **New entrants**: reduces barriers to entry (e.g., need for sales force declines), provides technology for driving business processes

- **Substitute products and services**: facilitates creation of new products and services

- **Customers’ bargaining power**: bargaining power shifts to customer

- **Suppliers’ bargaining power**: procurement over Internet raises power over suppliers, suppliers can benefit from reduced barriers to entry and elimination of intermediaries
Porter’s Value Chain

- **The Competitive Model** deals with the environment within which a company competes.

- **The Value Chain** addresses the flow of a product through the organization.
  - It starts with the original idea in research and tracks its progress all the way to the customers.
The Business Value Chain Model

- Highlights activities in a business where
  - competitive strategies can best be applied
  - ISs are likely to have a strategic impact.
  - Primary activities
  - Support activities
Using Information Systems to Achieve Competitive Advantage

The Value Chain Model

- Administration and Management: Electronic scheduling and messaging systems
- Human Resources: Workforce planning systems
- Technology: Computer-aided design systems
- Procurement: Computerized ordering systems

Primary Activities
- Inbound Logistics: Automated warehousing systems
- Operations: Computer-controlled machining systems
- Sales and Marketing: Computerized ordering systems
- Service: Equipment maintenance systems
- Outbound Logistics: Automated shipment scheduling systems

Support Activities
- Sourcing and Procurement Systems

Industry Value Chain
- Suppliers
- Firm
- Distributors
- Customers

Customer Relationship Management Systems
The Value Web

- Networked system synchronizes the value chains of partners
- Responds rapidly to supply and demand.

Figure 3-3
Synergies, Core Competencies, and Network-Based Strategies

- **Synergies:**
  - When output of some units can be used as inputs to other units
  - When two firms can pool markets and expertise (e.g., recent bank mergers)
  - Lower costs and generate profits
  - Enabled by information systems that ties together disparate units so they act as whole
Network-based strategies:

Network economics:
- Marginal costs of adding another participant are near zero, whereas marginal gain is much larger
- E.g., larger number of participants in Internet, greater value to all participants

Virtual company:
- Uses networks to link people, resources, and ally with other companies to create and distribute products without traditional organizational boundaries or physical locations
Synergies, Core Competencies, and Network-Based Strategies

- Core competency:
  - Activities firm is world-class in
    - E.g., world’s best miniature parts designer, best package delivery service.
  - Knowledge gained over many years of experience + research.
  - Information system that encourages the sharing of knowledge across business units helps.
    - E.g., Procter & Gamble uses intranet to help people working on similar problems share ideas and expertise.
Disruptive Technologies: Riding the Wave

- Disruptive technologies:
  - Technologies with disruptive impact on industries and businesses, rendering existing products, services and business models obsolete:
    - Personal computers
    - World Wide Web
    - Internet music services
  - First movers versus fast followers
    - First movers of disruptive technologies may fail to see potential, allowing second movers to reap rewards (fast followers)
Prior to the Internet, competing globally was only an option for huge firms able to afford factories, warehouses, and distribution centers abroad.

The Internet drastically reduces costs of operating globally.

Globalization benefits:

- Scale economies and resource cost reduction
- Higher utilization rates, fixed capital costs, and lower cost per unit of production
- Speeding time to market
Hewlett-Packard and other electronics companies assign distribution and production of their products to a number of different countries.
Global Business and System Strategies

- Domestic exporters
  - Heavy centralization of corporate activities in home country
- Multinationals
  - Concentrates financial management at central home base
  - decentralize production, sales, and marketing to other countries
- Franchisers
  - Product created, designed, financed, and initially produced in home country
  - rely on foreign units for further production, marketing, and human resources
- Transnationals
  - Regional (not national) headquarters and perhaps world headquarters; optimizing resources as needed
Global System Configurations

- **Centralized systems:**
  - All development and operation at domestic home base

- **Duplicated systems:**
  - Development at home base but operations managed by autonomous units in foreign locations

- **Decentralized systems:**
  - Each foreign unit designs own solutions and systems

- **Networked systems:**
  - Development and operations occur in integrated and coordinated fashion across all units
The large Xs show the dominant patterns, and the small Xs show the emerging patterns. For instance, domestic exporters rely predominantly on centralized systems, but there is continual pressure and some development of decentralized systems in local marketing regions.

**Figure 3-5**

<table>
<thead>
<tr>
<th>SYSTEM CONFIGURATION</th>
<th>Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Domestic Exporter</td>
</tr>
<tr>
<td>Centralized</td>
<td>X</td>
</tr>
<tr>
<td>Duplicated</td>
<td></td>
</tr>
<tr>
<td>Decentralized</td>
<td></td>
</tr>
<tr>
<td>Networked</td>
<td></td>
</tr>
</tbody>
</table>
What Is Quality?

- **Producer perspective:**
  - Conformance to specifications and absence of variation from specs
- **Customer perspective:**
  - Physical quality (reliability), quality of service, psychological quality
- **Total quality management (TQM):**
  - Quality control is end in itself
  - All people, functions responsible for quality
- **Six sigma:**
  - Measure of quality: 3.4 defects/million opportunities
How Information Systems Improve Quality

- Reduce cycle time and simplify production process.
- Benchmarking
- Use customer demands to improve products and services.
- Improve design quality and precision.
  - Computer-aided design (CAD) systems
- Improve production precision and tighten production tolerances.
Computer-aided design (CAD) systems improve quality of product design.
• Businesses are collections of business processes—

• Some times they are written in manuals, but in many cases business processes are informal.

• To use IS effectively, you need to change business processes.

• Before changing processes, you need to change people’s attitudes and behaviors, and even the organization itself.
• Business process management = continuous improvement
  • Identify processes for change.
  • Analyze existing processes.
  • Design new process.
  • Implement new process.
  • Measure new process.
Competing on Business Processes

**Figure 3-6**

- Customer: Go to bookstore → Search shelves → Book Available? (Yes) → Purchase book → Take book home → Go to another store (No)
  - Clerk: Book available? (No) → Clerk searches → Found (Yes) → Inquire about ordering → Able to order? (No) → Return to store
  - Customer: Return to store → Purchase book → Take book home
  - Clerk: Place Order → Receive book → Notify Customer
Figure 3-7
Business Process Reengineering

- A radical form of fast change
- Not continuous improvement, but elimination of old processes, replacement with new processes, in a brief time period
- Can produce dramatic gains in productivity, but increases organizational resistance to change
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
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
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
    - ...
  - 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,
  - etc.
The Data Processing (DP) Era (1960-1980)

- Meanwhile computers were developed for scientific and defense purposes
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 *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
Better budgeting and resulting accountability lead to consistent earnings growth.

Source: *A Nation Transformed by Information*, Oxford University Press, 2000
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.
- 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
Beginnings 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!

- 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 1998, Cisco had a market value of $100 billion!
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...
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” 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>1978</th>
<th>1986</th>
<th>1997</th>
<th>Company Name</th>
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<td>General Electric</td>
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<td>American Int'l Group</td>
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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
Components of a Business

Organizing a Business: Basic Business Functions

- Five basic business entities:
  - Suppliers
  - Customers
  - Employees
  - Invoices/payments
  - Products and services