Manhattanville College

Master of Science in Leadership and Strategic Management
Information Technology Management
LSMP5009/OMHR5019

Instructor:	Kevin M. Burns President Alecian Corporation. kevinburns@aleciancorp.com	***Class Dates (2004):*** June 12-13; July 10-11; July 24-25

Required Reading Material:

From Harvard Business Online (http://www.hbsp.harvard.edu/)

Cases: Charles Schwab A (Harvard Business School, #9-300-024)

Charles Schwab B (Harvard Business School, #9-300-025)

Charles Schwab Inc: Creating an International Marketspace (Center For Asian Business Cases, #HKU067)

Cigna Property & Casualty Reengineering A (Harvard Business School, #9-196-059)

Concordia Casting (Harvard Business School, # 9-192-151)

Partial Texts:

Loosely Coupled: The Missing Pieces of Web Services. Doug Kaye, 2003. Download Part 1, Chapter 1 (Evolution) from http://www.rds.com/books/looselyCoupled/download.html

Other required reading material will be distributed in class.

Note: Please read the following materials in advance of our first class on June 12th.

1. **HBS case study "Cigna Property & Casualty Reengineering A"**
2. **HBS case study "Concordia Casting"**

Course Overview:

The role of Information Technology has evolved greatly over the course of the last four decades. Originally consigned to the corporate backwater as a support function for Accounting, IT is now recognized as a key strategic business component providing value far beyond the mere processing of financial reports. The burgeoning segment of the economy consisting of technology oriented companies whose sole purpose is the creation of solutions designed to improve productivity and provide competitive advantage is more evidence of the heightened awareness of the intrinsic value of IT, notwithstanding the anticlimactic reality of Y2K hysteria, the dot.com debacle, and the technology industry slump of the last few years.

No component of the economy, whether within the service or the manufacturing sectors, can exist without IT. In recent years advances in applications and systems development, technical infrastructure, communications, and the use of the Internet as an e-commerce tool have provided businesses with vast opportunities for improved goods and services. Over the course of the last decade businesses have recognized that IT functionally operates as much in a strategic partnership with the corporation as such areas as Marketing, Sales, Finance, and Product Development. In addition, there is a growing realization that the vast amounts of data utilized in the normal course of doing business represents a key strategic asset that, once unlocked, can provide enormous analytic and competitive value. There is great individual significance, in other words, in both the *Information* and *Technology* portions of IT.

Mainstream economists, chief among them Fed Chairman Alan Greenspan, have maintained that the economic boom of the 1990's was due to an unprecedented rise in worker productivity, and that this engine of growth was in turn fueled principally by technological advances arising from IT.

In order to be successful today's business managers must understand the nature and strategic value of IT, no matter what functional areas in which they themselves actually operate. An understanding of the processes, challenges, directions, and corporate synergies associated with IT as a value-added business partner is critical.

The purpose of this course is to give students a window into the minds of IT practitioners, examining the ways in which IT can be brought to bear on real business issues. The major focus will be on IT as a strategic business partner, and how non-IT managers can best interact with their IT peers by gaining an understanding of the people, processes, and issues involved within the context of gaining strategic and competitive advantage.

Current trends that will be discussed:

- Increasingly mobile work force
- Economic fundamentalism on the part of technology purchasers (Total Cost of Ownership or TCO)
- Demand for improved security
- Overall reduction in demand and associated cost for IT staff, but continued high demand in key skill areas.
- Vendor Mergers (i.e. Compaq and HP)
- Beyond transactions (BPM and Analytics)
- Platform and integration strategies are key (i.e. Java and .NET)
- Increased focus on user self-service (Customer Service and Help Desk)

***Course Objectives**:*

Course material will concentrate on the following:

1. Understanding the strategic components and uses of IT.
2. Factors underlying the effective application of IT to gain business value.
3. Critical technology issues facing today's business leaders (non-technical and technical).
4. Management practices and challenges in the IT organization.
5. Examination of upcoming IT trends.
6. The impact of IT on organizational leadership.
7. IT's role as a component of effective decision making.
8. Understanding the ways in which the IT function can best be used as a strategic and value added business partner.

Principally, students should expect to gain an enhanced understanding of IT as more than just the traditional perception of a technology department filled with geeks who dress strangely, work odd hours, and speak in unrecognizable acronyms. Since the students represent current and future non-IT business leaders, the benefit of this course will be a framework providing the knowledge needed to work synergistically with their IT colleagues in pursuit of overall corporate strategic and economic goals.

Instructional Methods:

Class sessions will incorporate lecture, facilitated discussion, case studies, student breakout sessions, and student group presentations. Pre-class reading material will consist of cases, relevant industry white papers, and topical articles of interest.

Lectures, readings, and facilitated discussions will provide the base information for the concepts and material each student is expected to master. Case studies, breakout sessions, and student group presentations will present the opportunity to apply these concepts both in an academic and real world or practical environment.

This is not a course in any specific technical skill. Students should not expect to learn about the use of any particular software or hardware. A basic understanding of the use of Microsoft Word and Microsoft Excel (or some equivalent), as well as use of the Internet as a research tool, will be helpful but unnecessary.

Class Attendance:

Attendance at class meetings in a fundamental requirement of this course! The courtesy of prior notification of an unavoidable absence is expected. Failure to comply with this policy will be reflected in the class participation component of the final grade.

Student Presentation:

As part of the overall course requirement students will organize into teams of three and prepare and deliver a twenty-minute in-class presentation (not including five or ten minutes reserved for class feedback and Q&A) on the strategic use and impact of IT in one team member's organization. Students will conduct interviews with technical and business managers, gathering information on how IT functions within the organization. Topics to be covered could include: a brief description of the business; key challenges facing IT leadership; synergies (or lack of them) between the IT department and their business counterparts; how decision making is influenced (or not) by IT; key business drivers and competitive issues framed by an IT context; an analysis of how IT functions as a value added business partner within the organization, or if it does not how it could be made to do so; and, an analysis of one actual IT project undertaken by the business describing whether it succeeded or failed and why.

No company confidential information should be included in any presentation. Only general material germane to the assignment need be utilized.

The organization each team will choose to examine should be large and complex enough to provide sufficient material for the presentation. Students will be expected to work as a group with everyone contributing equally to information gathering as well as presentation preparation and delivery. (All students in a team will receive the same grade for the

presentation.) Each team will appoint a team leader, presumably the team member whose organization is the subject of the presentation. The team leader is expected to notify the instructor by the start of the Sunday June 13th session as to the names of the other team members and the organization the team proposes to examine.

Grading Policy:

Class participation (40%): Students are expected to have prepared all required materials and be ready to apply them to class discussions. Lectures and facilitated discussions are meant to be viewed as interactive; each student should be ready and willing to participate in active lively dialogue as the nature of some of the class material is designed to stimulate spirited and provocative discussion. Case analysis and breakout sessions will be highly participative by definition.

Presentation (60%): Students will be principally judged on their ability to apply the information from class discussions, reading materials, case studies, and in-class projects and discussions to the strategic analysis of IT within the identified organization. A very successful presentation will be an overall review rather than a focus on one particular area of interest or concern. While they are expected to be professional in nature a very successful presentation will be one weighted toward content, not form. Additional grading consideration may be given to teams that accompany their presentations with a written report covering relevant material beyond that which is included in the presentation (one report per team, not one per team member), although this should be considered optional.

Each student's overall grade for the course will be based on the individual performance with regard to class participation coupled with the team grade for the presentation.

Course Schedule:

Saturday June 12 – Sunday June 13, 2004

Class outline:

1. Issues in IT management
2. Strategic alignment of IT to create and enhance business synergies
3. IT architecture
4. Business process reengineering
5. IT economic value

Pre-class reading assignment:

3. HBS case study "Cigna Property & Casualty Reengineering A"
4. HBS case study "Concordia Casting"

Students should be prepared to discuss the following with reference to case study "Cigna Property & Casualty Reengineering A":

1. A description of the situation facing Gerry Isom.
2. How Isom's business vision is or is not responsive to the situation.
3. An evaluation of the approach taken.
4. An assessment of the reengineering design.
5. An evaluation of the implementation approach.

Case study "Concordia Casting" will be evaluated in group break out sessions. Students will be given discussion topics in class.

Saturday July 10 – Sunday July 11, 2004

Class outline:

1. Current topics of interest in IT including e-commerce, web services, knowledge management, business continuity planning, disaster recovery, enterprise resource planning, quality control, outsourcing, customer relationship management, open source, security, privacy, etc.
2. Ethical considerations in IT
3. Future trends in IT

Pre-class reading assignment:

1. Industry research material distributed by the instructor in the previous session
2. HBS case study "Charles Schwab" parts A and B
3. CABC case study "Charles Schwab Inc: Creating an International Marketspace"
4. Chapter 1 from Kaye text , Loosely Coupled: The Missing Piece of Web Service.

Students should be prepared to discuss the following with reference to case study "Charles Schwab" parts A and B:

1. The internal and external pressures facing David Pottruck.
2. As David Pottruck, would you cut prices on 1/15/98?
3. The IT issues facing Dawn Lepore.

Case study "Charles Schwab Inc: Creating an International Marketspace" will be evaluated in group break out sessions. Students will be given discussion topics in class.

Saturday July 24 – Sunday July 25, 2002

Class outline: Additional topics of interest in IT, and delivery of student presentations.

Pre-class reading assignment: Industry research material distributed by the instructor in the previous session.

Topics for discussion in the presentations should follow the guidelines in the ***Student Presentation*** section of the syllabus. Following are suggested topics for discussion with company technical and business leaders to assist in gathering the necessary information:

1. Define the organization's computing platform and architecture, and describe how it has evolved.
2. What are the key information systems applications?
3. What administrative structures and systems are in place for managing IT?
4. Is the necessary technological expertise available in the organization or is it provided through strategic partnerships?
5. What programs are in place for ongoing training of IT personnel? Is IT expertise being developed and managed appropriately?
6. How does IT develop the necessary understanding of the business of the organization, and how do business professionals develop the necessary understanding of IT? Has this been successful or not, and for what reasons?
7. What systems exist for tracking new technology developments and how they may best be strategically deployed?
8. How does the organization manage IT resource allocation and project prioritization?
9. What's the current level of IT spending? As a percent of sales? How does this compare to the industry average?
10. Has spending on IT changed in the organization over the last five years? Ten years? How is IT spending expected to change in the next three to five years and why?
11. Who leads the IT function and how is that accomplished?
12. Is there an IT steering committee, and if so how does it function?
13. Does IT play a strategic or support role in the organization?
14. How does IT strategy conform to overall business strategy? What mechanisms are in place to insure such conformance?
15. Is IT management and architecture appropriate to accomplish strategic goals?
16. How are risks associated with IT managed?
17. How are opportunities for using IT to add business value being identified and exploited?
18. What changes are required to make more effective use of IT and to better align it with the business? Does the organization have the resources (and willingness) to implement these changes?
19. Is transaction level data available to provide timely, integrated, and detailed understanding of core operating processes?
20. Does the organization have an analytic mindset, and if so how does IT enable that?
21. Have IT systems been designed and implemented in such a way to enable their evolution as the business changes?
22. Does the organization have information use policies in place governing business unit and enterprise level access?
23. Are individuals and teams across the organization information literate?
24. Is the information infrastructure of the organization properly designed and implemented?
25. Does the information infrastructure extend to key external relationships?

(Required topic for all presentations) What is the team's overall assessment of the state of IT in the organization?

Information Technology Management

M.S., Leadership and Strategic Management
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Summer Session 2004

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Agenda

- Review syllabus
- Organizations, Environments and Information Technology
- Strategic IT
- Business Process Reengineering
- IT Economics

Section 1

New Technological Paradigms

- Internet & Intranet
- E-Commerce (B2B, B2C)
  - EDI → Web Services
- Business Process Management
- Expert Systems (branch of Artificial Intelligence)
  - Business Rule Management Systems (BRMS)
- Outsourcing
- Pattern Recognition (i.e. voice, face, handwriting, ect.)
- Mobile Systems and Convergence – (i.e. Handhelds and PCs, Handhelds and Cell Phones)

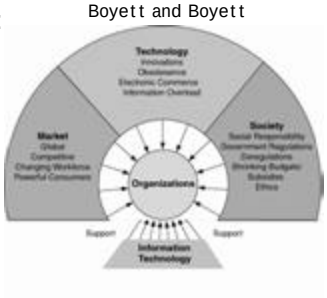
Information Technology has become the major facilitator of business activity in the world today.

Unpredictable Change and Pressures

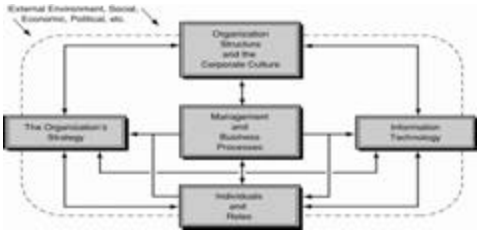
The BIG three:

- The Market
- Technology
- Society

Boyett and Boyett

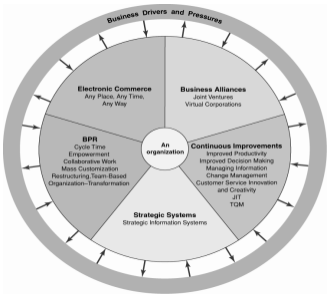


Organizational Impacts



Scott-Morton

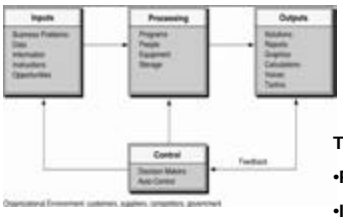
Organizational Responses



Information System

"An information system (IS) collects, processes, stores, analyzes, and disseminates information for a specific purpose."

Like any other system it includes: **inputs**, **outputs**, and **feedback**.

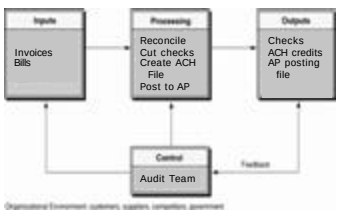


Types

- **Formal**
- **Informal**

Example

Bill Payment Example



Computer-Based Information System

- *"A computer-based information system (CBIS) is an information systems that uses computer technology to perform some or all of its intended tasks."*
- Components:
  - Hardware
  - Software
  - Database
  - Network
  - Procedures
  - People

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Classification Schemes

Information Systems Classification Schemes

By organizational structure
- *Departmental*
- *Enterprise*
- *Inter-organizational*

By functional area
- *Accounting*
- *Finance*
- *Manufacturing (production/operations)*
- *Marketing*
- *Human Resources*
- *Security*

By support provided
- *Transaction processing (TPS)*
- *Management information (MIS)*
- *Office automation (OAS)*
- *Decision support (DSS)*
- *Executive support (EIS)*
- *Group support (GSS)*
- *Intelligent support (IIS?)*

By activity supported
- *Operational systems*
- *Managerial systems*
- *Strategic systems*

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Classification Schemes by Support

It's a timeline…why?

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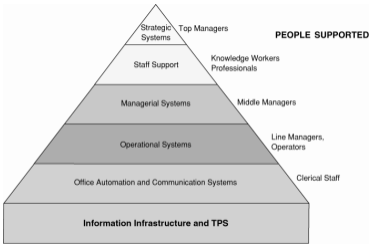
People & Information Systems



Data, Information & Knowledge

- Data – elementary descriptions of things, events, activities and transactions
- Information – data that have been organized to convey meaning and value to the recipient
- Knowledge – data or information that have been organized to convey understanding, experience, accumulated learning, and expertise

Information Infrastructure and Architecture

- An architecture is a blue print or plan
- An infrastructure is a particular instance of the architecture

Information Architecture

- Mainframe
- PCs
- Distributed Computing or Networked Systems
  - Client/Server (2-tiered)
  - 3-tiered Architectures
  - N-tiered Architectures
  - Service Oriented Architectures

Service-Oriented Architectures

2 systems talking to each other much the way a person (consumer) uses a browser to interface with an internet site (provider). This is a new paradigm and is starting to gain a foothold. One type of service-oriented architecture is Web services.

Section 2

Strategic IT
•Business Alignment- IT
•Globalization

12 Components of Alignment

BUSINESS STRATEGY

1. **Business Scope** – Includes the markets, products, services, groups of customers/clients, and locations where an enterprise competes as well as the competitors, suppliers and potential competitors that affect the competitive business environment.
2. **Distinctive Competencies** – The critical success factors and core competencies that provide a firm with a potential competitive edge. This includes brand, research, manufacturing and product development, cost and pricing structure, and sales and distribution channels.
3. **Business Governance** – How companies set the relationship among management stockholders and the board of directors. Also included are how the company is affected by government regulations, and how the firm manages its relationships and alliances with strategic partners.

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12 Components of Alignment

ORGANIZATION INFRASTRUCTURE & PROCESSES

4. **Administrative Structure** – The way the firm organizes its businesses. Examples include central, decentral, matrix, horizontal, vertical, geographic, federal, and functional.
5. **Processes** - How the firm's business activities (the work performed by employees) operate or flow. Major issues include value added activities and process improvement.
6. **Skills** – H/R considerations such as how to hire/fire, motivate, train/educate, and culture.

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12 Components of Alignment

IT STRATEGY

7. **Technology Scope** - The important information applications and technologies.
8. **Systemic Competencies** - Those capabilities (e.g., access to information that is important to the creation/achievement of a company's strategies) that distinguishes the IT services.
9. **IT Governance** - How the authority for resources, risk, and responsibility for IT is shared between business partners, IT management and service providers. Project selection and prioritization issues are included here (see next section).

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12 Components of Alignment

IT INFRASTRUCTURE AND PROCESSES

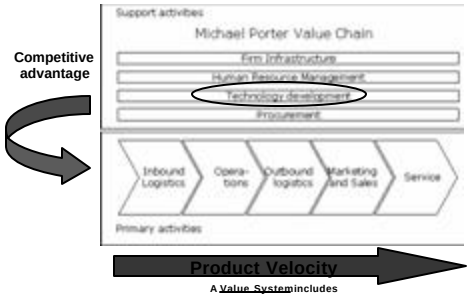
10. **Architecture** - The technology priorities, policies, and choices that allow applications, software, networks, hardware, and data management to be integrated into a cohesive platform.
11. **Processes** - Those practices and activities carried out to develop and maintain applications and manage IT infrastructure.
12. **Skills** - IT human resource considerations such as how to hire/fire, motivate, train/educate, and culture.

Alignment IT-Business

ENABLERS	INHIBITORS
Senior executive support for IT	IT/business lack close relationships
IT involved in strategy development	IT does not prioritize well
IT understands the business	IT fails to meet its commitments
Business - IT partnership	IT does not understand business
Well-prioritized IT projects	Senior executives do not support IT
IT demonstrates leadership	IT management lacks leadership

Porter Value Chain Model (Manufacturing)

Competitive advantage



Product Velocity

A Value System includes the VCs of the enterprise plus external partners (ie. suppliers, distributors)

Strategic IT Frameworks

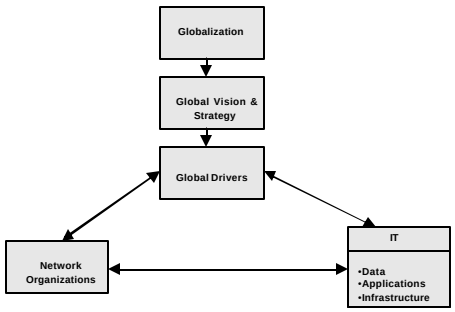
How can IT enhance links in the value system? 5 step Process (Porter & Miller)

1. Assess **information intensity**(higher the dependency, the higher the strategic opportunities); not to be confused w/ **information content** (ie. Clothes retailer may have little information content in their product but a high intensity level in their value chain)
2. Assess **role** of IT (affects on partners, customers and competitors) and reactions from value chain participants
3. **Rank** the ways IT can create competitive advantage
4. Can IT spawn **new businesses** (ie. E-commerce)
5. Develop a **plan** for leveraging IT

Define Competitive Advantage

Bakos and Treacy 's causal model of competitive advantage

Global Business Drivers Framework (Ives etal.)



Business Strategies Examples

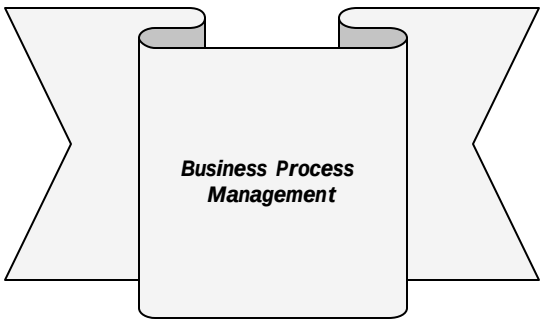
- Cost Leadership – Reducing inventory costs or increasing productivity
- Differentiation – Quality, speed, customization, ect.
- Growth – increasing market share, acquiring more customers or selling more product (cross-selling, up-selling)
- Alliances – growth by focusing on core strengths and synergistically working with partners
- Innovation – new products, new features and new production methods
- Internal Efficiency – improving the way business is executed as well as decision making
- Customer-orientation – "the customer is king"

Note: These strategies are interrelated (i.e. Innovation achieved through alliances that reduce costs and increase growth)

Managerial Issues

- Implementing strategic information systems can be risky – often newer technologies (risk analysis)
- Strategic information systems requires planning and control
- Sustaining competitive advantage is challenging
- People
- Ethical issues

Section 3



Motivation

- **Competition** can be very intense, involving large corporations.
- Providing quality products to **customers** at low prices is necessary, but may not be sufficient.
- A fundamental **change** in the manner in which business is done is sometimes the only way to succeed.
- Some features of reengineering include: reducing cycle times, mass customization, vendor collaboration, providing unique services to customers, closely managing the complete supply and demand chains to suppliers and buyers.

Timeline

Increases in Standards of Living

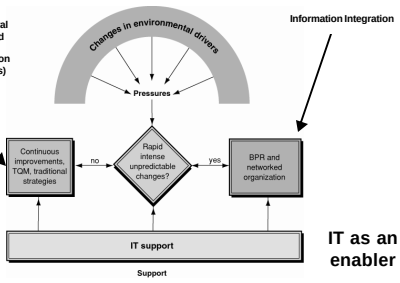
1776 – Adam Smith's "Wealth of Nations" - Division of Labor

Industrial Revolution
•Mass Production (Assembly Lines)
•Hierarchical Organization
•Complex Support Systems for planning and budgeting, resource allocation, coordination and control

Globalization
•Increased competition and uncertainty → disequilibrium (see Scott-Morton model introduced earlier)
•Structure, process, strategy, management and/or technology will need adjustment

BPR Continuous Improvement

Traditional continuous improvement (i.e. automation of existing processes, small structural modifications, quality and productvity improvement programs, and modification in management programs)



IT as an enabler

Business Process Reengineering

- Initially, attention was given to a complete restructuring of organizations.
- Later, the concept was changed due to failures of BPR projects and the emergence of Web-based applications.
- Today, BPR can focus on anything from the complete restructuring of an organization to the redesigning of individual processes.
- Major objective of BPR = ***Information Integration*.**

Definitions

- Business process – collection of activities that take 1 or more kinds of inputs and create a valued output (customer perspective). Procurement is an example.
- Business Process Management Systems (BPM or Workflow Management Systems) - Provide organizations with an automated way to integrate applications, data, and business processes within the organization at the process level.
- BPR – fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in measures of performance such as quality, cost, speed, and services. (Hammer and Champy).

Definitions

- Demand Chain – All of the activities that relate to obtaining an order among all participants: customers, purchasing agents, salespersons, ect. The chain links organizations with their partners.
- Supply Chain – All of the activities that occur once you get an order. The chain links organizations with its partners (suppliers and customers).
- Supply Chain Management (SCM) – The planning, organizing, coordinating and control of a business process along the supply chain of a business.
- Networked Organization – Networked organizations refer to organizational structures that resemble computer networks and are supported by information systems.
- Organizational Transformation – Process of moving from the traditional to a reengineered, frequently networked, organization.

BPR Basics

- What are the symptoms
  - Stove pipes
  - Fragmented piecemeal systems
  - Need for integration
- The characteristics
  - Combining jobs -- Empowered employees
  - Jobs order natural -- Multi-version processes
  - Work done anywhere -- Controls minimized
  - Hybrid central/decentralized

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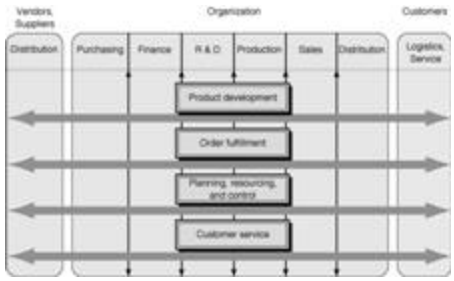
Stovepipes - Business Processes Across Functional Areas



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Reengineering Legacy Systems

- ***Legacy Systems*** are holdovers of earlier architectures that are still in use after an organization migrates to a new architecture.
  - The decision—to keep, improve, or replace—can present management with agonizing alternatives.
- ***Reverse engineering*** is the process of examining systems to determine their present status, and to identify what changes are necessary to allow the system to meet current and future business needs.

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The Enabling Role of IT

Old Rule	*Intervening Technology*	*New Rule*
Information appears in only one place at one time.	Shared databases, client/server architecture, Internet, intranets	Information appears simultaneously wherever needed.
Only an expert can perform complex work.	Expert systems, neural computing	Novices can perform complex work.
Business must be either centralized or distributed.	Telecommunication and networks: client/server, intranet	Business can be both centralized and distributed.
Only managers make decisions.	Decision support systems, enterprise support systems, expert systems	Decision making is part of everyone's job.

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Tools for BPR

- ✓ *Simulation and visual simulation tools*
- ✓ *Flow diagrams*
- ✓ *Application development tools*
- ✓ *Integrated tool kits*
- ✓ *Work analysis*
- ✓ *Workflow software*
- ✓ *Business process design*
- ✓ *Comprehensive modeling tools*
- ✓ *Other tools*

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BPR -- *Samples*

- Mass Production to Mass Customization
- Push vs. Pull supply chain
- Cycle Time Reduction
- Restructuring Organizations

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Mass Customization

- One of the most successful models of e-Commerce is *mass customization.*
  - the production of large quantities of customized items.
- It supplements or even replaces one of the most innovative concepts of the Industrial Revolution, *mass production.*
- Mass customization can be facilitated by the Web in four different approaches;
  - *Collaborative customizers*
  - *Adaptive customizers*
  - *Cosmetic customizers*
  - *Transparent customizers*

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Mass Customization & EC

- EC transforms the supply chain from a traditional *push model* to a *pull model*.
  - Push model - the business process starts with manufacturing and ends with consumers buying the products or services.
  - Pull model - the process starts with the consumer ordering the product (or service) and ends with the manufacturer making it.
- The pull model enables customization since orders are taken first.

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Cycle Time Reduction

- **Cycle time** refers to the time it takes to complete a process from beginning to end.
- Time is recognized as a major element that provides competitive advantage.
- IT helps to contribute to **cycle time reduction.**

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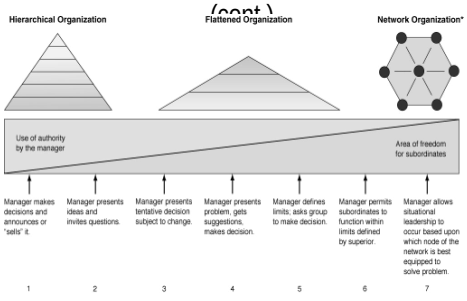
Networked Organizations

- Today some organizations are turning away from the hierarchical organization toward the *networked organization.*
  - *Networked organizations* refer to organizational structures that resemble computer networks and are supported by information systems.
- In the *information-based* economy, most people do *knowledge work,* and the subordinate often has more expertise than the "hierarchical" supervisor.
- *A flattened organization* has fewer layers of management and a broader span of control than the hierarchical organization.

Networked Organizations (cont.)



* Multiple networks exist in organizations.

Empowerment Using IT

- ***Empowerment*** is the vesting of decision-making or approval authority in employees where, traditionally, such authority was a managerial prerogative.
- Empowerment can be enhanced through IT.
  - Empowered employees are expected to perform better.
- In addition to empowering employees, companies are empowering their customers, suppliers, and other business partners.
  - E.g. Federal Express uses the Internet to empower its customers.

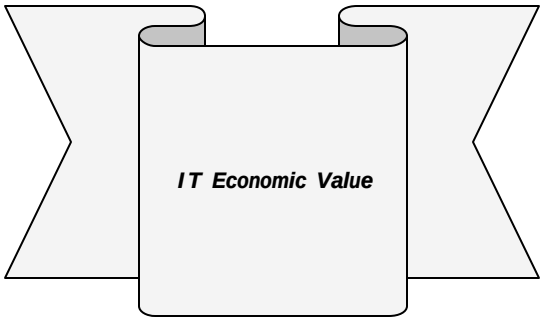
Virtual Corporations

- A **Virtual Corporation** (VC) is an organization composed of several business partners sharing costs and resources for the purpose of producing a product or service.
- According to Goldman et al. (1995), permanent virtual corporations are designed to do the following:
  1. Create or assemble productive resources rapidly.
  2. Create or assemble productive resources frequently and concurrently.
  3. Create or assemble a broad range of productive resources.

Virtual Corporations (cont.)

- In a VC, the resources of the business partners remain in their original locations but are integrated.
- In order to function, VCs rely on the following forms of IT;
  - Communication/ collaboration among dispersed business partners
    - e.g., e-mail, desktop videoconferencing, screen-sharing, etc.
  - EDI → Web Services
  - Intelligent agents
  - Modern database technologies and networking
  - Intranet/Internet applications

Section 4



Technological & Financial Trends

- Moore's Law
  - Moore suggested in 1965 that the number of transistors, and thus the power, of an integrated circuit (computer chip) would double every year while the cost remained the same.
  - He later revised this estimate to a slightly less rapid pace: doubling every 18 months.
- Price-to-performance ratio
  - Organizations will have the opportunity to buy, for the same price, twice the processing power in 1½ years, four times the power in 3 years, eight times the power in 4½ years, etc.

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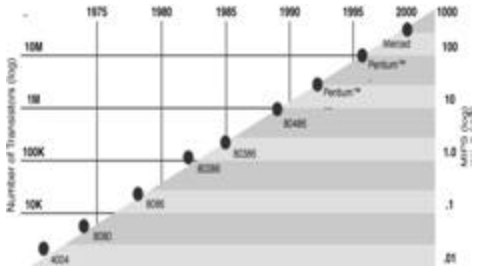
Moore's Law



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Technology & Organizations

- Impact of new technologies on organizations:
  - First, most organizations will perform existing functions at decreasing costs over time and thus become more efficient.
  - Second, creative organizations will find new uses for information technology—based on the improving price-to-performance ratio—and thus become more effective.
  - New and enhanced products and services will provide competitive advantage to organizations that have the creativity to exploit the increasing power of information technology.

Page 54

The Productivity Paradox

- Over the last 50 years, organizations have invested trillions of dollars in information technology.
  - Total worldwide annual spending on IT in 2000 was two trillion dollars, and is expected to be over three trillion dollars by 2004.
- Yet it is very hard to demonstrate that IT investments really have increased outputs or wages.
- The discrepancy between measures of investment in information technology and measures of output at the national level is described as the *Productivity Paradox*.

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Productivity

- Economists define *productivity* as outputs divided by inputs.
  - Outputs are calculated by multiplying units produced, for example, number of automobiles, by their average value.
- If inputs are measured simply as hours of work, the resulting ratio of outputs to inputs is *labor productivity*.
- If other inputs—investments and materials—are included, the ratio is known as *multifactor productivity.*

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Explaining the Productivity Paradox

Economists have developed a variety of explanations for the productivity paradox. These can be grouped into the following three categories;

❶ Data & analysis problems hide productivity gains.
❷ Gains from IT are offset by losses in other areas.
❸ Productivity gains are offset by IT costs or losses.

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❶ Data & Analysis Problems

- Productivity numbers are only as good as the data used in their calculations.
- In service industries, such as finance or health-care delivery, it is more difficult to define what the products are, how they change in quality, and how to allocate corresponding costs.
- The productivity gains may not be apparent in all processes supported by the information systems.
- A failure to consider the *time lags* between IT investments & IT benefits may underestimate the productivity impacts.

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❷ Offsetting of Losses

- Sometimes IT produces gains in certain areas of the economy, but these gains are offset by losses in other areas.
- For example:
  - ✓ An organization may install a new computer system that makes it possible to increase output per employee.
  - ✓ If the organization reduces its production staff but increases employment in unproductive overhead functions, the productivity gains from information technology will be dispersed.

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❸ Offsetting of IT Costs or Losses

- The third possibility is that IT really does not increase productivity.
- Strassmann (1997) suggests that little or no relationship between IT spending and corporate profitability.
- Examples of factors that reduce the ability of IT to increase productivity:
  - ✓ Support Costs
  - ✓ Wasted Time
  - ✓ Support Development Problems
  - ✓ Software Maintenance
  - ✓ Incompatible systems and workarounds

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Evaluating IT

Lucas (1999) suggests that the following issues must be considered while assessing the value of investing in IT.

(1) There are multiple kinds of values, and the return on investment measured in dollar terms is only one of them.

(2) Different types of investments in IT are associated with different probabilities of providing returns.

(3) The probability of obtaining a return from an IT investment depends on probability of conversion success & implementation factors.

(4) The expected value of the return on IT investment in most cases will be less than that originally anticipated.

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IT Appraisal Methods

Financial approach – These appraisal methods consider only impacts that can be monetary valued. They focus on incoming and outgoing cash flows.

Multi-criteria approach – These appraisal methods consider both financial impacts and nonfinancial impacts that cannot, or not easily be, expressed in monetary terms. These methods employ quantitative and qualitative decision-making techniques.

Ratio approach - These methods use several ratios (e.g., IT expenditures vs. total turnover) to assist in IT investment evaluation.

Portfolio approach – These methods apply portfolios to plot several investment proposals against decision-making criteria. The portfolio methods are more informative compared to multi-criteria methods and generally use fewer evaluation criteria.

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Value of Information to Decision Making

- The value of information to decision making is the difference between the net benefits—benefits adjusted for costs—of decisions made using the information and decisions without the information.

Value of Information =

Net benefits with information –

Net benefits without information

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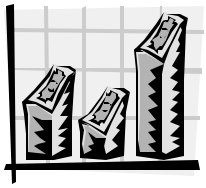
Evaluating Automation

- Automation of business processes is an area where it is necessary to define and measure IT benefits and costs.
- The decision of whether to automate is a capital investment decision. Such decisions can be analyzed by *cost-benefit analyses* that compare the total value of the benefits with the associated costs.



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Intangible Benefits

- Financial analyses need to consider not just tangible benefits but also intangible benefits.
- The most straightforward solution to the problem of evaluating intangible benefits is to make *rough estimates* of monetary values for all intangible benefits.
- Downing (1989) suggests eight ways to evaluate intangible benefits. Here are a few of them:
  - ✓ *Use "concrete indicators."*
  - ✓ *Solve for an unknown.*
  - ✓ *Prevent competitive disadvantage.*

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Evaluating IT through Benchmarks

- One approach to evaluating infrastructure is to focus on objective measures of performance known as *benchmarks.*
- Benchmarks come in two forms:
  - *Metric benchmarks* provide *numeric* measures of performance.
    - ✓ IT expenses as percent of total revenues.
    - ✓ Percent of "downtime" (when the computer is not available).
    - ✓ CPU usage (as percent of total capacity).
  - *Best-practice benchmarks* emphasize how information system activities are actually performed rather than numeric measures of performance.

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Case: Costmark

- Costmark is a benchmarking tool to assist in managing SAP R/3-related environments.
  - It provides a snapshot of various costs related to personnel, hardware, software licenses, maintenance, help-desk functions, and telecommunications.
- Some examples of reports generated by Costmark
  - Distribution of cost of operations across different user groups.
  - Total cost of operations across different user groups and across different departments.
  - Comparison of various costs with average costs obtained across all SAP-R/3 installations (i.e., industry average).

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Other Methods & Commercial Services

Costs: *One Time*	**Benefits:** *Quantifiable*
Software expert system purchase Software development Other software purchase Hardware platform lease or purchase	Improved decision speed Improved decision quality Automation of tasks Ability to perform new tasks
Costs: *Ongoing*	**Benefits:** *Intangible*
Operating personnel Communication lines Hardware maintenance Software upgrades Office space and utilities	Synergy with other projects Expanded long-term opportunities Strategic positioning Job enrichment Recording of knowledge

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Total Cost of Ownership

- An interesting approach for evaluating the value of IT is the *total cost of ownership (TCO)*.
  - TCO is a formula for calculating the cost of owning and operating a PC.
  - The cost includes hardware, technical support, maintenance, software upgrades, and help-desk and peer support.
  - By identifying such costs, organizations get more accurate cost-benefit analyses and also reduce the TCO.
  - It is possible to reduce TCO of workstations in networked environments by as much as 26 percent by adopting best practices in workstation management (Kirwin et al., 1997).

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Assessing Intangible Benefits

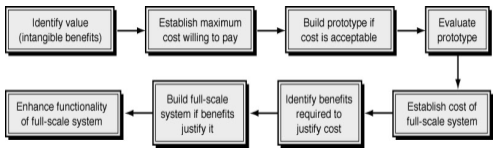
There are 4 main methodologies of assessing intangible benefits:

- ***Value analysis*** allows users to evaluate intangible benefits on a low-cost, trial basis before deciding whether to commit to a larger investment.
- ***Information economics*** focuses on the application of IT in areas where its intangible benefits contribute to performance on key aspects of organizational strategies and activities.
- ***Management by maxim*** provides a means of rationalizing IT infrastructure investments.
- ***Option valuation*** takes into account potential future benefits that current IT investments could produce.

Value Analysis

- Keen (1981) developed the *value analysis method* to assist organizations considering investments in decision support systems (DSSs).
- The value analysis approach includes eight steps, grouped into two phases.
- The first phase works with a low-cost prototype.
  - The decision maker identifies the desired capabilities and the (generally intangible) potential benefits.
  - If the decision maker feels that the system can provide these benefits, development proceeds on the full-scale system.
- The second phase involves the development of a full-scale system.

Value Analysis



Information Economics

- *Information Economics* is another method of evaluating IT that focuses on key organizational objectives.
- It incorporates the technique of *scoring methodologies*, which are used in many evaluation situations.
- *Scoring methodology* is used by analysts to first identify all the key performance issues and assign a weight to each one.
- Organizational objectives are used to determine which factors to include, and what weights to assign in the scoring methodology.
- This approach can incorporate both tangible and intangible benefits.
- This flexible approach can be carried out by software packages such as Expert Choice (*expertchoice.com*).

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Management by Maxim

- Organizations with multiple business units need frequently to make decisions about the appropriate level & types of infrastructure.
- Broadbent and Weill (1997) suggest a method called *Management by Maxim.*
- This method brings together corporate executives, business-unit managers, and IT executives in planning sessions to determine appropriate infrastructure investments in the following steps:
  - ✓ *Consider strategic context.*
  - ✓ *Articulate business maxims.*
  - ✓ *Identify IT maxims.*
  - ✓ *Clarify the firm's view of its IT infrastructure.*
  - ✓ *Specify infrastructure services.*

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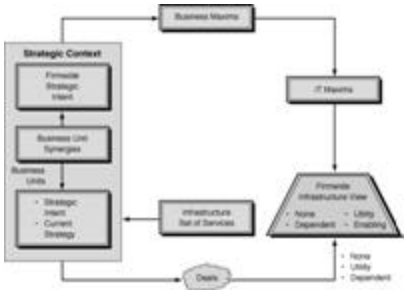
Management by Maxim



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Option Valuation of IT Investments

- A promising new approach for evaluating IT investments is *Option Valuation,* a concept well known in the securities markets.
  - In addition to stocks, investors can purchase options on stocks.
  - These options give their owners the right to buy or sell the stock at a given price within a specified time period.
  - An investor could buy stock now in a major computer manufacturer at $80 per share, or he/ she could pay around $8 now for the right to buy a share of that same stock at $80 any time in the next three months.
- Options offer an opportunity for a large profit in the future.
- Unfortunately, the mathematics of option valuation are well established but unfortunately too complex for many managers.

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IT Accounting Systems

- Ideally IT accounting systems will effectively deal with two issues:
  1. Provide an accurate measure of total IT costs for management control purposes.
  2. Charge users for shared (usually infrastructure) IT investments and services in a manner that contributes to the achievement of organization goals.
- These are two very challenging goals for any accounting system.
  - ✓ The complexities and rapid pace of change make them even more difficult to achieve in the context of IT.
  - ✓ In the early days of computing it was much easier to identify costs. Nowadays a large proportion of the costs are in "hidden," indirect costs that are often overlooked.

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Chargeback

- *Chargeback* is an alternative IT accounting method which distributes all costs of IT to users as accurately as possible, based on actual costs and usage levels.
  - ✓ Although accurate allocation sounds desirable in principle, it can create problems in practice.The most accurate measures of use may reflect technological factors that are totally incomprehensible to the user.
- *Behavior-oriented chargeback* is another IT accounting alternative. The primary objective of this system is influencing users' behavior.
  - ✓ It is possible to encourage (or discourage) usage of certain IT resources by assigning lower (or higher) costs. Although more difficult to develop, it recognizes the importance of IT to the success of the organization.

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Behavior-Oriented Chargeback

Examples of behaviors that behavior-oriented chargeback systems may seek to influence are:

- *Efficiency—Doing Things Right*
  - Reduce wasted resources.
  - Reduce use of scarce resources.
  - Encourage use in off-peak hours (load leveling).
  - Discourage "false economies" and suboptimizing behavior (actions that appear to help the individual unit but are bad for the organization)
- *Effectiveness—Doing the Right Things*
  - Encourage IT usage consistent with organizational strategies.
  - Encourage experimentation, technology assimilation, and organizational learning.
  - Encourage more productive use of surplus resources.
  - Improve communications between users & IS department.

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Behavior-Oriented Chargeback

There are three steps in implementing a behavior-oriented chargeback system:

1. *Determine objectives.*
2. *Determine appropriate measures.*
3. *Implement and maintain the system.*

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Outsourcing

- Many organizations may not be able to manage IT as well as firms that specialize in managing IT.
- For such organizations, the most effective strategy is *outsourcing.*
  - *Outsourcing* is the process of obtaining services from vendors, rather than from within the organization.
  - The decision to outsource usually considers two factors:
    (1) Which source is less expensive?
    (2) How much control is necessary?
- Since the late 1980s, *many* organizations are outsourcing the majority of their IT functions rather than just incidental parts.
  - In the mid-1990s, IBM, EDS, and Computer Sciences Corp. were winning approximately two-thirds of the largest outsourcing contracts.

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Offshore Outsourcing

- *Offshore outsourcing* of software development has become a common practice in recent years.
  - ✓ About one-third of Fortune 500 companies have started to outsource software development to software companies in India.
  - ✓ India has fifteen of twenty-three organizations worldwide that have achieved Level 5, the highest in SW-CMM ratings
- In addition to the traditionally outsourced services, Brown and Young (2000) identify two more scenarios for future outsourcing:
  1. *Creation of shared environments* (e.g., exchanges, portals, e-commerce backbones)
  2. *Providing access to shared environments* (e.g., applications service providers (ASPs), Internet data centers).

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Outsourcing Advantages

- ***Financial***
  - Avoid heavy capital investment, thus releasing funds for other uses.
  - Improve cash flow and cost accountability.
- ***Technical***
  - Be freer to choose software due to a wider range of hardware.
  - Achieve technological improvements more easily.
- ***Management***
  - Concentrate on developing and running core business activity.
  - Delegate IT development (design, production, and acquisition) and operational responsibility to supplier.

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Outsourcing Advantages (cont.)

- ***Human Resources***
  - Draw on specialist skills, available from a pool of expertise.
  - Enrich career development and opportunities for staff.
- ***Quality***
  - Clearly define service levels.
  - Improve performance accountability.
- ***Flexibility***
  - Respond quickly to business demands.
  - Handle IT peaks and valleys more effectively.

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Outsourcing Risks

(Clemons, 2000)

1. ***Shirking*** occurs when a vendor deliberately underperforms while claiming full payment
   - ✓ e.g., billing for more hours than worked, providing excellent staff first and later replacing them with less qualified ones.
2. ***Poaching*** occurs when a vendor develops a strategy and strategic application for a client and then uses them for other clients.
   - ✓ e.g., vendor redevelops similar systems for other clients at much lower cost, or vendor goes into client's business.
3. ***Opportunistic repricing or holdup*** occurs when a client enters into a long-term contract with a vendor and vendor changes financial terms at some point or overcharges for unanticipated enhancements and contract extensions.

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Outsourcing Strategies

(Clemons, 2000)

1. ***Understand the project*.** Clients must have a high degree of understanding of the project, including its requirements, the method of its implementation, and the source of expected economic benefits.
2. ***Divide and conquer*.** Dividing a large project into smaller and more manageable pieces will greatly reduce programmatic risk and provides clients with an exit strategy if any part of the project fails.
3. ***Align incentives*.** Designing contractual incentives based on activities that can be measured accurately can result in achieving desired performance.

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Case: CIBC Outsources to IBM

Problem:

- In the spring of 1996 the competitors of Canadian Imperial Bank of Commerce (CIBC) were ahead in implementing Internet banking, and CIBC started to lose market share.
- A decision was made to move quickly to implement the banks own Internet capabilities.

Solution:

- The bank decided to outsource the job to IBM's Global Services.
- Together, CIBC & IBM were able to implement home banking in 6 months.

Results:

- By 1998 the bank regained market share, having 200,000 online clients.

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Outsourcing Recommendations

(e.g., Marcolin and McLellan, 1998)

- *Write short-period contracts.*
  Outsourcing contracts are often written for five- to ten-year terms. Because IT changes so rapidly, it is very possible that some of the terms will not be in the customer's best interests after five years.
- *Subcontracting.*
  Vendors may subcontract some services to other vendors. The contract should give the customer some control over the circumstances, e.g. choice of vendors.
- *Selective outsourcing.*
  This is a strategy used by many corporations who prefer not to outsource the majority of their IT (like Kodak), but rather to outsource certain areas (such as connectivity or network security).

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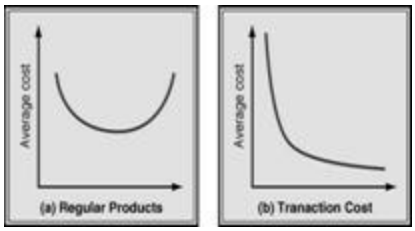
Digital vs. Non-digital Products



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Justifying Web-based Systems

- The justification of EC application can be difficult and usually one needs to prepare a *business case*.
  - The purpose of the *business case* is not merely to justify an investment to the corporate leadership, but to develop the baseline of desired results.
  - This can be used to judge and measure the actual performance.
- The benefit and costs of EC depend on its definitions.
  - But even when the applications are defined, we still have measurement complexities.
- Tjan (2001) suggests conducting an Internet portfolio planning analysis to identify appropriate EC applications.
  - Using matrices, it is possible to find the *fit* of each project with the organizational objectives and the *viability* (potential payoff).

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Intranet & Extranet Returns on Investment

- Kinko's Inc.

  This copying and small-business-support retail chain, created an intranet document distribution and repository for information directed at its 900 retail branches.

  The intranet application resulted in savings of $500,000 per year in reduced paper, printing, and postage expenses. These savings gave the company a 50 percent ROI on the project.

- Heineken USA Inc.

  This beer company deployed an inventory-forecasting & sales extranet application to its network of 450 distributors.

  The application, apart from bringing significant savings from a reduction in manual data entry and paper shuffling, has also contributed to shrinking order-cycle time and facilitating better inventory planning.

IT Failures

The following definitions indicate the range of possibilities for the various types of IT failures:

Outright failure. The system is never completed, and little or nothing is salvaged from the project.

Abandoned. The system is completed, including some or all of the originally specified features, but either it is never used or usage stops after a short period.

Scaled down. The system is completed and used, but lacks much of the functionality of the original specifications.

Runaway. The project requires much more money and time than planned, regardless of whether it is ever completed or used.

Case: Denver International Airport

- The Denver International Airport (DIA), at 53 square miles, was designed to be the largest U.S. airport.
- By 1992, it was recognized that baggage handling would be critically important.
- BAE Automated Systems, Inc., a world leader in the design and implementation of material handling systems, was commissioned to develop an IT-based baggage handling system.
- Problems with the baggage system, however, kept the new airport from opening as originally scheduled in October 1993.
- By the time the airport opened in late February 1995, it was 16 months behind schedule and close to $2 billion over budget.

Managing Development Risks

Liebowitz (1999) identified the following suggestions for managing development risks;

- All phases of development must be carefully planned out at the beginning of the project.
- Fear of failure of developing innovative IS projects has inhibited the creation and successful use of IS projects.
- The user interface (and user reporting) design is a critical element in gaining acceptance of an information system.
- Accuracy and timeliness of information affects the level of confidence that the users and managers have in the information system.
- All interested parties including senior IS managers should be actively involved throughout all phases of the system development.

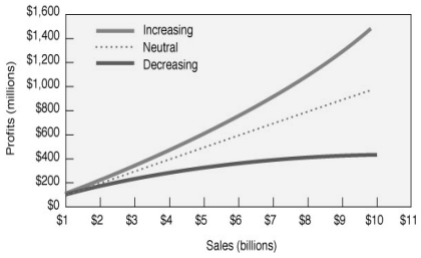
The New Economics of IT

- The WWW resembles commercial broadcasting in its early days.
- The market is large—at least one-half of the population of the United States, plus foreign markets, now have access to the Internet—and it is growing rapidly.

The New Economics of IT (cont.)

- The Web is also different from broadcasting in ways that increase its economic potential.
  - ✓ At present, typical Web users have above-average incomes and education.
  - ✓ Users can view most Web content at any time, rather than just at the scheduled times of broadcast programs.
  - ✓ The Web can reach smaller, very specialized "niche" markets better than the mass media.

Increasing & Decreasing Returns



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Managing Increased Returns

Arthur (1996) suggests the following management strategies for increased returns:

- ***Build up a large customer base through low prices.***
  e.g., Netscape allows individual consumers (as opposed to organizations) to download its Web browser at no charge.
- ***Encourage development of complementary products.***
  e.g. Novell provided support and assistance for developers to create applications or modify existing applications to run on its network operating system.
- ***Use "linking and leveraging."***
  In addition to encouraging outside suppliers, firms can acquire or internally develop products that complement existing products.

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Management Issues

- ✓ ***Constant growth and change.***
  Managers need to continuously monitor developments in IT to identify new technologies relevant to their organizations.
- ✓ ***Shift from tangible to intangible benefits.***
  The economic justification of IT applications will increasingly depend on intangible benefits.

- ✓ ***Not a sure thing.***
  Although IT offers opportunities for significant improvements in organizational performance, these benefits are not automatic.

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Management Issues

- ✓ ***Chargeback.***
  Users have little incentive to control IT costs if they do not have to pay for them.
- ✓ ***Outsourcing.***
  The complexities of managing IT, and the inherent risks, may require more management skills than some organizations possess.
- ✓ ***Risk.***
  Investments in IT are inherently more risky than investments in other areas.
- ✓ ***Increasing returns.***
  Industries whose primary focus is IT, or that include large amounts of IT in their products, often operate under a paradigm of increasing returns.