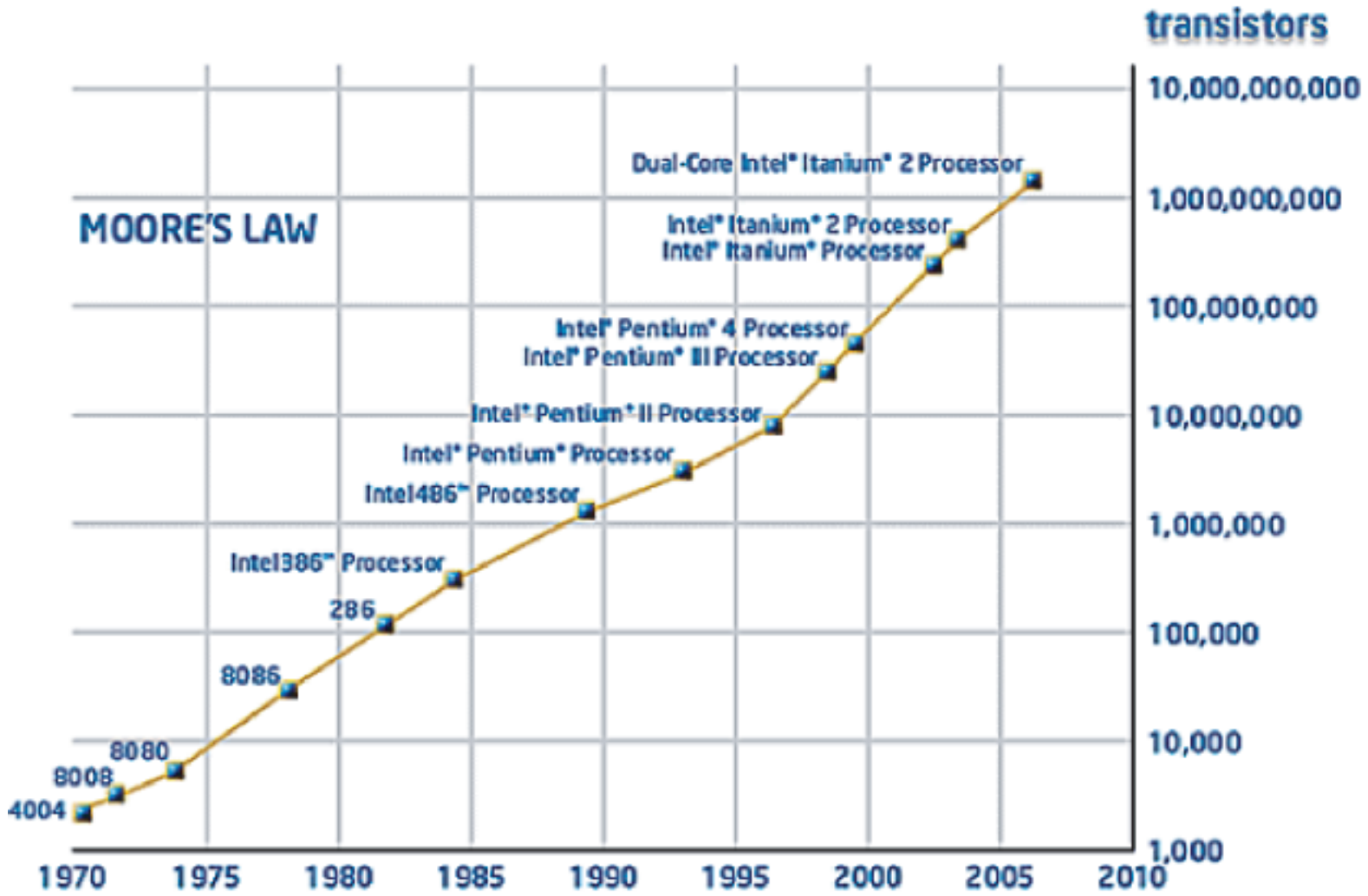
Information Technology Economics

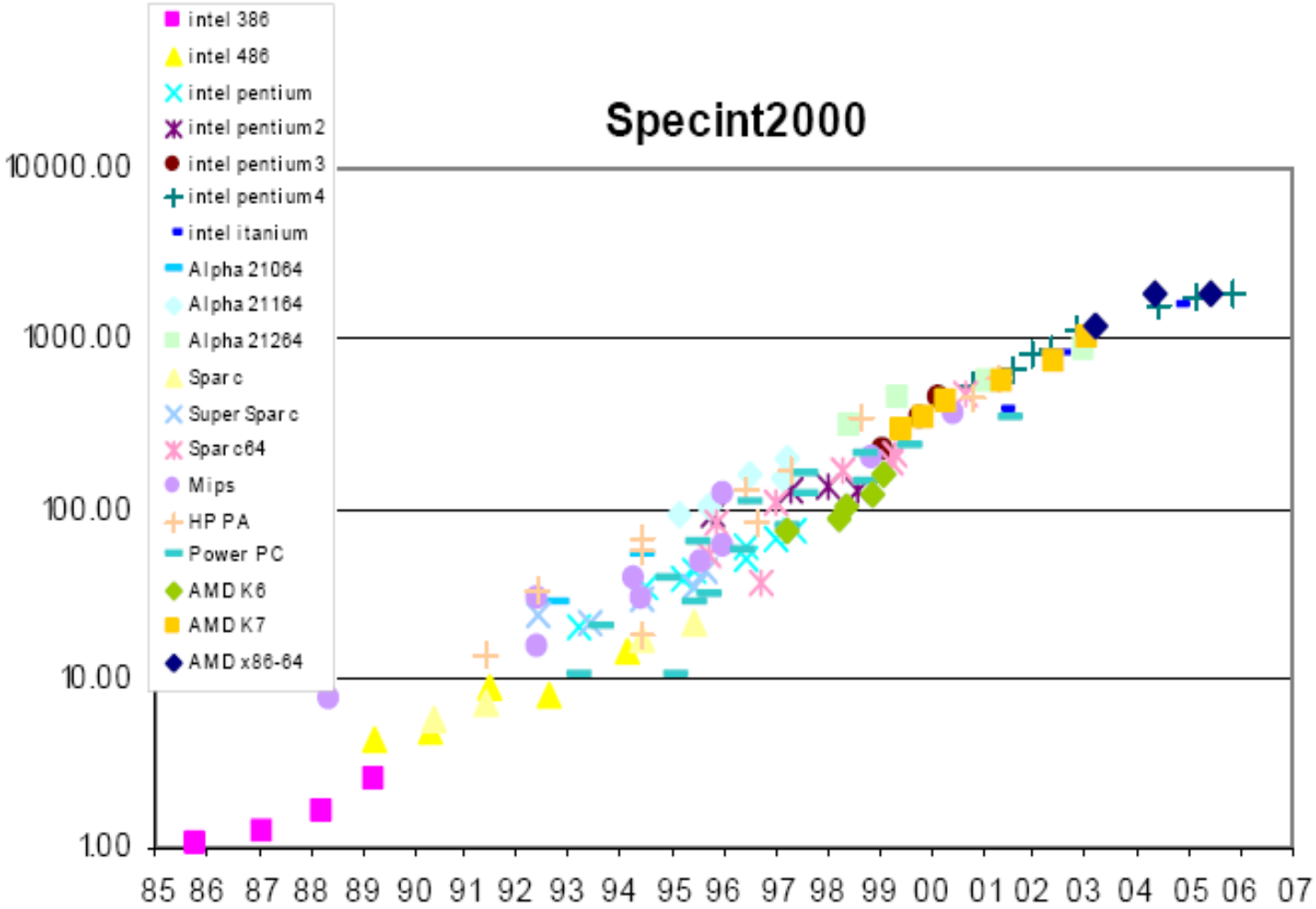
Learning Objectives

- Identify the major aspects of the economics of information technology.
- Explain and evaluate the productivity paradox.
- Describe approaches for evaluating IT investment and explain why is it difficult to do it.
- Explain the nature of intangible benefits and the approaches to deal with it.
- List and briefly describe the traditional and modern methods of justifying IT investment.

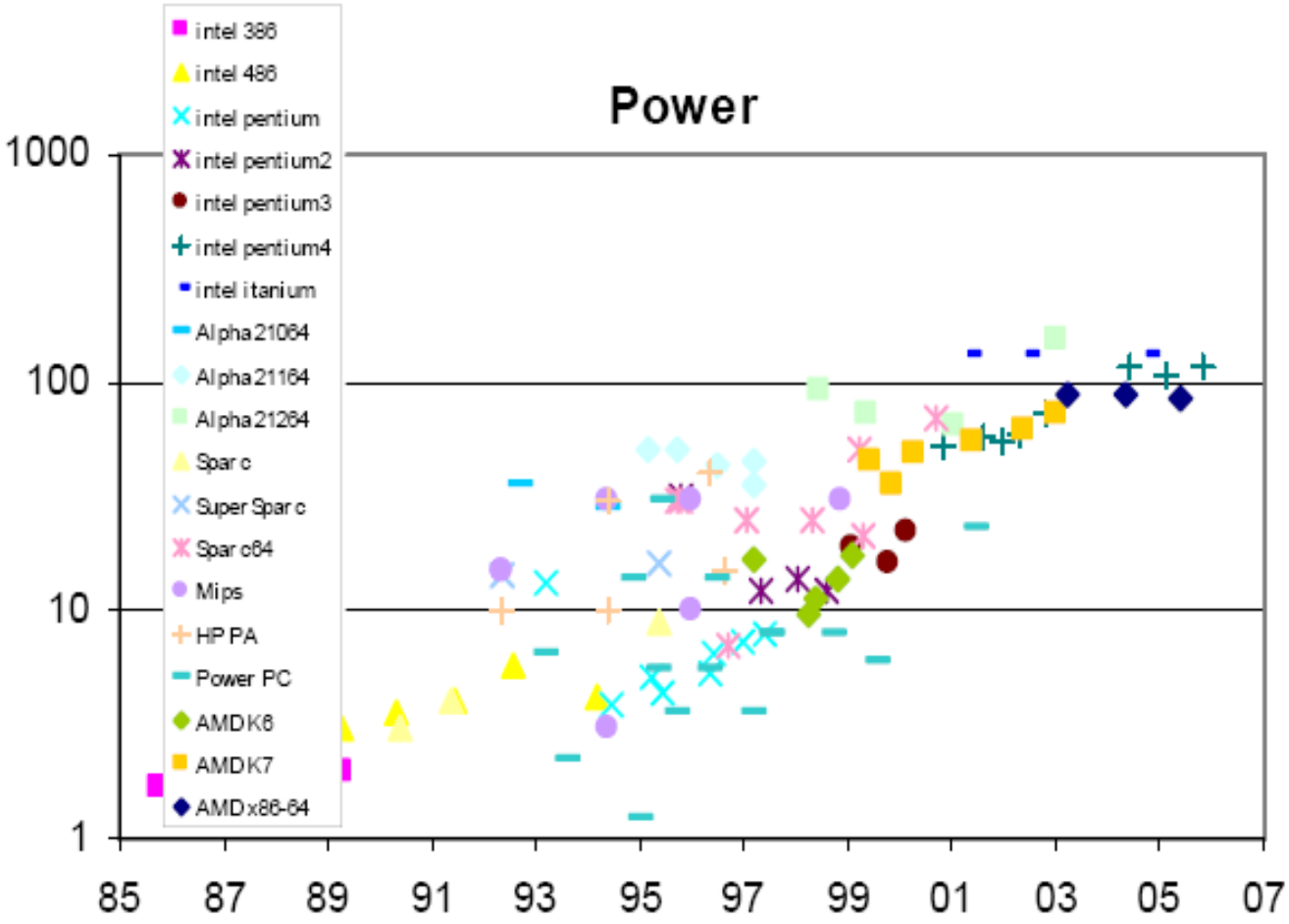
Moore's Law


transistors
10,000,000,000
1,000,000,000
100,000,000
10,000,000
1,000,000
100,000
10,000
1,000
MOORE'S LAW
Dual-Core Intel® Itanium® 2 Processor
Intel® Itanium® 2 Processor
Intel® Itanium® Processor
Intel® Pentium® 4 Processor
Intel® Pentium® III Processor
Intel® Pentium® II Processor
Intel® Pentium® Processor
Intel486™ Processor
Intel386™ Processor
286
8086
8080
8008
4004
1970
1975
1980
1985
1990
1995
2000
2005
2010

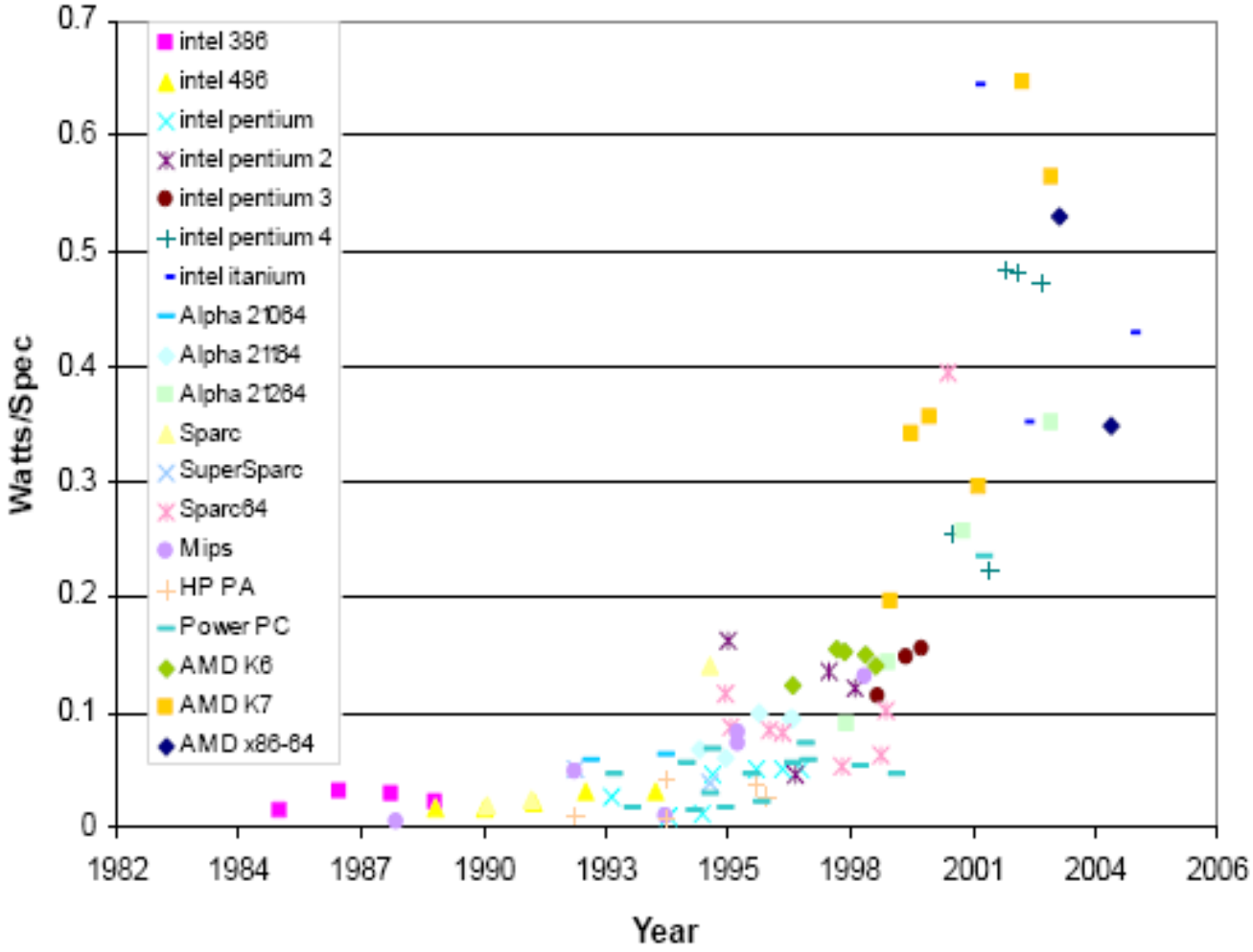
Uniprocessors: performance



Power consumption (W)

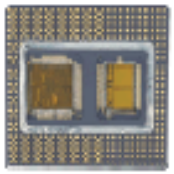


Efficiency (power/performance)



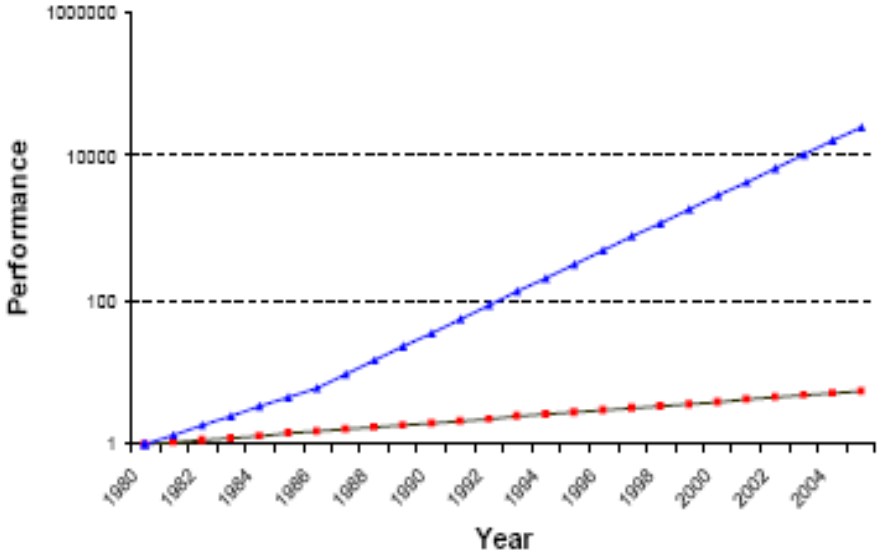
Access latency to DRAM

- Access time correlated to the speed of light
- Memory technologies are changing:
  - SRAM not easily scalable
  - DRAM does not have the best cost/bit anymore
- Efficiency problem in terms of power consumption



µProc
60%/yr.
(2X/1.5yr)

DRAM
9%/yr.
(2X/10 yrs)



Decreasing returns on investment

- ’80s: expansion of superscalar processors
  - Improvement of 50% in performance
  - Transistors used to create implicit parallelism
    - Pipelined Processors (10 CPI a 1 CPI)
- ’90s: era of decreasing returns
  - Exploit at best the implicit parallelism
    - Issue from 2 to 6 ways, issue out-of-order, branch prediction (from 1 CPI to 0.5 CPI)
    - Performance below expectations
    - Delayed and cancelled projects
- 2000: beginning of the multicore era
  - Explicit Parallelism

Productivity paradox

- Very hard to demonstrate at the level of national economy, that IT investments really increased productivity.
  - Data and analysis problems hide productivity gains
  - IT productivity gains are offset by losses in other areas or by IT costs or losses
- Factors that could reduce IT productivity
  - Support costs
  - Wasted time
  - Software problems

Value of Information - Evaluating

One measurement of the benefit of an investment is the value of the information provided. The value of information is the difference between the net benefits (benefits adjusted for costs) of decisions made using information and the net benefits of decisions made without information.

Value of information = Net benefits withinformation - Net benefits without information

Investment types

- Transformation: core infrastructure
- Renewal: opportunity to reduce cost or raise quality
- Process improvement: opportunity to improve operational performance
- Experiments: new technologies

Traditional evaluation of IT investment

- ✓ Return on Investment
  - ➢ Measures the effectiveness of management in generating profits with the available assets
- ✓ NPV
  - ➢ Compares the total value of the benefits with the associated costs
  - ➢ Works well in situations where the costs and benefits are well defined (tangible) so that they can be converted into monetary value
- ✓ IRR
- ✓ Payback period

Cost-Benefits Analyses - Evaluating

TABLE 14.2 IT Investment Opportunities Matrix

Type of Investment	Example	Comments	Upside Benefits	Probability of Return
Infrastructure	Wide area network	Support current business—may allow for future investments	Little itself, but allows new programs	.2 to 1.0 (.5)
Required—(compliance), managerial control	OSHA, SOX reporting system, budgets	Usually a cost of doing business	SOX compliance may generate benefits	0 to .5 (.2)
No other way to do the job	Computerized reservations system, air traffic control	Enable new task or process, provide better customer service, new products	Could gain more than forecast	.5 to 1.0 (.75)
Direct return from IT	Merrill Lynch, Chrysler	Structure, cost-benefit, and NPV appropriate	A little if you can build on the investment	.7 to 1.0 (.9)
Indirect returns	CRS in travel agencies	Potential for considerable return, but indirect benefits hard to estimate	Could be substantial future benefits	0 to 1.0 (.5)
Competitive necessity	Bank ATMs, much EDI, electronic commerce	Need the system to compete in the business; what is the cost of not investing in technology?	Very little if you are following the industry	0 to 1.0 (.2)
Strategic application	Baxter, Merrill Lynch CMA	High risk–high potential; may be able to estimate return only after implementation	A high potential	0 to 1.0 (.5)
Transformational IT	Virtual organizations, Oticon	Must be combined with changes in management philosophy; good for fast-response organization—risky to change structure, but high potential rewards	A high potential	0 to 1.0 (.5)

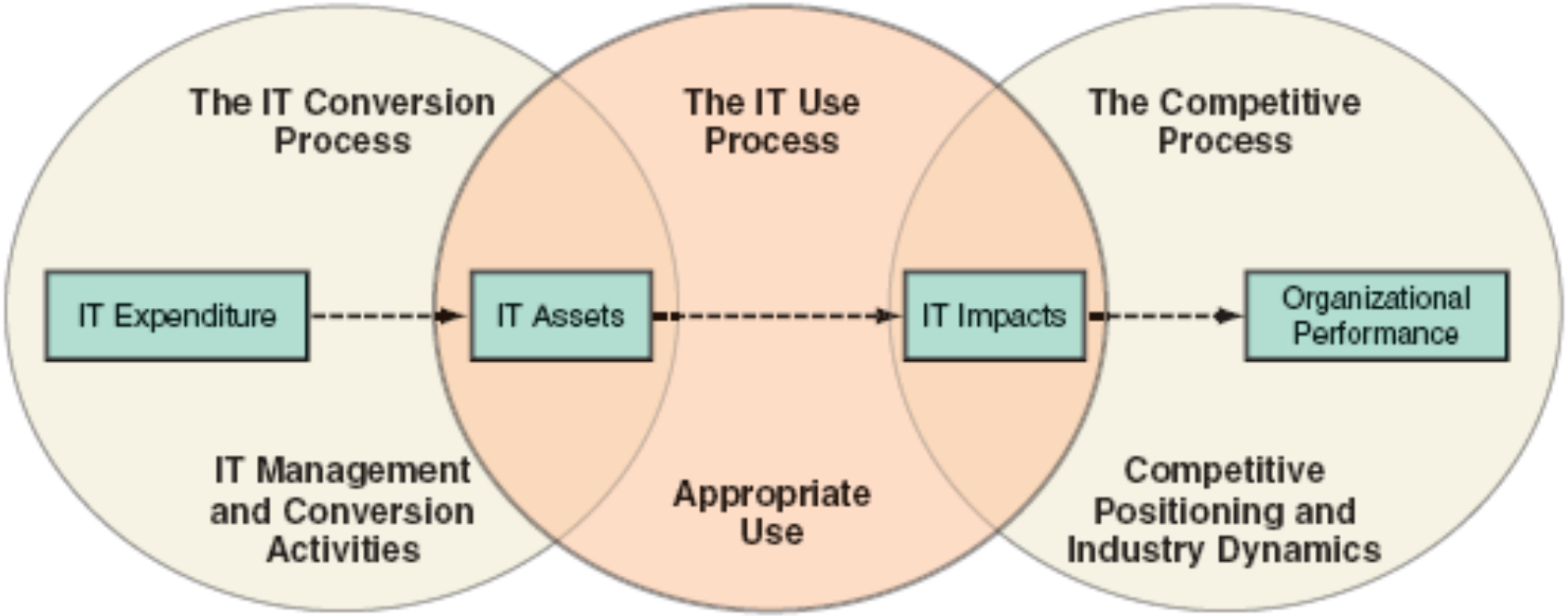
"Costing" IT Investments - Evaluating

- Placing a dollar value on the cost of IT investments is not a simple task. One of the major issues is to allocate fixed costs among different IT projects. Fixed costs are those costs that remain the same in total regardless of change in the activity level.
- Another area of concern is the Life Cycle Cost; costs for keeping it running, dealing with bugs, and for improving and changing the system. Such costs can accumulate over many years, and sometimes they are not even anticipated when the investment is made.
- There are multiple kinds of values (tangible and intangible)
  - improved efficiency
  - improved customer relations
  - the return of a capital investment measured in dollars or percentage
  - *many more …*
- Probability of obtaining a return depends on probability of implementation success

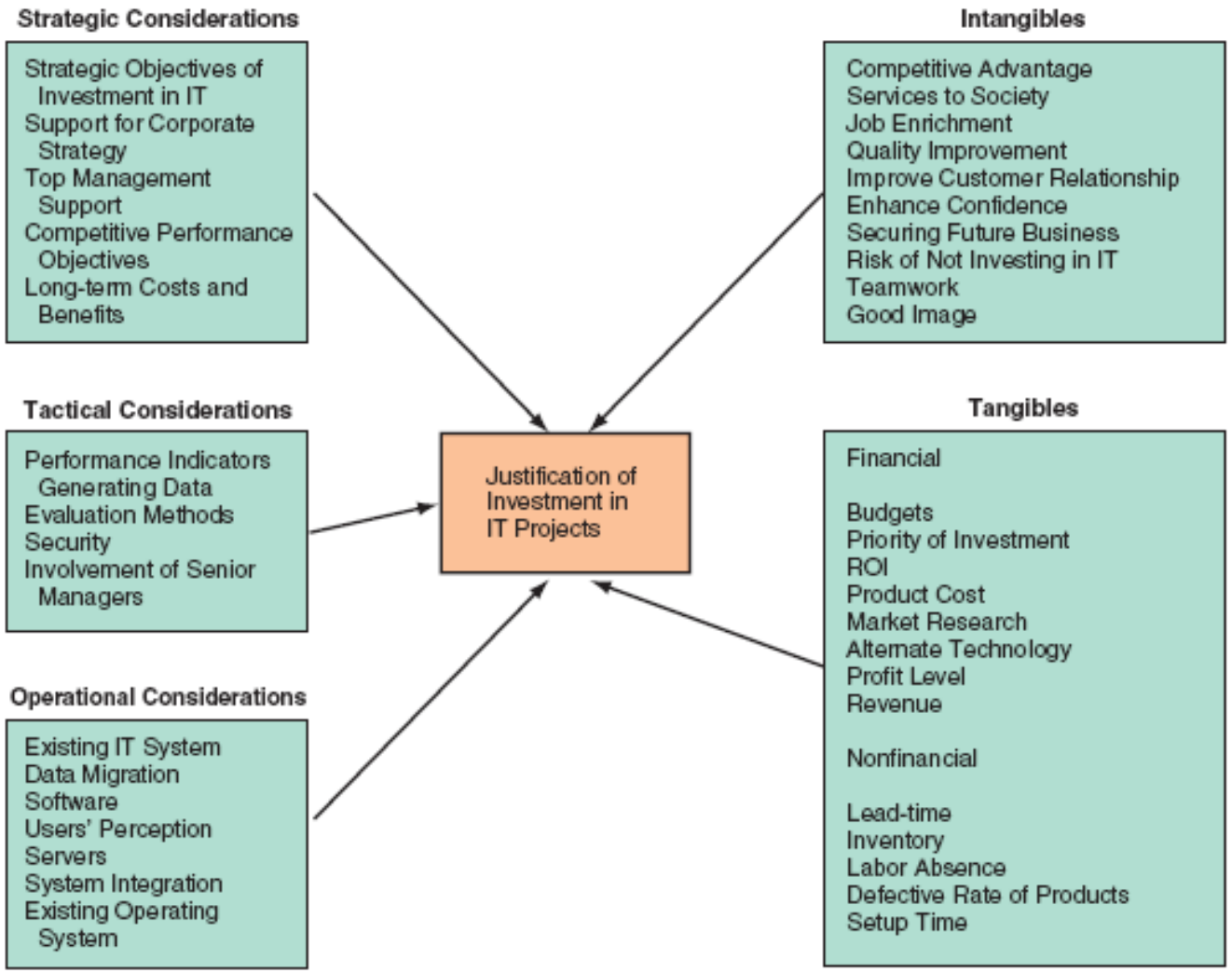
Intangible Benefits
Sawhney's Method of Handling

- **Think broadly and softly.**
  - Supplement hard financial metrics with soft ones
- **Pay your freight first.**
  - Think carefully about short-term benefits that can "pay the freight" for the initial investment in the project.
- **Follow the unanticipated.**
  - Keep an open mind about where the payoff from IT and e-business projects may come from

Specific Evaluation Methods



Specific Evaluation Methods (Continued)



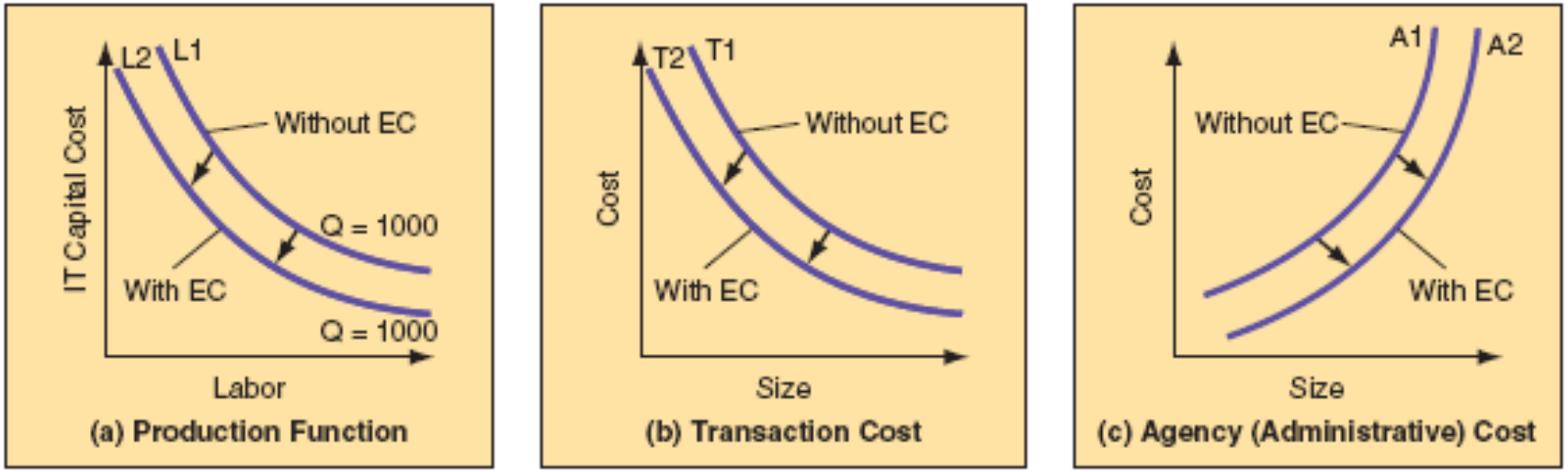
"Costing" IT – Economic Strategies

TABLE 14.3 Methods for Evaluating IT Investments

- **Value analysis.** With the value analysis method, the organization evaluates intangible benefits using a low-cost, trial EC system before deciding whether to commit to a larger investment in a complete system.
- **Information economics.** Using the idea of critical success factors, this method focuses on key organizational objectives and potential impacts of the proposed EC project on those objectives.
- **Scoring methodology.** This method assigns weights and scores to various aspects of the evaluated project and then calculates a total score. Information economics methods are used to determine the aspects to include in the scoring.
- **Benchmarks.** This method is appropriate for evaluating EC infrastructure. Using industry standards, for example, the organization can determine what the industry is spending on e-CRM. Then the organization can decide how much it should spend. Benchmarks may be industry metrics or best practices recommended by professional associations or consultants.
- **Management by maxim.** An organization may use this method to determine how much it should invest in large EC (and IT) infrastructures. It is basically a combination of brainstorming and consensus-reaching methodologies.
- **Real-options valuation.** This is a fairly complex assessment method, and used only infrequently. It can be fairly accurate in certain situations. The idea behind this method is to look at future opportunities that may result from the EC investment and then place monetary values on them.
- **Balanced scorecard.** This method evaluates the health or performance of the organization by looking at a broad set of factors, not just financial ones. It is becoming a popular tool for assessing EC projects (see Chapter 11).
- **Performance dashboard.** This is a variant of the balanced scorecard that is widely used in e-business situations. A dashboard is a single view that provides the status of multiple metrics (see Chapter 11).
- **Activity-based costing.** This managerial accounting concept was adapted for assessing EC investments in recent years and has been proven to be fairly successful.

Unfortunately, none of these methods is perfect or universal. Therefore, one needs to look at the advantages and disadvantages of each, which vary according to the specific situation.

Economic Potential of IT



Web-based Systems – Economic Strategies

Web-based systems can considerably increase productivity and profitability. However, the justification of EC applications can be difficult. Usually one needs to prepare a business case that develops the baseline of desired results, against which actual performance can and should be measured. The business case should also cover both the financial and non-financial performance metrics against which to measure the e-business implementation and success.

Most decisions to invest in Web-based systems are based on the assumption that the investments are needed for strategic reasons and that the expected returns cannot be measured in monetary values.

Failures

Information technology is difficult to manage and can be costly when things do not go as planned. A high proportion of IS development projects either fail completely or fail to meet some of the original targets for features, development time, or cost. Many of these are related to economic issues, such as an incorrect cost-benefit analysis.

The economics of software production suggest that, for relatively standardized systems, purchasing or leasing can result in both cost savings and increased functionality. Purchasing or leasing can also be the safest strategy for very large and complex systems.

Managerial Issues

- Constant growth and change.
- Shift from tangible to intangible benefits.
- Not a sure thing.
- Chargeback.
- Risk.
- Outsourcing.
- Increasing returns.