

Management Information Systems

B13. Information Technology Economics



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- Course: Management Information Systems
- Period: Spring 2013
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- 02. Information Technologies: Concepts and Management

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Learning Objectives

- 01. Identify the major aspects of the economics of information technology.
- 02. Explain and evaluate the productivity paradox.
- 03. Describe approaches for evaluating IT investment and explain why is it difficult to do it.
- 04. Explain the nature of intangible benefits and the approaches to deal with it.
- 05. List and briefly describe the traditional and modern methods of justifying IT investment.
- 06. Identify the advantages and disadvantages of approaches to charging end users for IT services (chargeback).
- 07. Identify the advantages and disadvantages of outsourcing.
- 08. Describe the economic impact of EC.
- 09. Describe economic issues related to Web-based technologies including e-commerce.



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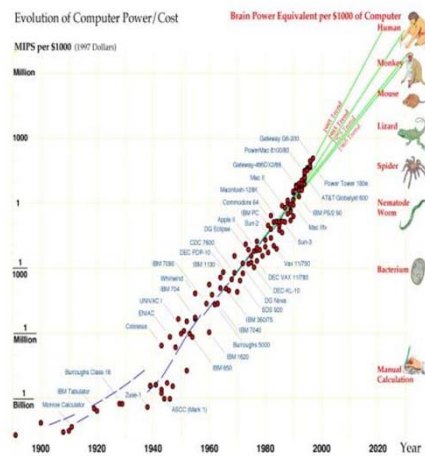
Learning Objectives

- 10. Describe causes of systems development failures, the theory of increasing returns, and market transformation through new technologies.



01. Computing Power Measurement

- Computing Power vs. Benefits
 - What does growth in computing power mean in economic terms?
 - 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.



01. Computing Power Measurement

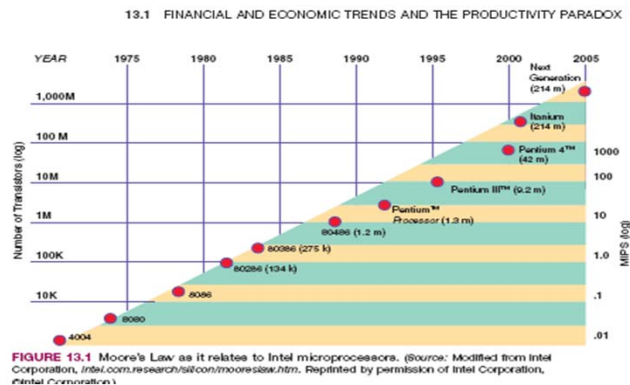
- Evaluation
 - What is the payoff from IT investments?
 - How can it be measured?
- Evaluate
 - Productivity
 - Benefits
 - Costs
 - Other economic aspects of information technology



<http://216.54.19.111>

01. Computing Power Measurement

- Moore's Law



01. Computing Power Measurement

- Productivity
 - Productivity is a ratio that measures outputs versus inputs. It is calculated by dividing outputs by inputs.
 - On a company by company basis major benefits from information technology investments have been shown.
 - However, it is very hard to demonstrate, at the level of a national economy, that the IT investments really have increased outputs or decreased inputs.
 - The discrepancy between measures of investment in information technology and measures of output at the national level has been called the productivity paradox.



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01. Computing Power Measurement

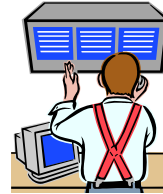
- Possible Explanations of the Paradox
 - Problems with data or analyses hide productivity gains from IT.
 - Gains from IT are offset by losses in other areas.
 - IT productivity gains are offset by IT costs or losses.



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02. Evaluating IT Investment

- IT Investment Categories
 - Distinguishing between investments in infrastructure and investments in specific applications will assist the analysis.
 - IT infrastructure provides the foundations for IT applications in the enterprise (data center, networks, data warehouse, and knowledge base) and are long-term investments shared by many applications throughout the enterprise.
 - IT applications are specific systems and programs for achieving certain (payroll, inventory control, order taking) objectives and can be shared by several departments, which makes evaluation of their costs and benefits complex.



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02. Evaluating IT Investment

- Evaluating IT Investments
 - 1) Value of information in decision making
 - 2) Traditional cost-benefit analysis
 - 3) Costing IT investments
 - 4) Intangible benefits
 - 5) Business case approach



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02. Evaluating IT Investment

- 1) Value of Information in Decision Making
 - 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.

$$\text{Value of Information} = \text{Net Benefits with information} - \text{Net Benefits without information}$$

It is generally assumed that systems that provide relevant information to support decision making will result in better decisions, and therefore they will contribute toward the return on investment. However, this may not always be the case.

02. Evaluating IT Investment

- 2) Traditional Cost-Benefit Analysis
 - Capital investment decisions can also be analyzed by cost-benefit analyses, which compare the total value of the benefits with the associated costs.

Method	Advantages	Disadvantages
Internal rate of return (IRR)	Brings all projects to common footing. Conceptually familiar.	Assumes reinvestment at same rate. Can have multiple roots. No assumed discount rate.
Net present value or net worth (NPV or NW)	Very common. Maximizes value for unconstrained project selection.	Difficult to compare projects of unequal lives or sizes.
Equivalent annuity (EA)	Brings all project NPVs to common footing. Convenient annual figure.	Assumes projects repeat to least common multiple of lives, or imputes salvage value.
Payback period	May be discounted or non-discounted. Measure of exposure.	Ignores flows after payback is reached. Assumes standard project cash flow profile.
Benefit-to-cost ratio	Conceptually familiar. Brings all projects to common footing.	May be difficult to classify outlays between expense and investment.

02. Evaluating IT Investment

- 2) Traditional Cost-Benefit Analysis
 - Traditional tools used to evaluate capital investment decisions are net present value and return on investment.
 - In net present value (NPV) calculations analysts convert future values of benefits to their present-value equivalent by discounting them at the organization's cost of funds. They then compare the present value of the future benefits to the cost required to achieve those benefits.
 - Return on investment (ROI) measures the effectiveness of management in generating profits with its available assets (the higher the better). It is calculated by dividing net income attributable to a project by the average assets invested in the project.



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02. Evaluating IT Investment

- 3) Costing IT Investments
 - 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.



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02. Evaluating IT Investment

- 3) Costing IT Investments
 - 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.
 - Probability of obtaining a return depends on probability of implementation success



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02. Evaluating IT Investment

- 3) Costing IT Investments
 - 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 ...



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02. Evaluating IT Investment

- 4) Intangible Benefits
 - IT projects generate intangible benefits such as increased quality, faster product development, greater design flexibility, better customer service, or improved working conditions for employees.
 - These are very desirable benefits, but it is difficult to quantify them with a monetary value.
 - Intangible benefits can be very complex and substantial.



02. Evaluating IT Investment

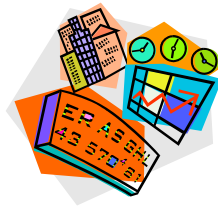
- 4) Intangible Benefits
 - Evaluating intangible benefits
 - Make rough estimates of monetary values for all intangible benefits, and then conduct a NVP or similar financial analysis.
 - Scoring matrix or scorecard

			BUILD	BUILD	BUY	BUY
	Factors	Weight	Score	Wt-avg Score	Score	Wt. Avg Score
3	Processing Speed	0.50	4	2.00	2	1.00
4	DB ease of retrieval	0.10	3	0.30	5	0.50
5	Maintenance	0.25	1	0.25	3	0.75
6	Customer Satisfaction	0.10	5	0.50	1	0.10
7	Supplier Satisfaction	0.05	5	0.25	1	0.05
8		1.00		3.30		2.40
9						
10						
11						
12						
13						

These scores are subjective.

02. Evaluating IT Investment

- 4) 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



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02. Evaluating IT Investment

- 5) Business Case Approach
 - One method used to justify investments in projects is referred to as the business case approach.
 - A business case is a written document used by managers to garner funding for specific applications or projects.
 - Its major emphasis is the justification for the required investment.
 - It also provides the bridge between the initial plan and its execution by incorporating the foundation for tactical decision making and technology risk management.



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02. Evaluating IT Investment

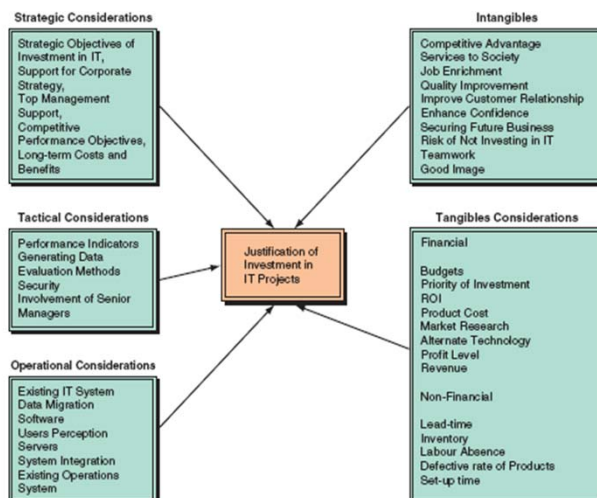
- 5) Business Case Approach
 - Business case helps to
 - Clarify how the organization will use its resources
 - Justify the investment
 - Manage the risk
 - Determine the fit of an IT project with the organization's mission



02. Evaluating IT Investment

- 5) Business Case Approach
 - Investment justification

Information Technology for Management, Ed. 5, Etraim Turban et al., Wiley



03. Evaluating and Justifying IT Investment

- Evaluating and Justifying IT Investment
 - IT investment pose different problems from traditional capital investment decisions.
 - However, even though the relationship between intangible IT benefits and performance is not clear, some investments should be better than others.



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03. Evaluating and Justifying IT Investment

- Evaluating and Justifying IT Investment
 - Appraisal methods are categorized into the following four types.
 - Financial (NPV & ROI) methods consider only impacts that can be monetary-valued. They focus on incoming and outgoing cash flows.
 - Multicriteria (information economics and value analysis) appraisal methods consider both financial impacts and non-financial impacts that cannot be expressed in monetary terms. These methods employ quantitative and qualitative decision-making techniques.
 - Ratio (IT expenditures vs. total turnover) methods use several ratios to assist in IT investment evaluation.
 - Portfolio methods apply portfolios (or grids) to plot several investment proposals against decision-making criteria.



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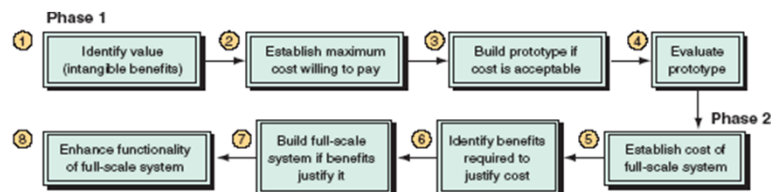
03. Evaluating and Justifying IT Investment

- Total Cost of Ownership (TCO)
 - It is a formula for calculating the cost of owning, operating, and controlling an IT system.
 - The cost includes:
 - Acquisition cost (hardware and software)
 - Operations cost (maintenance, training, operations, ...)
 - Control cost (standardization, security, central services)



03. Evaluating and Justifying IT Investment

- Value Analysis Method
 - It evaluates intangible benefits on a low-cost, trial basis before deciding whether to commit to a larger investment in a complete system.



03. Evaluating and Justifying IT Investment

- Information Economics
 - It is an approach that focuses on key organizational objectives, including intangible benefits. Information economics incorporates the familiar technique of scoring methodologies, which are used in many evaluation situations.
 - A scoring methodology evaluates alternatives by assigning weights and scores to various aspects and then calculating the weighted totals. The analyst
 - 1) Identifies all the key performance issues
 - 2) Assigns a weight to each one
 - 3) Each alternative in the evaluation receives a score on each factor, usually between 0 and 100 points, or between 0 and 10.
 - 4) These scores are multiplied by the weighting factors and then totaled. The alternative with the highest score is judged the best.



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03. Evaluating and Justifying IT Investment

- Infrastructure Investment Decisions
 - It is much more difficult to evaluate infrastructure investment decisions than investments in specific IS application projects.
 - Since many of the infrastructure benefits are intangible and are applicable to different present and future applications.



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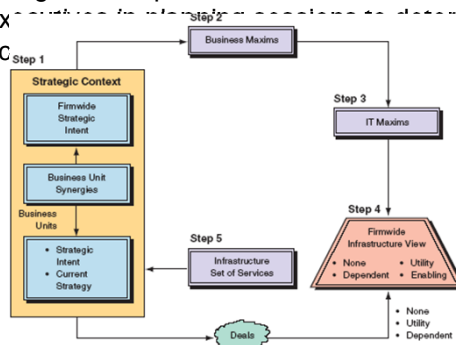
03. Evaluating and Justifying IT Investment

- Infrastructure Investment Decisions
 - Benchmarks - objective measures of performance.
 - These measures are often available from trade associations or annual statement analyses.
 - Metric benchmarks provide numeric measures of performance, for example:
 - IT expenses as percent of total revenues
 - Percent of downtime (time when the computer is unavailable)
 - CPU usage as a percentage of total capacity
 - Percentage of IS projects completed on time and within budget.
 - Best-practice benchmarks emphasis is on how information system activities are actually performed rather than on numeric measures of performance.



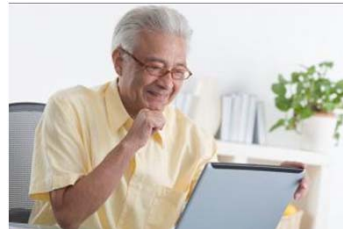
03. Evaluating and Justifying IT Investment

- Infrastructure Investment Decisions
 - Management by maxim
 - It brings together corporate executives, business-unit managers, and IT executives to determine appropriate infrastructure investments.



03. Evaluating and Justifying IT Investment

- Real Option Valuation of IT Investment
 - A new approach for evaluating IT investments is to recognize that they can increase an organization's performance in the future.
 - Instead of using only traditional measures like NPV to make capital decisions, financial managers look for opportunities that may be embedded in capital projects.
 - These opportunities, if taken, will enable the organization to alter future cash flows in a way that will increase profitability.
 - These opportunities are called real options.



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03. Evaluating and Justifying IT Investment

- Real Option Valuation of IT Investment
 - Common types of real options include:
 - The option to expand a project (so as to capture additional cash flows from such growth)
 - The option to terminate a project that is doing poorly (in order to minimize loss on the project)
 - The option to accelerate or delay a project.



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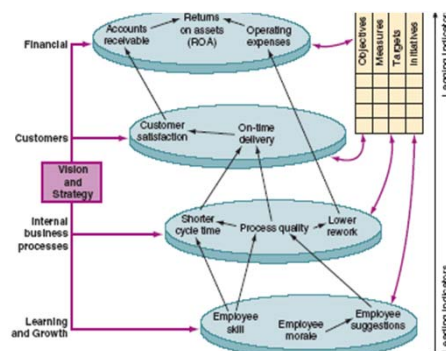
03. Evaluating and Justifying IT Investment

- Balanced Scorecard Method
 - It evaluates the overall health of organizations and projects. It advocates that managers focus not only on short-term financial results, but also on four other areas:
 - Finance, including both short- and long-term measures
 - Customers (how customers view the organization)
 - Internal business processes (finding areas in which to excel)
 - Learning and growth (the ability to change and expand)



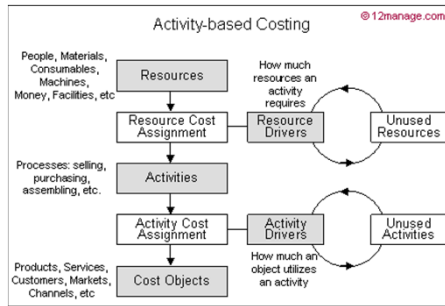
03. Evaluating and Justifying IT Investment

- Balanced Scorecard Method
 - Logics of balanced scorecard method



03. Evaluating and Justifying IT Investment

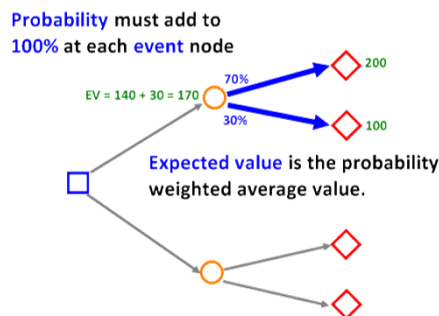
- Activity-Based Costing (ABC)
 - It views the value chain and assigns costs and benefits based on the activities.



<http://www.12manage.com>

03. Evaluating and Justifying IT Investment

- Expected Value (EV)
 - It evaluates possible future benefits by multiplying the size of the benefit by the probability of its occurrence.



<http://cbrownley.wordpress.com>

04. IT Economic Strategies

- IT Economic Strategies
 - In addition to identifying and evaluating the benefits of IT, firms need to account (track) for its costs.
 - Accounting systems should provide an accurate measure of total IT costs for management control.
 - Second, users should be charged for shared IT investments and services in a manner that is consistent with the achievement of organizational goals.



<http://www.cakex.org>

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04. IT Economic Strategies

- Chargeback
 - All expenses go into an overhead account.
 - With this approach IT is “free” and has no explicit cost, so there are no incentives to control usage or avoid waste.
 - Cost recovery is an approach where all IT costs are allocated to users as accurately as possible, based on actual costs and usage levels.
 - Behavior-oriented chargeback system sets IT service costs in a way that meets organizational objectives, even though the charges may not correspond to actual costs.



<http://www.dromengine.com>

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04. IT Economic Strategies

- Outsourcing
 - Strategy for obtaining the economic benefits of IT and controlling its costs by obtaining IT services from outside vendors rather than from internal IS units within the organization.

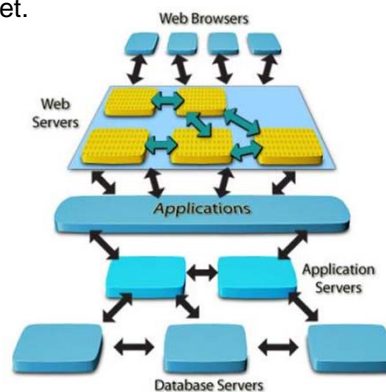


Information Technology for Management, Ed. 5, Efraim Turban et al., Wiley

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04. IT Economic Strategies

- Outsourcing
 - Offshore outsourcing of software development
 - ASPs and utility computing
 - Application service provider (ASP) manages and distributes software-based services and solutions from a central, off-site data center, via the Internet.

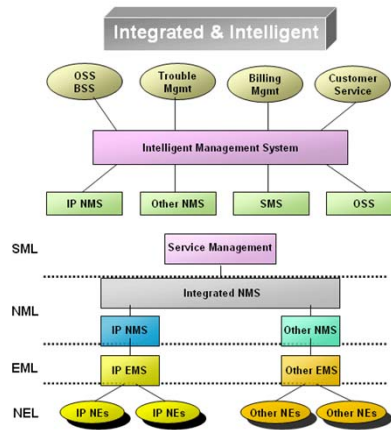


<http://www.open.ac.uk>

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04. IT Economic Strategies

- Outsourcing
 - Offshore outsourcing of software development
 - Management service provider (MSP)
 - MSP is a vendor that remotely manages and monitors enterprise applications.



<http://www.opentel.co.kr>

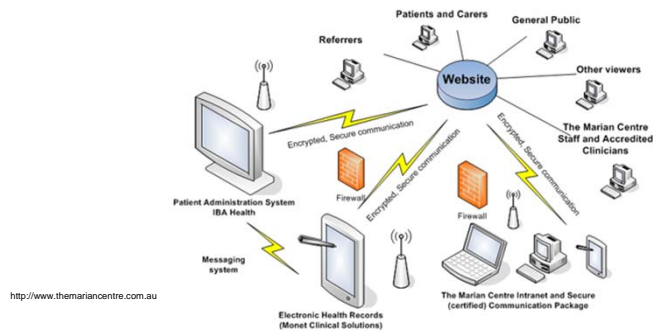
04. IT Economic Strategies

- Outsourcing
 - Potentials of outsourcing benefits

- FINANCIAL**
- Avoidance of heavy capital investment, thereby releasing funds for other uses.
 - Improved cash flow and cost accountability.
 - Cost benefits from economies of scale and from sharing computer housing, hardware, software, and personnel.
 - Less need for expensive office space.
- TECHNICAL**
- Access to new information technologies.
 - Greater freedom to choose software due to a wider range of hardware.
 - Ability to achieve technological improvements more easily.
 - Greater access to technical skills.
 - Faster application development.
- MANAGEMENT**
- Concentration on developing and running core business activity.
 - Delegation of IT development (design, production, and acquisition) and operational responsibility to supplier.
 - Elimination of need to recruit and retain competent IT staff.
- HUMAN RESOURCES**
- Opportunity to draw on specialist skills, available from a pool of expertise, when needed.
 - Enriched career development and opportunities for staff.
- QUALITY**
- Clearly defined *service levels* (see Chapter 15).
 - Improved performance accountability.
 - Quality accreditation.
- FLEXIBILITY**
- Quick response to business demands.
 - Ability to handle IT peaks and valleys more effectively.

05. Web-based Systems

- Web-based Systems
 - 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.



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05. Web-based Systems

- Web-based Systems
 - 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.



<http://www.ravica.com>

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06. IT Failures

- 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.



<http://www.gensight.com>

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06. IT Failures

- Failures
 - 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.
 - Irrespective of the potential for failure IT has the potential to completely transform the economics of an industry.



<http://www.gmptrainingsystems.com>

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