IMS9043 – IT in Organisations

IT and Economics

Learning Objectives

• Identify the major aspects of the economics of information technology.
• Explain the “productivity paradox.”
• Demonstrate how to define and measure tangible information technology benefits.
• Show how to evaluate intangible information technology benefits.

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.

Explaining the Productivity Paradox

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

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

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.

Information Technology Economics

• this is an extremely complex area theoretically and practically
  – the benefits of many IT investments are extremely difficult to estimate, monitor and measure
  – costs are, of course, relatively easy to estimate and measure
The Formal/Informal Distinction

- the extent to which organizations rely on formal processes to manage IT economics will vary from company to company
- large organizations will certainly rely on formal processes to a significant extent
- typical formal processes will include:
  - preparation of business cases to support IT investment proposals
  - cost/benefit analyses before and after implementation
  - internal IT charging processes (service level agreements or SLAs)
  - preparation of IT unit operating accounts and balance sheets
  - contracts with external suppliers (outsourcing arrangements)

The Information Technology Department

- the IT area is a functional unit, not a line unit
- the IT area facilitates the conduct of an organization’s business, it is not the reason for that business—therefore the most important things for companies are usually:
  - the costs of IT (much more significant during the 1990s and 2000s than during the 1980s)
  - the returns from IT investment (i.e., what business benefits accrue from putting money into networks, or new systems, or data warehouses, or websites)

The Information Technology Department

- overall the IT unit is expected to return value for money, and this has become perhaps the single most important IT management issue

The Costs Issue

- the fundamental problem is that IT costs have been increasing as a proportion of organizational costs for the past 40 years, and it is not always (some people might say never) easy to determine if value for money is being achieved
- in any case, many organizations still do not try to assess IT effectiveness and value

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.

The Economics of IT Investment

- the evaluation of cost-benefit relationships is the prerequisite for investment justification
- the issues are how to assess and measure benefits
  - tangible vs. intangible
  - monitorable vs. non-monitorable (i.e., this gives a four-cell grid)
- it is a management concern that most costs tend to be “hard”, many benefits are “soft”
EFFICIENCY vs Effectiveness

- early IT investments were generally made on the basis of improvements in efficiency
  - efficiency-based investments are generally easier to justify - outcomes
  - the 1960s emphasis on costs has seen the emphasis shift back to efficiency (though not totally)
  - a focus exclusively on efficiency entails some major risks
  - system replacement strategies are hard to justify (Y2K a symptom)
  - the conservative approach embeds risks because efficiency gains can be pointless if there are better ways of doing things:
    - the strange case of the Victorian Railways Clearing House

The Victorian Railways Clearing House

- from the Victorian era (not the State of Victoria)
- various separate companies provide tracks, rolling stock as part of the complete railway system in Victorian UK
- the Victorian Railways Clearing House was designed to allocate the returns from customers fares in 19th century England among the companies who owned railroad track and rolling stock
  - involved complex and time-consuming calculations and very accurate record-keeping
  - eg. Customer travels from Glasgow to Bournemouth – which company gets which part of their fare.
- it was an organisation designed as a pure information system

The Victorian Railways Clearing House ctd.

- the human beings in the system were treated as automatons - all their actions were fully defined
- the system became almost maximally efficient (according to the original definition of the problem that is) and operated from the 1840s to the 1930s with very similar staff levels and highly standardised work practices
  - in the meantime new technologies such as the telegraph, calculating machines, typewriters, etc. came, and in some cases went…
  - the system was highly efficient and almost totally resistant to change

Effectiveness

- the idea of improved effectiveness achieved a much higher profile during the 1980s
- improvements in effectiveness are difficult to measure (a company is not even able to make sensible efficiency comparisons if the changes are significant enough)
- it may be obvious that a qualitative change has occurred, but proving it at business case time can be a different matter

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Effectiveness Concepts

- improved customer service
- gaining competitive advantage
- more timely management information
- supporting core business functions
- avoiding competitive disadvantage
- improved management information
- improved product quality
- improved internal communications
- change through innovation
- improved external communications
- job enhancement for employees
  - (listed in order of significance according to a 1991 survey (Robson p221)

Measuring Costs and Benefits (Evaluating Investments)

- cost/benefit analyses typically rely on formal accounting techniques to determine the current value of future returns and expenditures - discounting and other techniques are used to calculate
  - IRR (internal rate of return) of an investment
  - ROI (return on investment)
  - NPV (net present value) of the return on an investment

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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.

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 “down time” (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.

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 costs of operations across different user groups.
  - Total cost of operations across different department.
  - Comparison of various costs with average costs obtained across all SAP-R/3 installations (i.e., industry average).

Other Methods & Commercial Services

- Benefits: Quantifiable
  - Improved decision speed
  - Improved decision quality
  - Automation of tasks
  - Ability to perform new tasks

- Benefits: Intangible
  - Synergy with other projects
  - Expanded long-term opportunities
  - Strategic positioning
  - Job enrichment
  - Recording of knowledge

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 28 percent by adopting best practices in workstation management (Kirwin et al., 1997).
Assessing Intangible Benefits

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.

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.

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.

Discretionary Funds

The bulk of IT funding in organizations is usually "spoken for" in advance:
> "bread and butter" outlays
• almost all the literature is concerned with discretionary funding for new initiatives.
• discretionary allocation
  > power source, politics
  > reward, punish

IT Unit Funding

Where the IT unit’s funds come from:

Business Planning Processes

are dependent for their effectiveness on the reliability and accuracy of cost and revenue estimates:
• provide the operating framework within which the whole organization works
The IT Business Plan

- The IT business plan is an outcome of the organization’s total business planning processes
- IT has limited opportunities to influence that outcome
  - the IT area is in large part constrained to do what the organization wants it to do
  - flexibility is possible in relation to IT areas of responsibility

IT Unit Costs

- General infrastructure
  - computer centres
  - power etc.
- Maintenance of the operational infrastructure
  - extensions and upgrades
  - repairs and replacements
  - network planning and design
- Support
  - networks
  - desktop
  - end user
  - user training
  - staff training

Discretionary Funding

- poses more focused problems - specifically concerning expenditure for which there will be competing priorities
- based largely on past experience (for many years, the controls on IT units were not very rigorous), many IT managers and staff assume that the justification for IT expenditure is “obvious”

Value Linking

- synergy effects from two overlapping initiatives
- an IT application may be designed to exploit changes made by a previous (or parallel) application
  - value linking occurs when this is taken into account when assessing the value of either or both applications
- the careful planning of a sequence of activities will generate benefits over and above those achievable if the projects were run independently

Value Acceleration

- value acceleration is recognised when a particular activity creates a stronger base for subsequent activities
- eg - the creation of improved technology infrastructure may:
  - reduce the costs of many or all subsequent projects
  - provide a facility enabling the organization to initiate projects it could not have otherwise done

Problems?

- many companies simply do not implement measurement processes of any great sophistication
- research has shown that the majority of managers prefer “hard” monitorable benefits in almost all cases
- most strategic investment decisions are made as judgement calls based on advice and broad estimates of strategic necessity or benefit
Reference:

- Turban, Leidner, McLean, Wetherbe
  Chapter 13