Information Systems Security and Control

Management Challenges

- In nearly every organization, Information System projects take much more time and money to implement than originally anticipated or the completed system does not work properly.
- Some of these problems are caused by Information System technology but many can be attributed to managerial and organizational factors.

Dealing with the Complexity of Large-scale Systems Projects

- Large scale systems affect large numbers of organizational unit and staff members and that have extensive information requirements are difficult to oversee, coordinate, and plan for.
- Implementing such systems, which have multiyear development periods, is especially problem ridden because the systems are so complex.

Estimating the Time and Costs to Implement a Successful Large System

- There are few reliable techniques for estimating the time and cost to develop medium-scale to large-scale Information System.
- Few projects take into account the *long-term maintenance costs* of systems.

System Failure

- System failure refers to an Information System that either does not perform as expected, is not operational at a specified time, or cannot be used in the way it was intended.

System Failure – Cancel/Postpone

- As many as 75% of all large system may be considered to be operating failures.
- Although these systems are in production, they take so much extra time and money to implement or are functionally deficient that businesses can't recap the expected benefits.
- A research found that 28% of all corporate software development projects are cancelled before completion and 46% are behind schedule and over budget.

System Failure – Untouched/Unused

- In some systems, nearly all reports are never read. They are considered as worthless and full of figures of no consequence for decision making or analysis.
- Other systems go untouched because they are too difficult to use or because their data cannot be trusted. Users continue to maintain their records manually.
- Still other systems full of processing delays, excessive operational costs or never-ending production problems. And the Information System staff had no time to work out long-term solutions for them.

Information System Problem Areas

- Design
- Data
- Cost
- Operations

Information System Problem Areas: Design

- The actual design of the system fails to capture essential business requirements organizational performance.
- Information may not provided quickly enough to be helpful; it may be a format that is impossible to digest and use; or it may represent the wrong pieces of data.
- A system may be designed with a poor user interface.
- An Information System is a failure if its design is not compatible with structure, culture and goals of the organization as a whole.

Information System Problem Areas: Data

- The data in the system have a high level of inaccuracy or inconsistency.
- The information in certain fields may be erroneous or ambiguous; or they may not be broken out properly for business proposes.
- Information required for a specific business function may be inaccessible because the data are incomplete.

Information System Problem Areas: Cost

- Some systems operate quite smoothly, but their cost to implement and run on a production basis is way over budget.
- Other systems may be too costly to complete.

Information System Problem Areas: Operations

- The system does not run well.
- Information is not provided in a timely and efficient manner.
- Jobs that abort too often lead to excessive reruns and delayed or missed schedules for delivery of information.
- An online system may be operationally inadequate because the response time is too long.

Measuring System Success

- Not everyone may agree both the value or effectiveness of a particular Information System.
- Individuals with different decision making styles or ways of approaching a problem may have different opinions about the same system.
- MIS researchers have looked for a formal set of measures of rating systems.

Measuring System Success Criteria

- Various criteria have been developed, but the following measures of system success are considered as the most important.
  - High levels of system use
  - User satisfaction with system
  - Favorable attitudes about Information System function
  - Achieved system objectives
  - Financial payoff to the organization

Measuring System Success Criteria

- High levels of system use
  - As measured by polling users, employing questionnaires or monitoring parameters such as the volume of on-line transactions.

Measuring System Success Criteria

- User satisfaction with system
  - As measured by questionnaires or interviews.
  - Include users' opinions on the accuracy, timeliness, and relevance of information; on the quality of service. Especially critical are managers' attitudes on how well their information needs were satisfied and users' opinions about how well the system enhanced their job performance.

Measuring System Success Criteria

- Favorable attitudes about Information System function
  - About Information System and the Information System staff.

Measuring System Success Criteria

- Achieved system objectives
  - The extent to which the system meets its specified goals as reflected by improved organizational performance and decision making resulting from use of the system.

Measuring System Success Criteria

- Financial payoff to the organization
  - Either by reducing costs or by increasing sales or profits.

Causes of Information System Success and Failure

- Systems are developed because of powerful external environmental forces and equally powerful internal or institutional forces.
- Many systems fail because of the opposition of either the environment or the internal setting.

Causes of Information System Success and Failure - Example

- The introduction or alternation of an Information System has a powerful behavioral and organizational impact. It transforms the way various individuals and groups perform and interact.
- Changes in the information is defined, accessed, and used to manage the resources of the organization often lead to new distributions of authority and power. This can lead to the failure of an good system.
- An important characteristic of most important systems is that individuals are asked or required to change their behavior to make the system function.

The Concept of Implementation

- Implementation refers to all organizational activities working towards the adoption, management, and routinization of an innovation.
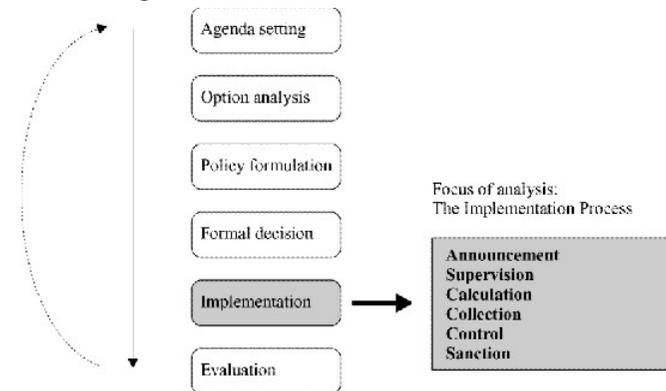
Implementation Approach

- Focus on Actors & Roles
    - Organizations should select actors with appropriate social characteristics and systematically develop organizational roles.

Implementation Approach

- Focus on Strategies of Innovation
    - Top-down innovation
        - Absence of senior management support for innovation dooms the project from the start
    - Grassroot innovation
        - Without strong grass roots & end-user participation, Information System projects can also fail.

Implementation Approach

- Focus on General Organizational Change factors
  - Organizational Change factors are decisive to the long-term routinization of innovations.

Change Agent

- In the context of implementation, the systems analyst is a **Change Agent**.
- It acts as the catalyst during the change process to ensure successful organizational adaptation to a new system or innovation.

Causes of Implementation Success and Failure

- The role users in the implementation process
- The degree of management support for the implementation effort
- The level of complexity and risk of the implementation project
- The quality of management of the implementation process

The Role Users in the Implementation Process

- User involvement in the design and operation of IS has several positive results.
  - They have more opportunities to mold the system according to their priority to control the outcome.
  - They are more likely to react positively to the completed system because they have been active participants in the change process itself.

The Degree of Management Support for the Implementation Effort

- If an Information System project has the backing and commitment of management at various levels; it is more likely to be perceived positively by both users and the technical information services staff.

The Level of Complexity and Risk of the Implementation Project

- Some system development projects are more likely to fail or suffer delays because they carry much higher level of risk than others.
- Researchers have identified three key dimensions that influence the level of project risk. These include
  - ◆ Project size
  - ◆ Project structure
  - ◆ The level of technical experience of the IS staff and project team.

Project Size

- *The larger the project* – as indicated by the dollars spent, the size of the implementation staff, the time allocated to implementation and the number of organization units affected – *the greater the risk*.

Project Structure

- Some projects are more highly structured than others.
- Their requirements are clear and straightforward so the outputs and processes can be easily defined.
- Users know exactly what they want and what the system should do; there is almost no possibility of them changing their minds.
- Such projects run a lower risk than those whose requirements are relatively undefined, fluid and constantly changing; where outputs cannot be easily fixed because they are subject to users' changing ideas; or because users cannot agree on what they want.

Experience with Technology

- The project risk will rise if the project team and the IS staff lack the required technical expertise.
- If the team is unfamiliar with the hardware, system software, application software, or database management system proposed for the project, it is highly likely that the project will experience technical problems or take more time to complete because of the need to master new skills.

The Quality of Management of the Implementation Process

- The development of a new system must be carefully managed. Requirement are hard to define. The same piece of information may be interpreted and defined differently by different individuals. A systems development project without proper management will suffer these consequences:
  - Cost overruns that vastly exceed budgets
  - Unexpected time slippage
  - Technical shortfalls resulting in performance that is significantly below the estimated level
  - Failure to obtain anticipated benefits

Why Projects Managed so Poorly?

- Ignorance and optimism
  - the techniques for estimating the length of time required to analyze and design systems are poorly developed.
- The mythical man-month
  - while costs may vary as a product of people and months, the progress does not.
- Falling behind
  - bad news travels slowly upwards – slippage in projects, failure and doubts are often not reported to senior management until it is too late.

What can Go Wrong?

- Analysis
- Design
- Programming
- Testing
- Conversion

What can Analysis Go Wrong?

- Time, money and resources have not been allocated to researching the problems. The problem remains poorly defined. Objectives of the implementation project will be vague and ambiguous; benefits will be difficult to measure.
- Little or no time is spent in preliminary planning. There are no standards to use in estimating preliminary costs or the duration of the project.
- The project team is not properly staffed. Personnel are assigned on an "as available" basis and cannot dedicate themselves to the project. User groups to be served by the systems are not represented on the team.

What can Analysis Go Wrong?

- The information services staff promises results that are impossible to deliver.
- Requirements are derived from inadequate documentation of existing systems or incomplete findings from systems study activities.
- Users refuse to spend any time helping the project team gather the requisite information.
- Project analysts cannot interview users properly. They do not know how to ask the right questions. They cannot carry on extended conversations with users because they lack good communication skills.

What can Design Go Wrong?

- Users have no responsibility for or input to design activities. The design, therefore, reflects the biases of the technical staff. It does not mesh well the structure, activities, and culture of the organization or the priority of management.
- The system is designed only to serve current needs. No flexibility has been built in to anticipate the future needs of the organization.
- Drastic changes in clerical procedures or staffing are planned without any organizational impact analysis.
- Functional specifications are inadequately documented.

What can Programming Go Wrong?

- The amount of time and money required for software development is underestimated.
- Programmers are supplied with incomplete specifications
- Not enough time is devoted to the development of program logic; too much time is wasted on writing code.
- Programmers do not take full advantage of structured design or object-oriented techniques. They write programs that are difficult to modify and maintain.
- Programs are not adequately documented.
- Requisite resources (such as computer time) are not scheduled.

What can Testing Go Wrong?

- The amount of time and money required for proper testing is underestimated.
- The project team does not develop an organized test plan.
- Users are not sufficiently involved in testing. They do not help to create sample test data or review the test results. They refuse to devote much time to the testing effort.
- The implementation team does not develop appropriate acceptable tests for management review. Management does not review and sign off on test results.

What can Conversion Go Wrong?

- Insufficient time and money are budgeted for conversion activities, especially for data conversion.
- Not all the individuals who will use the system are involved until conversion begins. Training begins only when the system is about to be installed.
- To compensate for cost overruns and delays, the system is made operational before it is fully ready.

What can Conversion Go Wrong?

- System and user documentation is inadequate.
- Performance evaluations are not conducted. No performance standards are established and the results of the system are not weighed against the original objectives.
- Provisions for system maintenance are inadequate.
- Insufficient information systems personnel are trained to support the system and to make maintenance changes.

Managing Implementation

- Not all aspects of the implementation process can be easily controlled or planned. However the chances for system success can be increased by anticipating potential implementation problems and applying appropriate corrective strategies.
- Various project management, requirements gathering, and planning methodologies have been developed for specific categories of problems. Strategies have also been devised for ensuring that users play an appropriate role throughout the implementation period and for managing the organizational change process.

Project Management Techniques

- External Integration Tools
  - Link the work of the implementation team to that of users at all organizational levels.
- Internal Integration Tools
  - Ensure that the implementation team operates as a cohesive unit.
- Formal Planning Tools
  - Structure and sequence tasks, providing advance estimates of the time, money, and technical resources required to execute them.
- Formal Control Tools
  - Help monitor the progress toward goals.
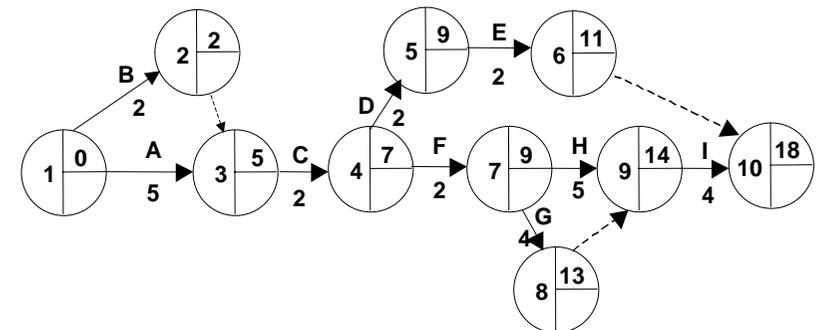
Formal Planning Methods

- Projects with high structure and low technology present the lowest risk.
- The design is fixed and stable and the project does not pose any technical challenges.
- If such projects are large, they can be successfully managed by formal planning and formal control tools.
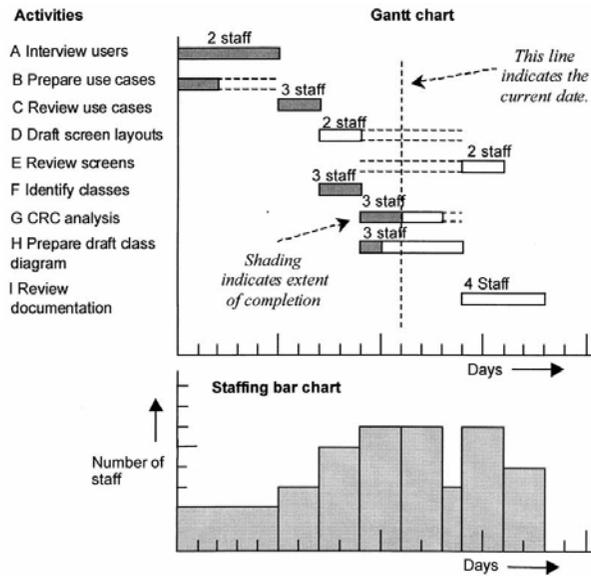
Formal Planning Methods

- With project management techniques such as PERT (Program Evaluation and Review Technique) or Gantt Charts, a detailed plan can be developed.
- These project management techniques can help managers identify bottlenecks and determine the impact that problems will have on project completion times. They also can help system developers partition implementation into smaller, more manageable segments with defined, measurable business results.

Example of PERT chart

Example of Gantt Chart

Activities

A Interview users
B Prepare use cases
C Review use cases
D Draft screen layouts
E Review screens
F Identify classes
G CRC analysis
H Prepare draft class diagram
I Review documentation

Gantt chart

2 staff
3 staff
2 staff
2 staff
3 staff
3 staff
3 staff
4 Staff

This line indicates the current date.

Shading indicates extent of completion

Days →

Staffing bar chart

Number of staff

Days →

Advantages of Formal Planning

- Milestone phases can be selected
- Specifications can be developed from the feasibility study
- Specifications standards can be established
- Processes for project approval can be developed

Advantages of Formal Control

- Disciplines to control or freeze the design can be maintained.
- Deviations from the plan can be spotted.
- Periodic formal status report against the plan will show the extent of progress.