Lecture 3, Part 2: Feasibility Study
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Why a feasibility study?

- Objectives of a feasibility study:
  - To find out if an system development project can be done:
    - ...is it possible?
    - ...is it justified?
  - To suggest possible alternative solutions.
  - To provide management with enough information to know:
    - Whether the project can be done
    - Whether the final product will benefit its intended users
    - What the alternatives are (so that a selection can be made in subsequent phases)
    - Whether there is a preferred alternative

When to do Feasibility Study?

- Start examining feasibility early: when performing problem analysis.
  - Determine whether detailed study and analysis are worthwhile.
  - Thorough feasibility study is performed after software requirements specification is written, before proceeding any further with the project.
- A project that is feasible at one point, may not be feasible at a later point.
  - Feasibility should be reviewed throughout the project.

Content of a feasibility study

- The present organizational system
  - Stakeholders, users, policies, functions, objectives,...
- Problems with the present system
  - inconsistencies, inadequacies in functionality, performance,...
- Goals and other requirements for the new system
  - Which problem(s) need to be solved?
  - What would the stakeholders like to achieve?
- Constraints
  - including non-functional requirements on the system (preliminary pass)

Content of a feasibility study [2]

- Possible alternatives
  - “Sticking with the current system” is always an alternative
  - Different business processes for solving the problems
  - Different levels/types of computerization for the solutions
- Advantages and disadvantages of the alternatives
- Things to conclude
  - Feasibility of the project
  - The preferred alternative

Types of feasibility

- Technical feasibility
  - Is the project possible with current technology?
  - How much technical risk is there?
  - Does the technology exist at all?
    - Is it available locally?
    - Can it be obtained?
    - Will it be compatible with other systems?
- Economic feasibility
  - Is the project possible, given resource constraints?
  - What benefits will result from the system?
    - Both tangible and intangible benefits
    - Quantify them
  - What are the development and operational costs?
  - Are the benefits worth the costs?
- Schedule feasibility
  - Is it possible to build a solution in time to be useful?
    - Any constraints on the schedule?
    - Can these constraints be met?
- Operational feasibility
  - Urgency of the problem and the acceptability of any solution:
    - If the system is developed, will it be used?
    - Human and social issues...
    - Internal issues:
      - Available of human resources?
      - Potential labour objections?
      - Manager resistance?
    - External issues:
      - Organizational politics and policies?
      - Social acceptability?
      - legal aspects and government regulations?
Technical Feasibility

- Is the proposed technology or solution practical?
  - Do we currently possess the necessary technology?
  - Do we possess the necessary technical expertise?
  - Is the relevant technology mature enough to be easily applied to our problem?

- What kinds of technology will we need?
  - Some organizations like to use state-of-the-art technology
    • ...but most prefer to use mature and proven technology.

- Is the required technology available “in house”?
  - If the technology is available: does it have the capacity to handle the solution?
  - If the technology is not available: can it be acquired?

Schedule Feasibility

- How long will it take to get the technical expertise?
  - We may have the technology, but that doesn't mean we have the skills required to properly apply that technology.

- Assess the schedule risk:
  - Given our technical expertise, are the project deadlines reasonable?
  - If there are specific deadlines, are they mandatory or desirable?
    • If the deadlines are not mandatory, the analyst can propose several alternative schedules.

- What are the real constraints on project deadlines?
  - If the project overruns, what are the consequences?
    • Deliver a properly functioning information system two months late...
    • ...or deliver an error-prone, useless information system on time?

Operational Feasibility

- How do end-users and managers feel about...
  - ...the problem you identified?
  - ...the alternative solutions you are exploring?

- You must evaluate:
  - Not just whether a system can work...
  - ...but also whether a system will work.

- Any solution might meet with resistance:
  - Does management support the project?
  - How do the end users feel about their role in the new system?
  - Which users or managers may resist (or not use) the system?
  - How will the working environment of the end users change?
  - Can or will end users and management adapt to the change?

Operational Feasibility: PIECES

The "PIECES" framework is useful for identifying operational problems to be solved, and their urgency.

- Performance
  • Is current throughput and response time adequate?

- Information
  • Do end users and managers get timely, pertinent, accurate and usefully formatted information?

- Economy
  • Are services provided by the current system cost-effective?
    • Could there be a reduction in costs and/or an increase in benefits?

- Control
  • Are there effective controls to protect against fraud and to guarantee information accuracy and security?

- Efficiency
  • Does current system make good use of resources: people, time, flow of forms,...?

- Services
  • Are current services reliable? Are they flexible and expandable?

See the course website for a more specific list of PIECES questions

Economic Feasibility

- Purpose - answer questions such as:
  • Is the project justified (i.e. will benefits outweigh costs)?
  • Can the project be done, within given cost constraints?
  • What is the minimal cost to attain a certain system?
  • Which alternative offers the best return on investment?

- Examples of things to consider:
  • Hardware/software selection
  • How to convince management to develop the new system
  • Selection among alternative financing arrangements (rent/lease/purchase)

- Difficulties
  • Benefits and costs can both be intangible, hidden and/or hard to estimate
  • Ranking multi-criteria alternatives

- Development costs (OTO)
  • Development and purchasing costs:
    • cost of development team
    • consultant fees
    • software used (buy or build)?
    • hardware (what to buy, buy/lease)?
    • facilities (site, communications, power,...)
  • Installation and conversion costs:
    • installing the system,
    • training personnel,
    • file conversion,...

- Operational costs (on-going)
  • System Maintenance:
    • hardware (repairs, lease, supplies,...),
    • software (licenses and contracts),
    • facilities
  • Personnel:
    • for operation (data entry, backups,...)
    • for support (user support, hardware and software maintenance, supplies,...)
    • on-going training costs
Economic Feasibility: Benefits

- **Tangible Benefits**
  - Readily quantified as $ values
  - Examples:
    - increased sales
    - cost/error reductions
    - increased throughput/efficiency
    - increased margin on sales
    - more effective use of staff time

- **Intangible benefits**
  - Difficult to quantify
  - but may be more important!
  - business analysts help estimate $ values
  - Examples:
    - increased flexibility of operation
    - higher quality products/services
    - better customer relations
    - improved staff morale

Economic Feasibility: Cost-Benefit Analysis

- Identify costs and benefits
  - Tangible and intangible, one-time and recurring
  - Assign values to costs and benefits

- Determine Cash Flow
  - Project costs and benefits over time, e.g. 3-5 years
  - Calculate Net Present Value for all future costs/benefits
    - determines future costs/benefits of the project in terms of today’s dollar values
    - a dollar earned today is worth more than a potential dollar earned next year

- Do cost-benefit analysis
  - Calculate Break-Even point:
    - how long will it take (in years) to pay back the accrued costs:
  - Calculate Return on Investment:
    - allows comparison of lifetime profitability of alternative solutions.

Economic Feasibility: Calculating Present Value

- **A dollar today is worth more than a dollar tomorrow...**
  - Your analysis should be normalized to “current year” dollar values.

- **The discount rate**
  - Measures opportunity cost:
    - Money invested in this project means money not available for other things
    - Benefits expected in future years are more prone to risk
  - This number is company- and industry-specific.
    - “what is the average annual return for investments in this industry?”

- **Present Value:**
  - The “current year” dollar value for costs/benefits n years into the future
    - ...for a given discount rate i

\[
P_{\text{Present Value}}(n) = \frac{1}{(1 + i)^n}
\]

- E.g. if the discount rate is 12%, then
  - Present\_Value(1) = \frac{1}{(1 + 0.12)^1} = 0.893
  - Present\_Value(2) = \frac{1}{(1 + 0.12)^2} = 0.797

Economic Feasibility: Net Present Value

- Measures the total value of the investment
  - …with all figures adjusted to present dollar values

\[
\text{NPV} = \text{Cumulative PV of all benefits} - \text{Cumulative PV of all costs}
\]

\[
\begin{align*}
\text{Cash Flow} & \quad \text{Year 0} & \quad \text{Year 1} & \quad \text{Year 2} & \quad \text{Year 3} & \quad \text{Year 4} \\
\text{Dev. Costs} & \quad (100,000) & \quad & \quad & \quad & \quad \\
\text{Oper. Costs} & \quad (40,000) & \quad (45,000) & \quad (50,000) & \quad (55,000) \\
\text{Present Value} & \quad 1 & \quad 0.893 & \quad 0.797 & \quad 0.712 & \quad 0.636 \\
\text{Time-adj Costs} & \quad (100,000) & \quad (91,377) & \quad (83,971) & \quad (77,717) & \quad (71,717) \\
\text{Cumulative Costs} & \quad (100,000) & \quad (191,377) & \quad (275,942) & \quad (353,659) & \quad (421,377) \\
\text{Benefits} & \quad 0 & \quad 25,000 & \quad 30,000 & \quad 35,000 & \quad 50,000 \\
\text{Time-adj Benefits} & \quad 0 & \quad 22,325 & \quad 23,910 & \quad 24,920 & \quad 31,800 \\
\text{Net Costs+Benefits} & \quad (100,000) & \quad (68,042) & \quad (23,922) & \quad (26,839) & \quad (13,572) \\
\end{align*}
\]
Economic Feasibility: Computing the payback period

- Compute the break-even point:
  - When does lifetime benefits overtake lifetime costs?
  - Determine the fraction of a year when payback actually occurs:

\[
\text{beginningYear amount} + \frac{\text{beginningYear amount}}{\text{endYear amount + beginningYear amount}}
\]

- For our last example, \( 51,611 / (70,501 + 51,611) = 0.42 \)
- Therefore, the payback period is 3.42 years

Economic Feasibility: Return on Investment (ROI)

- For comparing overall profitability
  - Which alternative is the best investment?
  - ROI measures the ratio of the value of an investment to its cost.

- ROI is calculated as follows:

\[
\text{ROI} = \frac{\text{Estimated lifetime benefits} - \text{Estimated lifetime costs}}{\text{Estimated lifetime costs}}
\]

or:

\[
\text{ROI} = \frac{\text{Net Present value} / \text{Estimated lifetime costs}}{\text{Estimated lifetime costs}}
\]

- For our example
  - ROI = \((795,440 - 488,692) / 488,692 = 62.76\%\),
  - or ROI = \(306,748 / 488,692 = 62.76\%\)

- Solution with the highest ROI is the best alternative

  - But need to know payback period too to get the full picture
  - E.g. A lower ROI with earlier payback may be preferable in some circumstances

Comparing Alternatives

- How do we compare alternatives?
  - When there are multiple selection criteria?
  - When none of the alternatives is superior across the board?

  - Use a Candidate Systems Matrix
    - The columns correspond to the candidate solutions;
    - The rows correspond to the feasibility criteria;
    - The cells contain the feasibility assessment notes for each candidate;
    - Each row can be assigned a rank or score for each criterion
      - e.g. for operational feasibility, candidates can be ranked 1, 2, 3, etc.
      - A final ranking or score is recorded in the last row.

  - Other evaluation criteria to include in the matrix
    - quality of output, ease of use, vendor support, cost of maintenance, load on system
Operational Feasibility

Functionality: Describes to what degree the software requirements and current business processes would have to be modified to take advantage of the software functionality.

Political: A description of how well received the solutions would be from both user management, user, and organization perspectives.

Technical Feasibility

Technology: An assessment of the maturity, availability (or ability to acquire), and desirability of the computer technology needed to support the candidate system.

Expertise: An assessment of the technical expertise needed to develop, operate, and maintain the candidate system.

Economic Feasibility

Cost to develop: Approximately $350,000.
Payback period (discounted): Approximately 4.5 years.
Net present value: Approximately $210,000.
Detailed calculations: See Attachment A.

Schedule Feasibility

An assessment of how long the solution will take to design and implement.

References
