Lecture 7: the Feasibility Study

→ What is a feasibility study?
  % What to study and conclude?

→ Types of feasibility
  % Technical
  % Economic
  % Schedule
  % Operational

→ Quantifying benefits and costs
  % Payback analysis
  % Net Present Value Analysis
  % Return on Investment Analysis

→ Comparing alternatives

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

→ A feasibility study is a management-oriented activity
  % After a feasibility study, management makes a “go/no-go” decision.
  % Need to examine the problem in the context of broader business strategy

Content of a feasibility study

→ Things to be studied in the 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 nonfunctional requirements on the system (preliminary pass)
  % Possible alternatives
    > “Sticking with the current system” is always an alternative
    > Different business processes for solving the problems
  % Advantages and disadvantages of the alternatives

→ Things to conclude:
  % Feasibility of the project
  % The preferred alternative

Exploring Feasibility

→ The “PIECES” framework
  % 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
Four 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
  ➤ Quantity these?
  ➤ 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 human resources?
  ➤ Potential labour objections?
  ➤ Manager resistance?
  ➤ Organizational conflicts and policies?
  ➤ External issues:
  ➤ Social acceptability?
  ➤ Legal aspects and government regulations?

Economic Feasibility

→ Can the bottom line be quantified yet?
  ➤ Very early in the project...
    ➤ a judgement of whether solving the problem is worthwhile.
  ➤ Once specific requirements and solutions have been identified...
    ➤ the costs and benefits of each alternative can be calculated

→ Cost-benefit analysis
  ➤ 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

Technical Feasibility

→ Is the proposed technology or solution practical?
  ➤ Do we currently possess the necessary technology?
  ➤ Do we possess the necessary technical expertise, and is the schedule reasonable?
  ➤ Is 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.
  ➤ A mature technology has a larger customer base for obtaining advice concerning problems and improvements.

→ 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?

Benefits and Costs

→ 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 maybe more important
    ➤ business analysts help estimate $ values
  ➤ Examples:
    ➤ increased flexibility of operation
    ➤ higher quality products/services
    ➤ lower information-reach
    ➤ improved staff morale

→ 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
Example: costs for small Client-Server project

<table>
<thead>
<tr>
<th>Department</th>
<th>Description</th>
<th>2004 Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel</td>
<td>Development Analyst (18 months 25% time)</td>
<td>$20,000</td>
</tr>
<tr>
<td></td>
<td>Technical Writer (8 months 25% time)</td>
<td>$30,000</td>
</tr>
<tr>
<td></td>
<td>Hardware Specialist (12 months 25% time)</td>
<td>$2,700</td>
</tr>
<tr>
<td></td>
<td>Support Staff (3 months 25% time)</td>
<td>$3,200</td>
</tr>
<tr>
<td></td>
<td>Secretarial &amp; Administrative Support</td>
<td>$5,400</td>
</tr>
</tbody>
</table>

Total Development Costs: $51,194

PROJECTED ANNUAL OPERATING COSTS

<table>
<thead>
<tr>
<th>Department</th>
<th>Description</th>
<th>2004 Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel</td>
<td>Support Staff (15 hours/ea $35.00/hr)</td>
<td>$600</td>
</tr>
<tr>
<td></td>
<td>System Analyst (15 hours/ea $45.00/hr)</td>
<td>$6,750</td>
</tr>
<tr>
<td></td>
<td>Systems Architect (50 hours/ea $45.00/hr)</td>
<td>$2,250</td>
</tr>
<tr>
<td></td>
<td>Application Specialist (250 hours/ea $25.00/hr)</td>
<td>$6,250</td>
</tr>
<tr>
<td></td>
<td>Programmer/Analysts (400 hours/ea $35.00/hr)</td>
<td>$11,000</td>
</tr>
</tbody>
</table>

Total Operating Costs: $23,544

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

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

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

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

Analyzing Costs vs. Benefits

- 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 Return on Investment:
    - Allows comparison of lifetime profitability of alternative solutions.
    \[
    \text{ROI} = \frac{\text{Lifetime benefits} - \text{Lifetime costs}}{\text{Lifetime costs}}
    \]
  - Calculate Break-Even point:
    - How long will it take (in years) to pay back the accrued costs:
      - Accrued Cost (initial + incremental) = Accrued Benefits

Net Present Value

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

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

Net Costs/Benefits
- \(\text{Net Costs/Benefits} = \text{Total Development Costs} - \text{Total Operating Costs} = \$51,194 - \$23,544 = \$27,650\)
Computing the payback period

→ Can compute the break-even point:
  % when does lifetime benefits overtake lifetime costs?
  % Determine the fraction of a year when payback actually occurs:
  \[
  \begin{array}{l}
  \text{endYear amount} = \text{beginningYear amount} \\
  \text{beginningYear amount} + \text{endYear amount} \\
  \text{Therefore, the payback period is 3.42 years}
  \end{array}
  \]

Return on Investment (ROI) analysis

→ 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:
  \[
  \text{ROI} = \frac{\text{Net Present value} / \text{Estimated lifetime costs}}{}
  \]
  % For our example
  \[
  \begin{array}{l}
  \text{ROI} = \frac{(795,440 - 488,692)}{488,692} = 62.76\% \\
  \text{or} \quad \text{ROI} = \frac{305,748}{488,692} = 62.76\%
  \end{array}
  \]

→ 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

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.
  % May need to hire new people
  % Or re-train existing systems staff
  % Whether hiring or training, it will impact the schedule.

→ 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 poorly functioning information system two months late...
  % ...or deliver an error-prone, useless information system on time?
  % Missed schedules are bad, but inadequate systems are worse!
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?
  - Can or will end users and management adapt to the change?

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 Feasibility Analysis 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

Feasibility Study Contents

1. Purpose & scope of the study
   - Objectives (of the study)
   - who commissioned it & who did it,
   - sources of information,
   - process used for the study,
   - how long did it take,

2. Description of present situation
   - organizational setting, current system(s),
   - Related factors and constraints.

3. Problems and requirements
   - What’s wrong with the present situation?
   - What changes are needed?

4. Objectives of the new system
   - Goals and relationships between them

5. Possible alternatives
   - including ‘do nothing’.

6. Criteria for comparison
   - definition of the criteria

7. Analysis of alternatives
   - description of each alternative
   - evaluation with respect to criteria
   - cost/benefit analysis and special implications.

8. Recommendations
   - what is recommended and implications
   - what to do next:
     - e.g., may recommend an interim solution and a permanent solution

9. Appendices
   - to include any supporting material.

Example matrix

<table>
<thead>
<tr>
<th>Description</th>
<th>Candidate 1 Name</th>
<th>Candidate 2 Name</th>
<th>Candidate 3 Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational Feasibility</td>
<td></td>
<td></td>
<td></td>
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<td>Technical Feasibility</td>
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<td></td>
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<tr>
<td>Schedule Feasibility</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Economic Feasibility</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Ranking</td>
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<td></td>
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</tbody>
</table>
### Feasibility Criteria

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Weight</th>
<th>Candidate 1</th>
<th>Candidate 2</th>
<th>Candidate 3</th>
<th>Candidate 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operational Feasibility</strong></td>
<td>30%</td>
<td>Score: 60</td>
<td>Score: 100</td>
<td>Score: 100</td>
<td>Score: 100</td>
</tr>
<tr>
<td><strong>Technical Feasibility</strong></td>
<td>30%</td>
<td>Score: 50</td>
<td>Score: 95</td>
<td>Score: 90</td>
<td>Score: 85</td>
</tr>
<tr>
<td><strong>Economic Feasibility</strong></td>
<td>30%</td>
<td>Score: 65</td>
<td>Score: 82</td>
<td>Score: 85</td>
<td>Score: 85</td>
</tr>
</tbody>
</table>

#### Operational Feasibility
- **Score**: 60
  - **Candidate 1**: Meets all necessary requirements.

#### Technical Feasibility
- **Score**: 50
  - **Candidate 1**: Meets all necessary requirements.

#### Economic Feasibility
- **Score**: 65
  - **Candidate 1**: Meets all necessary requirements.

### Schedule Feasibility
- **Score**: 95
  - **Candidate 1**: Meets all necessary requirements.

### Ranking
- **Score**: 100
  - **Candidate 1**: Meets all necessary requirements.