VI. The Feasibility Study

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

Benefits and costs
Cost/Benefit analysis
Accounting methods
Comparing alternatives

Operational Feasibility: The PIECES Framework

Performance -- Does current mode of operation provide adequate performance throughout and response time?
Information -- Does current mode provide end users and managers with timely, pertinent, accurate and useful formatted information?
Economy -- Does current mode of operation provide cost-effective information services to the business? Could there be a reduction in costs and/or an increase in benefits?
Control -- Does current mode of operation offer effective controls to protect against fraud and to guarantee accuracy and security of data and information?
Efficiency -- Does current mode of operation make maximum use of available resources, including people, time, flow of forms,...?
Services -- Does current mode of operation provide reliable service? Is it flexible and expandable?

The Feasibility Study Phase

The objectives of a feasibility study are to find out if an information system project can be done (...is it possible?...is it justified?) and to suggest possible alternative solutions.

A feasibility study should provide management with enough information to decide:
- Whether the project can be done;
- Whether the final product will benefit its intended users;
- What are the alternatives among which a solution will be chosen (during subsequent phases)?
- Is there a preferred alternative?

After a feasibility study, management makes a go/no-go decision.

A feasibility study is a management-oriented activity

What to Study? ...What to Conclude?

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**Technical Feasibility**

- Is the proposed technology or solution practical?
- Do we possess the necessary technology?
- If relevant technology is practical, is it available in the information systems shop?
- If the technology is not available, can it be acquired?

**Schedule Feasibility**

- We may have the technology, but that doesn't mean we have the skills required to properly apply that technology. True, all information systems professionals can learn new technologies. However, that learning curve will impact the technical feasibility of the project; specifically, it will impact the schedule.
- Given our technical expertise, are the project deadlines reasonable? Some projects are initiated with specific deadlines. You need to determine whether the deadlines are mandatory or desirable. If the deadlines are desirable rather than mandatory, the analyst can propose alternative schedules.
- It is preferable (unless the deadline is absolutely mandatory) to deliver a properly functioning information system two months late than to deliver an error-prone, useless information system on time! Missed schedules are bad, but inadequate systems are worse!

**Economic Feasibility**

- The bottom line in many projects is economic feasibility.
- During the early phases of the project, economic feasibility analysis amounts to little more than judging whether the possible benefits of solving the problem are worthwhile.
- As soon as specific requirements and solutions have been identified, the analyst can weigh the costs and benefits of each alternative.
- This is called a cost-benefit analysis.

**Cost/Benefit Analysis**

- The purpose of a cost/benefit analysis is to answer questions such as:
  - Is the project justified (because benefits outweigh costs)?
  - Can the project be done, within given cost constraints?
  - What is the minimal cost to attain a certain system?
  - What is the preferred alternative, among candidate solutions?
  - Examples of things to consider:
    - Hardware/software selection
    - How to convive management to develop the new system
    - Selection among alternative financing arrangements (rent/lease/purchase)
    - Difficulties -- discovering and assessing benefits and costs; they can both be intangible, hidden and/or hard to estimate, it's also hard to rank multi-criteria alternatives

**Types of Benefits**

- Examples of particular benefits: cost reductions, error reductions, increased throughput, increased flexibility of operation, improved operation, better (e.g., more accurate) and more timely information.
- Benefits may be classified into one of the following categories:
  - Monetary -- when $-values can be calculated
  - Tangible (Quantified) -- when benefits can be quantified, but $-values can't be calculated
  - Intangible -- when neither of the above applies
  - How to identify benefits? By organizational level (operational, lower/middle/higher management) or by department (production, purchasing, sales,...)

**Types of Costs**

- Project-related costs
  - Development and purchasing costs: who builds the system (internally or contracted out)? software used (buy or build)? hardware (what to buy, buy/lease)? facilities (site, communications, power,...)
  - Installation and conversion costs: installing the system, training of personnel, file conversion,...
  - Operational costs (on-going)
    - Maintenance: hardware (maintenance, lease, materials,...), software (maintenance fees and contracts), facilities
    - Personnel: operation, maintenance
  - For a small business that wants to introduce a PC-based information system, these cost categories translate to the following:
    - Project costs: purchasing (hardware, software, office furniture), customizing software, training, system installation and file conversion
    - On-going costs: operating the system (data entry, backups, helping users, vendors etc.), maintenance (software) and user support, hardware and software maintenance, supplies,...
### Accounting Methods

Assuming that both benefits and costs can be identified and evaluated, how do we compare them to determine project feasibility? Typical cases include comparing costs of alternatives (assuming equal benefits) or comparing various payment options:

- **Payback Analysis**: how long will it take (usually, in years) to pay back the project, and accrued costs:
  - Total costs (initial + incremental) - Yearly return (or savings)

- **Return on Investment Analysis**: compares the lifetime profitability of alternative solutions.

**Lifetime benefits** - **Lifetime costs**

- **Net Present Value Analysis**: determines the profitability of the new project in terms of today’s dollar values. Will tell you that if you invest in the proposed project, after n years you will have $XXX profit/loss on your investment.

### Discount Rates

- A dollar today is worth more than a dollar tomorrow...
- The dollar values used in this type of analysis should be normalized to refer to current year dollar values.
- For this, we need a number, the **discount rate**, which measures the opportunity cost of investing money in other projects, rather than the information system development one. This number is company- and industry-specific.
- To calculate the **present value**, i.e., the real dollar value given the discount rate, n years from now, we use the formula:
  \[
  \text{Present Value} = \frac{1}{(1 + i)^n}
  \]
- For example, if the discount rate is 12%, then:
  \[
  \text{Present Value (1)} = \frac{1}{1 + 0.12} = 0.893
  \]
  \[
  \text{Present Value (2)} = \frac{1}{(1 + 0.12)^2} = 0.797
  \]

### Payback Analysis

- **Basically, we need to compute**:
  \[
  \text{Total costs} = \text{initial} + \text{incremental} - \text{Yearly return (or savings)}
  \]
  but it must be done with present dollar values.

### How to Compute Exactly the Payback Period

- Need to determine the time period when lifetime benefits will overtakes the lifetime costs: This is the **break-even point**.
- Determining the fraction of a year when a payback actually occurs:
  \[
  \frac{\text{beginningYear amount}}{\text{endYear amount} - \text{beginningYear amount}}
  \]
- For our last example, 51,611 / (70,501 + 51,611) = 0.42
- Therefore, the payback period is 3.42 years.
Net Present Value

- After discounting all costs and benefits, subtract the sum of the discounted costs from the sum of the discounted benefits to determine the net present value.
- If it is positive, the investment is good.
- If negative, the investment is bad.
- When comparing multiple solutions or projects, the one with the highest positive net present value is the best alternative.

Return on Investment (ROI) Analysis

- The ROI analysis technique compares the lifetime profitability of alternative solutions or projects.
- The ROI for a solution or project is a percentage rate that measures the relationship between the amount the business gets back from an investment and the amount invested.
- The ROI for a potential solution or project is calculated as follows: ROI = (Estimated lifetime benefits - Estimated lifetime costs) / Estimated lifetime costs
- For our example, ROI = (795,440 - 488,692) / 488,692 = 62.76%
- The solution offering the highest ROI is the best alternative.

Comparing Alternatives with the Feasibility Analysis Matrix

- How do we compare alternatives when there are multiple selection criteria and none of the alternatives is superior across the board?
- Use a Feasibility Analysis Matrix!
- In a feasibility analysis matrix, the columns correspond to the candidate solutions; some 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.);
- After ranking or scoring all candidates on each criterion, a final ranking or score is recorded in the last row.
- Examples of other evaluation criteria: quality of output, ease of use, vendor support, cost of maintenance, load on system

Feasibility Analysis 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</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Technical</td>
<td></td>
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<tr>
<td>Schedule</td>
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<td></td>
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<tr>
<td>Economic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ranking</td>
<td></td>
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</tr>
</tbody>
</table>
### Feasibility Study Contents

- **Purpose and scope of the study** -- objectives, who commissioned it, did it, sources of information, process used for the study, how long did it take...
- **Description of current situation** -- organizational setting, current system(s).
- **Related factors and constraints.**
- **Objectives of the new system.**
- **Possible alternatives** -- including, possibly, the present situation. 
- **Criteria for comparison** -- definition of the criteria
- **Analysis of alternatives** -- includes description of each alternative, evaluation with respect to criteria, including cost/benefit analysis and special implications. 
- **Recommendations** -- what is recommended, implications, what to do next; sometimes it makes sense to recommend an interim solution and a permanent solution.
- **Appendices which include supporting material.**

### Another Example

Consider a scenario: You want to adopt a programming environment for your Zeus project; there are three alternatives: Strobe, KEE and Loops.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Strobe</th>
<th>KEE</th>
<th>Loops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ease reg (H)</td>
<td>H</td>
<td>H+</td>
<td>H</td>
</tr>
<tr>
<td>Min costs (H)</td>
<td>L</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>Customizability</td>
<td>H-</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>

*: H+, provided source code is available. **: the following questions need to be answered: (i) hardware platform for the project? (ii) do we get a free copy?

### An Example (cont’d)

As you begin to understand the setup, you begin to form an idea of how different processes are done: **HandleOrder, AnswerQuery, PurchaseBooks, GetUsedBooks**...

You confirm your understanding with the manager and assistant manager.

Next you consider alternatives: (a) improve the manual system with redesigned cards, new card-filing system; (b) install a personal computer with a database where you keep all book orders; (c) install a network of PCs to handle orders, purchase orders, inventory.

You confirm with the manager that his criteria for evaluating alternative solutions are: (1) cost -- no more than $30K; (2) improved service; (3) ease of use. 

Next, you evaluate each alternative with respect to each criterion. To do this, you talk to your technical people who help you with advice on the size of programming tasks etc. Once you are done, you show the results to the manager. You don’t show him any conclusions yet. Finally, you prepare your report and you hand it in.