Software Engineering

Feasibility Studies

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Feasibility Study

A **Feasibility Study** is a study made before committing to a project.

A feasibility study leads to a decision:

- Go ahead(事前)
- Do not go ahead(事中)
- Think again(事后)

In software projects, the feasibility study often leads to a **Budget Request**.

A feasibility study may be in the form of a **Proposal**.

Why are Feasibility Studies Difficult?

Uncertainty

- Clients may be unsure of the scope of the project.
- Benefits are usually very hard to quantify.
- Approach is usually ill-defined.
- Estimates of resources and timetable are very rough.
- Organizational changes may be needed.

Therefore, feasibility studies rely heavily on the judgement of experiences people.

Mistakes made at the beginning of a project are the most difficult to correct.

Why are Feasibility Studies Difficult?

Advocacy（倡导）

- Advocacy is needed to build enthusiasm for a software project: to convince an organization to undertake an expensive, complex project with many risks.
- Enthusiasm is good, but enthusiasts usually emphasize potential benefits and downplay risks.

People carrying out the feasibility study and making the decision often have a vested interest in the project going ahead, e.g., financial gain, career development.

It is possible that your feasibility study may recommend not going ahead with a project.

The Decision Maker's Viewpoint

The feasibility study makes **recommendations**.

Senior member(s) of the client's organization decide whether to begin a major software project.

What information do they needed?

Client: Who is this project for?

Scope: What are the boundaries of the project?

Benefits: What are the benefits? Can they be quantified? If the software is a product, what are the forecasts of likely sales?

Technical: Is the project possible? Is there at least one technical way to carry out the project?

Resources: What are the estimates of staff, time, equipment, etc.?

Alternatives(备选方案): What are the options if the project is not done?

Where are the Risks? Can they be Minimized?

Technical risks

- There must be an outline plan with a rough timetable and staff allocation.
- The plan must have a very large margin for contingencies. Projects typically require twice the staff and /or time envisages in the feasibility plan.

External

- Every system interacts with others. Are the others committed to the necessary efforts (e.g., potential users and customers)?
- Where are the external pressures and obstacles?

Organizational Feasibility

A major computer system makes demands on an organization:

- Does the organization have the management expertise?
- Does the organization have the technical expertise? Even if the work is carried out by a contractor, the organization needs expertise to oversee the work.
- Is the organization committed to the changes in personnel, workflow, etc.?

Example

Copyright deposit system.

Example 1: U.S. Government Agency
(Decision before Feasibility Study)

Outline Description:

A U.S. government agency, which manages huge numbers of documents and other records, wishes to move from a paper based approach to a system that can manage digital documents.

Example 1: Chronology(大事记)

- A computing center at University S developed a prototype system to demonstrate technology.
- Funds were approved by Congress to "procure“ a major computer system.
- An external feasibility study was commissioned to report on the technical approach to be followed and the results of the University S prototype (technical feasibility).

Problems

- The decision to go ahead was made and the budget was approved before the feasibility study was begun.
- The feasibility study looked at only the technical aspects.

Example 1: Problems

Organizational:

- Agency senior management lacked the experience to lead a very large project that will completely change the agency.
- No thought was given to the workflow and job changes that would affect almost every member of staff.

Preparation:

- No preliminary study was made of volumes or kinds of data; nor of the complex policies for access (e.g., privacy, classified information).

Requirements:

- The requirements were complex and only partially understood. Major changes were inevitable even after the system when into production with real users.

Example 1: Dilemma(困境)

The external feasibility study was paid for by agency and restricted to technical considerations, but noted:

- A successful implementation needed fundamental changes at the senior management level.
- A phased approach, using iterative refinement over many years, might possibly work, but only after the organizational problems are addressed.

But…

The agency did not want to return money to Congress.

The agency, adopted a pure waterfall model, put out a Request for Proposal(RFP) for the requirements, and placed a major contract with a software house.

This is how disasters are made.

Feasibility Study: Scope

Scope expresses **the boundaries of the system**:

- It will have a list of included functions
- It will have a list of excluded functions
- It will have a list of dependencies
- It will have a list of current systems to be replaced

Confusion over scope is a common reason for clients to be dissatisfied with a system.

"Is that all you planned to do?“ "But I assumed that you were going to do xyz.“ "I can't use the system without abc."

Example 2: A Government Repository

(Confusion over Scope)

A government organization, L, required a "repository system“ to store and make accessible very large amounts of highly varied material over long periods of time.

An outside organization, C, built a repository system to store and manipulate complex digital material.

But…

Nobody built the sub-systems needed to organize, validate, and to load material into the repository. L expected the repository system to include these sub-systems. C considered the sub-systems separate from the repository system.

- *A good feasibility study would have seen this confusion.*

Feasibility Study: Benefits

Why is this project proposed? Can you quantify the benefits?

Organization benefits

- Create a marketable product.
- Improve the efficiency of an organization (e.g., save staff).
- Control a system that is too complex to control manually.
- New or improved service (e.g., faster response to customers).
- Safety or security.

Professional benefits are not the reason for doing a project.

Feasibility Study: Technical

A feasibility study needs to demonstrate that the proposed system is **technically feasible**.

This requires:

- An outline of the requirements.
- A possible system design (e.g., database, distributed, etc.).
- Possible choices of software to be acquired or developed.
- Estimates of numbers of users, data, transactions, etc..

These rough numbers are part of the provisional plan that is used to estimate the staffing, timetable, equipment needs, etc.

The technical approach actually followed may be very different.

Feasibility Study: Planning and Resources

The feasibility study must include an outline plan:

- Estimate the staffing and equipment needs, and the preliminary timetable
- Identify major milestones and decision points
- Identify interactions with and dependences on external systems
- Provide a preliminary list of deliverables and delivery dates

There will be a separate lecture about Project Management in next semester.

Feasibility Study: Alternatives and Risks

A feasibility study should identify risks and alternatives.

Risks

- What can go wrong ?
- How will progress be monitored and problems identified (visibility) ?
- What are the fall back options?

Alternatives

- Continue with current system, enhance it, or create new one?
- Develop in-house, or contract out? (How will a contract be managed?)
- Phases of delivery and possible points for revising plan.

Techniques for Feasibility Studies

The highest priority is to ensure that the client and development team have the same understanding of the goals of the system.

For the development team to understand the goals:

- Interviews with client and the staff of the client's organization
- Review of existing systems (including competitors')

For the client to appreciate the proposed system:

- Demonstration of key features or similar systems
- Mock-up of user interfaces
- Walk through typical transactions or interactions

Techniques for Feasibility Studies

Outline budget:

- *N* people for *m* months at $*x* per month
- Equipment, buildings, etc.
- Contingency (at least 50% is needed)

Phases/milestones:

- Specify deliverables and approximate dates
- Planned releases

Feasibility Study: Decision

Different organizations and senior managers have different styles for feasibility studies, e.g., some decision makers:

- Monitor the team and the process.
- Rely on detailed reading of a written report.
- Rely on face-to-face questioning of knowledgeable people.

But they must understand the decision.

Feasibility Report

A feasibility study should have a **written report**.

It should be a well written, well presented document.

- For a general audience: client, financial management, technical management, etc.
- Short enough that everybody reads it.
- Long enough that no important topics are skipped.
- Details can be included in supporting documents.

A report that is not read and understood is useless.

Feasibility Report

Appoint a team member to read and edit the entire report.

Content

- If different authors write different sections of the report are they consistent? E.g., do the scope, requirements, and plan agree on what is to be done?

Style

- Is the text comprehensible?
- Does the report use jargon that is not clear to the client?