



Software Project Management

Durga Prasad Mohapatra

Professor

CSE Deptt.

NIT Rourkela



Project Evaluation and Programme Management

cont...



Project Estimation Techniques



Contents

- **Introduction**
- **Project planning**
- **Basics of project estimation**

What makes a successful project?

Delivering:

- agreed functionality
- on time
- at the agreed cost
- with the required quality

Stages:

1. Set targets
2. Attempt to achieve targets

BUT what if the targets are not achievable?

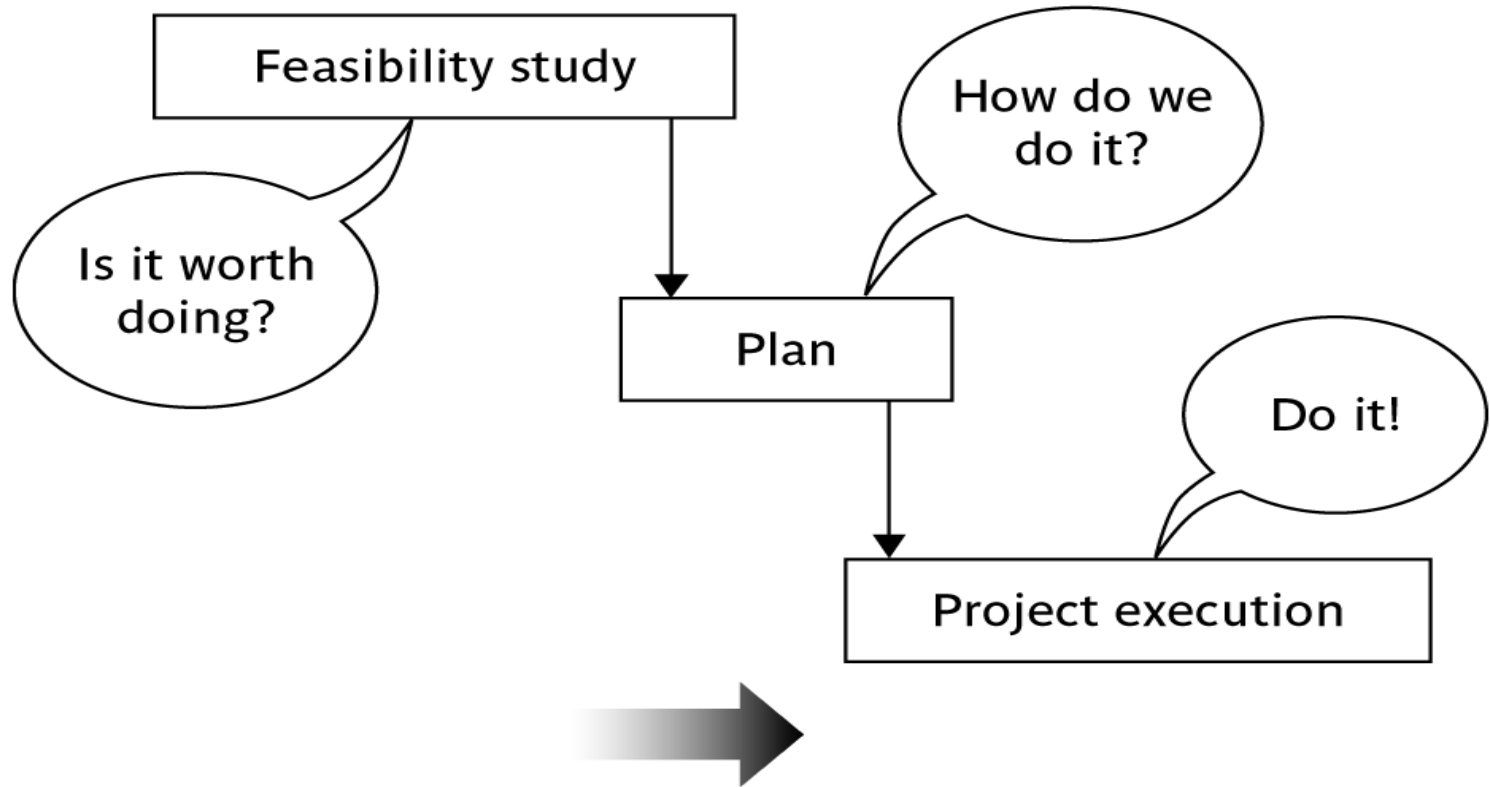
Introduction to project planning

- A project manager's activities are varied.
 - can be broadly classified into two categories:
 - project planning
 - project monitoring and control

Project Planning

- Once a project is found to be feasible,
 - project managers undertake project planning.
- Initial plan is made before development starts
---- then updated frequently.

Project Planning cont ...



Project Planning Activities

- Estimation:
 - Effort, cost, resource, and project duration
- Project scheduling:
- Staff organization:
 - staffing plans
- Risk handling:
 - identification, analysis, and abatement procedures
- Miscellaneous plans:
 - quality assurance plan, configuration management plan, etc.

Project Planning Activities cont ...

1. Identify the steps required to accomplish the project objectives
2. Identify the tasks needed to be done at each step (using Work Breakdown Structures)
3. Estimate of how much effort each task requires
4. Estimate the resources required for each task
5. (Given 3. and 4.) Calculate how long each task/step will take
6. (Given 4. and 5.) Estimate the task, step and project costs
7. Determine the inter-dependencies of tasks, if any.
8. Prepare the schedule for each task and the whole project (Milestones, Deliverables, costs, payments)

Why project planning?

- Requires utmost care and attention, because commitments to unrealistic time and resource estimates result in:
 - irritating delays.
 - customer dissatisfaction
 - adverse affect on team morale
 - poor quality work
 - project failure.

Sliding Window Planning

- Involves project planning over several stages:
 - protects managers from making big commitments too early.
 - More information becomes available as project progresses.
 - Facilitates accurate planning

SPMP Document

- After planning is complete:
 - Document the plans:
 - in a Software Project Management Plan(SPMP) document.

Organization of SPMP Document

- **Introduction** (Objectives, Major Functions, Performance Issues, Management and Technical Constraints)
- **Project Estimates** (Historical Data, Estimation Techniques, Effort, Cost & Project Duration Estimates)
- **Project Resources Plan** (People, Hardware and Software, Special Resources)
- **Schedules** (Work Breakdown Structure, Task Network, Gantt Chart Representation, PERT Chart Representation)
- **Risk Management Plan** (Risk Analysis, Risk Identification, Risk Estimation, Abatement Procedures)
- **Project Tracking and Control Plan**
- **Miscellaneous Plans** (Process Tailoring, Quality Assurance, Configuration Management)

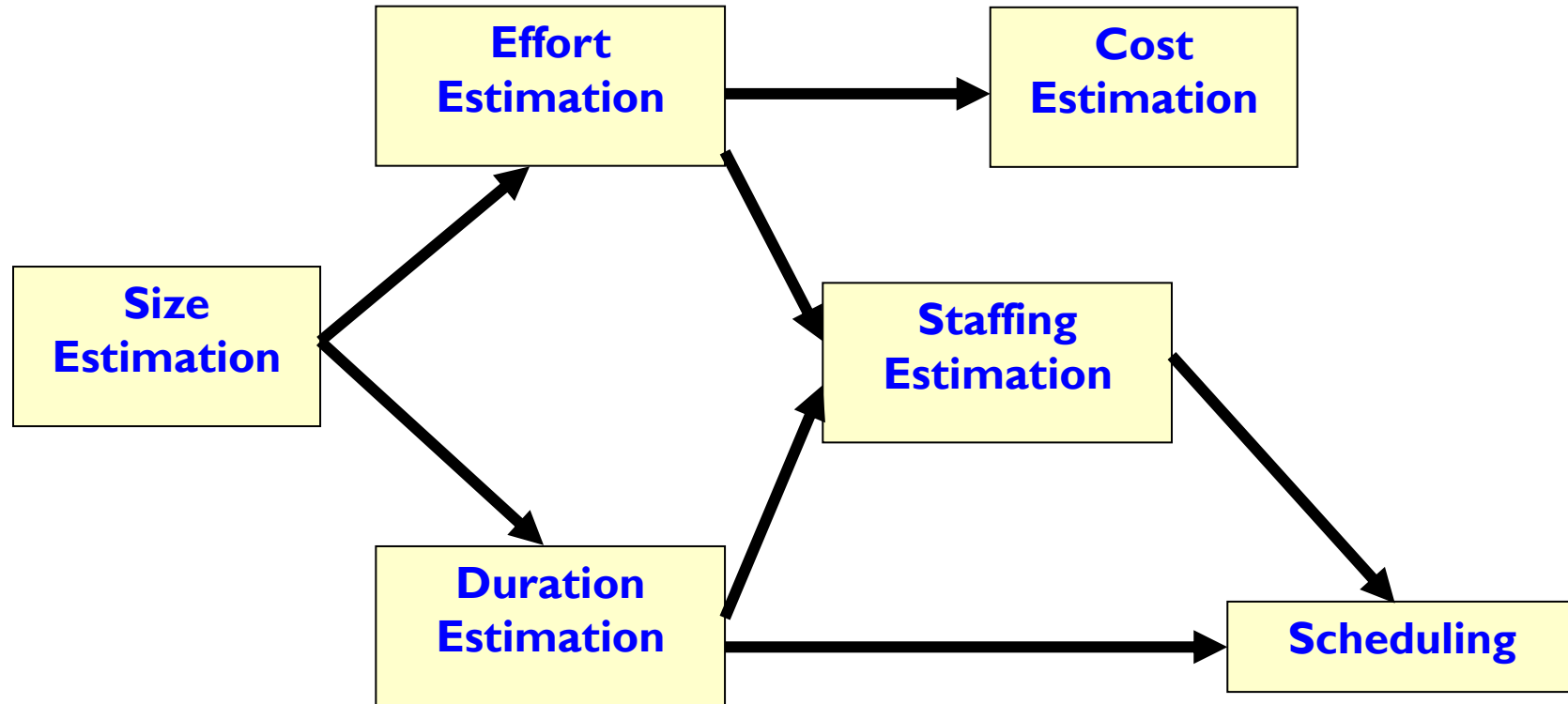
Fundamental estimation questions

- What is the **size** of the software to be developed?
- How much **effort** is required to complete an activity?
- How much **calendar time** is needed to complete an activity?
- What is the **total cost** of an activity?

Sequence of Estimations

- First, determine size of the product.
- From the size estimate,
 - determine the effort needed.
- From the effort estimate,
 - determine project duration, and cost.

Sequence of Estimations and Scheduling




Software cost components

- Hardware and software costs.
- Travel and training costs.
- Effort costs:
 - The dominant factor in most projects
 - The salaries of engineers involved in the project
- Overheads:
 - Costs of building, heating, lighting.
 - Costs of networking and communications.
 - Costs of shared facilities (e.g. library, staff restaurant, etc.).
 - Rule of thumb: as much as the effort costs

Person Month

- Suppose a project is estimated to take 300 person-months to develop:
 - Is one person working for 30 days same as 30 persons working for 1 day?
 - No? why?
- How many hours is a man month:
 - Default Value: 152 hours per month
 - 19 days at 8 hours per day.



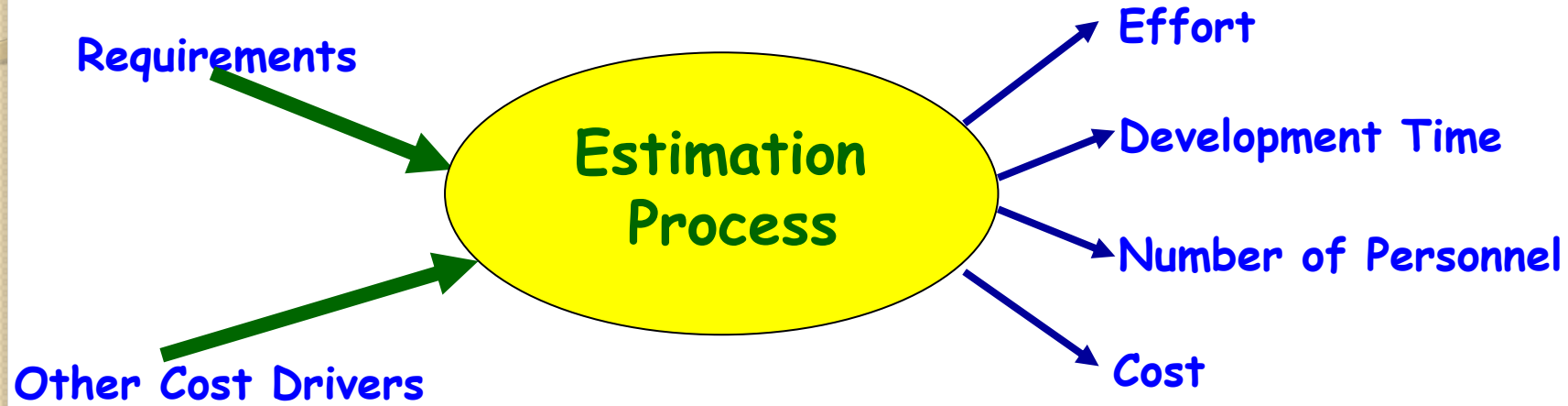
Why Person-Month and not Person-days or Person years?

- Modern Projects typically take a few months to complete...
- Person-years is clearly unsuitable.
- Person-days would make monitoring and estimation overhead large and tedious.

Costing and pricing

- Estimates are made to discover the cost of producing a software system.
 - However, there is no simple relationship between the development cost and the price charged to the customer.
 - Broader organisational, economic, political and business considerations influence the price charged.

Cost Estimation Process



Software pricing factors

Market opportunity	A development organisation may quote a low price because it wishes to move into a new segment of the software market. Accepting a low profit on one project may give the opportunity of more profit later. The experience gained may allow new products to be developed.
Cost estimate uncertainty	If an organisation is unsure of its cost estimate, it may increase its price by some contingency over and above its normal profit.
Contractual terms	A customer may be willing to allow the developer to retain ownership of the source code and reuse it in other projects. The price charged may then be less than if the software source code is handed over to the customer.
Requirements volatility	If the requirements are likely to change, an organisation may lower its price to win a contract. After the contract is awarded, high prices can be charged for changes to the requirements.
Financial health	Developers in financial difficulty may lower their price to gain a contract. It is better to make a smaller than normal profit or break even than to go out of business.

Words of wisdom

Unless a software project has clear definitions of its key milestones and realistic estimates of the time and money it will take to achieve them, there is no way that a project manager can tell whether the project is under control or not...

When are estimates required?

Project phase	Estimates required
Initiation	Time, cost and benefit estimates in project definition.
Planning	Time estimates in project schedule. Cost estimates in project budget. Cost & benefit estimates in business case.
Start of project stages	Time and cost estimates reconfirmed for the stage.

Some problems with estimating

- Subjective nature of much of estimating
 - It may be difficult to produce evidence to support your precise target
- Political pressures
 - Managers may wish to reduce estimated costs in order to win support for acceptance of a project proposal
- Changing technologies
 - these bring uncertainties, especially in the early days when there is a 'learning curve'
- Projects differ
 - Experience on one project may not be applicable to another

Over and under-estimating

- Parkinson's Law: 'Work expands to fill the time available'
- Underestimate:
 - Advantage: No overspend
 - Disadvantages: System is usually unfinished

Over and under-estimating cont ...

- Weinberg's Zeroth Law of Reliability: 'a software project that does not have to meet a reliability requirement can meet any other requirement'.

Effect of Underestimation

- Research results confirm:
 - Motivation and morale lowered with highly aggressive target.
- Underestimation can lead to abandonment of the project:
 - Developers usually respond to highly pressing deadlines with substandard work.

Basis for successful estimating

- Information about past projects
 - Need to collect performance details about past project: how big were they? How much effort/time did they need?
- Need to be able to measure the amount of work involved
 - Traditional size measurement for software is 'lines of code'
 - but known to have problems

Refining Estimates

- Reasons for Adjusting Estimates
 - Interaction costs are hidden in estimates.
 - Normal conditions do not apply.
 - Things go wrong on projects.
 - Changes in project scope and plans.
- Adjusting Estimates:
 - Time and cost estimates of specific activities are adjusted as the risks, resources, and situation particulars become more clearly defined.

Summary

- Discussed the various activities carried out during project planning.
- Presented the contents of Software Project Management Plan (SPMP) document.
- Discussed some basic concepts of project estimation.

References :

1. B. Hughes, M. Cotterell, R. Mall, *Software Project Management*, Sixth Edition, McGraw Hill Education (India) Pvt. Ltd., 2018.
2. R. Mall, *Fundamentals of Software Engineering*, Fifth Edition, PHI Learning Pvt. Ltd., 2018.



Thank you