Project Management Fact Sheet:

Project Estimation

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Department of Premier and Cabinet

Tasmania
Explore the possibilities

Project estimation is a challenge for all but the foolhardy. The definition of 'estimation', according to several dictionaries, is: '*To calculate approximately*'; '*A tentative evaluation or rough calculation*'; or '*A judgment based on one's impressions; an opinion*'. Also: '*Estimate usually implies a subjective and somewhat inexact judgment*'. Estimation is the process that provides the benefit, funding and resourcing figures that are required for a variety of decision-making purposes.

The key questions

- What is a project estimate?
- What is project estimation?
- Who compiles the project estimation document?
- What gets estimated?
- Why is estimation important?
- Where are estimates used?
- How do we gauge the quality of an estimate?
- How is poor estimation revealed?
- What causes poor estimates?
- What steps need to be taken in completing accurate project estimations?

What is a project estimate?

John Smyrk says that an estimate is:

- 'A prediction about some characteristic of a proposed project; or
- An attempt to establish for a project, before it is undertaken, its structure and the parameters of that structure.'

It is certainly an approximate, tentative calculation or prediction, or a subjective judgement on the time and resources needed to complete a project. Hopefully it isn't too much of an opinion or an inexact judgement. It may be prudent to include a 'contingency factor' in any estimate that is presented to senior management, to deal with uncertainty for the 'inexact' costings. This statement may also include a comment about the uncertainty in the estimate if appropriate to the organisation.

What is project estimation?

According to John Smyrk:

'Estimation has meanings at two levels of discussion:

- A general definition: Estimation is the process of establishing a reliable analytical model of a project.
- A specific definition: Estimation is the process of establishing values for critical parameters in an analytical model of a project.'

For example:

- General definition - developing:
  - Work Breakdown Structure – bottom-up approach (work-based)
  - Outputs Breakdown Structure – top-down approach (outputs-based)

  (Refer to *Project Management Fact Sheet: Developing a Work Breakdown Structure*)

- Specific definition - determining:
  - the dates in a Schedule of Milestones (Time)
    (Refer to *Project Management Fact Sheet: Developing a Milestone History Monitor*)
  - the resources needed to undertake a project (Resources)

- money required to fund a project's outlays (Costs)

The critical time for any project estimation is at the planning or INITIATION phase. This time is critical, as it should be considered the starting point for future funding options for the project. If the project estimate at this time is way out of 'whack', then any requests for extensions of funding may be rejected by management, or worse still granted, but with severe penalties attached for failing to complete the project to the revised budget.

The challenge of project estimation is getting the costs of resources and time accurate enough to provide a fairly clear picture, without making the outcomes/benefits for Government appear to be too expensive to achieve, and therefore not attempted. In both the Business Case and the Project Business Plan, point estimates cannot normally be provided, and only ranges (defined by an upper and lower bound) should be provided.

It is useful to remember that estimating is a different process to budgeting. With budgeting, you are allocating funding, either to be utilised or already been utilised by the project, not working out what may be needed for potential use by the project.

'Guess-timation' is a term that is used where the person compiling the project estimation draws on their gut feeling, previous experience and/or knowledge gained through years of estimating. It differs from the more rigorous process of estimation through the application of (sometime loose) calculations in that the person may not be able to specifically state from where all of the costings have been drawn.

Who compiles the project estimation document?

A Senior Manager or the Project Manager (if appointed), with assistance from other project personnel as appropriate, would usually develop any estimation documentation. It is important to note that, although the Project Manager may compile the document, its content, and therefore its budget, may be sourced from senior management. This approach (top down versus bottom up) is something that needs to be considered when compiling the estimation, and may play an important role in the final costings.

It must be remembered by the person who is compiling the estimate that their job is not to negotiate funding, just provide what is estimated to be needed; the negotiation will need to be done, but through a different process within the life of the project, and will involve formally agreed changes to the project scope.

What gets estimated?

1. Resource Costs (both fixed and variable) concerned with:

- Labour (eg employing the Project Manager and Team, contractors, Contract Management) including:
    - salary and employment benefits (leave, sick leave, superannuation, professional development)
    - overtime
    - allowances (travel, meals etc)
- Outlays (eg housing the Project Manager and Team, peripherals to support Steering Committee, Reference Groups and Working Parties), including:
    - office equipment (desks, chairs, meeting tables etc)
    - IT infrastructure (hardware, software, peripheral devices etc)

- utilities (power, telecommunications etc)
- rental expenses (including rates, if applicable)
- installation of above
- office supplies (pens, paper, supplies for printer etc)
- photocopying and printing
- telephone and mobile phone costs
- recurrent costs for the business upon project completion (if applicable)

2. Time to be taken to execute the project, including:

- Development of each of the project's outputs (including review and approval time for fitness-for-purpose of outputs/deliverables)
- Administration and above-the-line project management
- Contingency factors, to take into account leave, sick leave, staff changes

Why is estimation important?

Estimates are used to:

- Underpin benefit-cost analysis
- Set expectations of timeframes

Unexpected changes in the project's variables (resources and time) will impact, usually adversely, on the project. It is, therefore, important for good estimation to be provided, otherwise there may not be enough allocated time and/or money to execute the project successfully.

According to John Smyrk, when an Agency/organisation or Business Unit proposes a project for consideration, a number of criteria should be taken into account to ensure at least a fair and accurate estimation:

- Net Present Value (NPV) – the change in the Agency's wealth attributable to the project, brought about by the realisation of the outcomes
- Qualitative outcomes – particularly important as no obvious dollar value can be attributed to these outcomes
- Overall risk that the business case will not be realised

As the project has yet to be undertaken, the feasibility of commencing the project must include all of the above parameters, especially if the estimation is expected to be as accurate as possible for the benefit-cost analysis of the project.

Where are estimates used?

Estimates are used - directly or indirectly:

- Throughout the business case
- As a foundation for the project business plan
- During project monitoring

How do we gauge the quality of an estimate?

To answer this question, we need to define a new concept 'an estimation error':

- Estimates are the ex ante values of a project's parameters
- When a project is over, we know the actual values of these parameters
- Actuals are the ex post values of a project's parameters
- An estimation error is the difference between them
- Too often the quality of the project's estimates is judged by how small they are

- It should be noted that it is a worthwhile exercise to have the quality of the estimate assured by an independent person if feasible. This assurance at least allows senior management to have faith in the reliability of the presented estimate.

How is poor estimation revealed?

- Target outcomes do not reach their target measures
- Achievement of target outcomes is delayed
- Outlays exceed the project budget
- Actual resource consumption exceeds the project's resource allocation (often hidden!)
- Undesirable outcomes emerge that were not anticipated

What causes poor estimates?

- Poor base parameters, either
    - work-based estimates
    - output-based estimates
- Incomplete or inaccurate scoping of project
    - outputs missing
    - fitness-for-purpose features not understood
- Incomplete or inaccurate work breakdown structure
- Infeasible project not resolved
    - deadlines or milestones not achievable or realistic
    - budget allocation will not cover cost of required project outlays

What steps need to be taken in completing accurate project estimations?

According to the TenStep Project Management Process (www.tenstep.com), project estimation can be broken down into the following steps:

- Step 1 - Initially
    - establish a clear picture of what to estimate
    - determine who should be involved in estimating process
    - determine if there are any constraints
    - use multiple estimating techniques if possible
- Step 2 – Estimating Effort
    - determine how accurate estimation needs to be and the rigour that needs to be applied to calculations
    - estimate effort hours against which further estimations can be compared
    - factor the effort hours (may be influenced by the training level of resources who will be completing each task)
    - add specialist resource hours if required
    - consider rework (ideally not an issue, but not an ideal world all the time)
    - add into original estimate
    - add separate activities
    - add blocks of time
    - add project management time (important and often forgotten)
    - add contingency hours (in case all doesn't go to plan)
    - calculate total effort
    - review and adjust as necessary
    - document all assumptions
- Step 3 – Estimating Time and Resources
    - estimate productive hours per day (not necessarily 8 hours per day when you consider normal breaks for lunch, morning and afternoon tea) – be realistic

- determine how many resources will be applied to each project activity (more people, if feasible, shortens time it takes to complete activity)
- determine available workdays (consider holidays, training etc)
- take into account any part-time resources (less time available means task will take longer)
- factor in multi-tasking productivity loss for part-time resources (switching between tasks will lead to loss of some productive time)
- calculate delays and lag-time (vendor supply delays, Steering Committee approval may be delayed for a variety of reasons in some cases)
- determine what work can be done simultaneously (parallel tasks may lessen time tasks take to complete)
- document assumptions

- Step 4 – Estimating Costs

  - estimate labour costs – cost is derived from effort hours of each resource, multiplying by hourly cost (may need to include benefit costs eg leave, superannuation) – remember the consultants fee may have an administrative component
  - estimate non-labour costs – travel, training, facilities, infrastructure etc
  - document all assumptions

- Step 5 – Confirm the Quality of the Estimate

  - walk-through the estimation process
  - challenge 'low' or 'attractive' estimates
  - confirm the appropriateness of all ranges
  - seek independent validation for critical elements of the estimates
  - accept the estimates only if there is good evidence that they are reliable

Conclusion

There is no easy way to produce accurate estimations, except with experience and using better practice from other projects. Depending on your Agency/organisation, each project manager will have varying degrees of expertise in this area. Don't be discouraged, every project manager has had to start somewhere, but other people can be of assistance to get started, and continue on improving your estimation processes.

Remember, it is possible and often prudent to re-estimate throughout a project at key points, and always record your actual costs so that other project managers may benefit from your project experience. Another useful tool to implement post-project is to record the lessons learnt in the project review process – not just for your benefit, but also for your fellow practitioners.

Pete's Estimating Laws

(www.projectconnections.com)

1. 'Everything takes longer than you think (sometimes a lot longer).
2. Thinking about everything takes longer than you think.
3. Project Managing and leading a project team is a FULL TIME job, and then some.
4. Software Engineers are always optimistic (generally REALLY optimistic).
5. Schedules are (almost) always wrong.
6. If you under-estimated an early task when you wrote the WBS (schedule), you probably under-estimated middle and later tasks. Revisit the later phases of the schedule as early as possible when you discover early phase schedule (estimate) errors.

7. Business types (upper management) REALLY do use your estimates for planning. For example, head count, money, customer deliverables, shipping dates, ordering materials, scheduling manufacturing lines, advertising timing, etc. Be able to express your level of confidence on various estimates when you provide them to others.

8. Initially, a good schedule estimate is 80% confidence for near term deliverables, 60-80% for long-term deliverables. Revisit the schedule and revise your estimates after the Initiation Phase (Kickoff) and again after the Design Phase to improve on these early confidence levels.

9. Don't let yourself be bullied into committing to something you cannot achieve.

10. Don't bully someone else into committing to something they cannot achieve.

11. Notify "Need To Know" people AS SOON AS POSSIBLE if there is a significant problem or potential problem in meeting the schedule. Remember that there was a certain degree of optimism in the schedule originally. Note: It's an art to not over-do this.

12. Let team members know that you, the project manager, expect early notification of schedule problems as a courtesy. You decide on the severity or risk of the problem and its impact to the schedule, what actions to take, and what contingencies are appropriate.

13. Most people's estimating skills improve with experience; some don't.

14. Learn your own estimating flaws and compensate for them. Then learn the flaws in your new estimations and compensate for them. Repeat continuously while employed as a project manager.

15. Learn others' estimating flaws and learn to compensate for them. Mentor them on improving their flaws and then compensate for their improvements. Repeat continuously while they are on your project team.

16. In some environments, some people are hedging their estimates, some people are expecting them to hedge the estimates and some people are doing neither. It's an interesting problem to get all of them to stop this behaviour and have people give honest, best-effort estimates. Laws 14 and 15 are useful for dealing with this variability while you are working to get your team members to be more honest with you. Laws 13-16 are part of the "people aspects" of the project management job - like it or not, we have to deal with these "real world effects" on the projects we manage.

17. Be wary of anyone who wants 100% confidence in an estimate. 90% confidence is an exceptional human achievement for any complex task, even with extremely good data.

18. Look up the word "estimate" in the dictionary. You may find it useful in a meeting.

Where to get additional help

- Refer to the *Tasmanian Government Project Management Guidelines.*
- Further information and resources are available from www.egovernment.tas.gov.au

Acknowledgements

This Fact Sheet contains elements of the *Tasmanian Government Project Management Guidelines* prepared by the Department of Premier and Cabinet.

References: Smyrk, John (5 August 2004) Sigma Management Science Pty Ltd, *Project Estimation Workshop*, Presentation material

TenStep Project Management Process (www.tenstep.com)

ProjectConnections (www.projectconnections.com)