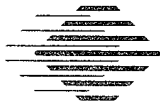Special Report
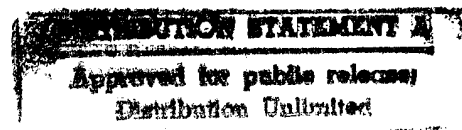
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Checklists and Criteria for Evaluating the Cost and Schedule Estimating Capabilities of Software Organizations

Robert E. Park

January 1995

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Checklists and Criteria for Evaluating the Cost and Schedule Estimating Capabilities of Software Organizations

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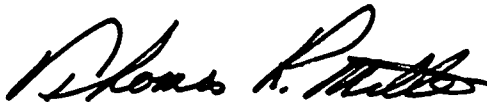This report was prepared for the

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Review and Approval

This report has been reviewed and is approved for publication.

FOR THE COMMANDER

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SEI Joint Program Office

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Checklists and Criteria for Evaluating the Cost and Schedule Estimating Capabilities of Software Organizations

Abstract. This report provides criteria and checklists for evaluating the capability of an organization's software estimating process and the infrastructure that supports it. It also supplies guidelines for good estimating practice. The checklists and guidelines can be used to elicit information for process assessments and to motivate and guide organizations in process improvement efforts.

1. Introduction

This report has four components:

- A list of reasons organizations have for estimating software size, effort, cost, and schedule.

- A checklist of requisites for reliable estimating processes. This checklist can be used to focus and guide assessments of process maturity. It identifies six requisites of reliable estimating processes and provides examples of evidence to look for as indicators of process maturity.

- A checklist for successful estimating environments. This checklist can be used by enterprise managers to identify issues to address when seeking to establish and sustain a corporate software estimating capability. It can be used also as a guideline for evaluating the commitment and support an organization provides for its estimating process.

- A summary of important elements of good estimating practice.

These materials provide criteria and guidelines to help organizations assess the capability of software estimating processes and the infrastructures that support them. They arm you with questions to ask and examples of evidence to look for when assessing the capability of an estimating process and the organization's commitment to make the process work.

Although we prepared these materials to help people assess the processes and practices used to estimate *software* costs and schedules, almost everything in this report applies equally to hardware and integrated systems projects as well. If you have responsibilities for developing hardware or integrated systems, you may find that altering the word 'software' wherever it appears will make the materials useful beyond just the software functions of your organization.

The checklists and tables in this report were prepared as part of the SEI's Software Cost Estimating Improvement Initiative. Please let us know if you find them helpful, or if you have suggestions for improving their usefulness for your organization. For a closely related

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checklist that provides guidance for evaluating individual estimates, please see *A Manager's Checklist for Validating Software Cost and Schedule Estimates* [Park 95].

2. Why Do We Estimate Software Size, Effort, Cost, and Schedule?

There are many reasons to estimate the size, effort, cost, and schedule of software products and projects. Table 1 on the next page lists the ones that we identified during our work on the Software Cost Estimating Improvement Initiative [Park 94]. We present this list

- To give visibility to the variety of reasons why reliable estimating processes are important.

- To help you identify opportunities for getting your money's worth from the estimates you prepare or receive.

As Colonel Russell Logan of the Air Force Pentagon Communications Agency observed when reviewing this work:

> Cost estimating should be a corporate process—an essential one at that—and not something to be singled out for or subject to budgetary axing just to save costs. It is either an essential part of your business or it is not. If not, any effort expended on estimating is meaningless.
>
> In a downsizing epoch (such as many organizations face today, both in government and business), estimating becomes a tool in your engineering and management belt and not a piece to be sold off.
>
> While cost and schedule estimating has not been well done historically, it remains nonetheless an essential element in the tools required by all software professionals. Effective estimating is necessary if a business is to survive and thrive. It is as essential as knowing the target language and environment, and it must become part of the bottom line for any corporate structure.

Table 1: Reasons for Estimating Software Size, Effort, Cost, and Schedule

To scope proposed software tasks	To avoid underestimating the magnitude and complexities of software projects
To explore the affordability of a system	To evaluate the consequences of internal and external constraints
To explore alternative system concepts	To establish achievable objectives
To explore alternative design concepts	To establish a basis for quality service
To explore alternative proposals for enhancements and upgrades	To establish commitments
To identify key design elements	To bound the risk of commitments
To identify key process parameters	To balance levels of risk against customer needs
To identify key assumptions	To provide a basis for successful risk management
To identify key cost drivers, so they can be properly managed	To prepare successful proposals
To identify uncertainties and quantify risks	To provide a quantitative basis for presenting proposed costs and schedules to customers
To identify and manage major risk items	To inform a customer of the potential cost of services from a fee-for-service organization
To set priorities	To evaluate proposals from competing bidders
To help plan the necessary steps for completing a project	To support independent reviews of proposed projects (independent cost estimates)
To identify tasks and their relationships	To serve as a basis for negotiating cost agreements
To assess schedule feasibility	To establish baselines for project tracking
To identify and evaluate cost and schedule tradeoffs	To predict life-cycle costs
To plan for staffing profiles and manpower buildups that meet project needs	To predict returns on investments
To allocate and schedule resources	To provide information for establishing business strategies
To establish budgets	
To get funding	
To assess an organization's ability to perform within targeted costs	

3. Requisites and Indicators

Reliable cost and schedule estimating processes share a number of important characteristics. Table 2 lists six that we have observed. We believe these to be requisites for producing estimates that organizations can trust.

Table 2: Six Requisites for Reliable Estimating Processes
1. A corporate memory (historical database)
2. Structured processes for estimating product size and reuse
3. Mechanisms for extrapolating from demonstrated accomplishments on past projects
4. Audit trails (Values for the cost model parameters used to produce each estimate are recorded and explained.)
5. Integrity in dealing with dictated costs and schedules (Imposed answers are acceptable only when legitimate design-to-cost or plan-to-cost processes are followed.)
6. Data collection and feedback processes that foster capturing and correctly interpreting data from work performed

Trust, of course, is a matter of degree. Just how extensively to rely on an organization's estimating depends on how thoroughly that organization addresses these process requisites.

The first checklist in this report expands upon Table 2. It provides you with elements of evidence to look for when assessing the capability and maturity of an estimating process. It also gives you a structured format to use when probing for evidence and recording your observations.

Although Table 2 and its associated checklist are useful guides, they do not tell you all that you need to know when assessing an organization's estimating capability. Reliable estimating processes don't just happen. Developing and sustaining any process requires organizational commitment and action. Table 3 supplements Table 2 by identifying seven indicators of serious and sustained commitment to reliable estimating. This table (and the checklist that supports it) looks at the commitment and support an organization provides for its estimating process, rather that at the internal structure of the process itself.

Table 3 differs from Table 2 in another way as well. It is a list of indicators, not requisites. While items in the list seem to be good things to do (and we may personally feel strongly about them), different organizations—in differing situations—may have differing approaches to providing sustainable process infrastructures that work for them. Nevertheless, the extent

to which these indicators are present can influence our assessment of an organization's long-term commitment to treat estimating as a corporate asset.

Table 3: Seven Indicators of Estimating Capability
1. Management acknowledges its responsibility for developing and sustaining an estimating capability.
2. The estimating function is supported by a budget and funds.
3. Estimators have been equipped with the tools and training needed for reliable estimating.
4. The people assigned as estimators are experienced and capable.
5. Recognition and career paths exist such that qualified people want to serve as estimators.
6. Estimators work with process improvement teams to quantify and track progress in software process improvement.
7. The estimating capability of the organization is quantified, tracked, and evaluated.

The second checklist in this report expands upon Table 3. It provides a guide for enterprise managers to use when planning the actions they will take to make their estimating process an asset they can rely on. Evaluators can also use the checklist to probe for evidence of an organization's support for its estimating process. The stronger the evidence, the stronger the indication that the organization produces (and will continue to produce) estimates that can be trusted.

The final item of this report is a summary of some important elements of good estimating practice. This summary includes examples that do not fit neatly in a checklist of process requisites, but that are worth considering when implementing an estimating process or assessing its maturity. We have organized the summary in list format, much like the checklists. You will find it at the end of the report, immediately following the two checklists.

4. Checklists and Elements of Good Practice

We present the checklists and elements of good practice in the pages that follow. You may make, use, or distribute as many copies as you wish, so long as you reproduce the entire document and include the copyright notice in each case.

We have made no attempt to prejudge or prioritize the importance of the individual items of evidence that we illustrate in the checklists. As you assign priorities or weights to the evidence you find, you should be guided by the size and type of the organization, its products and customers, the purposes for which the estimates are used, and the nature and combinations of the evidence you observe. In almost all cases, the evidence itself (or lack thereof) will be your best guide to the importance to place on what you find in any particular assessment. As always, the total picture will be what is important. The checklists simply help you probe and sort through the details that give substance to that picture.

5. References

[Goethert 92]   Goethert, Wolfhart B., et al. *Software Effort Measurement: A Framework for Counting Staff-Hours* (CMU/SEI-92-TR-21, ADA258279). Pittsburgh, Pa: Software Engineering Institute, Carnegie Mellon University, September 1992.

[Park 92]   Park, Robert E., et al. *Software Size Measurement: A Framework for Counting Source Statements* (CMU/SEI-92-TR-20, ADA258304). Pittsburgh, Pa: Software Engineering Institute, Carnegie Mellon University, September 1992.

[Park 94]   Park, Robert E., Goethert, Wolfhart B., and Webb, J. Todd. *Software Cost and Schedule Estimating: A Process Improvement Initiative* (CMU/SEI-94-SR-03). Pittsburgh, Pa: Software Engineering Institute, Carnegie Mellon University, May 1994.

[Park 95]   Park, Robert E. *A Manager's Checklist for Validating Software Cost and Schedule Estimates* (CMU/SEI-95-SR-04). Pittsburgh, Pa: Software Engineering Institute, Carnegie Mellon University, January 1995.

Requisites for Reliable Estimating Processes
— A Maturity Checklist —

This checklist is designed to help you evaluate the maturity of an organization's software estimating process. It can be used to elicit information for process assessments or to motivate and guide organizations in process improvement activities.

Requisite 1. A corporate memory (historical database)

Evidence of Maturity

The organization has a process for organizing and retaining information on completed projects (a historical database). ❏

The historical database is treated as an integral part of the estimating process, and estimators have active roles in specifying and sustaining the information it contains. ❏

The database contains a useful set of completed projects. ❏

The elements included in (and excluded from) effort, cost, schedule, size, and reuse measures are clearly identified. ❏

    (For examples, see the SEI checklists for effort, schedule, and size measurement.)

Schedule milestones (start and finish dates) are described in terms of criteria for initiation or completion. ❏

Effort and cost data clearly indicate which parts of the life cycle and which activities are covered by the different categories of hours or costs recorded. ❏

Records for projects indicate whether or not unpaid overtime was used. ❏

Unpaid overtime, if used, is quantified, so that recorded data provide a valid basis for estimating future effort. ❏

Cost models are used to provide a consistent framework (standard terms and parameters) for recording historical data. ❏

Historical data have been examined to identify inconsistencies, and anomalies have been corrected or explained. ❏

    (This is perhaps best done with the same cost models that are used for estimating.)

Work-flow schematics are used to describe similarities and differences among projects. ❏

Information on completed projects includes

- The life-cycle model used, together with the portion covered by the recorded schedule and costs. ❑
- The original size estimate. ❑
- Changes in size resulting from changes in requirements. ❑
- The original cost and schedule estimate, together with the values and rationales used for cost model parameters. ❑
- Re-estimates and estimates-to-complete. ❑
- Reasons for re-estimates. ❑

  (Reasons help us interpret the data. Examples include changes in requirements; changes in priorities; major surprises; erroneous estimates of size, difficulty, or other parameters; delays due to resource constraints; and divergence of performance from plans.)

- Actual costs and schedules. ❑
- Actual (measured) size of delivered code. ❑
- Staffing profile. ❑
- Labor mix. ❑
- Skill level of the project team, measured relative to the skill level of the organization's typical team. ❑
- Nonlabor costs. ❑
- Management costs. ❑
- System integration costs. ❑
- An estimate at completion. ❑

  (What would have been estimated at the start, had we known then what we know now, together with a record of the values and rationales used to map the cost model parameters to actual organization performance.)

- Extenuating circumstances or reasons for the differences between the original and final estimates. ❑
- A work breakdown structure or alternative description of tasks included in the recorded costs. ❑
- A work-flow schematic for the software process. ❑

  (So that differences in processes are made visible and effects of process improvements can be tracked.)

- A summary or list of significant deliverables produced by the project (software, documentation, etc.). ❑
- A summary of any unusual issues or contract factors that affected cost or schedule. ❑
- If multiple builds or releases are used, the size, cost, schedule, and characteristics of each build or release. ❑

Requisite 2. Structured processes for estimating product size and reuse

Evidence of Maturity

The estimating processes for size and reuse are documented. ❑

The estimating processes for size and reuse are followed. ❑

The descriptions of size and reuse identify what has been included in (and excluded from) the size and reuse measures. ❑

The measures of reuse distinguish between code that will be modified and code that will be integrated as-is into the system. ❑

Size estimates are checked by relating them to measured sizes of other software products or components. ❑

The size estimating *process* is checked periodically by comparing its predictive capabilities with measured sizes of completed products. ❑

Because size estimating is often the weakest link in cost and schedule estimating, the organization has a continuing effort that focuses on improving its size estimating process. ❑

Requisite 3. Mechanisms for extrapolating from demonstrated accomplishments on past projects

Evidence of Maturity

The extrapolation process is documented. ❏

Cost models and other tools have been acquired (or developed) to assist estimators. ❏

The cost models have been calibrated to relevant historical data ❏

Cost model calibrations are up to date. ❏

The cost and schedule models are used to quantify demonstrated organizational performance in ways that normalize for differences among software products and projects. ❏

The consistency that estimators achieve when fitting cost models to historical data is measured and tracked. ❏

Values used for cost model parameters are validated by comparisons with past projects. ❏

The methods used to account for reuse recognize that reuse is not free. ❏

> (Estimates account for activities such as interface design, modification, integration, testing, and documentation that are associated with effective reuse.)

Extrapolations from past projects incorporate measured trends in technology improvement, either within the cost models themselves or as inputs to them. ❏

Estimators work jointly with project managers and experienced technical people to identify how the new work compares to work the organization or others have done before. ❏

More than one cost model or estimating approach is used, and differences among results are analyzed and explained. ❏

Trends in the organization's process and performance parameters are tracked to identify their effects on cost model calibrations. ❏

Requisite 4. Audit trails (The values for the cost model parameters used to produce each estimate are recorded and explained.)

Evidence of Maturity

The organization's process documentation identifies who is responsible for preparing the audit trail for software estimates. ❑

A list of parameter values and their rationales accompanies each estimate. ❑

A template or format is used to record the values of cost model parameters and their rationales. ❑

    (This helps avoid oversights.)

Uncertainties in parameter values are identified and quantified. ❑

    (For use in risk analyses.)

The lists of parameter values and their rationales are retained in the organization's historical database. ❑

Requisite 5. Integrity in dealing with dictated costs and schedules (Imposed answers are acceptable only when legitimate design-to-cost or plan-to-cost processes are followed.)

Evidence of Maturity

Management reviews and agrees to parameter values and rationales *before* costs are estimated. ❑

Reasons for changing parameter values from those identified in the calibration set are documented. ❑

Adjustments to cost model parameters to meet desired costs or schedules are accompanied by management actions that make the parameter values realistic. ❑

The actions that the organization intends to take to make its adjusted cost model parameters valid are spelled out in the project plan. ❑

Requisite 6. Data collection and feedback processes that foster capturing and correctly interpreting data from work performed

Evidence of Maturity

There is a defined process for gathering information on completed projects and entering it into the historical database. ❏

Postmortems are held at the completion of each project. ❏
- To ensure that recorded data are valid.
- To ensure that events that affected cost or schedule get recorded and described while they are still fresh in people's minds.

Estimates used for original project planning are saved and entered into the historical database. ❏

Re-estimates and estimates for changes to the product or process are recorded and saved in the historical database. ❏

Pilots and prototypes of new software processes are measured and tracked to capture information that can guide estimates for full-scale processes. ❏

Organizations that acquire software receive and save copies of the developer's postmortem reports. ❏

There is a structured process for capturing data on effort and cost from ongoing and completed projects. ❏

The capturing of data for cost estimating and planning is integrated with the measurement processes used for project tracking and oversight and process improvement. ❏

Estimates-to-complete are updated and reviewed at regularly scheduled intervals (e.g., monthly). ❏

Estimates-to-complete are updated and reviewed whenever there is a major change to requirements, resources, priorities, commitments, assumptions, or understanding of the project. ❏

The processes for capturing, collecting, and disseminating measurement results and descriptive data are supported by automation, so that opportunities for misinformation, sloppiness, and indifference are minimized. ❏

Indicators of Estimating Capability
— A Checklist for Successful Estimating Environments —

Successful estimating processes do not appear spontaneously. Building and sustaining a software estimating capability requires organizational commitment and action. This checklist is designed to help you assess the quality of the support that an organization provides for its estimating process. It identifies elements of evidence to consider when evaluating the infrastructure that supports that process.

Indicator 1. Management acknowledges its responsibility for developing and sustaining an estimating capability.

Evidence of Maturity

Estimating is treated as a corporate process that is essential to the organization's business success. ❑

The individual or office responsible for establishing and sustaining the organization's estimating capability has been clearly identified. ❑

At least one person in the organization has a standing assignment or responsibility as an estimator. ❑

(Continuity and experience are needed for sustaining and improving the organization's corporate memory and estimating capabilities.)

Two or more people have standing responsibilities or assignments as estimators. ❑

(To provide backup capability and reinforcement of professional skills.)

Estimating assignments and responsibilities have been in place long enough for the organization to develop competence in software estimating. ❑

Indicator 2. The estimating function is supported by a budget and funds.

Evidence of Maturity

The estimating function is a line item in the organization's budget and staffing plans. ❑

People and funds have been allocated to support the estimating function. ❑

The budget and funds provide for
- Establishing and sustaining a corporate memory. ❑
- Preparing estimates. ❑
- Capturing data from ongoing and completed projects. ❑
- Acquiring and using estimating models and tools. ❑
- Educating people to be estimators. ❑
- Training in the use of cost models and tools. ❑

Budgets and funds in previous years were sufficient to develop a current estimating capability. ❑

The current budget and funds are adequate for sustaining and improving the estimating capability. ❑

Indicator 3. Estimators have been equipped with the tools and training needed for reliable estimating.

Evidence of Maturity

Estimators have up-to-date desktop computing facilities (hardware and software). ❑

Cost models and other software such as spreadsheets, databases, and statistical programs have been acquired or developed. ❑

Estimators have received training in the cost, schedule, and size models they use. ❑

Estimators have received training in estimating. ❑

Indicator 4. The people assigned as estimators are experienced and capable.

Evidence of Maturity

The estimators have professional experience with the processes and products whose costs, schedules, or sizes they estimate. ❑

Estimators have educational backgrounds that support quantitative analysis. ❑

The number of years of estimating experience among people assigned as estimators is computed and tracked. ❑

The estimators participate in professional activities and societies related to estimating. ❑

Indicator 5. **Recognition and career paths exist such that qualified people want to serve as estimators.**

Evidence of Maturity

Estimating is viewed by both employees and managers as a career-broadening assignment. ❑

Previous estimators have moved on to positions of equal or higher responsibility. ❑

People ask to become estimators. ❑

Indicator 6. **Estimators work with process improvement teams to quantify and track progress in software process improvement.**

Evidence of Maturity

Estimators use their cost models to account for factors that make projects different, so that effects of process improvements can be meaningfully measured and compared. ❑

The organization uses trend analyses derived from cost-model calibrations to track progress in its software process performance. ❑

Indicator 7. **The estimating capability of the organization is quantified, tracked, and evaluated.**

Evidence of Maturity

Management tracks and reviews the effectiveness of its estimating processes. ❑

Managers and other users of estimates are interviewed periodically to identify ❑
- The estimating needs that are being met.
- The estimating needs that are not being met.
- Opportunities for improving the estimating process.

Elements of Good Estimating Practice

This is a list of practices that can help organizations produce reliable cost and schedule estimates. It includes examples that do not fit neatly in a checklist of process requisites, but that are worth considering when implementing a software estimating process or assessing its maturity.

Element	Evidence of Maturity
1. The purpose and objectives of each estimate are clearly understood by both the producer and the user of the estimate.	The purpose and objectives of each estimate are stated in writing. (Differing purposes or objectives affect the way an estimate should be interpreted or used. Examples include feasibility studies, planning estimates, rough order-of-magnitude estimates, formal estimates, proposal estimates, bid evaluation estimates, evaluations of alternative designs or management strategies, estimates to complete, estimates at completion, life-cycle cost estimates, risk analyses, and design-to-cost studies.)
2. The products to be produced are clearly described.	Estimates for product size and content are backed up by systematic engineering analyses. The terms and parameters that describe the product permit comparisons to be made with other products. (The parameter sets of cost models provide useful frameworks for this purpose.)
3. Tasks to be estimated are clearly identified.	Estimators use checklists to identify the elements and activities that are included in (and excluded from) estimates. Proposal teams use checklists to ensure that the proposal (and the estimate) covers all aspects of the work to be performed. Mappings to the contract work breakdown structure are documented.

4. People from related but different projects or disciplines are involved in the estimating process.

Estimators are included in proposal kickoff meetings.

Estimators work closely with project managers and the technical staff from the start of the project, as part of the proposal team.

If integrated project teams are used, they include at least one estimator.

5. Estimates are validated by relating them to demonstrated performance on completed projects.

Cost model calibrations are used to develop organizational proficiency and consistency in the ways the organization relates its parameter values to descriptions of projects.

Values assigned to cost model parameters are based on comparisons with values that give good fits to completed projects.

Reasons are documented for the values assigned to each cost model parameter.

Calibrations are performed and estimates are reviewed (or prepared) by an estimator who has organizational perspectives and experience, so that they draw on the full experience of the organization, not just the views of the project.

6. More than one cost model or estimating approach is used.

Differences in results are analyzed and accounted for.

Records are kept of the effectiveness of the different models for different applications or life-cycle phases, so that effective combinations of estimates from different models can be used for future estimates.

7. Potential cost and schedule impacts are estimated for all identified risks.

A structured process is used to identify and scope technical risks.

Uncertainties in values of cost model parameters are identified and quantified.

The effects of uncertainties in descriptive parameters are evaluated and reported along with estimates.

8. Dictated schedules (if present) are analyzed for impacts on cost.

Managers (and customers, where appropriate) are informed of potential cost savings associated with alternative schedules.

9. Dictated costs and schedules (if present) are analyzed for feasibility. The analyses identify the management alternatives and changes that must be made to key cost drivers if the targets are to be achievable.

Managers (and customers, where appropriate) are informed of potential ways to meet target costs and schedules.

Managers (and customers, where appropriate) are informed of changes that must be made to key cost drivers if target costs and schedules are to be achievable.

Estimators are not forced to give unrealistic cost or schedule estimates.

10. Estimates are kept current.

Estimates (or estimates-to-complete) are updated whenever
- Changes to requirements affect cost or schedule.
- Constraints change.
- Resources change.
- Priorities change.
- Actual values for product or process parameters are found to be significantly different from those on which the plan is based.
- Tracking measures indicate that critical path tasks cannot be completed as planned.

11. The results of estimates are integrated with project planning and tracking.

Plans are reviewed and updated whenever estimates change.

The estimates used for project planning are also used as baselines for project tracking.

Feedback from project tracking is used to improve both the estimating and development processes.

12. The organization has a historical database for organizing and retaining information on completed projects.

The historical database is treated as an integral part of the estimating process, and estimators have strong and active roles in specifying and sustaining the information it contains.

The elements included in (and excluded from) effort, cost, schedule, size, and reuse measures are clearly identified.
> (For examples, see the SEI checklists for effort, schedule, and size measurement.)

Schedule milestones (start and finish dates) are described by criteria for initiation or completion.
> (So that work accomplished between milestones is clearly bounded.)

Effort and cost data clearly indicate which parts of the life cycle and which activities are covered by the different categories of effort or costs recorded.

Records for projects indicate whether or not unpaid overtime has been used.

The amount of unpaid overtime is quantified.
> (Measures or estimates of unpaid overtime for each project are made and recorded, so that historical costs can provide a valid basis for estimating future effort.)

The database contains a useful set of completed projects.

Cost models are used to provide consistent frameworks (standard terms and parameters) for recording historical data.

Historical data are examined to identify inconsistencies, and anomalies are corrected or explained.
> (This is perhaps best done with the same cost models that are used for estimating.)

13. Information on completed projects is captured and entered into the historical database.

Original estimates for size, cost, and schedule are retained.

Postmortems are held at the completion of each project.

- To ensure that recorded data are valid.
- To ensure that events that have affected costs or schedules are described and recorded while they are still fresh in people's minds.

14. The emphasis throughout is on developing consistency in describing completed projects and in relating new work to demonstrated performance on those projects.

The consistency achieved when calibrating cost models to completed projects is measured and tracked.

The phrase "model accuracy" (implying that the model rather than the estimator made the estimate) is never used.

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			software estimating process

19. ABSTRACT (continue on reverse if necessary and identify by block number)

This report provides criteria and checklists for evaluating the capability of an organization's software estimating process and the infrastructure that supports it. It also supplies guidelines for good estimating practice. The checklists and guidelines can be used to elicit information for process assessments and to motivate and guide organizations in process improvement efforts.

(please turn over)

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