Desarrollo de un sistema en tiempo real de monitorización de pacientes para saber su estado anímico

Prepared on 09/11/2020

Estimate Summary

Desarrollo de un sistema en tiempo real de monitorización de pacientes para saber su estado anímico

Nominal Plan

Current Project Phase: Detailed Requirements / UI Design Complete

Management Metric	Expected Value (50% Probability)	Standard Deviation	Standard Deviation as Percentage
System Size (lines of code)	12.000	2.478	±21%
Effort (staff months)	13	18	±138%
Schedule (calendar months)	11,6	4,0	±35%
Completion Date	28/10/2021	4,0 months	±35%
Cost	n/a	n/a	n/a
Peak Staff (people)	1,8	1,6	±88%
Average Staff (people)	1,2	1,6	±138%
Overall Estimate Quality	Fair		

This estimate is the 50/50 estimate--the estimate for which there is both a 50 percent chance of overrunning and a 50 percent chance of underrunning the estimate. This is also known as the "nominal" estimate. This estimate is for the "main build" phase of a project, the time from detailed requirements specification complete to software acceptance. Earlier phases of a project are not estimated here.

Optimum Plan

Management Metric	Optimum Planning Value
Effort (staff months)	9
Schedule (calendar months)	12,7
Cost	n/a
Peak Staff (people)	1,2
Average Staff (people)	0,7

These planning values meet the project's entire set of constraints and priorities to the maximum extent possible.

Estimate Summary View Screen

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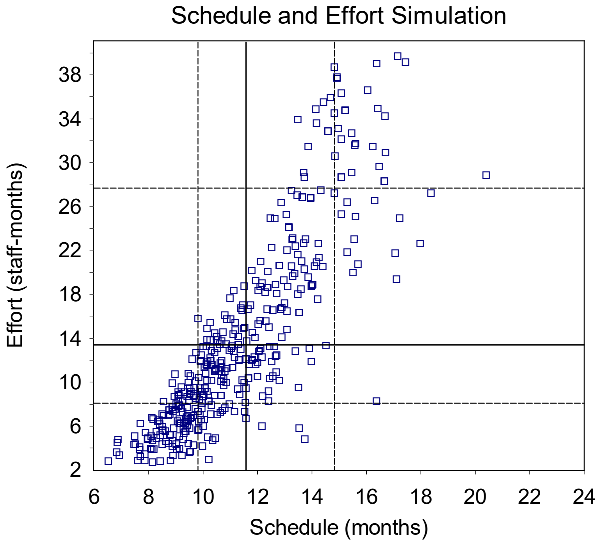
Detailed Requirements / UI Design Complete
Calibration Type: Project Type (from industry data)



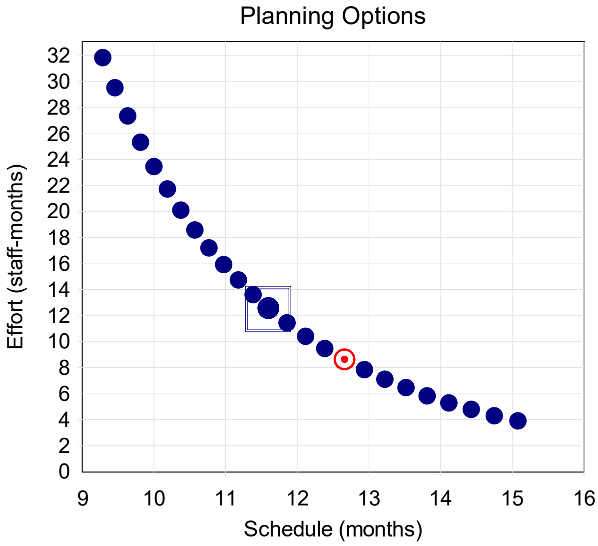
Scope (Lines of Code)

Expected:	12.000
Std Dev:	2.478 (±21%)
Min (5th Percentile):	7.752
Max (95th Percentile):	16.248

Nominal Plan ☐

(All priorities equal weighted)

Effort:	13 staff-months
Schedule:	11,6 months
Peak Staff:	1,8 staff
Cost:	n/a



Optimum Plan ⦿

(priorities set by estimator)

Effort:	9 staff-months
Schedule:	12,7 months
Peak Staff:	1,2 staff
Cost:	n/a

Project planning is currently not affected by constraints.

Estimate Quality

Summary of Estimate Quality

Estimates vary in the quality of the assumptions used to create them.

Some of these characteristics can be evaluated programmatically.

This report rates the quality of this estimate on a 5 point verbal scale:

- Excellent
- Very Good
- Good
- Fair
- Poor

Overall quality of this estimate: Fair

Calibration Evaluation

Estimates calibrated with three or more historical projects are most accurate. Estimates calibrated with one or two historical projects, cost drivers, or project types are less accurate. This estimate has been calibrated using project types.

Calibration quality: Fair

Scope Evaluation

Scope estimates created with fine-granularity units such as function points and lines of code include less imprecision than estimates created with large-granularity units such as classes and subsystems. Scope estimates created on a module-by-module basis are more accurate than entering only one basic scope estimate.

This estimate's type of scope estimate: Basic Size (Lines of Code)

Scope estimate quality: Very Good

Phase Evaluation

Estimates created later in a project are more accurate than estimates created early in the project. Even the best estimates cannot be very accurate if they are created at a point in the project when comparatively little is known about the software to be built.

Current project phase: Detailed Requirements / UI Design Complete

Estimate quality possible in this phase: Good

Estimate Quality Continued...

Consistency Check

The table below provides a consistency check by comparing the current project estimate to results from other projects of similar sizes and types. The estimated project has a type of "Real-time embedded / Avionics" and a subtype of "Scientific / Engineering Research."

Management Metric	Value	Assessment
Productivity (lines of code per staff-month)	1.273	Within Normal Range
Schedule (months)	12,7	Within Normal Range
Effort (staff-months)	9	Within Normal Range
Average Staff (people)	,7	Within Normal Range
Code Generation Rate (lines of code per month)	948	Within Normal Range

Overall consistency with industry data: Excellent

Suitability Evaluation

Estimate works effectively when at least two of the following conditions are met:

- Estimated size is greater than or equal to 5000 lines of code.
- Nominal development is expected to last at least 6 months.
- Nominal effort is expected to be at least 18 staff-months.
- Nominal peak staffing is at least 3 people.

When less than two of these criteria are met, the only way to achieve a reliable estimate is to use Historical calibration. Even when Historical calibration is used, some projects are too small to estimate reliably. This project uses Project Type (from industry data) calibration, and two of these conditions have been met.

Suitability of Estimate to estimate this project: Good

Planning Options Overview

Desarrollo de un sistema en tiempo real de monitorización de pacientes para saber su estado anímico

Nominal Plan

Management Metric	Planning Value
Effort (staff months)	13
Schedule (calendar months)	11,6
Cost	n/a
Peak Staff (people)	1,8
Average Staff (people)	1,2

Optimum Plan

Management Metric	Planning Value
Effort (staff months)	9
Schedule (calendar months)	12,7
Cost	n/a
Peak Staff (people)	1,2
Average Staff (people)	0,7

Shortest-Schedule Plan

Management Metric	Planning Value
Effort (staff months)	33
Schedule (calendar months)	9,3
Cost	n/a
Peak Staff (people)	5,5
Average Staff (people)	3,5

Least-Cost Plan

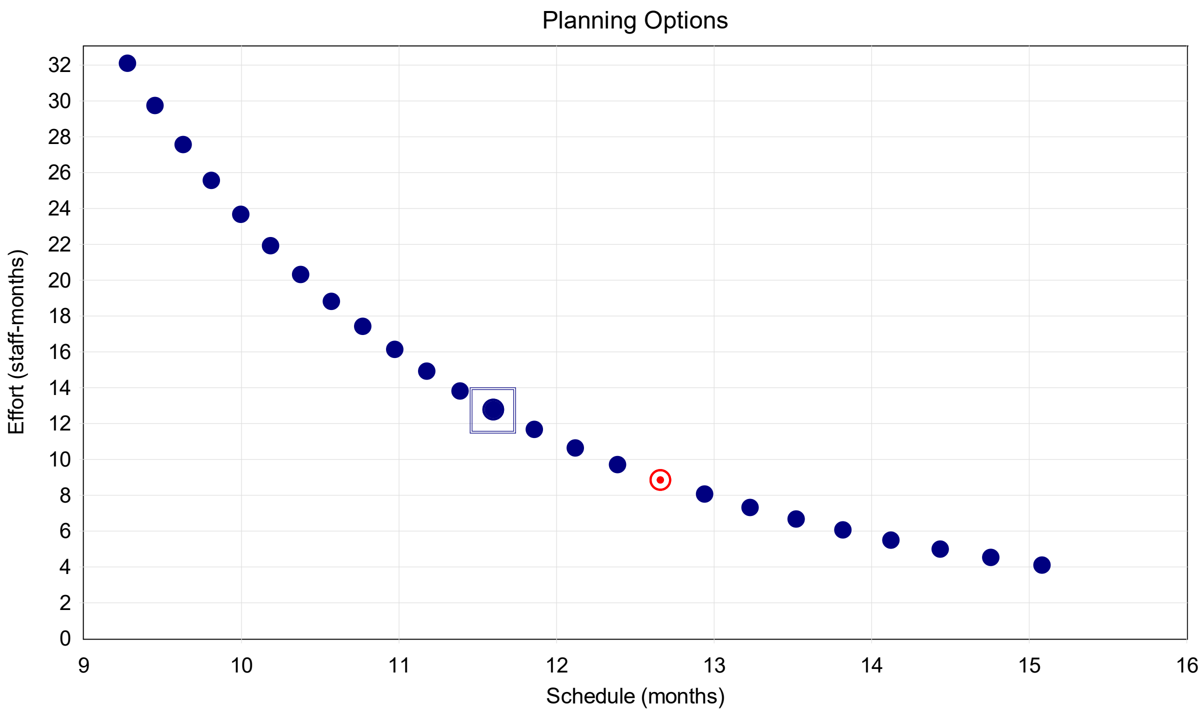
Management Metric	Planning Value
Effort (staff months)	5
Schedule (calendar months)	15,1
Cost	n/a
Peak Staff (people)	0,5
Average Staff (people)	0,3

Planning Options Graph

Desarrollo de un sistema en tiempo real de monitorización de pacientes para saber su estado anímico

The graph below contains planning options. These options are computed from the nominal effort, schedule, and cost produced by the Monte Carlo simulation. Each of these options is considered to be equally achievable in the configurations shown.

The nominal planning option, the planning option recommended before constraints and priorities are considered, is marked with a rectangle. The optimum planning option, the option that best meets the constraints and priorities entered (if any), is shown as a bullseye. The cost constraint (if any) is shown as a horizontal dashed line. The peak staff constraint is not indicated on this graph. The shaded portion of the graph (if any) shows the range of schedule and effort solutions that are allowed under the schedule and effort constraints entered by the estimator.



Planning Options

Desarrollo de un sistema en tiempo real de monitorización de pacientes para saber su estado anímico

The table below contains planning options. These options are computed from the nominal effort, schedule, and cost produced by the Monte Carlo simulation. Each of these options is considered to be equally achievable in the configurations shown. The schedule that best meets the constraints and priorities entered by the estimator (if any) is shown with a shaded background.

Option	Schedule	Effort	Peak Staff
1	9,3	33	5,5
2	9,5	30	5,0
3	9,6	28	4,5
4	9,8	26	4,1
5	10,0	24	3,8
6	10,2	23	3,4
7	10,4	21	3,1
8	10,6	19	2,9
9	10,8	18	2,6
10	11,0	17	2,4
11	11,2	16	2,2
12	11,4	14	2,0
13	11,6	13	1,8
14	11,9	12	1,6
15	12,1	11	1,4
16	12,4	10	1,3
17	12,7	9	1,2
18	12,9	9	1,0
19	13,2	8	0,9
20	13,5	7	0,8
21	13,8	7	0,7
22	14,1	6	0,7
23	14,4	6	0,6
24	14,8	5	0,5
25	15,1	5	0,5

Constraints and Priorities

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Constraints

Estimates can be constrained to hold results within numeric values for cost, effort, schedule, and peak staff. The table below shows the constraints used to create this estimate.

Constraint	Value
Maximum Schedule Allowed	n/a
Maximum Effort Allowed	n/a
Maximum Cost Allowed	n/a
Maximum Peak Staff Allowed	n/a
Minimum Mean Time to Defect (MTTD) Allowed	n/a

Project planning is currently not affected by constraints.

Priorities

Priorities can be used to determine the optimal project plan. The table below shows the priorities used to create this estimate.

Priority	Value
Schedule Priority	Medium Priority
Effort Priority	Low Priority
Cost Priority	High Priority
Peak Staff Priority	<Not prioritized>
Mean Time to Defect (MTTD) Priority	Absolute Priority

Notes

Defect-related constraints and priorities are currently used only for documentation purposes and do not have any quantitative effect on the estimates produced.

Milestones for Optimal Project Plan

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The table below contains project milestones for the optimal project plan. This estimate is for the "main build" phase of a project, that is, the time between detailed requirements specification complete to software acceptance. Dates are not provided for milestones prior to the project start date.

Project Day	Date	Milestone	Cumulative Schedule	Cumulative Effort
n/a	n/a	Start of Feasibility Study	n/a	n/a
n/a	n/a	Feasibility Study / Product Concept Complete	n/a	n/a
n/a	n/a	General Requirements Complete	n/a	n/a
1	09/11/2020	Detailed Requirements / UI Design Complete	0%	n/a
77	25/01/2021	High-Level Design Complete	20%	12%
166	24/04/2021	Detailed-Design Complete	43%	45%
219	17/06/2021	Feature Complete / Code Complete	57%	65%
308	13/09/2021	Start of User-Oriented System Test (beta test)	80%	90%
358	02/11/2021	Development and Test Complete	93%	97%
385	29/11/2021	Software Accepted	100%	100%

Staffing Profile for Optimum Project Plan

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The table below contains a staffing profile for the optimal project plan. These staffing figures include development staff, quality assurance staff, and first-level management.

Month	Month Starting	Team Size (at End of Month)	Cumulative Effort
1	09/11/2020	0,4	0
2	10/12/2020	0,7	1
3	09/01/2021	0,9	2
4	08/02/2021	1,1	3
5	11/03/2021	1,2	4
6	10/04/2021	1,1	5
7	11/05/2021	1,0	6
8	10/06/2021	0,9	7
9	11/07/2021	0,7	8
10	10/08/2021	0,6	8
11	09/09/2021	0,4	9
12	10/10/2021	0,3	9
12,7	29/11/2021	0,2	9

Cash Flow for Optimum Project Plan

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This report is not available.

Simulation Scatter Plot

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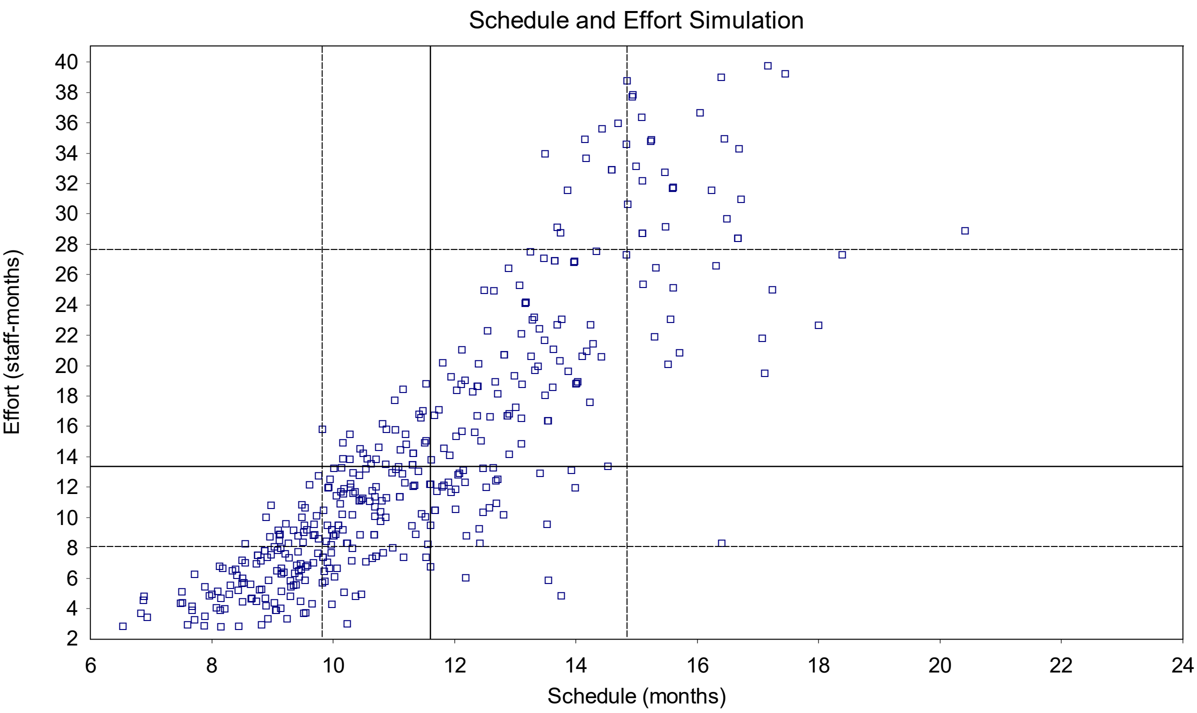
This graph shows the results of a Monte Carlo simulation. Project outcomes are simulated based on productivity data, scope estimates, and other assumptions. In this case, 500 project outcomes were simulated. This simulation is used to determine the way that a complex set of factors influence project outcomes. This chart provides a visual indication of how much convergence or lack of convergence there is among different estimating assumptions.

The solid lines show the median efforts and schedules of the simulated projects. The dashed lines show the effort and schedule outcomes that are 25 percent and 75 percent likely. The shaded portion of the graph (if any) shows the range of schedule and effort solutions that are allowed under the schedule and effort constraints entered by the estimator.



Scope Probabilities

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The table below contains scope estimates by probability. These scope estimates are expressed in lines of code. If the scope estimates were not originally expressed by the estimator in lines of code they have been converted to lines of code. The scope estimates are based on parameters that have been entered by the estimator, including the following:

Scoping Method: Basic Size (Lines of Code)

Project Phase: Detailed Requirements / UI Design Complete

Number of Simulations: 500

Probability (%)	Scope Will Be Less Than	Difference From Nominal
1,0	6.808	-43%
5,0	7.752	-35%
10,0	9.404	-22%
20,0	10.112	-16%
30,0	11.056	-8%
40,0	11.528	-4%
50,0	12.000	0%
60,0	12.472	4%
70,0	13.652	14%
80,0	14.124	18%
90,0	14.832	24%
95,0	16.248	35%
99,0	17.192	43%

Effort Probabilities

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The table below contains effort estimates by probability. These effort estimates are expressed in staff-months. They are based on parameters that have been entered by the estimator, including the following:

Calibration Method: Project Type (from industry data)

Project Phase: Detailed Requirements / UI Design Complete

Number of Simulations: 500

Probability (%)	Effort Will Be Less Than	Difference From Nominal
1,0	3	-78%
5,0	4	-69%
10,0	5	-61%
20,0	7	-46%
30,0	9	-33%
40,0	11	-15%
50,0	13	0%
60,0	17	27%
70,0	23	71%
80,0	35	161%
90,0	81	504%
95,0	197	1.369%
99,0	289	2.061%

Cost Probabilities

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This report is not available. Project labor cost has not been defined.

Schedule Probabilities

Desarrollo de un sistema en tiempo real de monitorización de pacientes para saber su estado anímico

The table below contains schedule estimates by probability. These schedule estimates are expressed in calendar months. They are based on parameters that have been entered by the estimator, including the following:

Calibration Method: Project Type (from industry data)

Project Phase: Detailed Requirements / UI Design Complete

Number of Simulations: 500

Probability (%)	Schedule Will Be Less Than	Difference From Nominal
1,0	7,0	-40%
5,0	8,1	-30%
10,0	8,8	-25%
20,0	9,5	-18%
30,0	10,1	-13%
40,0	10,7	-8%
50,0	11,6	0%
60,0	12,7	9%
70,0	13,9	20%
80,0	15,7	35%
90,0	20,9	81%
95,0	27,6	138%
99,0	33,6	190%

Calibration Summary

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Calibration Method: Project Type (from industry data)

Project Types

This estimate has been calibrated by choosing a description of the project type from a list of project types. The list of types includes business systems, shrinkwrap products, avionics, and many other types. Estimate creates a project estimate by using its database of productivity data for each project type. Because this data accounts for experience with software development across entire industries, estimates created in this way are subject to more variation than estimates created using other calibration methods.

Project Type: Real-time embedded / Avionics

Project Subtype: Scientific / Engineering Research

Technical Notes

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This page describes estimation parameters that will be of interest primarily to expert estimators.

Technical Value	Expected Value (50% Probability)	Standard Deviation
Productivity Parameter (PP)	6.765	3.978
Productivity Index (PI)	10,0	n/a
Nominal Manpower Buildup Parameter (MBP)	8,0	2,2
Nominal Manpower Buildup Index (MBI)	1,0	n/a
Minimum MBI Used in Creating Planning Options	-1,6	n/a
Maximum MBI Used in Creating Planning Options	3,3	n/a
MBI Used to Create Optimum Plan	0,1	n/a
Lines of Code Used to Create Simulation	12.000	2.360

Estimate Background

Software engineering studies have found that project estimates created with the aid of automated estimation software are more accurate than those created with manual estimation methods. Automated estimation tools ultimately allow software projects to be delivered at lower cost than manual methods do.

Accurate Estimates

Estimate is an automated software project estimation tool which employs a variety of sophisticated modeling techniques to create accurate software project estimates.

Estimation Algorithms

Estimate makes use of three mature estimation approaches.

• SLIM

SLIM was developed by Lawrence H. Putnam in the early 1970s and first offered as a commercial product in 1978. The methodology has been continuously refined since its initial offering and is fully described in a book Putnam co-authored with Ware Myers, "Measures for Excellence" (Yourdon Press, 1992).

The SLIM methodology is based on the insight that efficiently-run software projects follow well-defined patterns that can be modeled with a set of exponential equations. These equations form the core of Estimate's approach to creating cost, effort, schedule, peak staffing, and defect estimates.

• Cocomo 2.0

Cocomo 2.0 is a continuation of the work begun by Barry W. Boehm in the 1970s and described in his 1981 book, "Software Engineering Economics" (Prentice-Hall).

Since 1981, additional work has been done to refine the Cocomo model and to apply it to projects other than the U.S. Department of Defense projects for which it was originally developed. At present, the model has been extended into Cocomo 2.0, which allows estimates to be created for virtually any kind of project by specifying a set of cost drivers. Estimate uses the Cocomo 2.0 model as a supplement to the SLIM model when estimates are calibrated using cost drivers. A productivity baseline is established using the project type settings; the productivity factor is then adjusted using the computed Cocomo 2.0 productivity.

• Monte Carlo Simulation

Estimate uses Monte Carlo simulations to model complex interactions in the face of uncertain estimating assumptions. Estimate simulates hundreds of possible outcomes of the project being estimated based on size, productivity, current project phase, and other parameters entered by the estimator. It then estimates the likelihood of various project outcomes and assigns risk levels to different planning options. In complex situations that involve a lot of uncertainty, this methodology allows Estimate to create meaningful estimates that would otherwise be impossible to model.

Calibration Methods

Construx has found (along with most of the rest of the software industry) that a generic estimation model is virtually useless unless it is calibrated for the specific environment in which it will be used. Estimate employs three calibration methods, which provide varying degrees of estimation accuracy.

• Project Types

The easiest (and least accurate) calibration method involves describing the type of project being estimated by choosing from a list of common project types. The list of types includes business systems, shrinkwrap products, avionics, and many other types. Estimate then creates a project estimate by using its database of productivity data for each project type. Because this data accounts for experience with software development across entire industries, estimates created using this calibration method are subject to more variation than estimates created using other calibration methods.

• Cost Drivers

A more detailed method of calibrating Estimate for specific projects is to describe both the project type and additional project parameters. These additional parameters include project attributes (such as whether the development team will be co-located at the same facility or spread among geographically dispersed facilities), product attributes (such as whether the project is well-known or unprecedented), and personnel attributes (such as whether the development team is below average, average, or exceptional). When this calibration method is used, Estimate again makes use of its database of industrywide productivity data.

• Historical Projects

The most accurate method of calibrating Estimate is to enter data from completed projects within the organization that will perform the project being estimated. This approach cuts through a raft of estimating assumptions that affect productivity such as product complexity, personnel quality, quality of the organization's existing code base, organizational effectiveness, and so on. When calibration methods other than historical data are used, each of these factors must be approximated by the estimator, which introduces additional imprecision into the estimate at each step. By using historical project data from an organization to calibrate the estimation model for future projects, this approach provides accurate estimates with little work on the part of the estimator.