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Exploding Estimates

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OVERVIEW

The most successful estimating is based on software measurement techniques and historical data. Many factors are required for accurate estimating including: size; defect analysis; understanding project scope; and analyzing project attributes. This article will discuss these factors and the models used to develop estimates.

SIZE - THE MOST SIGNIFICANT FACTOR

Software size is the one factor that has the greatest impact on estimates. Size can be measured based on Function Point Analysis, which is now recognized as the best method to size software deliverables. Function Points are a unit of measure for software, just as "liters" are a volumetric measure of liquid. There are different categories of function points, as there are different types of liquids. Some liquid examples are gasoline, oil, water, milk, alcohol and nitroglycerin. Each should be treated differently and assessed differently. Function point examples are client/ server, mainframe, missile guidance, middleware and robotics. These software classes also are to be treated and assessed differently, especially from an estimating and productivity perspective. Regardless, Function Point Analysis is extremely beneficial as a consistent, standard measure to size software functionality within a class.

Size is obviously critical in estimating effort based on the simple concept that more units of output require more units of labor. Size however, also has a significant impact on the methods and techniques used to deliver the output. For example, how long will it take to fill a container with 500 litres of liquid? The answer depends on several factors; type of liquid, hose diameter, length, pressure, number of hoses, temperature, personnel, and other influences.

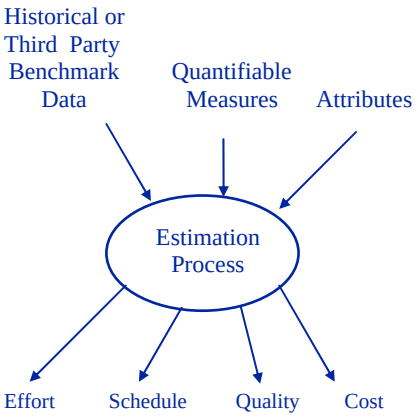
Software engineering is even more complex and dynamic. Unfortunately, many large projects have failed in the past 5 years, largely due to unreliable estimates. Team members experienced in filling small vials with water did not recognize they were dealing with large quantities of nitroglycerin. These were often referred to as "big bang" projects for obvious reasons. Filling a tank with nitroglycerin requires different techniques than filling a vial with water. The volume to be filled, constraints such as time and cost, and project approach and techniques, should all be considered.

These aspects need to be integrated into the estimate by calibrating your input measures and your estimation model.

THE IMPACT OF MEASURES AND ATTRIBUTES

The estimation process accepts project measures and attribute information to identify realistic estimates to the project team.

The estimates usually consist of effort, schedule, cost and quality information.



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The following is a partial list of common quantifiable project measures which often significantly impact estimates:

- Project size in Function Points
- Purchased and customized functionality in Function Points
- Forecasted rework
- Number of installed sites
- Number of interfaces with other systems or applications
- Number of users
- Number of architectures
- Project team size
- Defects
- Staff costs & per diems

The following is a partial list of attributes which are more difficult to quantify, but generally have a significant impact on the estimates:

- Experience of staff
- Cooperation of staff
- Criticality of software
- Distractions
- User participation
- Methodology
- Techniques
- Tools
- Architectures
- Bilingual/ Multilingual Support

The following is a partial list of commonly collected historical project and application data:

- Productivity rates
- Elapsed time delivery of projects
- Support rates
- Defect density and delivery rates
- Team sizes
- Project and application sizes

The estimation process typically uses a standard productivity rate (function points per hour) based on Historical Project & Application Data or a robust third party benchmark data base. This productivity rate is then adjusted based on the project Quantifiable Measures and Attributes. The resulting forecasted productivity rate is then used to estimate effort, schedule and cost.

Given the number of different measures and attributes which influence estimates, caution must be taken to avoid "analysis paralysis" syndrome. Start with a smart set of collected measures and attributes, then expand to further refine your estimates.

The Estimation Process described above is often embodied in an off-the-shelf tool or a customized model.

Estimation Tools and Models

There are many tools, both automated and manual, which allow an increased level of estimate precision. These tools are generally referred to as "parametric models." These models utilize measurement information such as: function points, schedule, constraints, and team size, to derive the estimate for effort (hours/ days/ months), schedule duration, defect density, and cost.

The models often are composed of algebraic expressions such as COCOMO (Constructive Cost Model), historical statistics of past performance or a third party benchmark data base. The best models can be calibrated to your organization's own experience. The key is that productivity statistics, calibrated for your environment, methodologies, techniques and tools, is the best method of forecasting your future performance. You must adjust the measurement definitions, models, and historical benchmarks to reflect your organization's experiences. This ensures comparisons are realistic and meaningful.

The process of inputting measures and outputting estimates often takes several iterations to determine the dynamics affecting the estimate and to identify what alternatives can be communicated to decision-makers. For example, the trade-off between expanding the schedule by 2 months and reducing forecasted cost by $200,000, should be brought to the attention of the decision-makers for consideration. The results generated from these models can then be considered along with other estimating techniques. The use of measurement-based estimates are not intended to completely replace other methods, but to complement existing successful techniques.

SUMMARY

Various estimation models, techniques and methods are available today and should be considered and used where appropriate. The best of these are measurement-based, logical, and objective. This ensures that your estimate will be viewed as valuable information which decision-makers can use with confidence.

Function Point Analysis techniques, in conjunction with reliable and repeatable estimating methods, provide an effective approach to predict project and application performance. The business of software engineering is much more dynamic and factor-dependent than other business functions. The more you understand your processes, personnel and the dynamics of estimation, the more realistic and accurate your estimates will become. The good news is that using and tracking various measurement information with structured, logical use of Function Points can dramatically improve estimation accuracy, making your project less volatile and explosive.

About the author

Steven Woodward wrote this article. Mr. Woodward operates Q/P Management Group of Canada. He specializes in software measurement, process improvement, risk management, and software benchmarking. His areas of expertise include software measurement, estimating, quality assurance, outsourcing management, project management, function point analysis, and information services education