Estimating software-intensive projects

Combining techniques for the right result.

Emmanuel Gonnet, September 2008
Game Time

- You can win a prize!
- Estimate how many slides I will go through during my presentation?
Agenda

- Solving business problems
- Examining some fundamentals
- Reviewing the estimation methods
  - Historical data
  - Counting
  - Decomposition
- Combining methods for better results
- Concluding – Best practices
What business problems?

Estimation solves issues related to “guesstimation” by:
- Reducing gaps between targets and reality
- Enabling planning and monitoring activities
  - Resource planning
  - Scheduling
- Gating the investment process
- Facilitating communication and transparency
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  - Expert judgment
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Accuracy varies with time

Source: COCOMO

Source: The Rational Unified Process
Implications

- Single point estimates are not accurate
- Accuracy should improve with time
- The estimation method should change as the project progresses.
Choice of an estimation method

- The choice of estimation method depends on:
  - The nature of the software (embedded, …)
  - The size of the project (small, medium..)
  - The point in time when the estimation is done
  - The type of project (Greenfield, maintenance…)
  - Others?
Implications

- Organizations should master multiple estimation methods that map to the possible scenarios they may face.
  - Some estimation techniques are not appropriate for certain combinations of variables
- A decision tree is needed to identify the right technique in the right context
Cost is size times productivity

Cost = Size * Productivity

Where
- Cost could be “days”
- Size could be “number of work units”
- Productivity could be “days/number of work units”
Implications

- Regardless of the technique used:
  - Size of the effort should be estimated
  - Productivity and contextual assumptions should be articulated.

- Sizing and productivity information should be transferable between estimation techniques
  - Establishing “work units” is paramount
  - Productivity is a major data element
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Historical data

- Based on past experience and recorded information
- Techniques are:
  - Expert judgments (i.e. wideband delphi)
  - Industry benchmarks
  - Recorded data (i.e. Timesheets)
  - Analogy
- Are you records in the C=S*P format?
Counting

- Based on the computation of certain elements
- Techniques are:
  - Function points, use case points…
  - Proxy-based methods
  - What else can you count?
- Good way to size the effort
  - Still require productivity information
Decomposition

- Based on the division of work into “bite-size” components
- Techniques are:
  - Decomposition into WBS
  - Decomposition of functions…
- Still requires historical data and counts:
  - List of tasks
  - Counting the functions …
- Benefits from the law of large numbers
Focus on use case points

- \((AW + UW) \times TF \times EF \times PHF\)
  - Where \((AW+UW) \times TF\) represent the size
  - Where \(EF \times PHF\) represents the productivity

- Requires
  - The counting of use cases and actors
  - Measures of productivity elements (data)

- Preferred method for the unified process post inception-phase

**AW**: Actor Weight, **UW**: Use Case Weight, **TF**: Technical Factors, **EF**: Environment Factors, **PHF**: Person Hour Factor
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Example: combining techniques for better accuracy
Best practices

- Contextualize the estimation process
  - Adopt the method that matches the situation
  - Combine methods for better results
- Choose work units and a data collection scheme
  - Measure both size and productivity
  - Employ measurable work units
  - Record data for better calibration and process improvement (learning)
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Winners?

- This presentation had 21 slides.