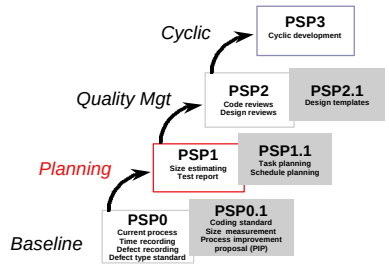
Planning III-A: Estimating Software Size - Estimating Methods, Proxies

Outline

- Review of PSP Levels
- Background
- Criteria for a size estimating method
- Some popular estimating methods
- Proxy-based estimating
- Homework #3

Review of PSP Levels *(Humphrey, 1995, p. 11)*

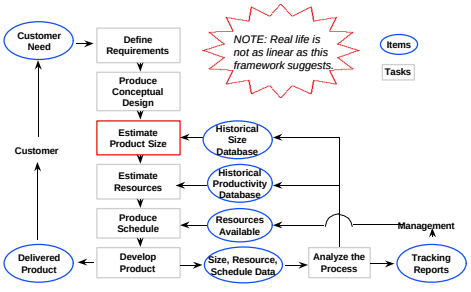


Background *(cf. Humphrey, 1995, p. 97-98)*

- Poor planning is a major reason why projects have trouble, and many fail.
- Size-estimating is the generally-accepted practice in engineering, manufacturing, and construction.
  - Start with general estimate or demonstration of similar-feature product.
  - (Iteratively) refine requirements and estimates.

Review of the Project Planning Framework

(cf. Humphrey, 1995, p. 99)



Background *(cf. Humphrey, 1995, p. 98-100)*

- *"The tricky part of software size estimating is in characterizing the product elements and relating them to your historical experience."*
- *The accuracy of any size-resource-cost model is "limited by the accuracy of the size estimates. So, even when you use an estimating model, you need an accurate size estimate."*
- *Models must be calibrated to the organizations which use them.*
- *Estimation errors can be very large, even 100% or more.*
- *Very few professionals (22% in JPL study) use size estimation to make cost estimates.*
- *Early project uncertainty makes it hard to accurately estimate SW size.*
  - *PC, PI, and Objects may reduce this problem.*

Criteria for a Size-Estimating Method

(cf. Humphrey, 1995, p. 100-101)

- Uses structured and trainable methods.
- Can use in all phases of development & maintenance.
- Usable for all SW product elements: code, files, reports, screens, & documentation.
- Suitable for statistical analysis.
- Applicable to future types of work.
- Provides a means to judge the accuracy of your work.

Popular Estimating Methods: Delphi (cf. Humphrey, 1995, p. 102-103)

- Uses several estimators
- Coordinator calculates average and returns summary forms
- Estimators discuss results
- Iterate until consensus
- Ex:
  - Initial SLOC: A=100, B=500, C=350, avg=317
  - 2nd estimate: A=275, B=400, C=325, avg=333
  - 3rd estimate: A=300, B=375, C=300, avg=325
- Can be very accurate, but
- Relies on a few experts,
- Is time consuming, and
- Can be biased.

Popular Estimating Methods: Fuzzy Logic (cf. Humphrey, 1995, p. 103-105)

- Roughly judge how predicted size compares with historical data.
- Historical data is divided into topical categories and subgroups based on size.You need a large amount of historical data for this.
- Look at examples on p. 103-105. (Note: $\log_{10}$(LOC) is used to create equally-sized ranges.)

Fuzzy Logic In-Class Practice Problem

- See “In-Class Practice Problems” handouts

Popular Estimating Methods: Standard Components

(cf. Humphrey, 1995, p. 102-103)

- Make a list of standard components
  - Files, modules, subsystems, screens, …
- Determine historical average SLOC for each standard component
- Estimate min, most-likely, and max number of each required standard component
- Calculate estimated number of each required component
  - Number = (min + 4*most-likely + max)/6
- Multiply each component's estimated number by its historical average SLOC
- Sum these SLOC's to obtain a total estimate for the project.
- Look at the example on p. 106.
- Easy to use, but
- Probably lack good historical base for large components, which must be estimated early in project.

Standard Components In-Class Practice Problem

- See “In-Class Practice Problems” handouts

Popular Estimating Methods: Function Points (cf. Humphrey, 1995, p. 102-103)

- Function-point = arbitrary unit.
- Most popular method for estimating the size of commercial SW app's.
- Albrecht (1979) at IBM.
- Five basic functions that occur frequently in commercial SW:

Function Types	Weights	Basic Counts	Total
Inputs	x4		
Outputs	x5		
Inquiries	x4		
Logical Files	x10		
Interfaces	x7		
Unadjusted Total			

- Look at example on p. 108, 109.
  Note adjustment factor calculation on p. 108.
- Not directly measurable in end-product, don't reflect development language, skill not readily improved w/o large historical database.

Function Points In-Class Practice Problem

- See "In-Class Practice Problems" handouts

Proxy-Based Estimating

(cf. Humphrey, 1995, lecture slides)

- Basic issues:
  - Good size measures are detailed and based on historical data.
  - Early estimators can rarely think in detail. (e.g. home construction and square feet vs. number, types, and sizes of rooms)
- Alternatives
  - Wait until you have the detail to generate an estimate
  - Make your best guess
  - Use a suitable proxy

Definition of a Proxy

(cf. Humphrey, 1995, p. 111)

- Def:
  - "A proxy is a substitute or stand-in", something that is used in place of another.
- A good proxy provides an easy early visualization of, and is related to, the size of the final product.
- Examples:
  - Objects, screens, files, scripts, function points, ...

Criteria for a Good Proxy

(cf. Humphrey, 1995, p. 111-113)

- Related to Development Effort
- Automatically Countable
- Easily Visualizable at Project Start
- Customizable to Organization's Needs
- Sensitive to Implementation Variations (.e.g. language, design style, application categories, etc.)

Potential Proxies

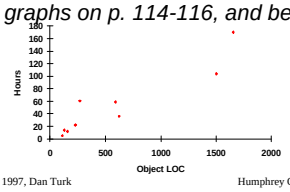
(cf. Humphrey, 1995, p. 113)

- Objects, document chapters - seem to meet proxy criteria.
- Screens, reports, scripts - not enough data to draw conclusions.
- Collect data and assess each type's applicability to your work.

Objects as Proxies

(cf. Humphrey, 1995, 113-116, and secture slides)

- *Object counts correlate well with development hours*
- *Object LOC correlates very closely - functions & procedures may work too (cf. graphs on p. 114-116, and below)*



General Proxy Choice and Use Process *(cf. Humphrey, 1995, 113-117)*

- *Collect data on proxy*
- *Correlate proxy with total product LOC and development hours*
- *If good correlation then it is a potential proxy*
- *Divide into categories and size ranges (as in Fuzzy-Logic method)*
- *Estimate based on assessment of similar categories and sizes*
- *Best to normalize object LOC to average method LOC*
- *Look at examples on p. 117.*

Homework #3

- *See "Homework Assignments" list and textbook instructions.*