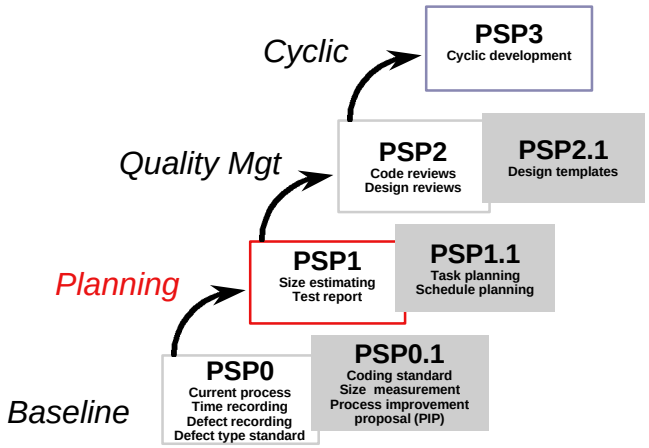
Planning III-A: Estimating Software Size - Estimating Methods, Proxies

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)*

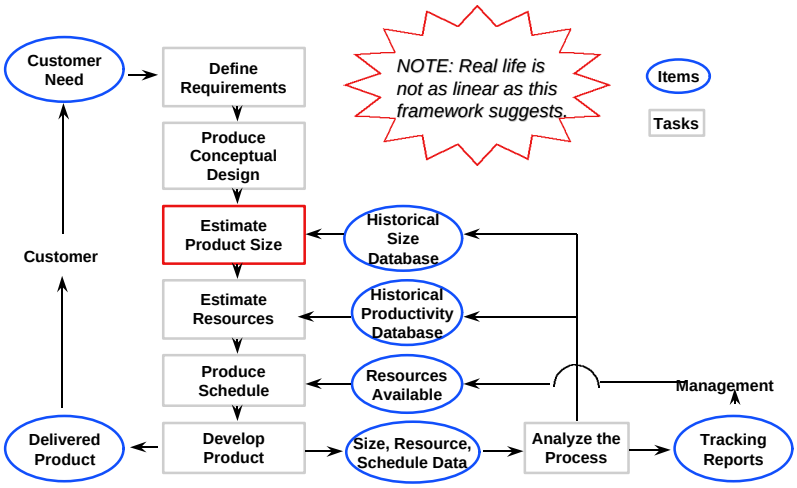


Background *(cf. Humphrey, 1995, p. 97-98)*

- *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

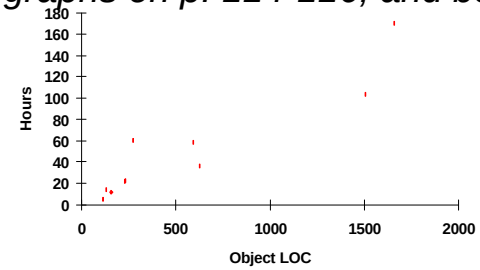
(cf. Humphrey, 1995, p. 113)

- *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.*