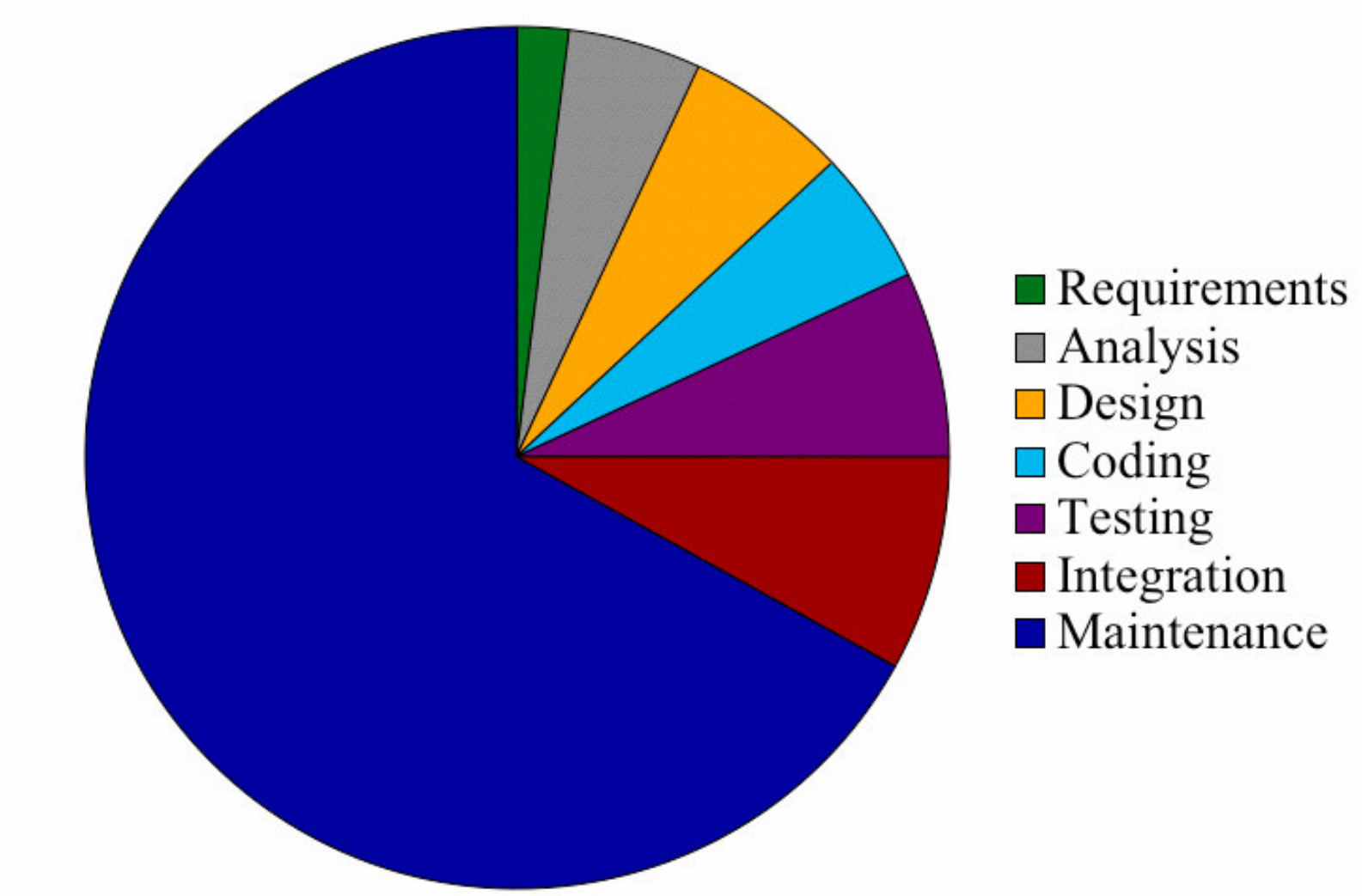
Software Project Planning

Relative Cost of Software Phases



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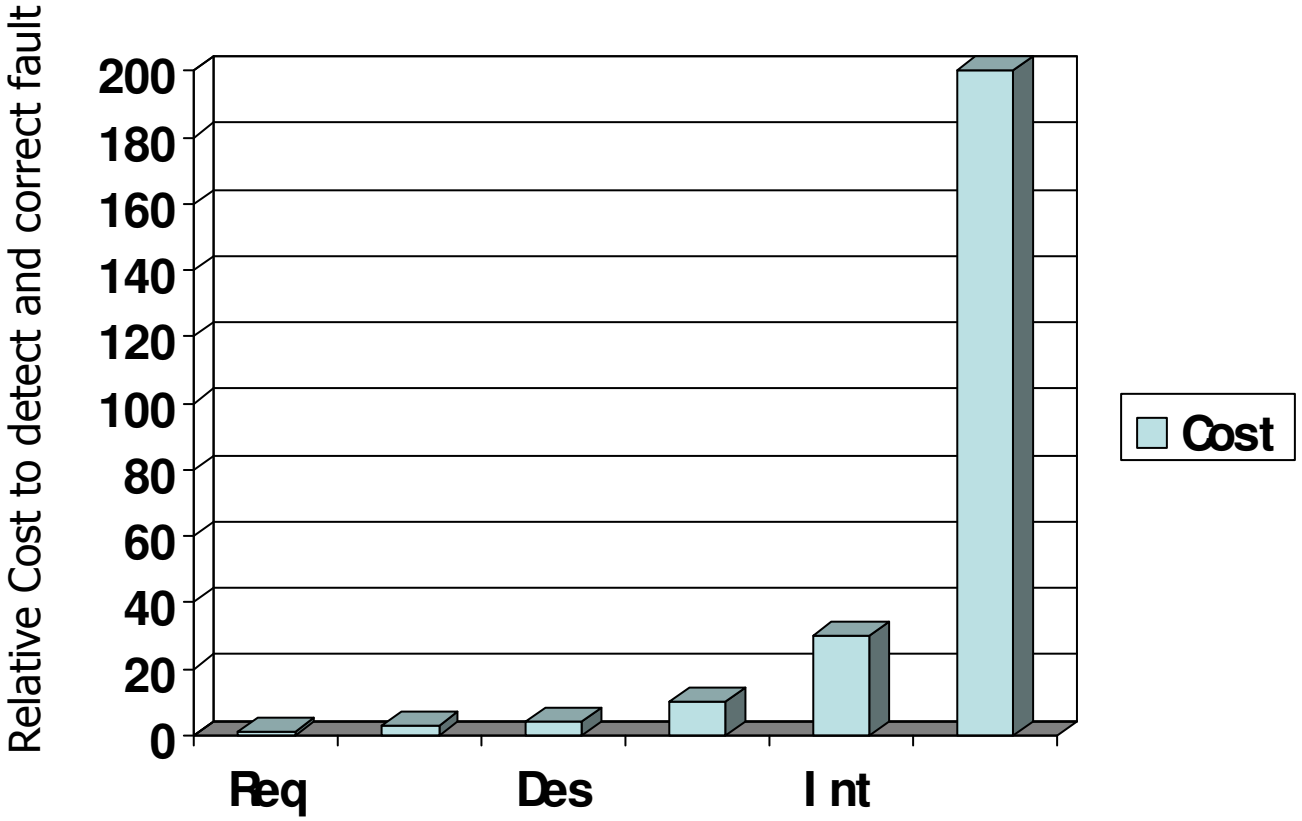
Cost to Detect and Fix Faults



Cost Estimation

A number of estimation techniques have been developed and are having following attributes in common :

- Project scope must be established in advance
- Software metrics are used as a basis from which estimates are made
- The project is broken into small pieces which are estimated individually

To achieve reliable cost and schedule estimates, a number of options arise:

- Delay estimation until late in project
- Use simple decomposition techniques to generate project cost and schedule estimates
- Develop empirical models for estimation
- Acquire one or more automated estimation tools

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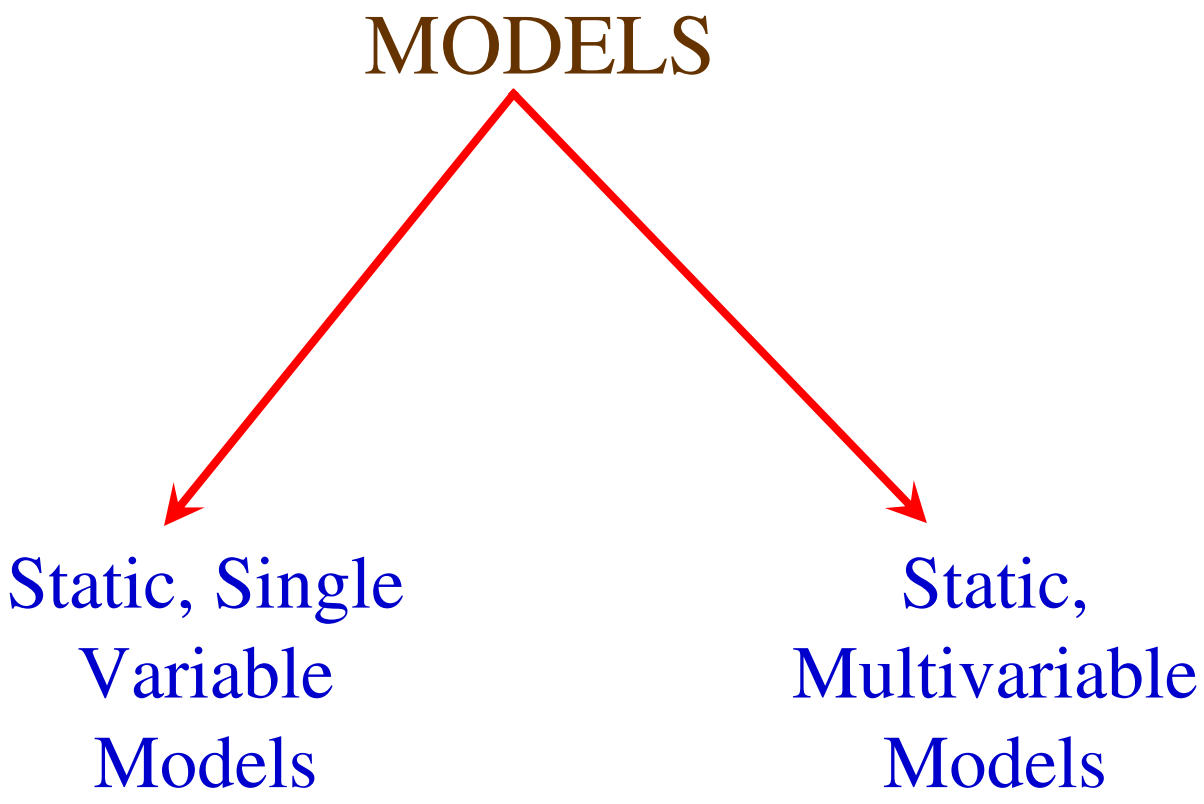

Static, Single Variable Models

For example, the SEL Model

Methods using this model use an equation to estimate the desired values such as cost, time, effort, etc. They all depend on the same variable used as predictor (say, size). An example of the most common equations is :

$$C = a\,L^{b} \quad \text{(i)}$$

C is the cost, L is the size and a,b are constants

$E = 1.4\,L^{0.93}$

$DOC = 30.4\,L^{0.90}$

$D = 4.6\,L^{0.26}$

Effort (E in Person-months), documentation (DOC, in number of pages) and duration (D, in months) are calculated from the number of lines of code (L, in thousands of lines) used as a predictor.

Static, Multivariable Models

For example, the Watson and Felix Model

These models are often based on equation (i), they actually depend on several variables representing various aspects of the software development environment, for example method used, user participation, customer oriented changes, memory constraints, etc.

$$E = 5.2\ L^{0.91}$$

$$D = 4.1\ L^{0.36}$$

The productivity index uses 29 variables which are found to be highly correlated to productivity as follows:

$$I = \sum_{i=1}^{29} W_i X_i$$

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Example: 4.4

Compare the Walston-Felix model with the SEL model on a software development expected to involve 8 person-years of effort.

(a)Calculate the number of lines of source code that can be produced.

(b)Calculate the duration of the development.

(c)Calculate the productivity in LOC/PY

(d)Calculate the average manning

Solution

The amount of manpower involved = 8 PY = 96 person-months

(a) Number of lines of source code can be obtained by reversing equation to give:

$$L = (E/a)^{1/b}$$

Then

$$L(SEL) = (96/1.4)^{1/0.93} = 94264 \text{ LOC}$$

$$L(SEL) = (96/5.2)^{1/0.91} = 24632 \text{ LOC}.$$

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(b) Duration in months can be calculated by means of equation

$$D(SEL) = 4.6\ (L)^{0.26}$$

$$= 4.6\ (94.264)^{0.26} = 15 \text{ months}$$

$$D(W\text{-}F) = 4.1\ L^{0.36}$$

$$= 4.1(24.632)^{0.36} = 13 \text{ months}$$

(c) Productivity is the lines of code produced per person/month (year)

$$P(SEL) = \frac{94264}{8} = 11783\ LOC / Person - Years$$

$$P(W-F) = \frac{24632}{8} = 3079\ LOC / Person - Years$$

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(d) Average manning is the average number of persons required per month in the project.

$$M(SEL) = \frac{96P - M}{15M} = 6.4 Persons$$

$$M(W - F) = \frac{96P - M}{13M} = 7.4 Persons$$