Information System Design

IT60105

Lecture 23

Staff Planning

Lecture #23

- Planning Staffs
  - Distribution of human resources
    - Nordon's Model
    - Putnam's model
    - Jensen's model
    - Putnam-Nordan-Rayleigh (PNR) curve

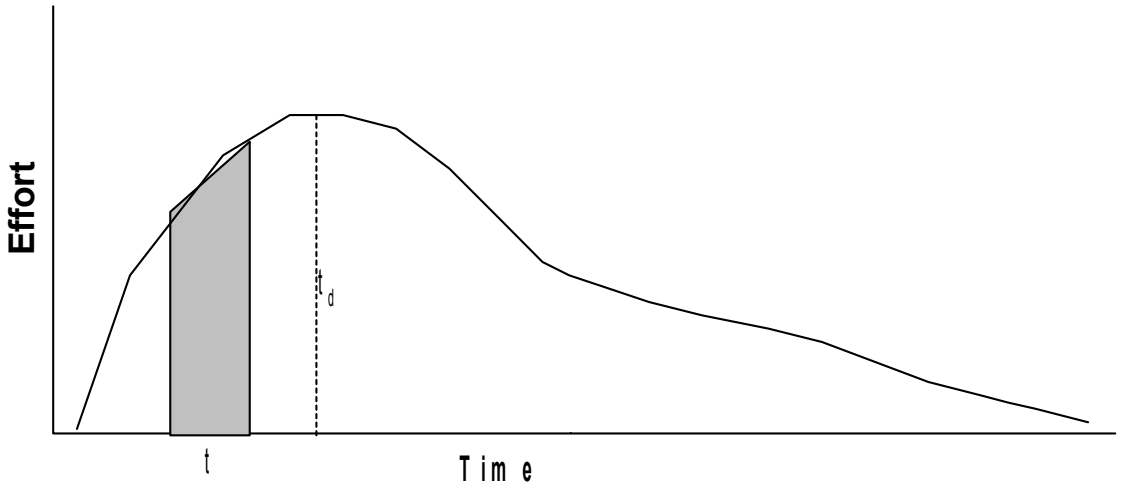
Staff Distribution Techniques

- Relationship between people and effort
  - Suppose, for a project effort is estimated as 50PM
    - ? 50 persons in one month
    - ?? One person in 50 months
    - ??? Start with one person then recruiting staffs gradually as and when require
      - Increased training cost
      - Increased complexity and number of communication paths

      etc.

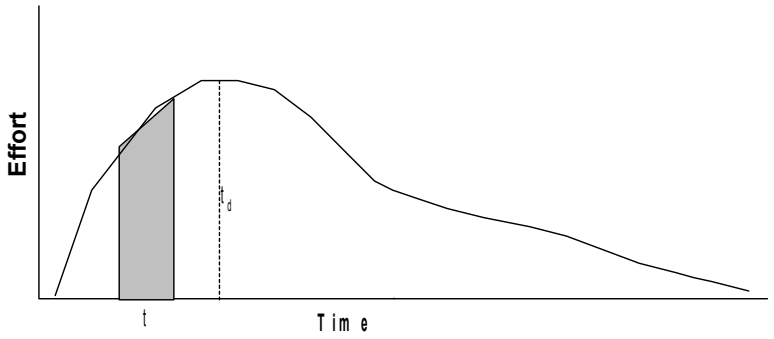
Norden's Model

- Norden investigate staffing pattern of R&D type projects
- He found that the distribution follows *Rayleigh curve*



Norden's Model

- Norden's proposed an equation to represent the Rayleigh curve



$$E = \frac{A}{t} \times t_d \times e^{-\frac{t^2}{2t_d^2}}$$

where

E is the effort required at time t

A is the area under the curve

t_d is the time at which the curve attains maximum value

Putnam's Model

- Putnam agreed with the same observation as Norden. He further proposed another simpler model

$$L = C_0 K^{\frac{1}{3}} t_d^{\frac{4}{3}}$$

where

L = Product size in KLOC

K = Total effort in PM

t_d = development time

C_0 = Project environment factor (C_0 = 2, 8 and 11 for poor, good and excellent development environment)

Conclusions

- A constant level of manpower throughout the project duration would lead to
  - wastage of effort
  - increase the time and effort to develop the project
  - some phase would be overstaffed and understaffed
  - increase the cost of development
- 40:60 Rule
  - 40% effort is required to develop the product and 60% effort is required to maintain the product

Conclusions (cont'd)

- Project schedule should not be elastic: compress and decompress desired project completion date as and when required
- Effect of schedule change on Cost
  - According to Putnam's model $A \propto \frac{1}{t_d^4}$
  - A small compression in delivery schedule can result in substantial penalty on human effort and hence project development cost

Jensen's Model

- The Putnam model works reasonably very well for very large systems, but seriously overestimates the effort on medium and small systems
- Jensen attempted to overcome this limitation
- Jensen propose the equation

$$L = C_{te} t_d E^{\frac{1}{2}}$$

where C_{te} is the effective technology constants

t_d is the time to develop the software

E is the effort needed to develop the software

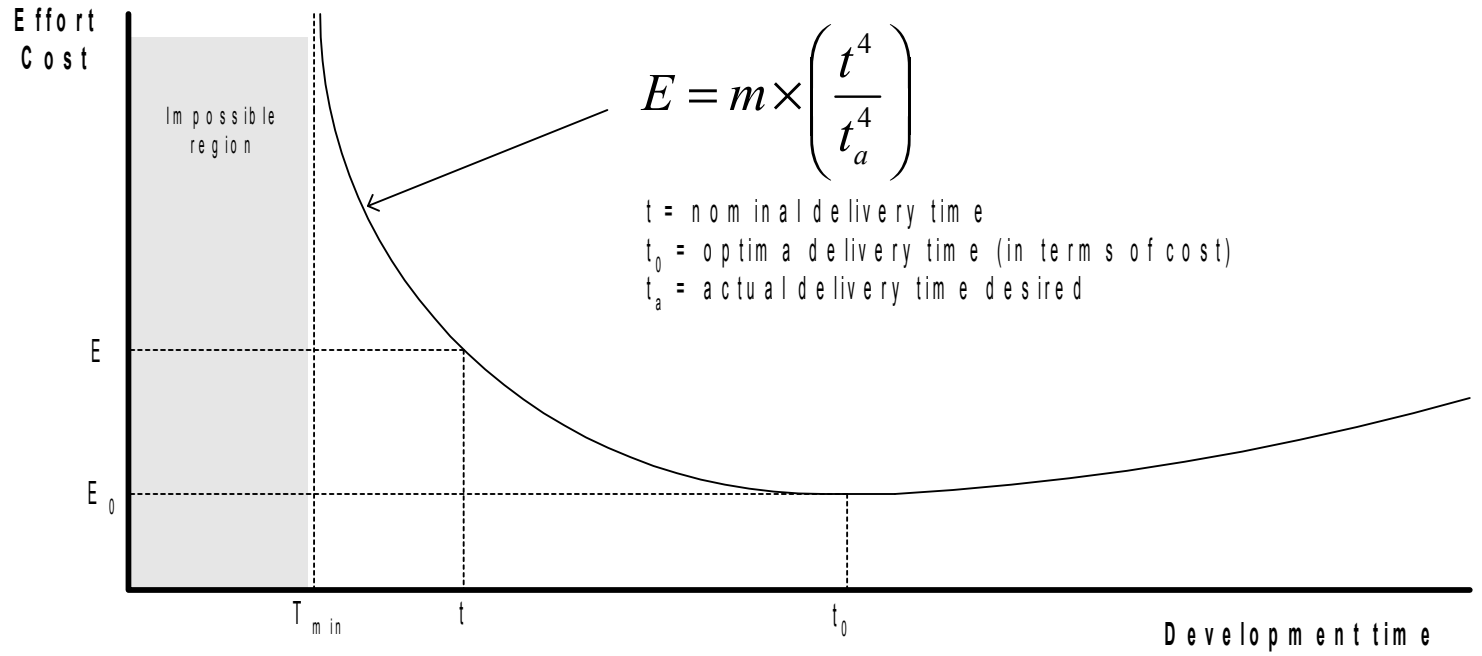
Jensen's Model

- According to Jensen model, when the project duration is compressed, the increase in effort (and cost) is proportional to the square of the degree of compression

- This is true for small and medium scale software project

Putnam-Norden-Rayleigh Curve

- **PNR curve** provides an indication of the relationship between effort applied and delivery time for a software project



Problems to Ponder

- Is the staff distribution is affected by process life cycle model?
- Which factors decide to have precise staff estimation during the planning phase?
- Industry standard is to follow **40-20-40** rule in staff distribution, where 20% is for coding. Comment on this rule.