CS 301
Software Engineering
Module - 37

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At the end of the session, you will be able to:

- Understand Constructive Cost Model of Estimation
- Estimate using Basic COCOMO approach
- Estimate using Intermediate COCOMO approach

Cost Construction Model of Estimation

- The COCOMO is a procedural cost estimate model for software projects and is often used as a process of reliably predicting the various parameters associated with making a project
- Developed by Barry Boehm in 1981, COCOMO uses a mathematical formula based on the size of the software project, typically measured in lines of code (LOC)
- Outcomes
  - Schedule
  - Effort

Type of Projects under COCOMO Models

- Organic:
  - Small team size
  - Familiar with problem
  - Well understood problem
- Semi-detached
  - More experience
  - Guidance
  - Creativity
- Embedded
  - Complex domain
  - Highly experience team required
  - Larger team size

Type of Projects under COCOMO Models

Aspects	Organic	Semidetached	Embedded
Project Size	2 to 50 KLOC	50-300 KLOC	300 and above KLOC
Complexity	Low	Medium	High
Team Experience	Highly experienced	Some experienced as well as inexperienced staff	Mixed experience, includes experts
Environment	Flexible, fewer constraints	Somewhat flexible, moderate constraints	Highly rigorous, strict requirements
Example	Simple payroll system	New system interfacing with existing systems	Flight control software

Type of Models

- Basic
- Intermediate
- Detailed
  - Partial Phases of software development

Effort Equation for the Basic Model

$E = a*(KLOC)^b$ Person Months

$Tdev = c*(E)^d$ Months

Person required = Effort/ Time

Where ,

- E is effort applied in Person-Months
- KLOC is the estimated size of the software product indicate in Kilo Lines of Code
- Tdev is the development time in months
- a, b, c are constants determined by the category of software project given in below table.

Software Projects	a	b	c	d
Organic	2.4	1.05	2.5	0.38
Semi-Detached	3.0	1.12	2.5	0.35
Embedded	3.6	1.20	2.5	0.32

Effort Equation for the Basic Model

$E = a*(KLOC)^b$ Person Months

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Person required = Effort/ Time

KLOC	Project Type	Effort Person Months	Tdev Months	Persons
50	Organic	146	17	9
300	Semi-detached	1784	34	52
400	Embedded	4773	38	127

Effort Equation for the Intermediate Model

$E_i = a*(KLOC)^b$ Person Months

Adjusted $E = E_i * EAF$

$Tdev = c*(E)^d$ Months

Person required = Effort/ Time

EAF = Effort Adjustment Factor

Where ,

- E is effort applied in Person-Months
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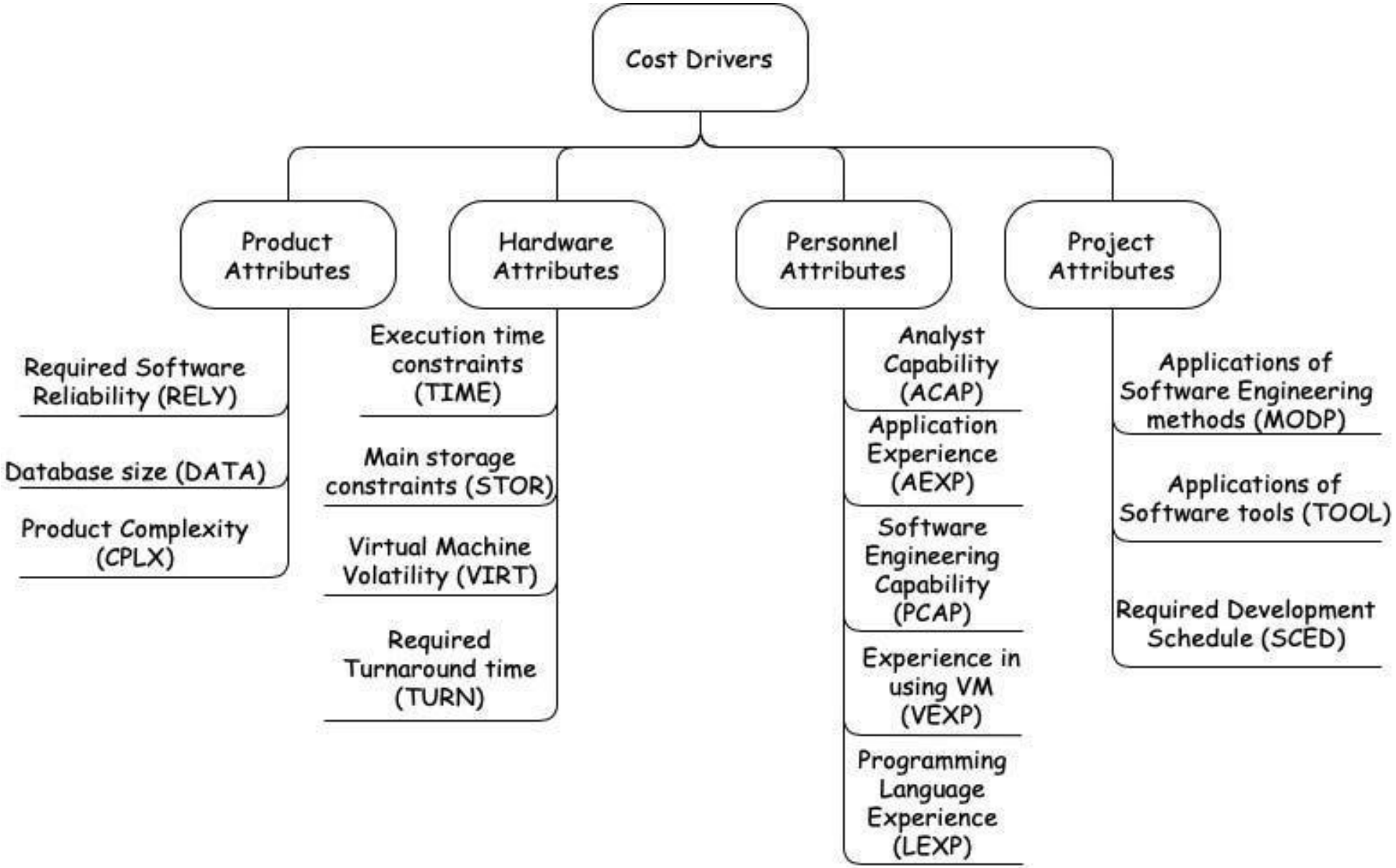
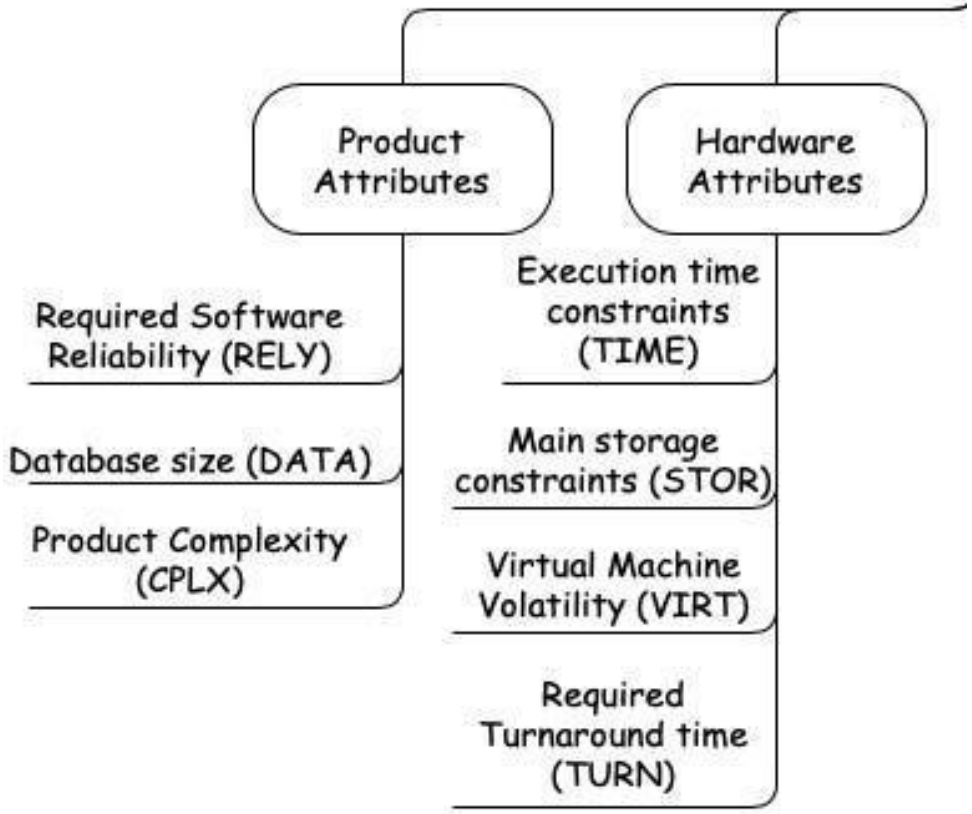
Effort Adjustment Factors - Intermediate



Effort Adjustment Factors - Intermediate

Cost Drivers	RATINGS					
	Very low	Low	Nominal	High	Very High	Extra High
Product Attributes						
RELY	0.75	0.88	1.00	1.15	1.40	..
DATA	..	0.94	1.00	1.08	1.16	..
CPLX	0.70	0.85	1.00	1.15	1.30	1.65
Computer Attributes						
TIME	..	..	1.00	1.11	1.30	1.66
STOR	..	..	1.00	1.06	1.21	1.56
VIRT	..	0.87	1.00	1.15	1.30	..
TURN	..	0.87	1.00	1.07	1.15	..



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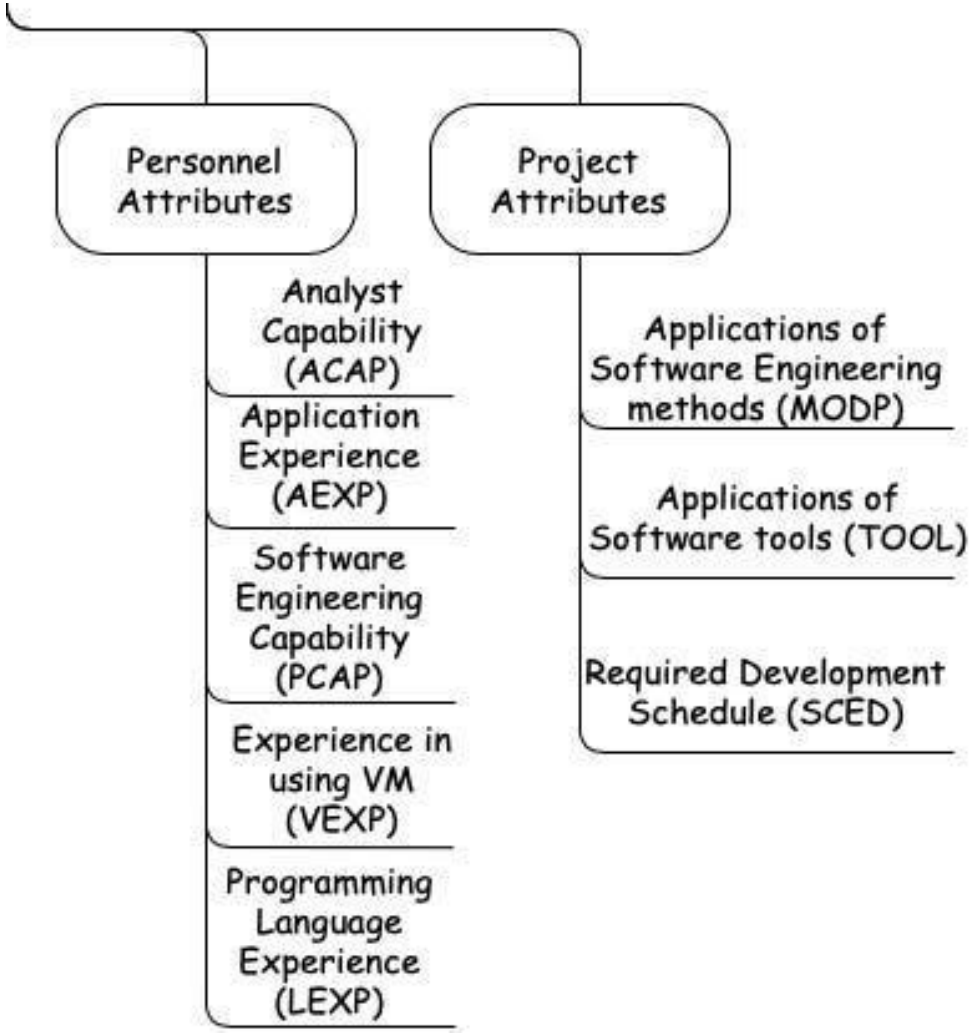

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	Very low	Low	Nominal	High	Very high	Extra high
Personnel Attributes						
ACAP	1.46	1.19	1.00	0.86	0.71	..
AEXP	1.29	1.13	1.00	0.91	0.82	..
PCAP	1.42	1.17	1.00	0.86	0.70	..
VEXP	1.21	1.10	1.00	0.90	..	..
LEXP	1.14	1.07	1.00	0.95	..	..
Project Attributes						
MODP	1.24	1.10	1.00	0.91	0.82	..
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Worst-case – 1.4 x 1.16 x .....1.04 = 72.38

Best-case – 0.75 x .94 x .....1.00 = 0.09

Advantages of COCOMO Approach

- Systematic cost estimation
- Helps to estimate cost and effort
- Helps in high-impact factors

Disadvantages of COCOMO Approach

- Assumes project size as the main factor
- Does not count development team-specific characteristics
- Not enough precise cost and effort estimate

We have covered the following

- Understand Constructive Cost Model of Estimation
- Estimate using Basic COCOMO approach
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