CP317 Software Engineering

Project management – week 1-2

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Agenda

- Review week 1-1
- Documentation
    - Document change control
    - Types of documentations
- Project management
    - Concept
- Project management tools
    - PERT charts
    - Critical path methods
    - Gantt charts
- Software Cost Estimation Models
    - COCOMO, Static Single Variable Model, Static Multi-Variable Model
- Risk management
    - Concept

Week 1-1 Review

- What is software engineering?
- What is the relationship between software engineering and engineering?
  - Differences and similarities
- What are the basic tasks of software engineering?
  - Requirement gathering
  - High-level design – architecture design
  - Low-level design – software design
  - Coding
  - Testing
  - Deployment
- Skills required for software engineers/developers

Documentations

- Documentations are important at every step of software engineering
  - Why?
- Documentation is produced throughout a project’s lifespan
- Set up a document tracking system before starting the project
- A document control/management system is one of the first tools
- The benefits of using documents
  - Keep the team members on tracks
  - Provides clear direction for work
  - Prevents conflicts
  - Produce high quality software products

Documentations– cont.

- The seven features of a good document management system?
  - The ability of sharing documents
  - Prevent multiple users from changing a document at the same time
  - Fetch the latest version of a document
  - Fetch earlier version of a document
  - Search documents by using keywords
  - See the changes made to a document
  - Compare two versions of a document to see their differences
- Examples: Rational ClearCase, Database systems

Documentations–cont.

- Documentation types
  - Requirements document
  - System design document/high-level design document
  - Software specification document/software design document/low-level design document
  - Software coding standard: a set of guidelines for programming
  - Software testing procedures (unit testing, integration)
  - Meeting note
  - Release notes

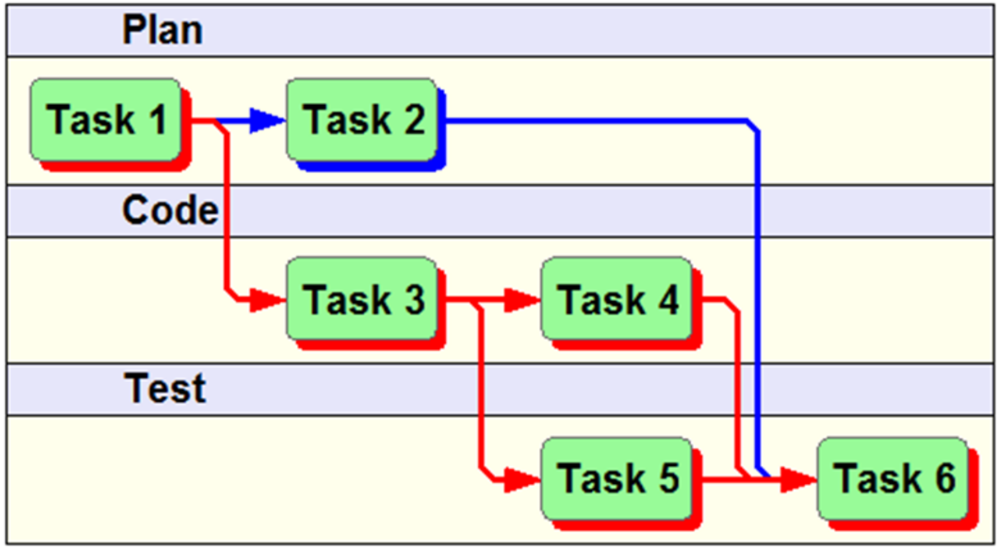
- Document revision history
  - Include Revision, Author, Date, Status and Description

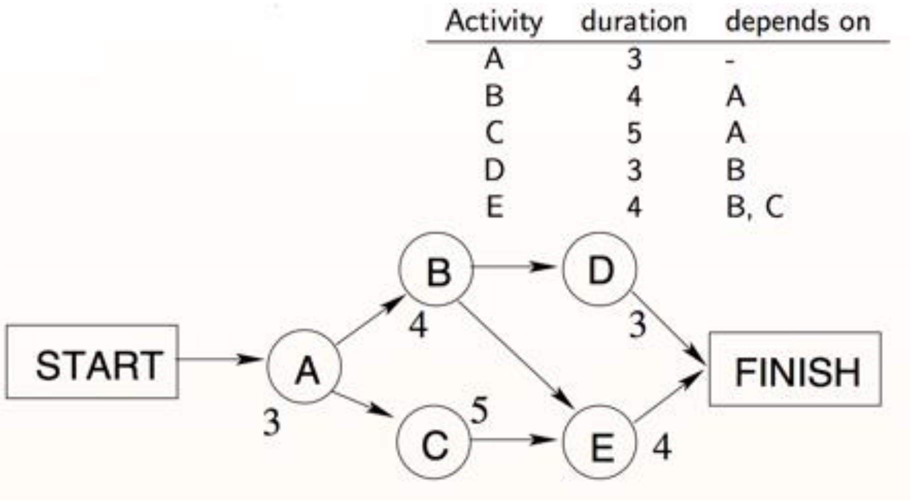
Project management

- Project management
  - Project management is the application of processes, methods, skills, knowledge and experience to achieve specific project **objectives** according to the project acceptance criteria within agreed parameters.
- The reasons why project management is necessary
  - Ensure that goals are set, tracked, and eventually met
  - Keep team members on track and focused on the problems at hands
- Software project management focuses on 4 P’s
  - People, Product, Process, Project.

Project management tools

- PERT Charts
  - A Program Evaluation & Review Technique(PERT) chart is a graph that uses nodes(circles or boxes) and links(arrows) to show the precedence relationships among the tasks in a project.
  - The format of PERT charts can be variety.

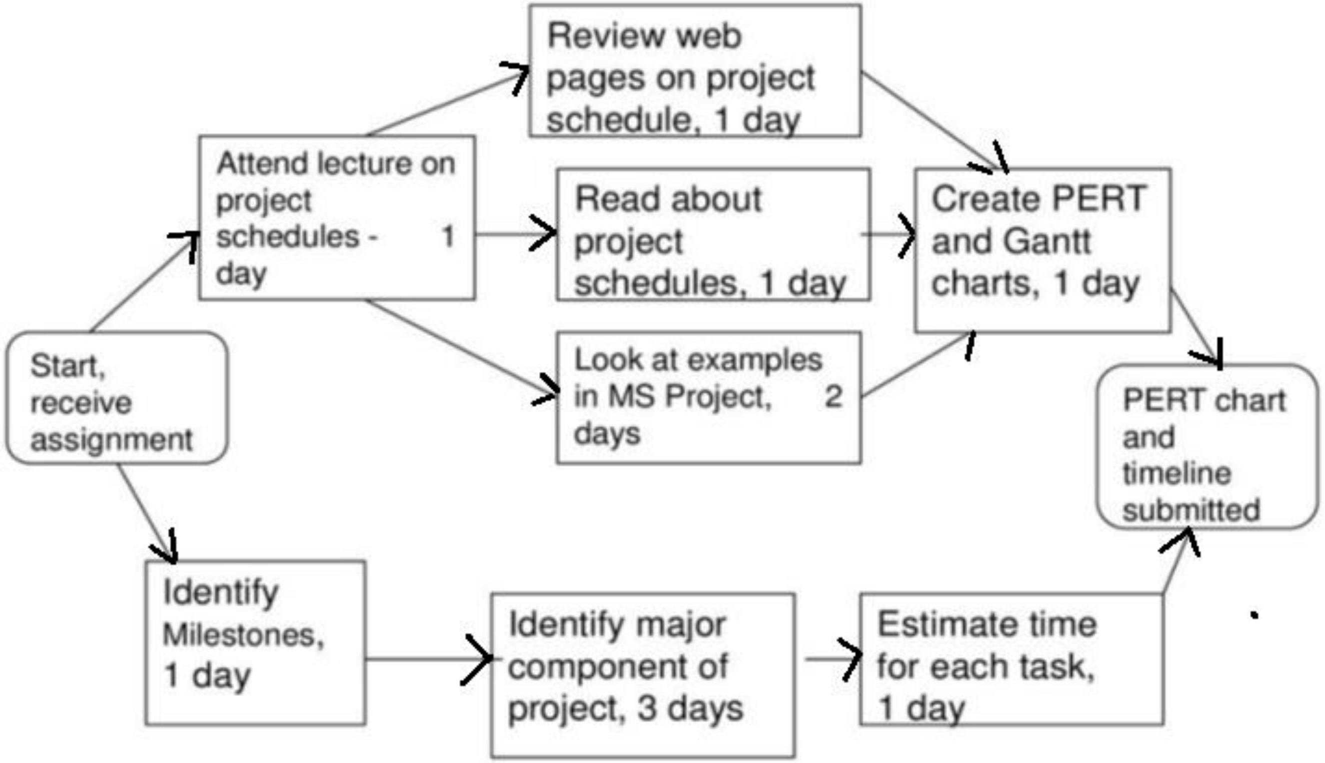




Activity	duration	depends on
A	3	-
B	4	A
C	5	A
D	3	B
E	4	B, C

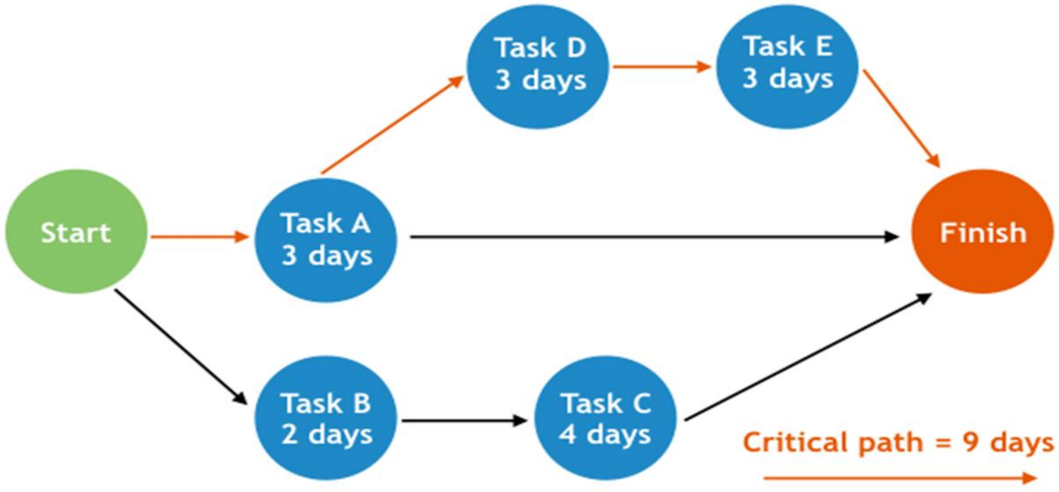
Project management tools – cont.

- PERT Charts Examples:
  - Assignment and planning
  - It has two paths


Start, receive assignment
Attend lecture on project schedules - 1 day
Review web pages on project schedule, 1 day
Read about project schedules, 1 day
Look at examples in MS Project, 2 days
Create PERT and Gantt charts, 1 day
Identify Milestones, 1 day
Identify major component of project, 3 days
Estimate time for each task, 1 day
PERT chart and timeline submitted

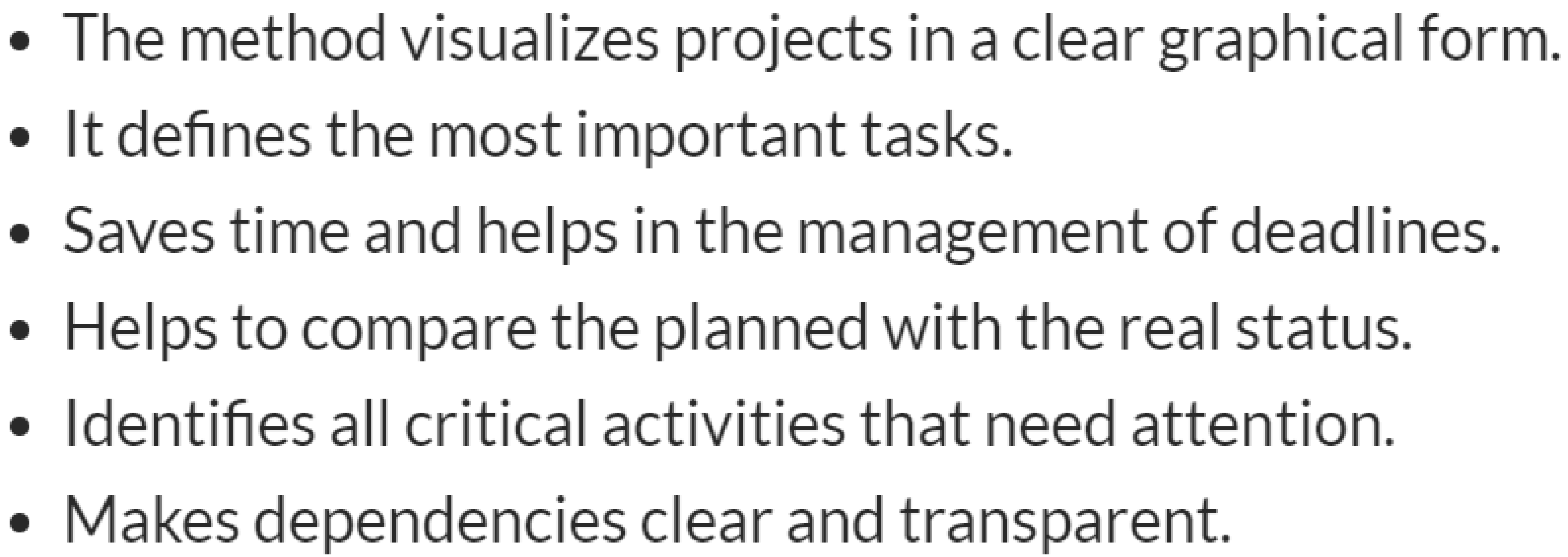
Project management tools – cont.

- Critical path methods
  - The critical path method is a technique for planning, managing and analyzing the timing of a project.
- A critical path
  - It is the longest duration path through the project network activities
  - If any tasks along the critical path is delayed, the project's final completion is also delayed.



Project management tools – cont.

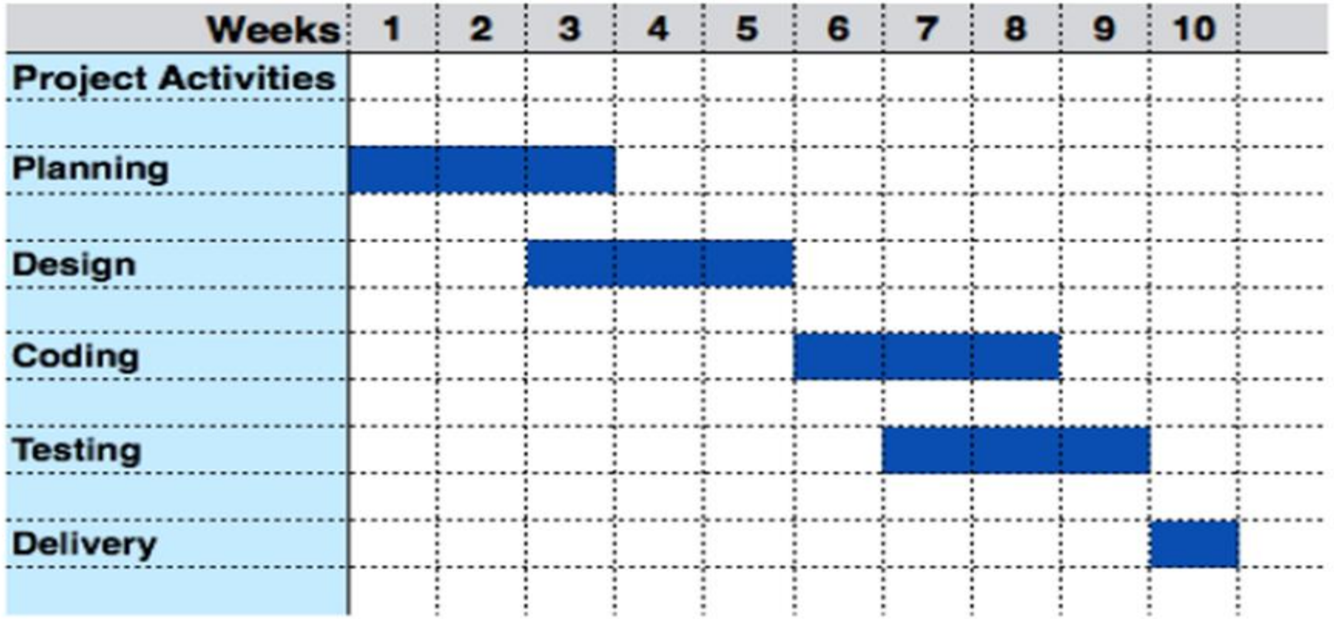
- The Six benefits of using Critical Path methods



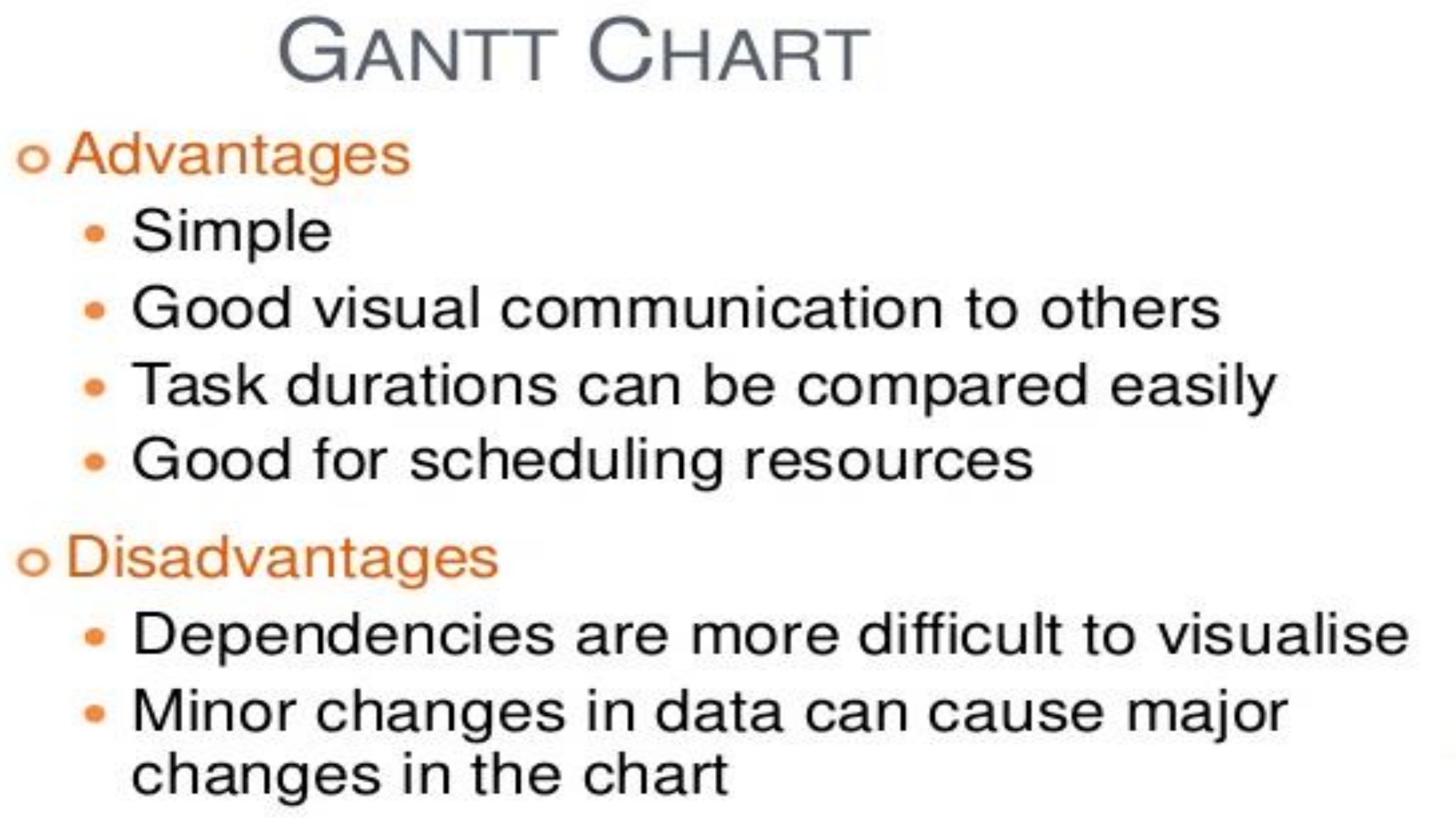
  - The method visualizes projects in a clear graphical form.
  - It defines the most important tasks.
  - Saves time and helps in the management of deadlines.
  - Helps to compare the planned with the real status.
  - Identifies all critical activities that need attention.
  - Makes dependencies clear and transparent.

Project management tools – cont.

- Gantt charts
  - A Gantt chart is a kind of bar chart invented by Henry Gantt in the 1910s to show a project schedule with respect to time periods.
- An example:



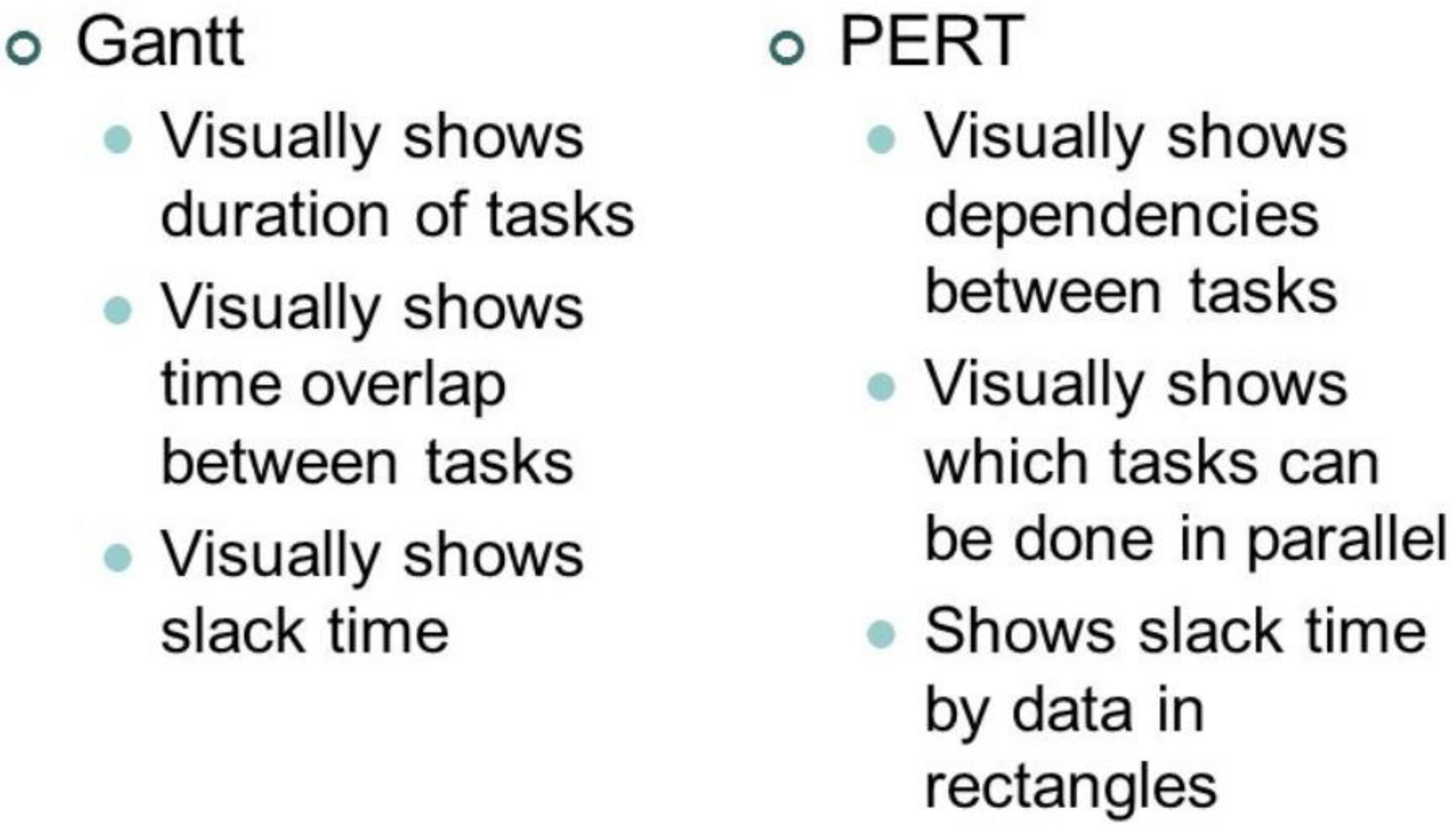
Project management tools – cont.



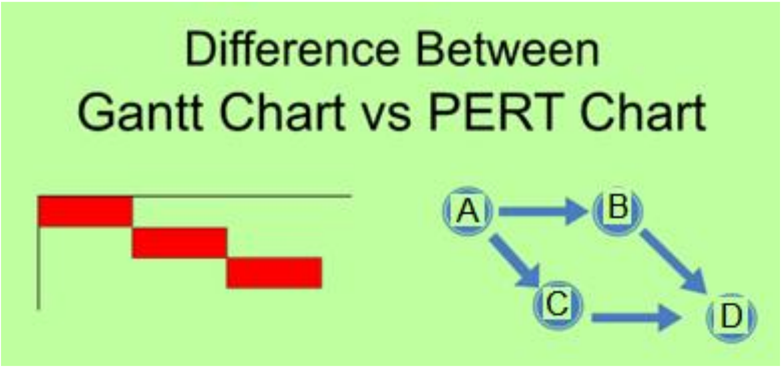
Gantt Chart

- Advantages
  - Simple
  - Good visual communication to others
  - Task durations can be compared easily
  - Good for scheduling resources
- Disadvantages
  - Dependencies are more difficult to visualise
  - Minor changes in data can cause major changes in the chart

Project management tools – cont.



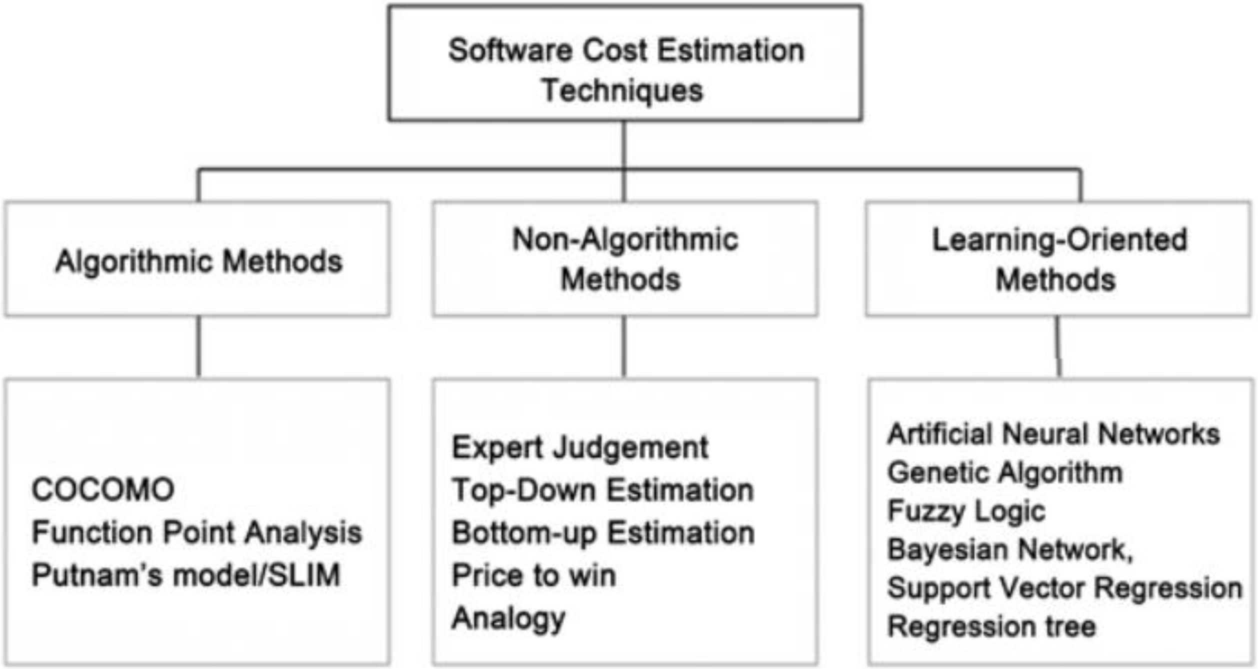
- Gantt
  - Visually shows duration of tasks
  - Visually shows time overlap between tasks
  - Visually shows slack time
- PERT
  - Visually shows dependencies between tasks
  - Visually shows which tasks can be done in parallel
  - Shows slack time by data in rectangles



Software Cost Estimation Models

- Why do we need software cost estimation models?

- COCOMO Model
- Static Single Variable Model
- Static Multi-Variable Model



Software Cost Estimation Techniques

Algorithmic Methods

Non-Algorithmic Methods

Learning-Oriented Methods

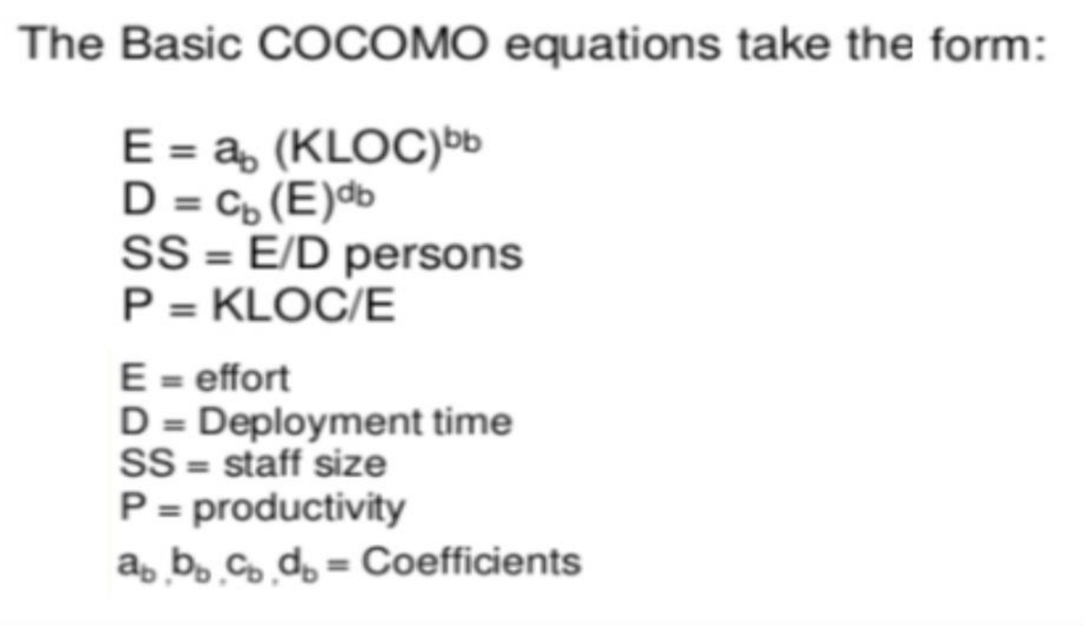
COCOMO
Function Point Analysis
Putnam's model/SLIM

Expert Judgement
Top-Down Estimation
Bottom-up Estimation
Price to win
Analogy

Artificial Neural Networks
Genetic Algorithm
Fuzzy Logic
Bayesian Network,
Support Vector Regression
Regression tree

COCOMO Model

- COnstructive COst MOdel (COCOMO)
  - COCOMO is a software cost estimate model for software projects that was created by Barry Boehm in the 1970s and published in 1981 in his book.



The Basic COCOMO equations take the form:

$E = a_b\ (KLOC)^{bb}$

$D = c_b\ (E)^{db}$

$SS = E/D$ persons

$P = KLOC/E$

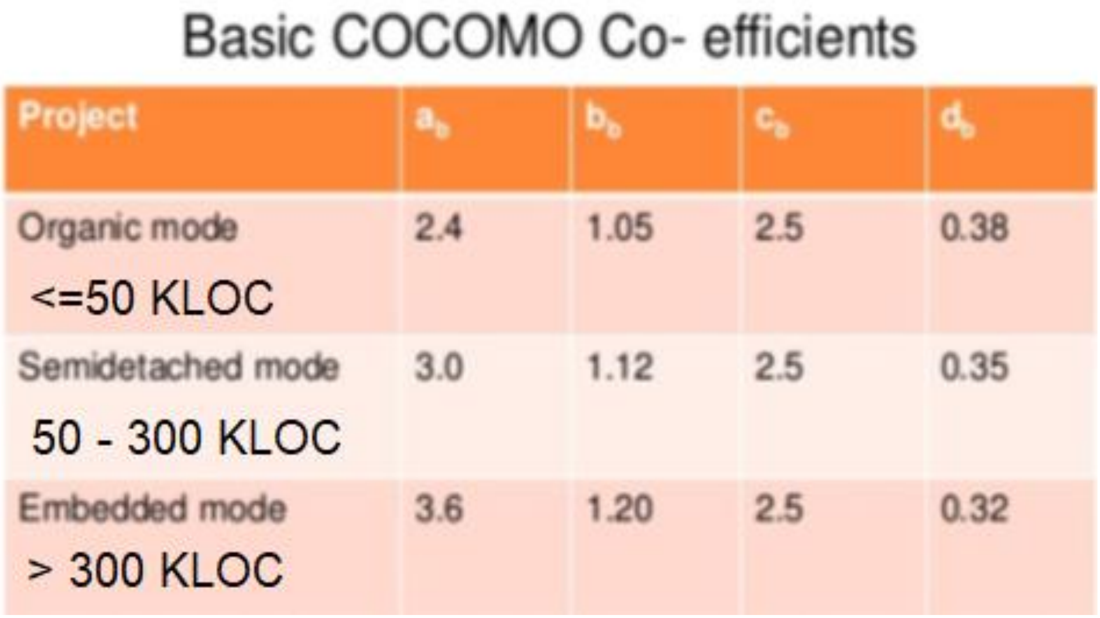
E = effort

D = Deployment time

SS = staff size

P = productivity

$a_b\ ,b_b\ ,c_b\ ,d_b$ = Coefficients

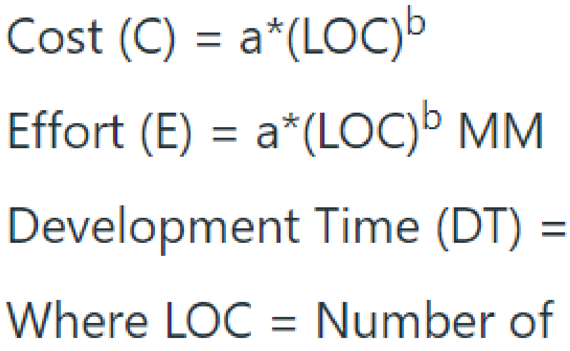


Basic COCOMO Co- efficients

Project	a_b	b_b	c_b	d_b
Organic mode <=50 KLOC	2.4	1.05	2.5	0.38
Semidetached mode 50 - 300 KLOC	3.0	1.12	2.5	0.35
Embedded mode > 300 KLOC	3.6	1.20	2.5	0.32

Static Single Variable Model

- This model is used to estimate the effort, cost and development time for a software project which depends on a single variable.

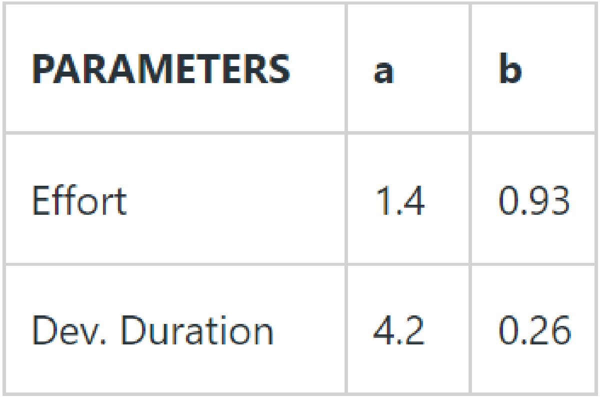


Cost (C) = a*$(LOC)^b$

Effort (E) = a*$(LOC)^b$ MM (MM means Man-Months)

Development Time (DT) = a*$(LOC)^b$ Months

Where LOC = Number of Lines of Code.

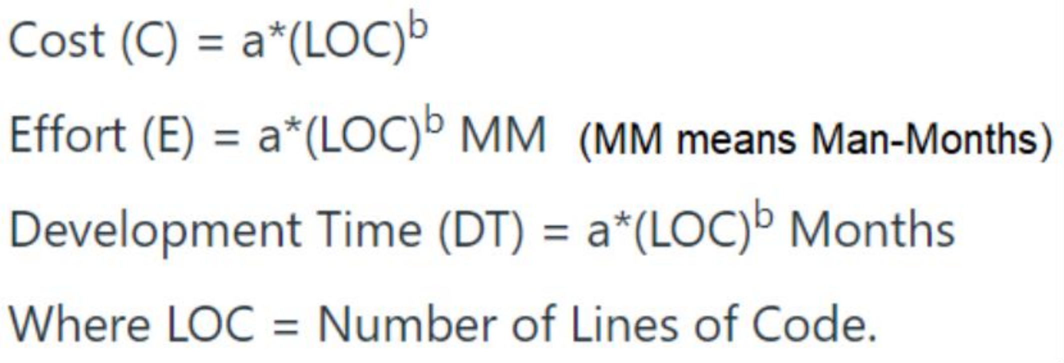


PARAMETERS	**a**	**b**
Effort	1.4	0.93
Dev. Duration	4.2	0.26

- Question:
  - Which one is the single variable?

Static Multi-Variable Model

- This model is used to estimate the effort, cost and development time for a software project with depends on multiple internal or external variables.

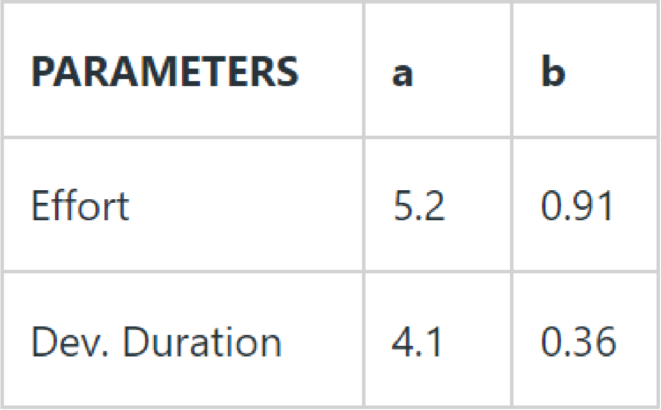


Cost (C) = $a*(LOC)^b$

Effort (E) = $a*(LOC)^b$ MM (MM means Man-Months)

Development Time (DT) = $a*(LOC)^b$ Months

Where LOC = Number of Lines of Code.



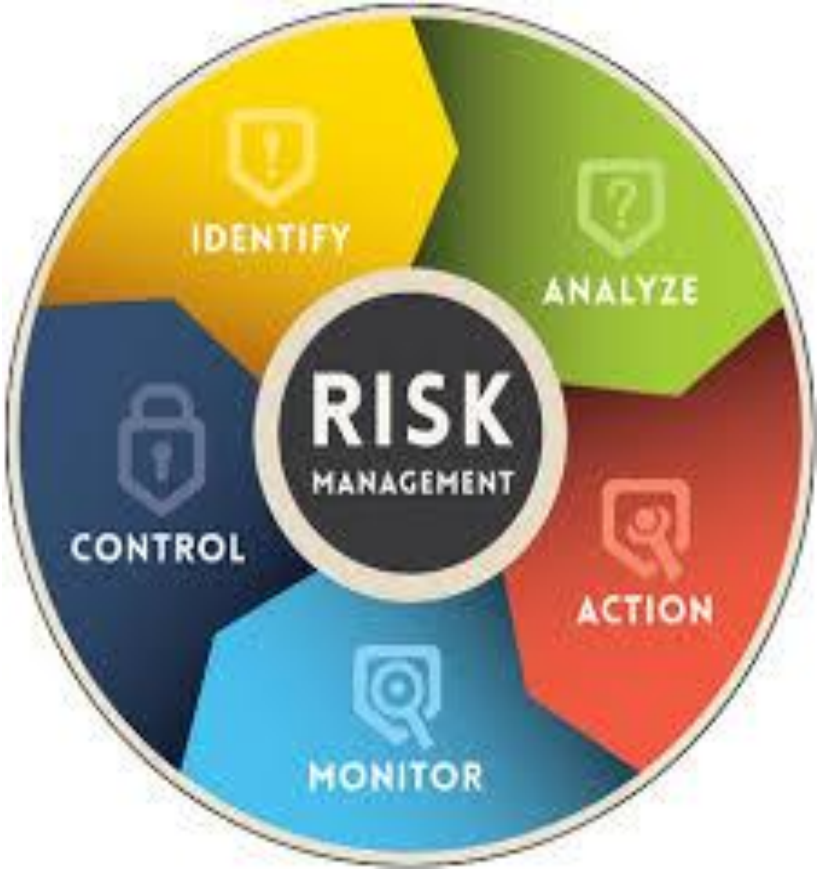
PARAMETERS	a	b
Effort	5.2	0.91
Dev. Duration	4.1	0.36

- Question:
  - Single variable model vs. multi-variable model

Risk management

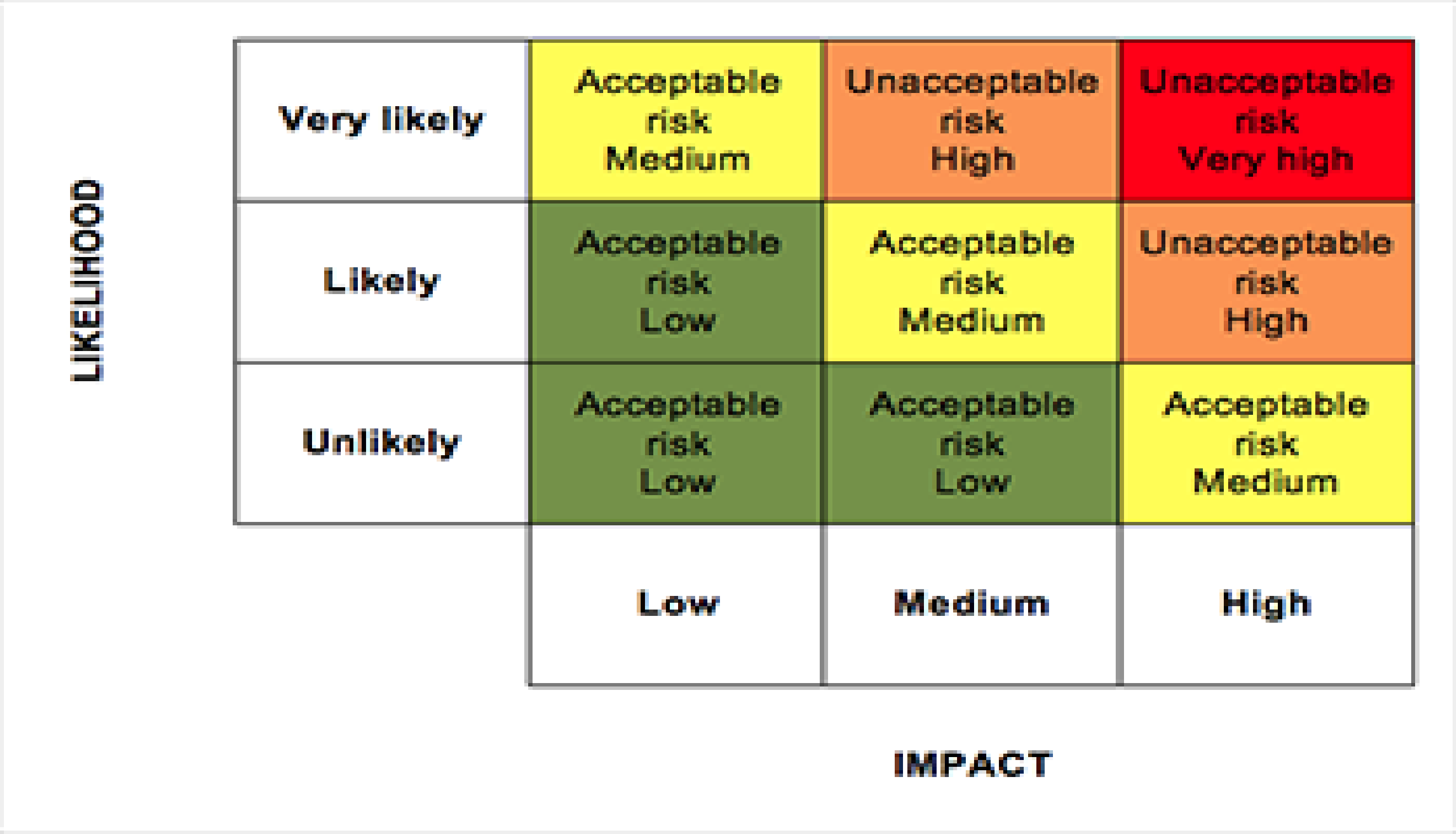
- Risk management
  - Risk management is a process that allows individual risk events and overall risks to be understood and managed proactively, optimizing success by minimizing threats and maximizing opportunities.

- People, Product, Process, Project.



Risk management – cont.

- For each task, you should determine the following
  - Likelihood
  - Severity/Impact
  - Consequence
  - Workaround



LIKELIHOOD

Very likely	Acceptable risk Medium	Unacceptable risk High	Unacceptable risk Very high
Likely	Acceptable risk Low	Acceptable risk Medium	Unacceptable risk High
Unlikely	Acceptable risk Low	Acceptable risk Low	Acceptable risk Medium
	Low	Medium	High

IMPACT

Summary

- Documentation
  - Benefits of using documents
- Project management
  - Concept
- Project management tools
  - PERT charts
  - Critical path
  - Critical path method
  - Gantt charts
- Software Cost Estimation Models
  - COCOMO, Static Single Variable Model, Static Multi-Variable Model
- Risk management
  - Concept

Announcement

- Please find a group by end of Sept. 2024
  - Send mean an email with group members (Name, student ID)
- Please let me know if you need help