F1I018: INGEGNERIA DEL SOFTWARE

Developing a Project Plan for Your Application

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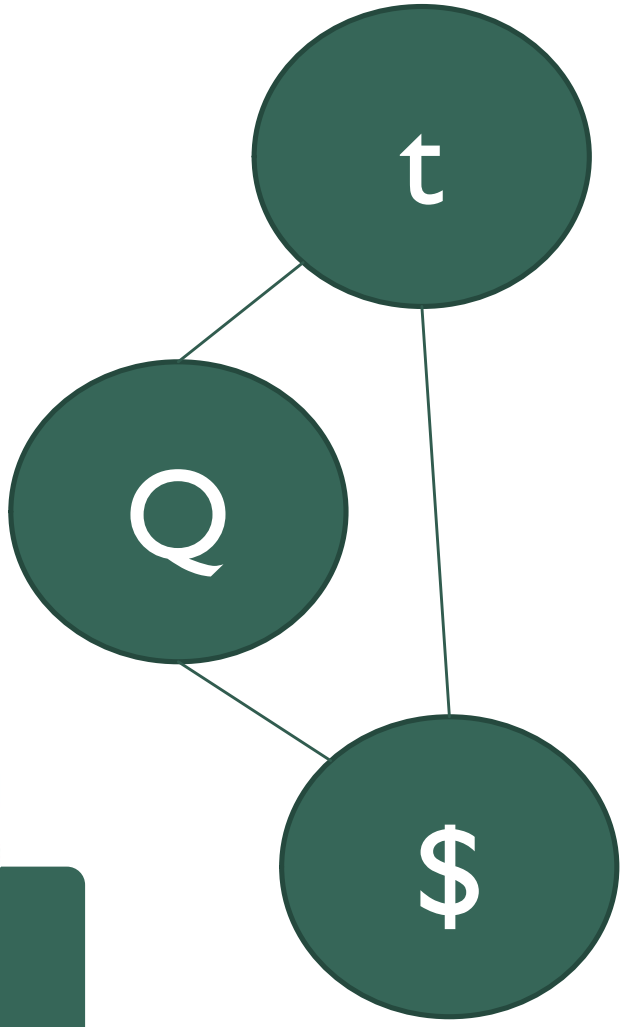
Henry Muccini

DEVELOPING A PROJECT PLAN FOR YOUR APPLICATION

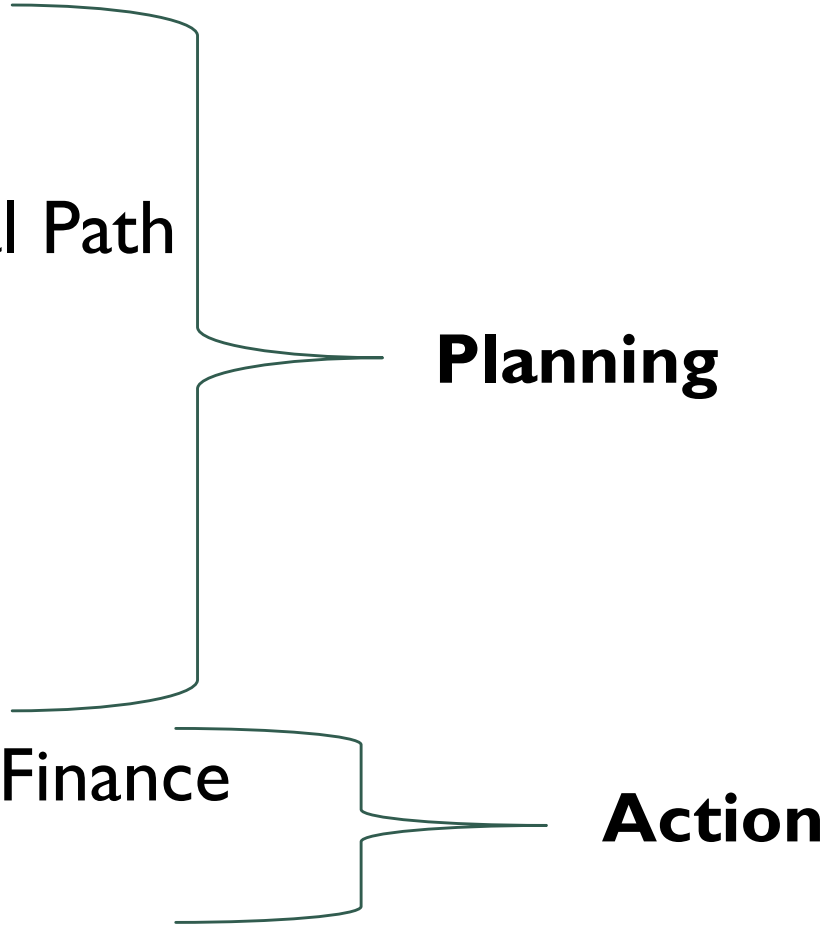
Project Planning activities

- Agreement - 1
- Planning - 7
- Action -3
- Review - 1



Principles of Project Planning

1. **Agreement**
2. List the tasks
3. Estimate time and Cost
4. Dependencies and Critical Path
5. Crashing
6. GANTT Chart
7. Resource Planning
8. Risks
9-10. Monitor Progress and Finance
11. Reschedule
12. **Review**

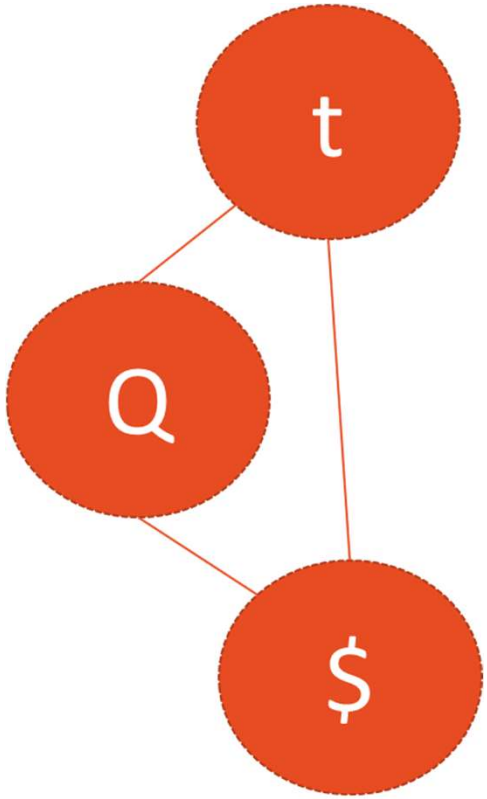


1. Agreement

Agree the succes criteria and constraints with all the customers, in writing

The output is a PID (Project Initiation Document)

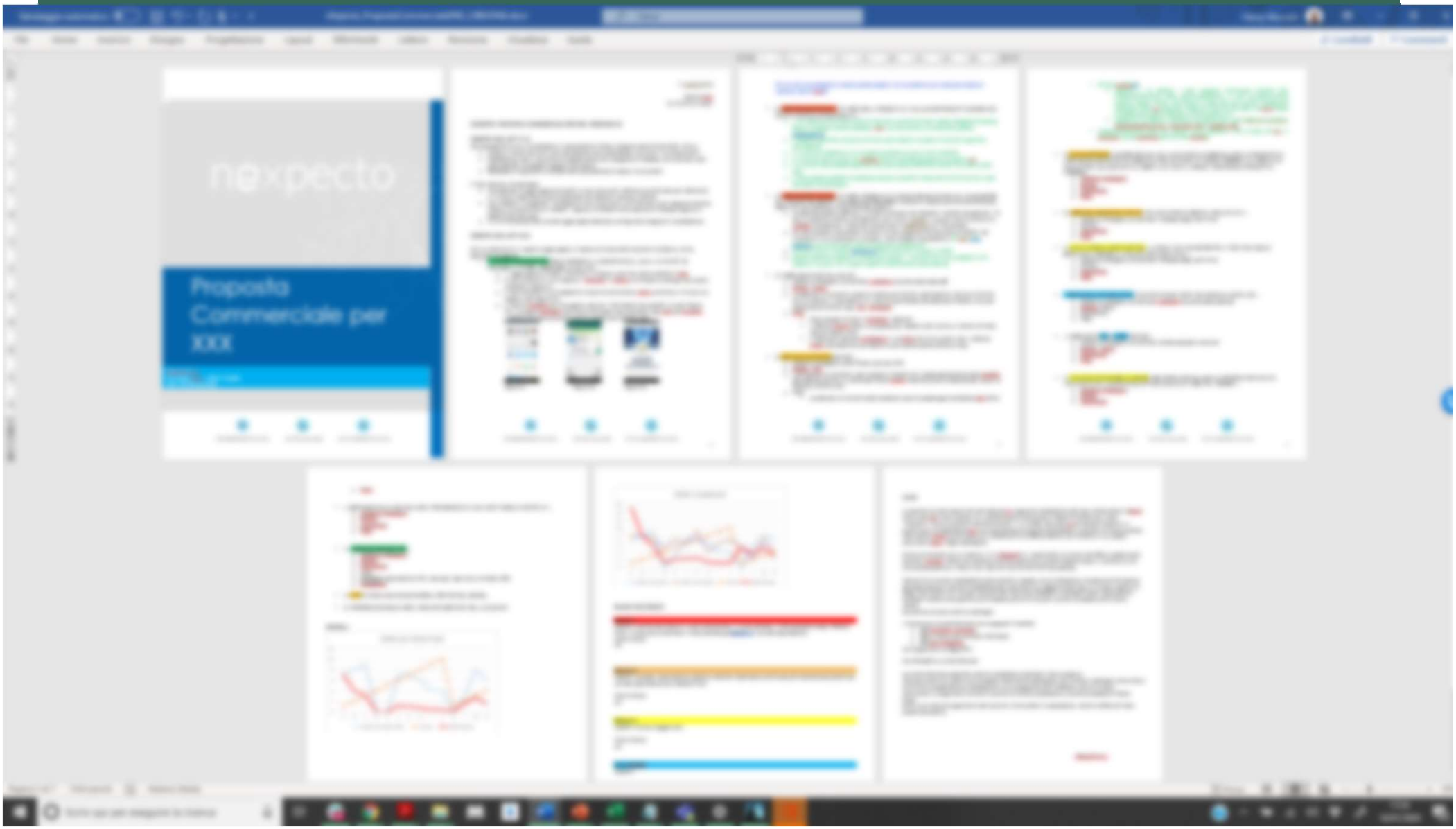
- Do not say MayBe!!!
- Define the key driver
  - The most important
  - Between Q, t, and $



Agreement

STESURA DI UN CONTRATTO

Agreement



PUNTI FONDAMENTALI DI UN CONTRATTO

- Data e Versione
- Autore
- Definizione di fasi incrementali di sviluppo
- Servizi:
  - Descrizione servizio
  - Condizioni necessarie per la realizzazione del servizio
  - Delivery type
- Tempistiche del progetto
  - Tempo 0
  - Milestones
  - #riunioni coperte dal buget
- Costi del progetto
  - Modelli di business
  - Costi di Manutenzione
  - Piano per lavori futuri

Planning

2. List the tasks
3. Estimate time and Cost
4. Dependencies and Critical Path
5. Crashing
6. GANTT Chart
7. Resource Planning
8. Risks

Planning: list the tasks

[►] CREATE A TASK LIST

- **Brainstorming:** Visualize what you need to do at every stage of the site creation process.
- **Work break down:** Then break that down into tasks that need to be accomplished.
  - Note whether a task is dependent on the completion of an earlier one.
- **Ask an expert**

- **Type of tasks:**
  - **Sw development** (associated to requirements and features);
  - **Hw acquisition tasks** (devices required for realizing the hw/sw infrastructure);
  - **Admin tasks** (approvals, internal procedures);
  - **Communication tasks** (internal, with customer, with clients, …)
  - Etc.

Planning: list the tasks

- Sw tasks:
  - realizzazione del modello statistico;
  - Realizzazione del modello di ottimizzazione;
  - Realizzazione del modello adattivo;
  - Sw per chioschi, big screens, readers, …
- Hw tasks:
  - Selezione e configurazione chioschi, big screens, readers, counters, etc
  - Creazione infrastruttura hw
- Admin tasks:
  - Gestione contratto con Uffizi
  - Acquisizione risorse umane
- Communication:
  - Con Direttore e responsabili Uffizi
  - Con UnivAQ
  - Team

Planning: costs > team

[►] ASSEMBLE A TEAM

- You may not have all the skills or time to do everything that needs to be done. Here are some common roles:

1. **Team Leader:** Every team needs someone who is able to make the final decisions.
2. **Designer:** Depending on the scale of the project, besides the familiar graphic designer, the team may need a user experience (UX) designer, creative designer, or interaction designer.
3. **Client-side developer:** Also known as a user interface (UI) designer, this developer specializes in creating interfaces that function efficiently on the iPad/iPhone platform.
4. **Server-side developer:** If you are building a dynamic site, you will want to have a developer skilled in programming languages like PHP or JavaScript to handle the server side code.

5. **Database administrator:** Depending on the complexity of the site, you may also need a database specialist to set up and maintain a database

- Hardware Integrator and IoT expert
- Statistics expert
- Optimization expert
- Mobile App development expert
- Web development expert
- Data Scientist
- Team leader
- UI developer
- Backend developer
- DB administrator

Principles of Project Planning

1. Agreement (studio di fattibilità, SOTA, contratto)
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COST ESTIMATE

HALF WAY BETWEEN AVERAGE AND WORST CASE

Project plans are based on effort estimates!

Simple Estimation Techniques

Discuss

- Guessing
- Parkinson's Law
- Pricing to win
- Budget method

Better Estimation Techniques

Based on experience or hard data collection

- Such techniques requires to "extensively record historical data"

Informal:

- Expert judgment
- Estimation by analogy
- Variation: Delphi method

Formal:

- Algorithmic cost modeling

Informal

Expert judgment

+ Relatively cheap estimation method.
+ Can be accurate if (AND ONLY IF) experts have direct experience with similar systems
- Does not use hard data

Estimation by analogy

+ Accurate if project data available
- **Impossible if** no comparable project has been undertaken.
- Estimates can be inaccurate if details overlooked.
-Subsequent similar projects can be quicker.

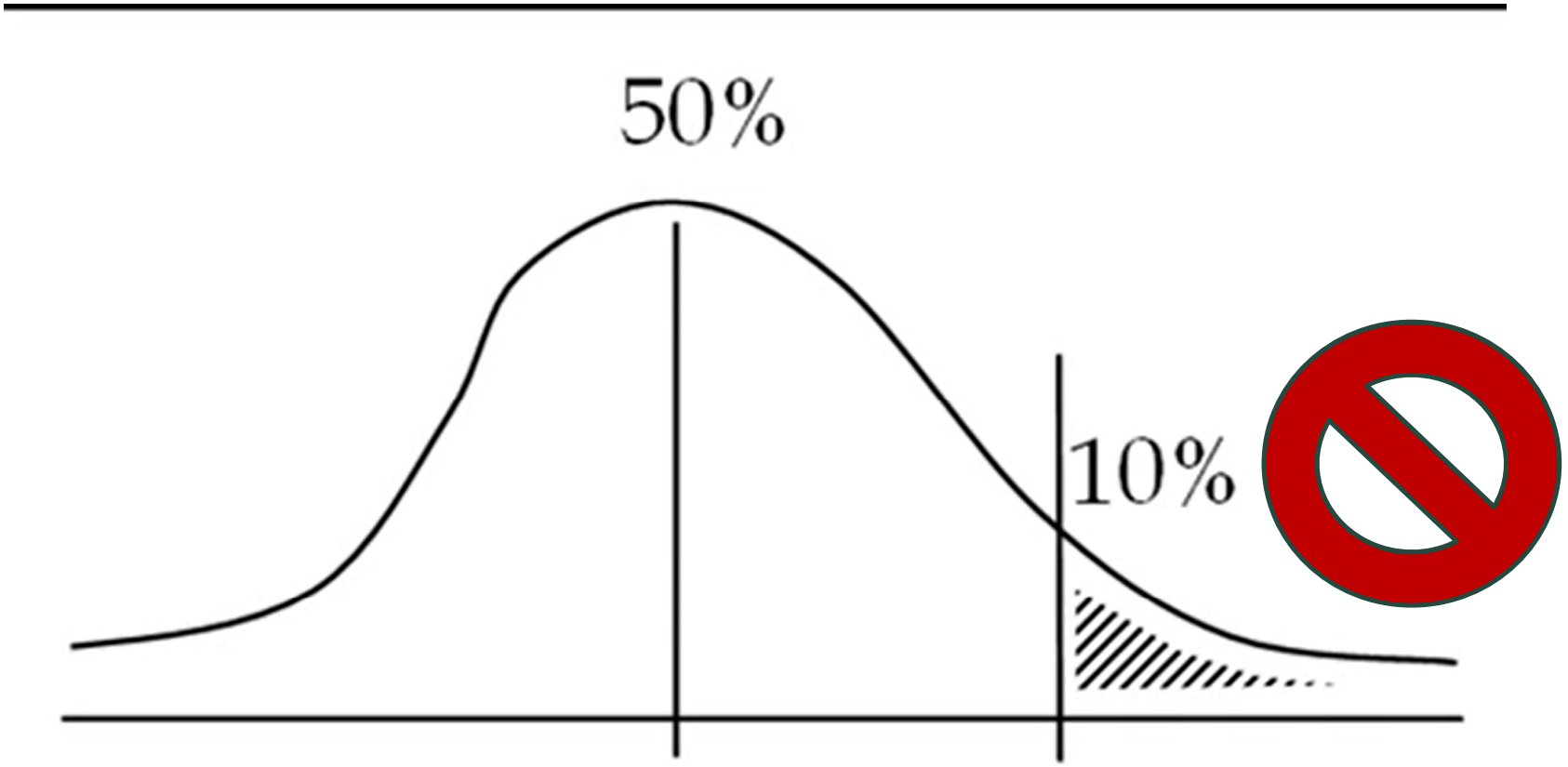
Informal: Delphi Method

Idea: Create a group expert opinion, while counterbalancing personality factors in process

Group of expert estimators + moderator

1. Experts independently create estimates.
2. Moderator collects written estimates from individuals.
3. Estimates are distributed to group.
   - → No names
4. Experts deliver new estimates based on new information from moderator.
5. Continue until consensus is reached.

3. ESTIMATE TIME AND COST



Formal: Algorithmic Cost Modeling

Cost and development time for a project is estimated **from an equation**

Effort estimates are based on size

- Highly inaccurate at start of project

Size is usually given in lines of code, which **not** reflect difficulty

- Some short programs are harder to write than long ones
- Lines of code ≠ effort
  - Not all activities produce code
- Programming Language: Java vs. assembler

Formal: Algorithmic Cost Modeling

$$EFFORT = A \times SIZE^{B} \times M$$

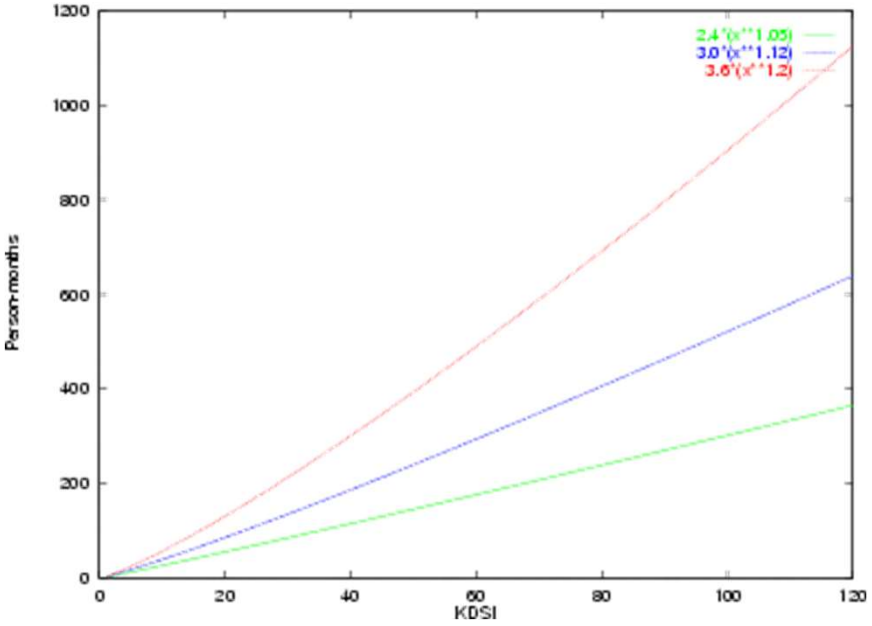
- A = is a constant factor that depends on local organizational practices and the type of software that is developed.
- SIZE = code size or function points
- B = expresses the non-linearity of costs with project size. As the size of the software increases, extra costs are emerged. The value of exponent B usually lies between 1 and 1.5.
- M = is a multiplier made by combining process, product and development attributes, such as the dependability requirements for the software and the experience of the development team.

Formal: Algorithmic Cost Modeling

$$EFFORT = A \times SIZE^{B} \times M$$

Basic COCOMO Formula

- Organic mode: PM = 2.4 (KDSI)$^{1.05}$
- Semi-detached mode: PM = 3 (KDSI)$^{1.12}$
- Embedded mode: PM = 3.6 (KDSI)$^{1.2}$



KDSI: thousands of delivered source instructions

PM: person-months

Formal: Algorithmic Cost Modeling

COCOMO -- Time to Develop

- Organic mode: $TDEV = 2.5(PM)^{0.38}$
- Semi-detached mode: $TDEV = 2.5(PM)^{0.35}$
- Embedded mode: $TDEV = 2.5(PM)^{0.32}$

TDEV: time (months) to develop

Example:

- Organic mode project, 32KLOC
- $PM = 2.4(32)^{1.05} = 91$ person months
- $TDEV = 2.5(91)^{0.38} = 14$ months
- $N = 91/14 = 6.5$ people

WORK BREAKDOWN

LIST THE TASKS AND PERT

Work breakdown and Planning

A Work breakdown reflects the decomposition of a project into subactivities down to a level needed for effective planning and control

Project planning involves scheduling all activities such that the **constraints** are satisfied and resource limits are not exceeded.

Activities

Have a beginning and end

- Often marked by milestones
- A milestone is a scheduled event for which some person is held accountable and which is used to measure and control progress.

Consume resources

- e.g. people and computer time

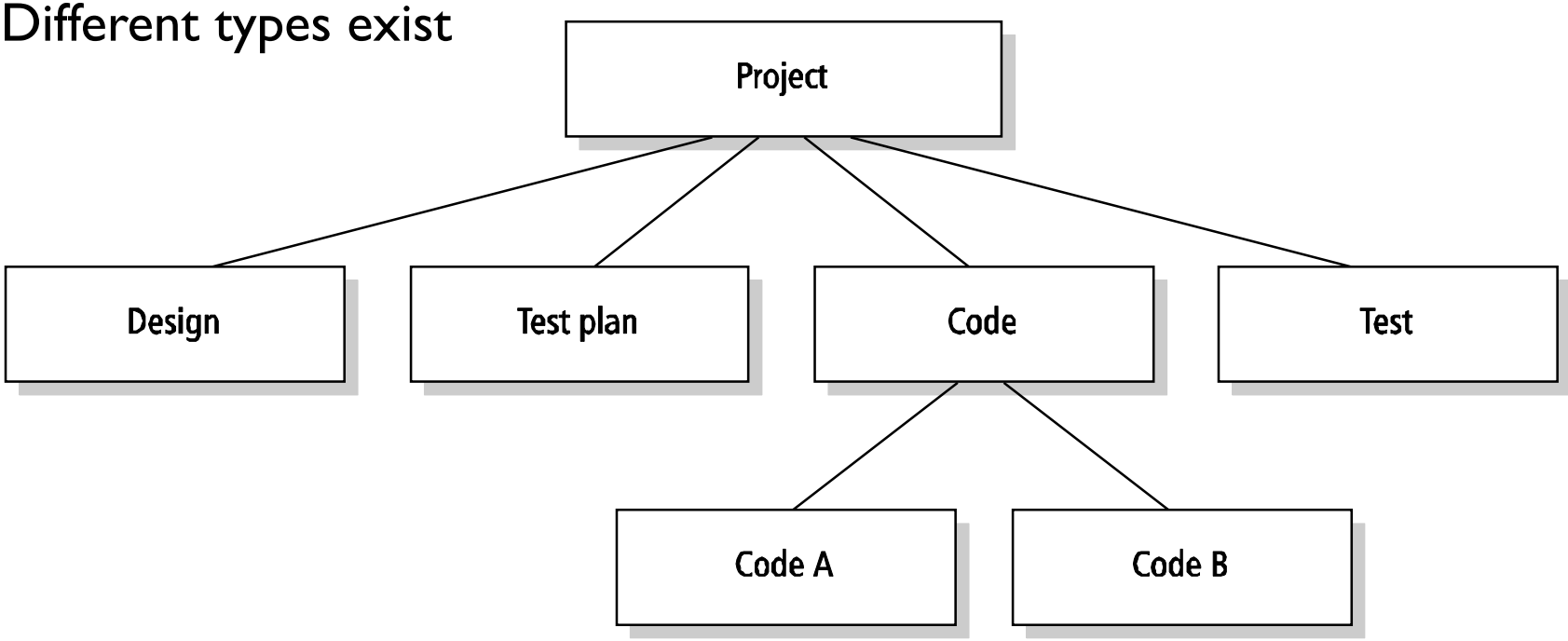
Have dependencies

- e.g. Can't code before we have a specification
- Expressed as constraints, a.k.a. precedence relations
- Usually temporal, but sometimes deliverables

Representing Activities

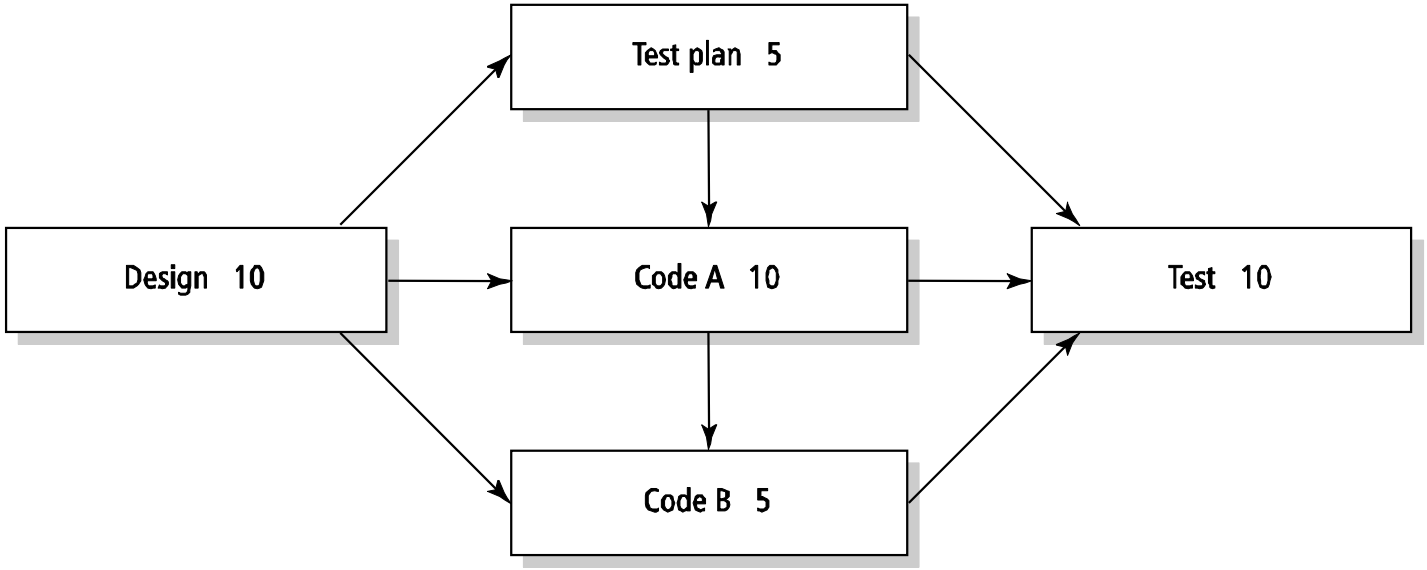
Work Breakdown Structure (WBS)

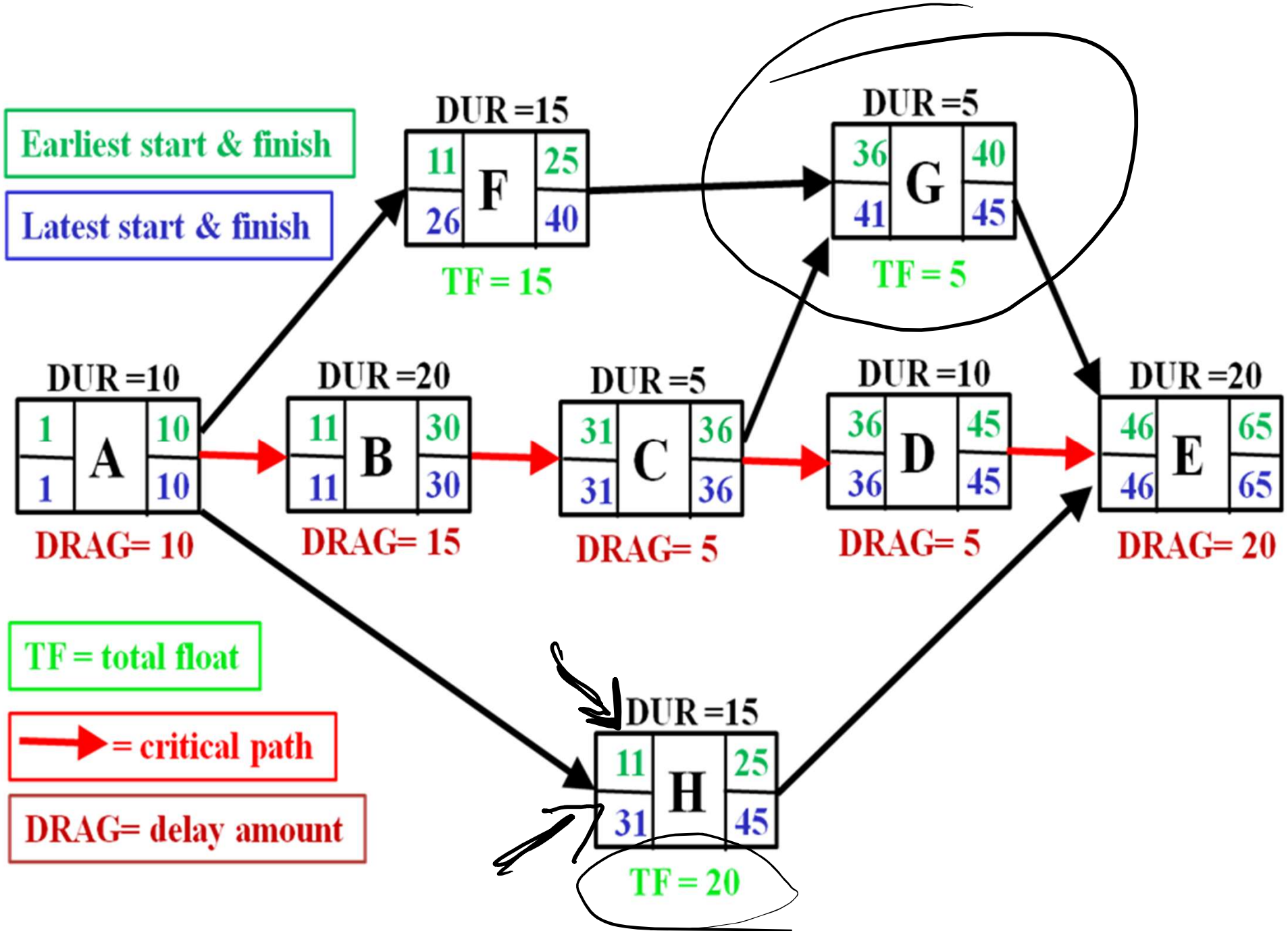
- Graphical representation of a project and constituent activities
- Can be abstract or highly detailed
- Different types exist



PERT CHARTS

- PERT = Program Evaluation and Review Technique
  - First used in 1950s on Polaris missile program
- Most useful for finding dependencies and minimum schedule time




Earliest start & finish
Latest start & finish
TF = total float
= critical path
DRAG= delay amount
DUR =10
1
1
A
10
10
DRAG= 10
DUR =15
11
26
F
25
40
TF = 15
DUR =20
11
11
B
30
30
DRAG= 15
DUR =5
31
31
C
36
36
DRAG= 5
DUR =5
36
41
G
40
45
TF = 5
DUR =10
36
36
D
45
45
DRAG= 5
DUR =20
46
46
E
65
65
DRAG= 20
DUR =15
11
31
H
25
45
TF = 20

Critical Path

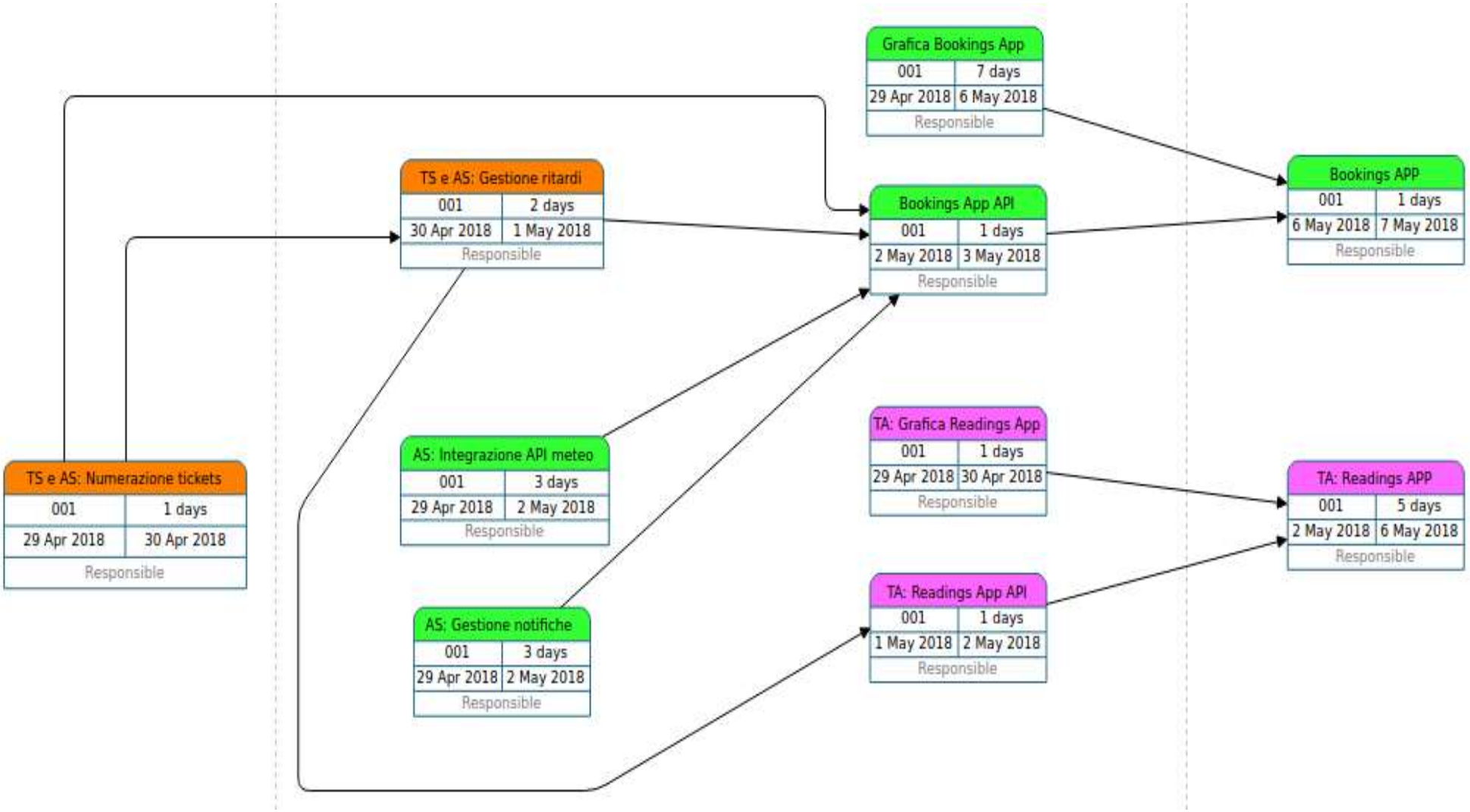
A **critical path** is a sequence of activities without slack time.

- example

If activities on a critical path are delayed, the total project is delayed as well.

Found by performing a breadth-first search while tracking the duration

ESEMPIO REALE DI PERT



Gantt Chart

Invented by Henry Gantt in 1910

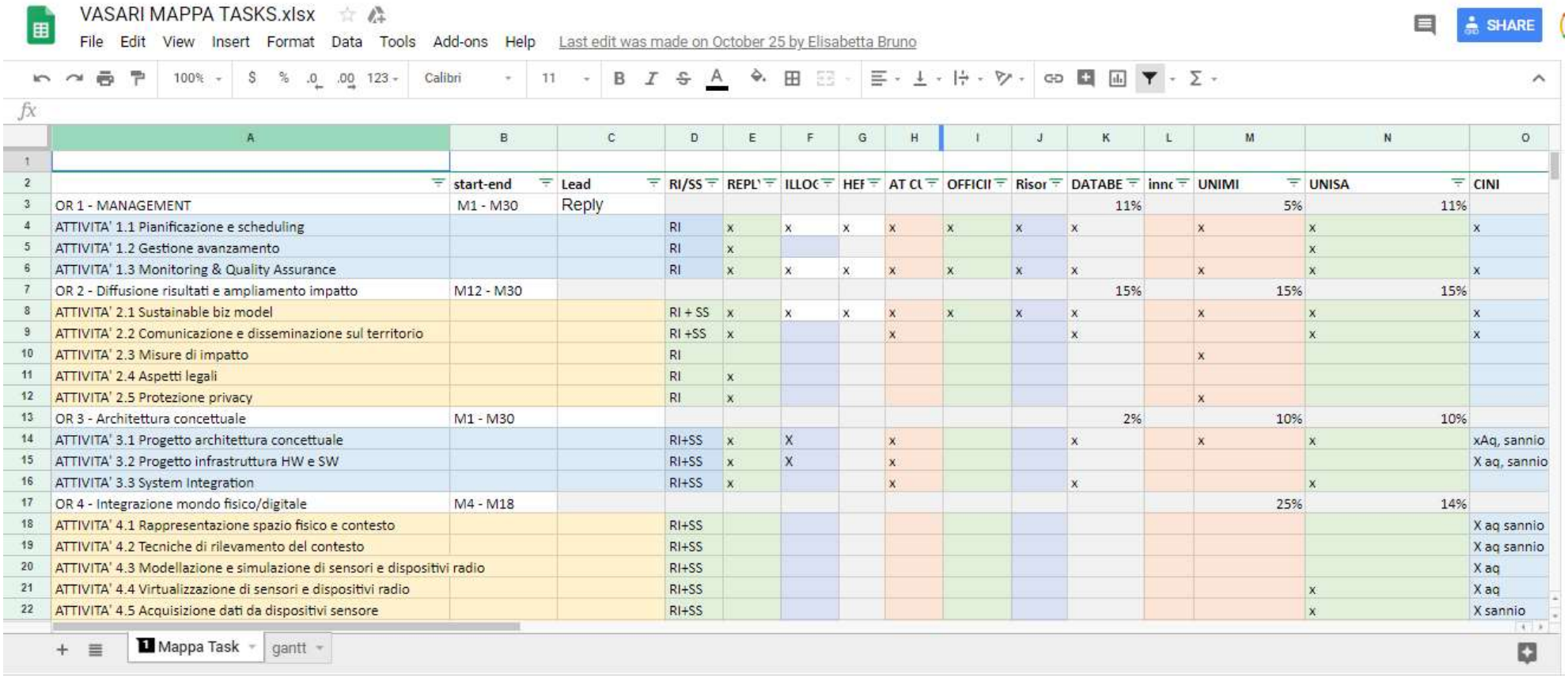
- Engineer and management scientist
- Used on Hoover dam project

Like a bar chart version of PERT chart with **extra features**

- Shows activities on a calendar
- Depicts additional temporal dependencies
  - Start activity after the start of…
  - Start activity before the end of…
- Allocate resources to tasks
  - Budgeting
  - Can ask what-if questions about allocations

GANTT

- https://docs.google.com/spreadsheets/d/1KhxzvuC-IB4mHqAB1DNt1tlvo5RFuLyYu1RYo5IEVAo/edit#gid=560140332



VASARI MAPPA TASKS.xlsx

File Edit View Insert Format Data Tools Add-ons Help Last edit was made on October 25 by Elisabetta Bruno

SHARE

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1															
2		start-end	Lead	RI/SS	REPL	ILLOC	HEF	AT CL	OFFICII	Risor	DATABE	innc	UNIMI	UNISA	CINI
3	OR 1 - MANAGEMENT	M1 - M30	Reply								11%		5%	11%	
4	ATTIVITA' 1.1 Pianificazione e scheduling			RI	x	x	x	x	x	x	x		x	x	x
5	ATTIVITA' 1.2 Gestione avanzamento			RI	x									x	
6	ATTIVITA' 1.3 Monitoring & Quality Assurance			RI	x	x	x	x	x	x	x		x	x	x
7	OR 2 - Diffusione risultati e ampliamento impatto	M12 - M30									15%		15%	15%	
8	ATTIVITA' 2.1 Sustainable biz model			RI + SS	x	x	x	x	x	x	x		x	x	x
9	ATTIVITA' 2.2 Comunicazione e disseminazione sul territorio			RI +SS	x			x			x			x	x
10	ATTIVITA' 2.3 Misure di impatto			RI									x		
11	ATTIVITA' 2.4 Aspetti legali			RI	x										
12	ATTIVITA' 2.5 Protezione privacy			RI	x								x		
13	OR 3 - Architettura concettuale	M1 - M30									2%		10%	10%	
14	ATTIVITA' 3.1 Progetto architettura concettuale			RI+SS	x	X		x			x		x	x	xAq, sannio
15	ATTIVITA' 3.2 Progetto infrastruttura HW e SW			RI+SS	x	X		x							X aq, sannio
16	ATTIVITA' 3.3 System Integration			RI+SS	x			x			x			x	
17	OR 4 - Integrazione mondo fisico/digitale	M4 - M18											25%	14%	
18	ATTIVITA' 4.1 Rappresentazione spazio fisico e contesto			RI+SS											X aq sannio
19	ATTIVITA' 4.2 Tecniche di rilevamento del contesto			RI+SS											X aq sannio
20	ATTIVITA' 4.3 Modellazione e simulazione di sensori e dispositivi radio			RI+SS											X aq
21	ATTIVITA' 4.4 Virtualizzazione di sensori e dispositivi radio			RI+SS										x	X aq
22	ATTIVITA' 4.5 Acquisizione dati da dispositivi sensore			RI+SS										x	X sannio

Mappa Task | gantt

Planning: risk management

2. List the tasks
3. Estimate time and Cost
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5. Crashing
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7. Resource Planning
8. Risks

RISK MANAGEMENT

Risk management

Risk management is concerned with **identifying** risks and drawing up **plans to minimise** their effect on a project.

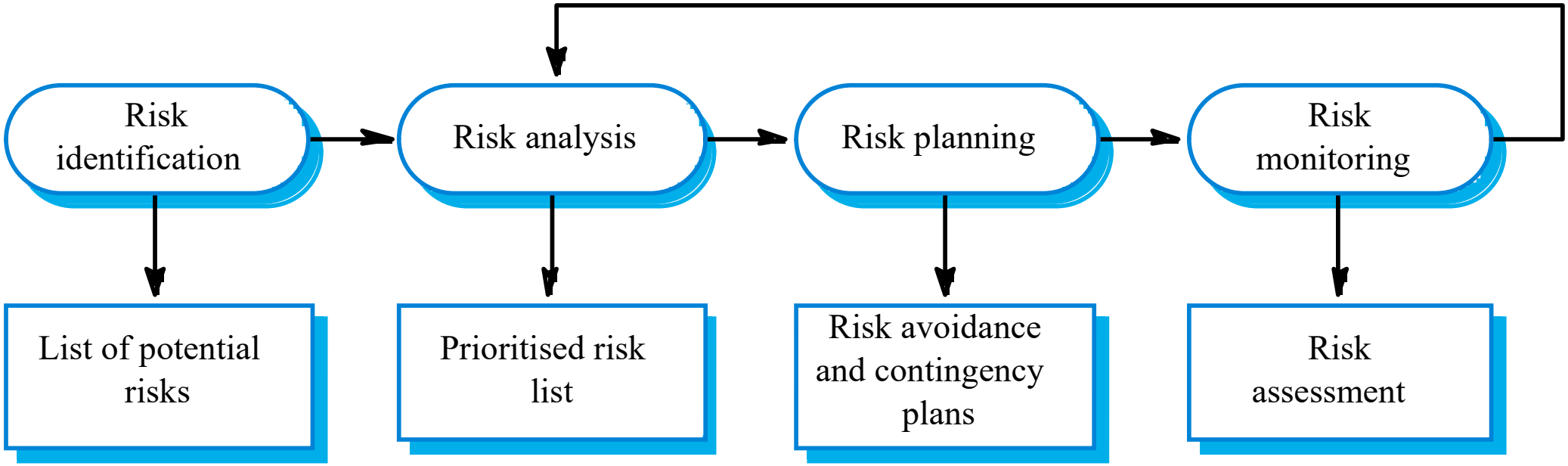
"**A risk is a possible future negative event that may affect the success of an effort**" [VV8.3]

- Project risks affect schedule or resources;
- Product risks affect the quality or performance of the software being developed;
- Business risks affect the organisation developing or procuring the software.

Analogy with "Software Faults and Software Failures"

THE RISK MANAGEMENT PROCESS

[FROM SOMMERVILLE BOOK]



- **PREVENT**
- **MONITOR**
- **FIX**

THE RISK MANAGEMENT PROCESS

1. Risk identification
   - Identify project, product and business risks;

Discuss

2. Risk analysis
   - Assess the likelihood and consequences of these risks;
   - Called "Risk Exposure" in VV

3. Risk planning
   - Draw up plans to avoid or minimise the effects of the risk;
   - From VV:
     - risk avoidance, transfer, acceptance
     - Like in deadlock handling

4. Risk monitoring
   - Monitor the risks throughout the project;

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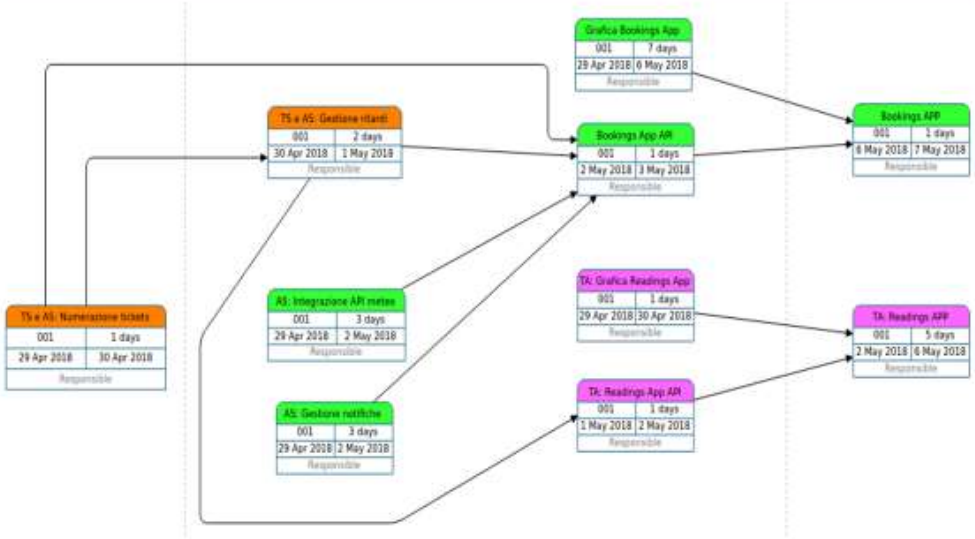
Planning

9-10. Monitor Progress and Finance
11. Reschedule

Action

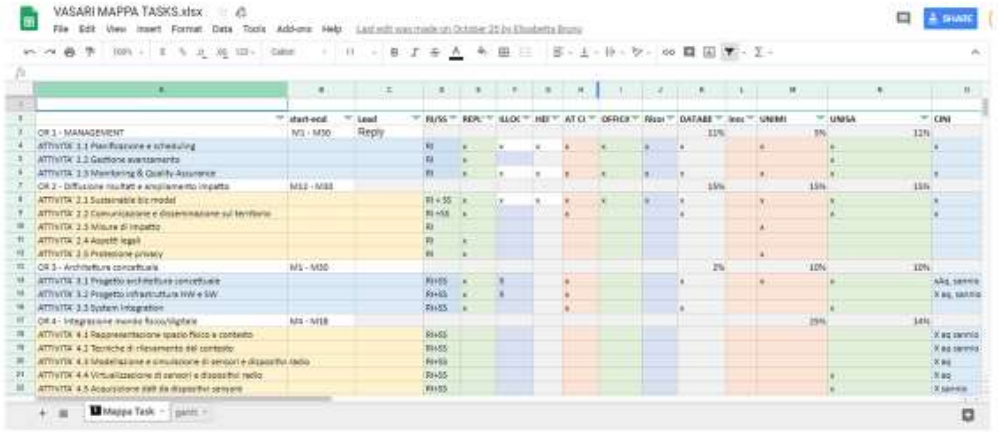
12. **Review**

ESEMPIO REALE DI PERT



GANTT

- https://docs.google.com/spreadsheets/d/1KhxzvuC-lB4mHqAB1DNt1tlvo5RFuLyYu1RYo5lEVAo/edit#gid=560140332



[►] MONITOR AND RESCHEDULE

Esempio 2: Uffizi (chioschi)

17

Review

Good

Bad

Better

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