Project management

- Organising, planning and scheduling software projects

PRECISAZIONE LINGUISTICA

(Wikipedia:) Un **progetto** consiste, in senso generale, nell'organizzazione di azioni nel tempo per il perseguimento di uno scopo predefinito, attraverso le varie fasi di **progettazione, …** da parte di uno o più progettisti, ... Scopo finale è la realizzazione di un bene o servizio il cui ciclo di sviluppo è gestito tipicamente attraverso tecniche di project management.

PROJECT

Progetto e *Progettazione*: due concetti molto DIVERSI!!!!!

DESIGN

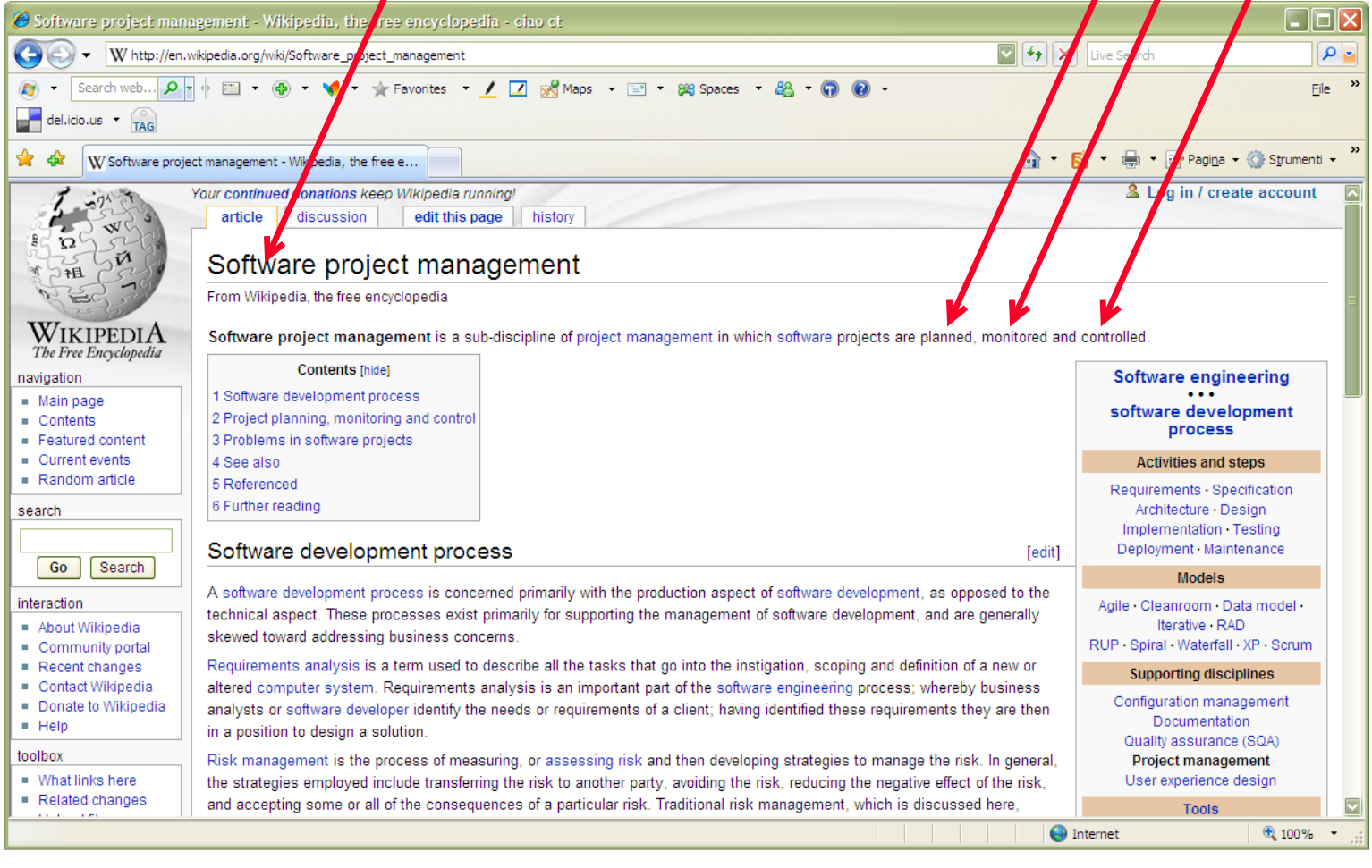
ATTENZIONE A NON FAR **CONFUSIONE**, perché:

Project viene tradotto in ITALIANO con *progetto*

MA

Design viene tradotto in ITALIANO con *progettazione,* ma anche spesso con il termine *progetto*

Software project management



Cosa fa un manager?
Le funzioni dei manager

- *Pianificare: che obiettivi, in che tempi*
- *Organizzare: quali attività, processi, come correlati, con quali competenze, …*
- *Rendere disponibili le necessarie risorse (persone,…): quali risorse, quando, a fare cosa,*
- *Dirigere: attivare l'esecuzione di attività e supportarne l'esecuzione*
- *Monitorare e Controllare: verificare l'esecuzione, i risultati, i tempi e mantenere le attività focalizzate al risultato mediante eventuali azioni correttive*

Software project management (SPM) SUCCESS Criteria

- SUCCESS Criteria: SPM is concerned with activities involved in ensuring that software is delivered **1.** on time and on schedule, **2.** on budget and **3.** in accordance with the requirements/expectations of the organisations developing and procuring the software. Moreover, maintaining a 'happy' and 'well-functioning' development team!
- Project management is needed because software development is always subject to budget and schedule constraints that are set by the organisation developing the software

Software management distinctions vs. other technologies

- The product is **intangible**
- The product is uniquely **flexible**
- Software engineering is not recognized as an engineering discipline with the same status as mechanical, electrical engineering, etc.
- The software development process is **not standardised**
- Many software projects are 'one-off' projects

Management activities

- Proposal writing
- Project planning and scheduling
- Project costing
- Project monitoring and reviews
- Personnel selection and evaluation
- Report writing and presentations → ci mette il manager la faccia con il capo e lo stakeholder
- Risk management

- Coordination – guidance – control

Project staffing: provvedere le giuste risorse di personale

→ TROVARE le PERSONE GIUSTE da inserire nel progetto

- May not be possible to appoint the ideal people to work on a project. Why?
  - Project budget may not allow for the use of highly-paid staff
  - Staff with the appropriate experience may not be available
  - An organisation may wish to develop employee skills on a software project (training of younger unskilled people)
- Managers have to work within these constraints especially when (as is currently the case) there is an international shortage of skilled IT staff

Project planning

Project PLANNING: formulare un piano dettagliato delle attività necessarie per raggiungere gli scopi del progetto

- Probably the most time-consuming project management activity
- Continuous activity from initial concept through to system delivery. Plans must be regularly revised as new information becomes available (re-planning)
- Various different types of plan may be developed to support the main software project plan that is concerned with schedule and budget

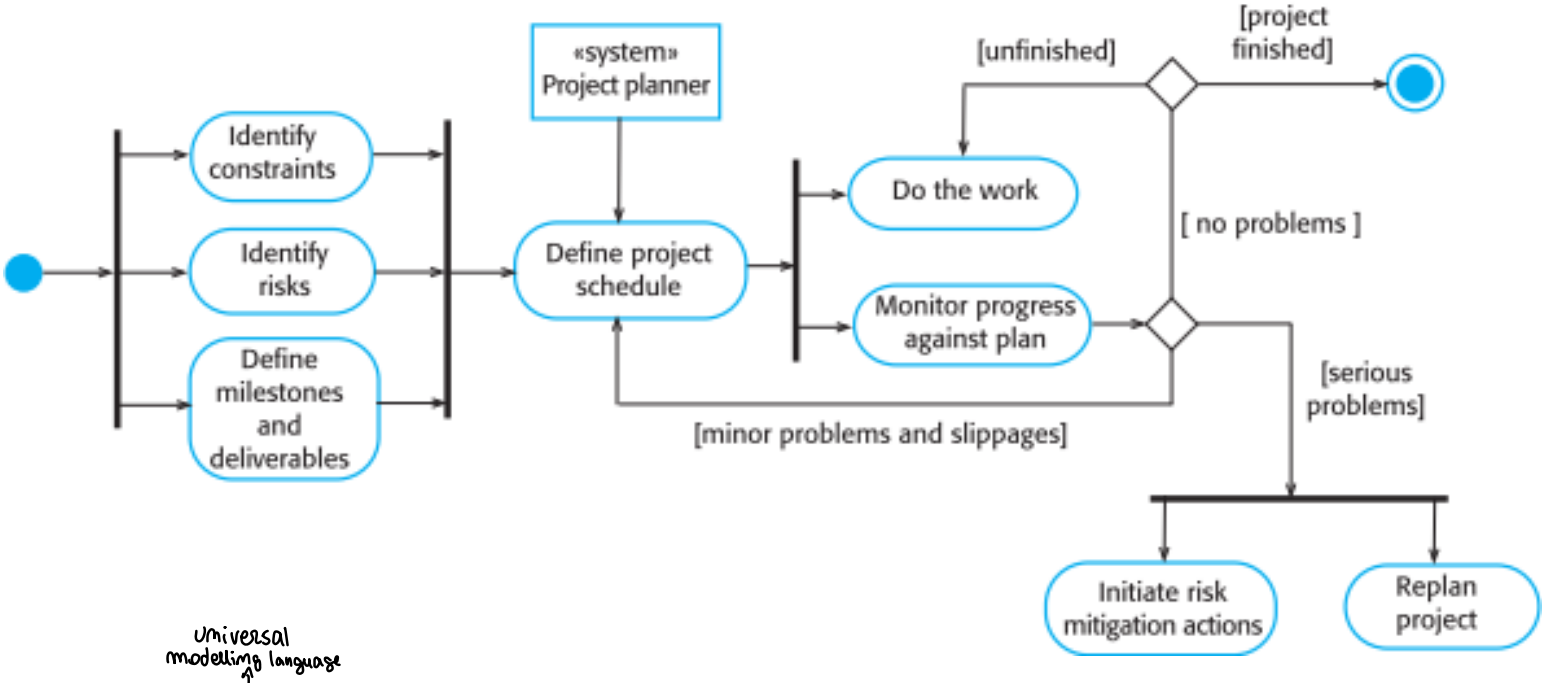
Several types of project plan are needed

Plan	Description
Quality plan	Describes the quality procedures and standards that will be used in a project.
Validation plan	Describes the approach, resources and schedule used for system validation.
Configuration management plan	Describes the configuration management procedures and structures to be used.
Maintenance plan	Predicts the maintenance requirements of the system, maintenance costs and effort required.
Staff development plan.	Describes how the skills and experience of the project team members will be developed.

Project planning process

Attività ciclica, che inizia con la definizione di un primo piano (deliverable, milestones, scheduling) e prosegue con una continua/frequente attività di monitoraggio, al fine di individuare la necessità di eventuali ri-pianificazioni.

Project planning process model



Universal modelling language

(UML Activity Chart)

The project plan

- The project plan sets out:
  - The resources available to the project;
  - The work breakdown: le varie attività/task da fare
  - A schedule for the work: tabella tempi, scadenze, organizzazione delle attività/task

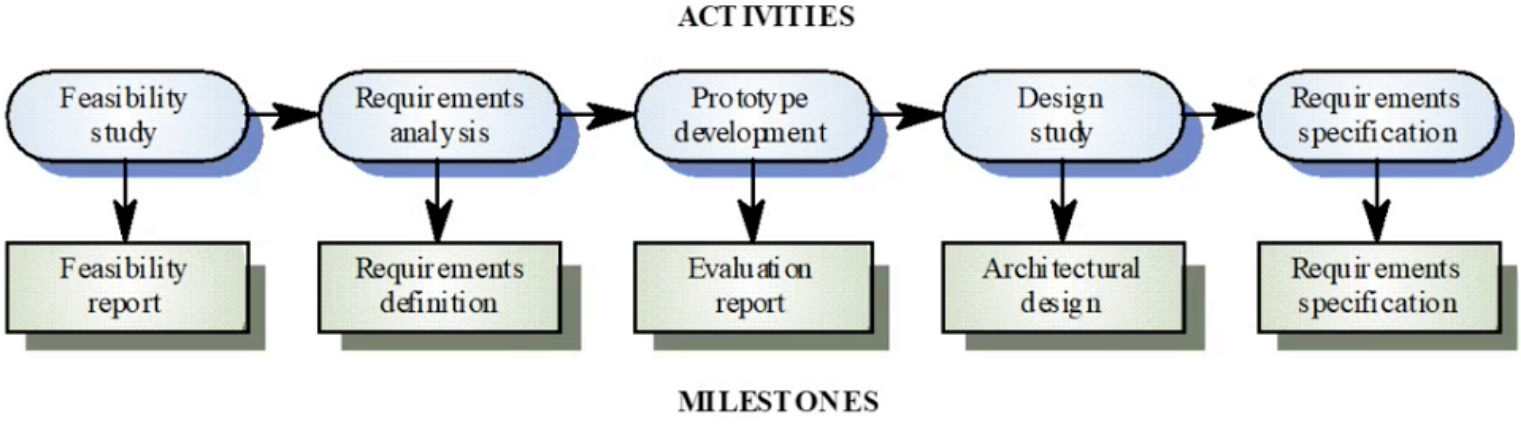
Project plan structure

- Introduction
- Project organisation
- Risk analysis
- Hardware and software resource requirements
- Work breakdown
- Project schedule
- Monitoring and reporting mechanisms

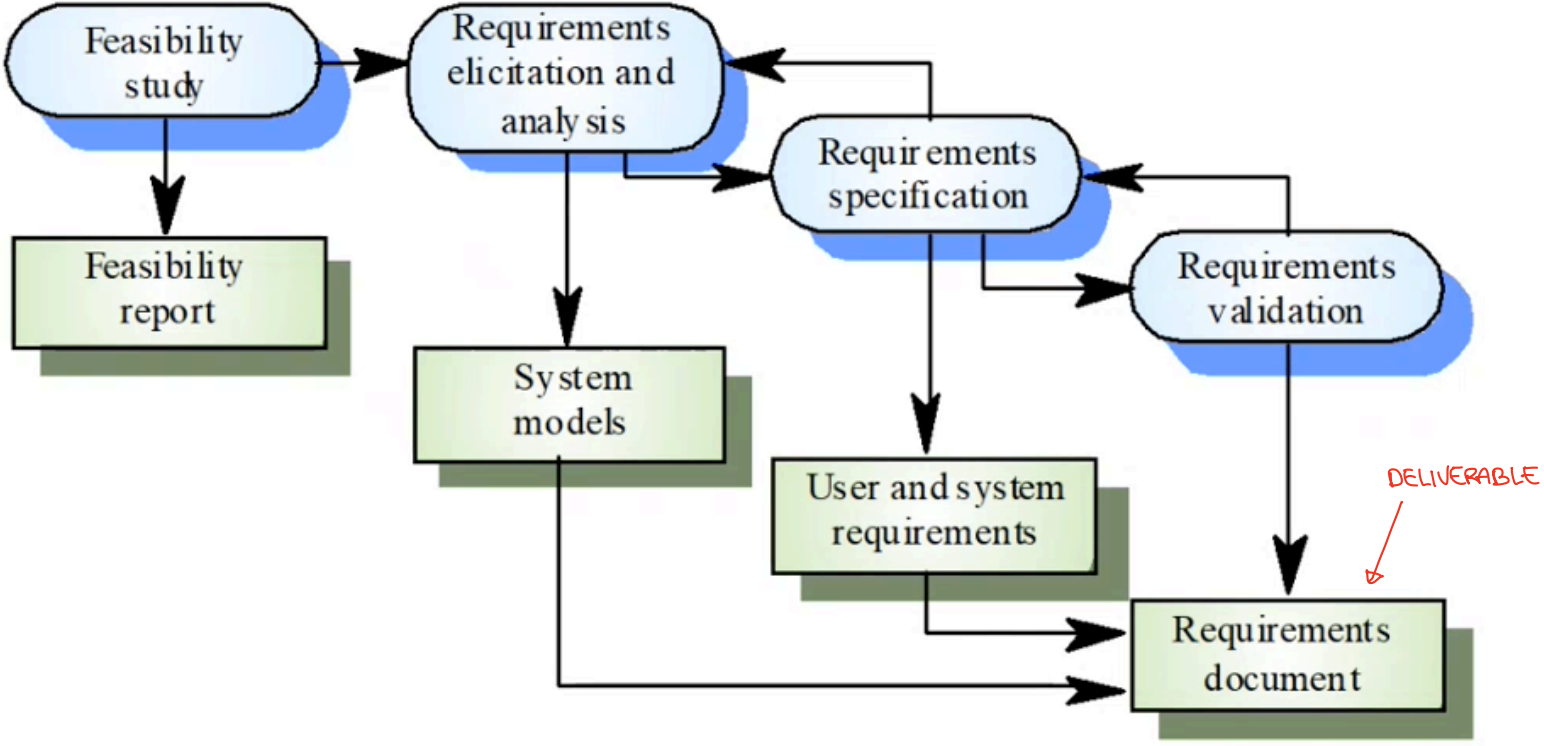
Activity organization: Milestone e Deliverable

- Activities in a project should be organised to produce tangible outputs for management to judge progress
- ***Milestones*** are the end-point of a process activity (one or more tasks). They *can* be associated also with a report.
- ***Deliverables*** are project results delivered to customers (reports or sw)
- The waterfall process allows for the *straightforward* definition of progress milestones
- Usually (but not necessarily) when a (…an important…) deliverable is produced, a milestone can correspond to that moment. On the other hand, in a milestone, a deliverable may be produced or may not.

Milestones in a possible RE process



..other example…



Project scheduling → per fare lo scheduling si usano dei tool grafici

- Split project into specific tasks and estimate time and resources required to complete each task
- Organize tasks concurrently to make optimal use of workforce
- Minimize task dependencies to avoid delays caused by one task waiting for another to complete
- Dependent on project managers intuition and experience

Scheduling difficulties

- **Estimating** the difficulty of problems and hence the time and hence the cost of developing a solution is hard
- Productivity is **not proportional** to the number of people working on a task
- **Adding** people to a late project makes it later because of communication overheads
- The **unexpected** always happens. Always allow contingency in planning

Bar charts and activity networks

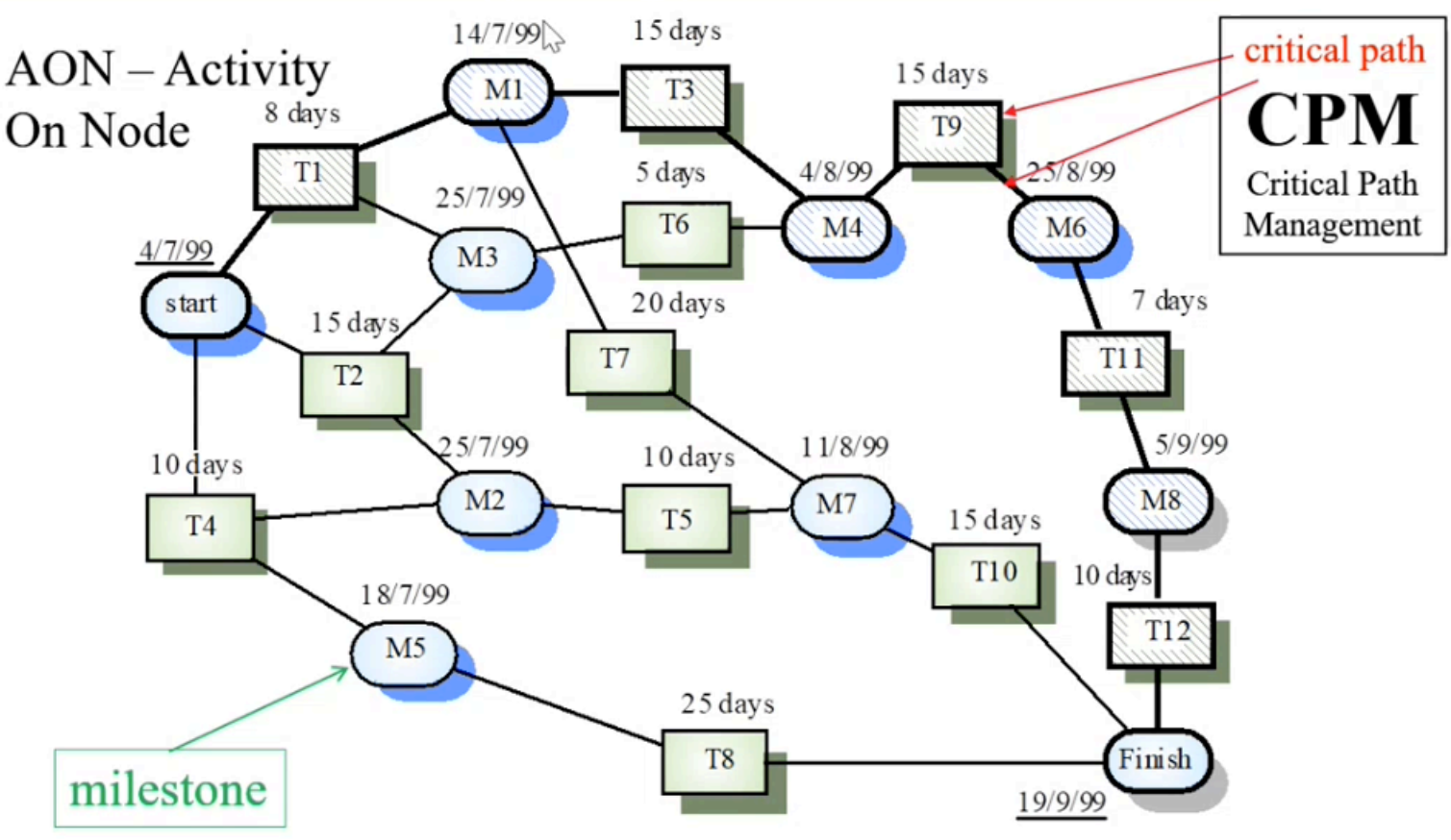
- Graphical notations used to illustrate the project schedule
- Show project breakdown into **tasks**. Tasks should not be too small. They should take about a week or two
- Activity charts show task dependencies and the critical path
- Bar charts show schedule against calendar time

se io ritardo un'attività su questo percorso ritardo tutto il progetto

Task durations and dependencies

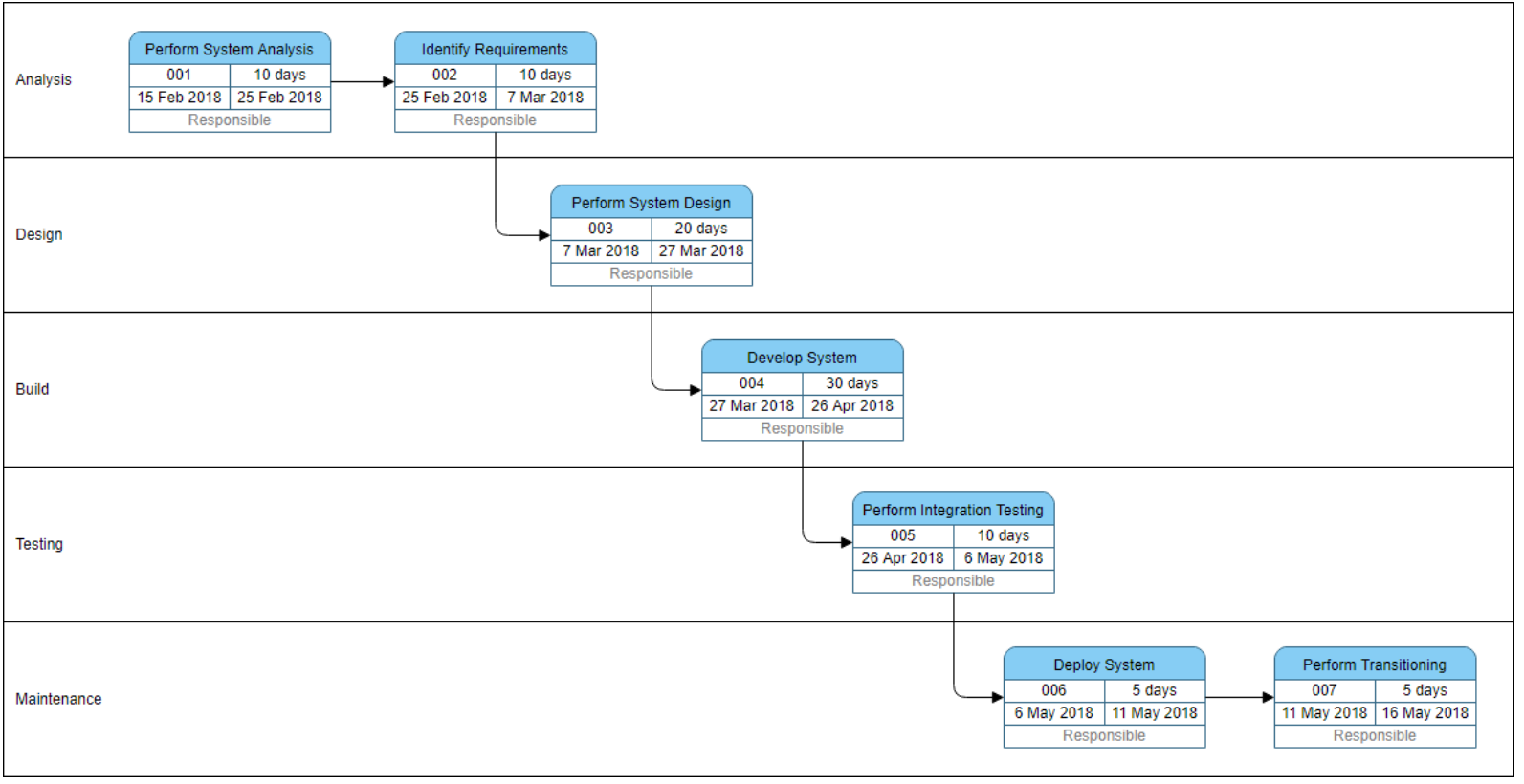
Task	Duration (days)	Dependencies
T1	8	
T2	15	
T3	15	T1 (M1)
T4	10	
T5	10	T2, T4 (M2)
T6	5	T1, T2 (M3)
T7	20	T1 (M1)
T8	25	T4 (M5)
T9	15	T3, T6 (M4)
T10	15	T5, T7 (M7)
T11	7	T9 (M6)
T12	10	T11 (M8)

Activity network (Act. Diagram, … PERT)

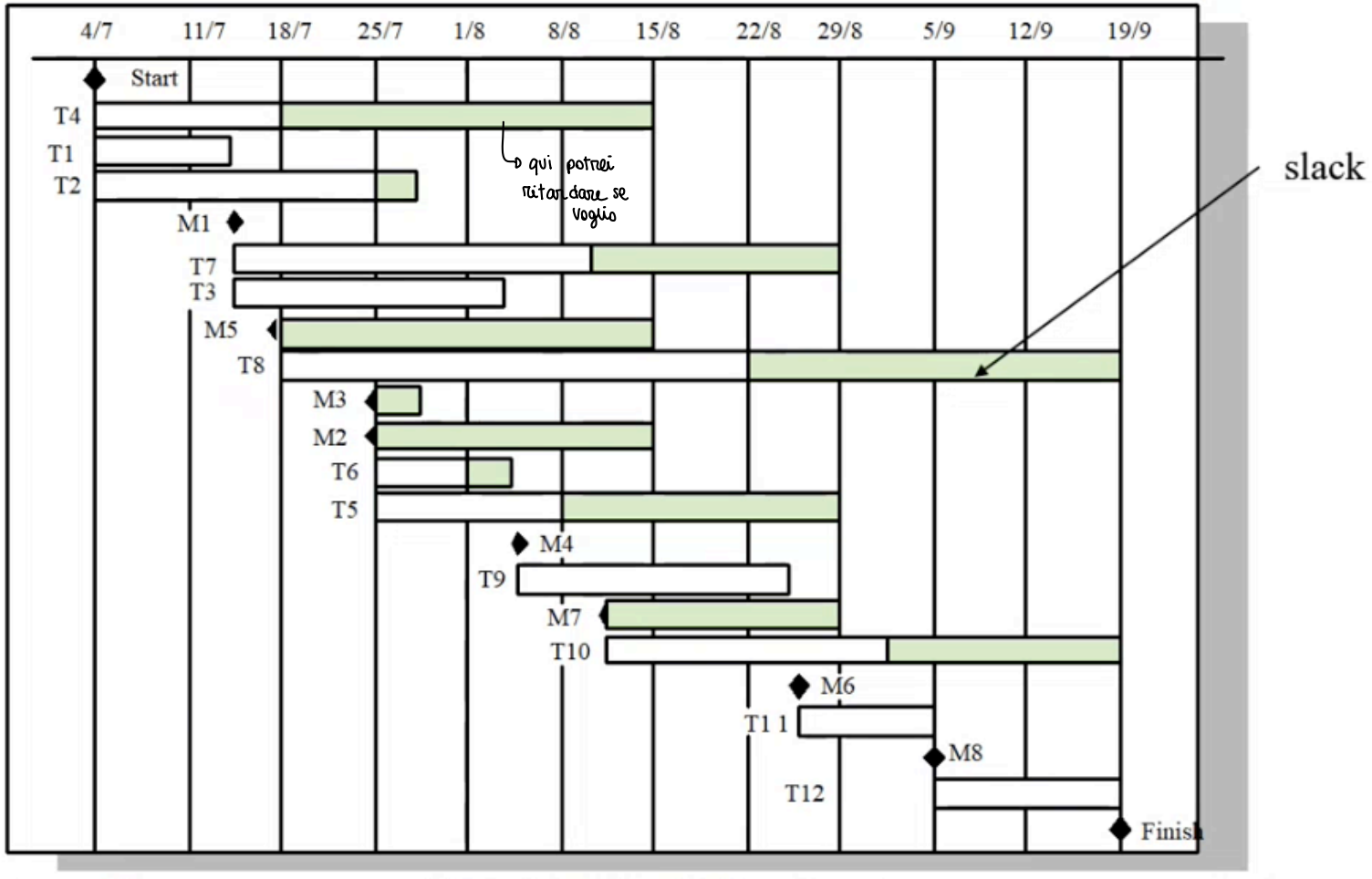


PERT

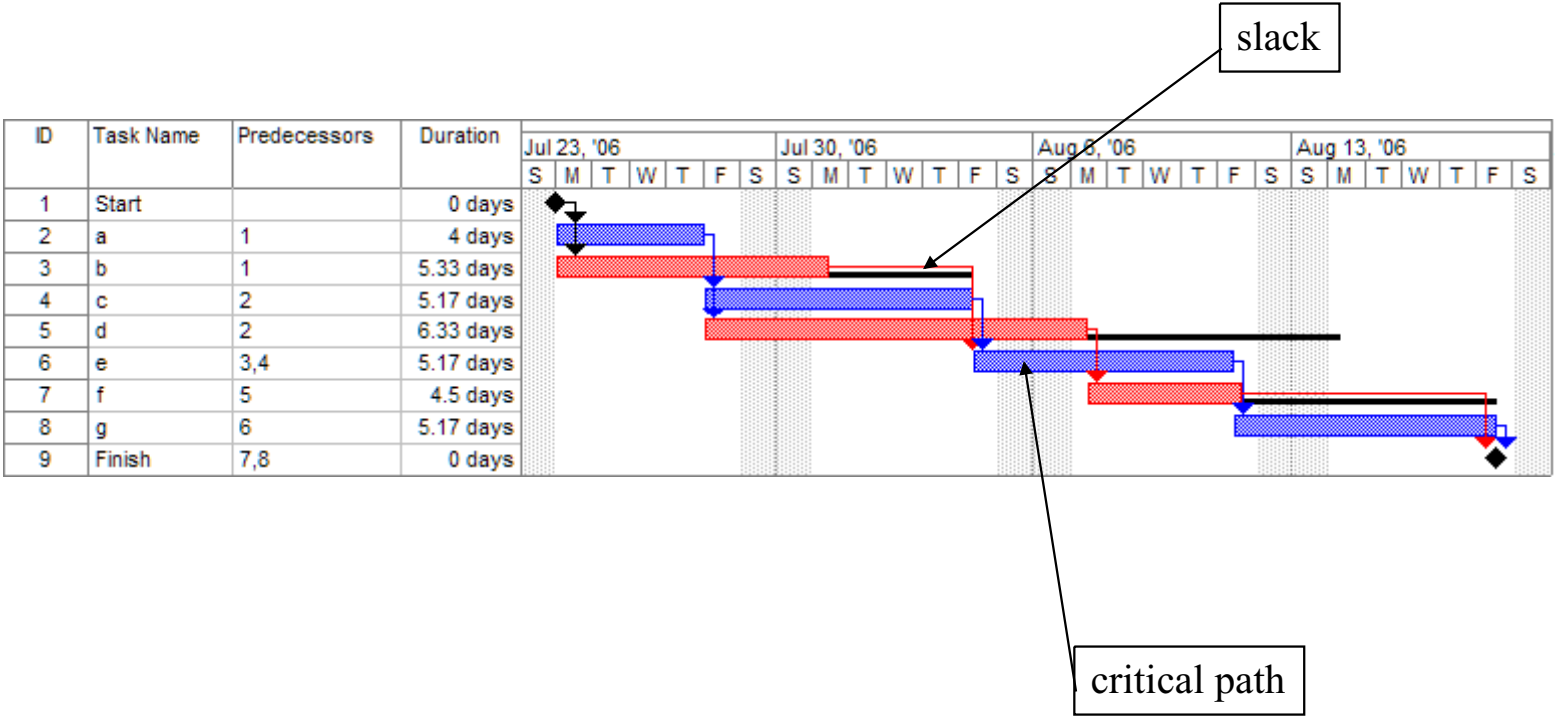
PERT per il Waterfall Model life cycle



Activity timeline (**Gantt chart**)

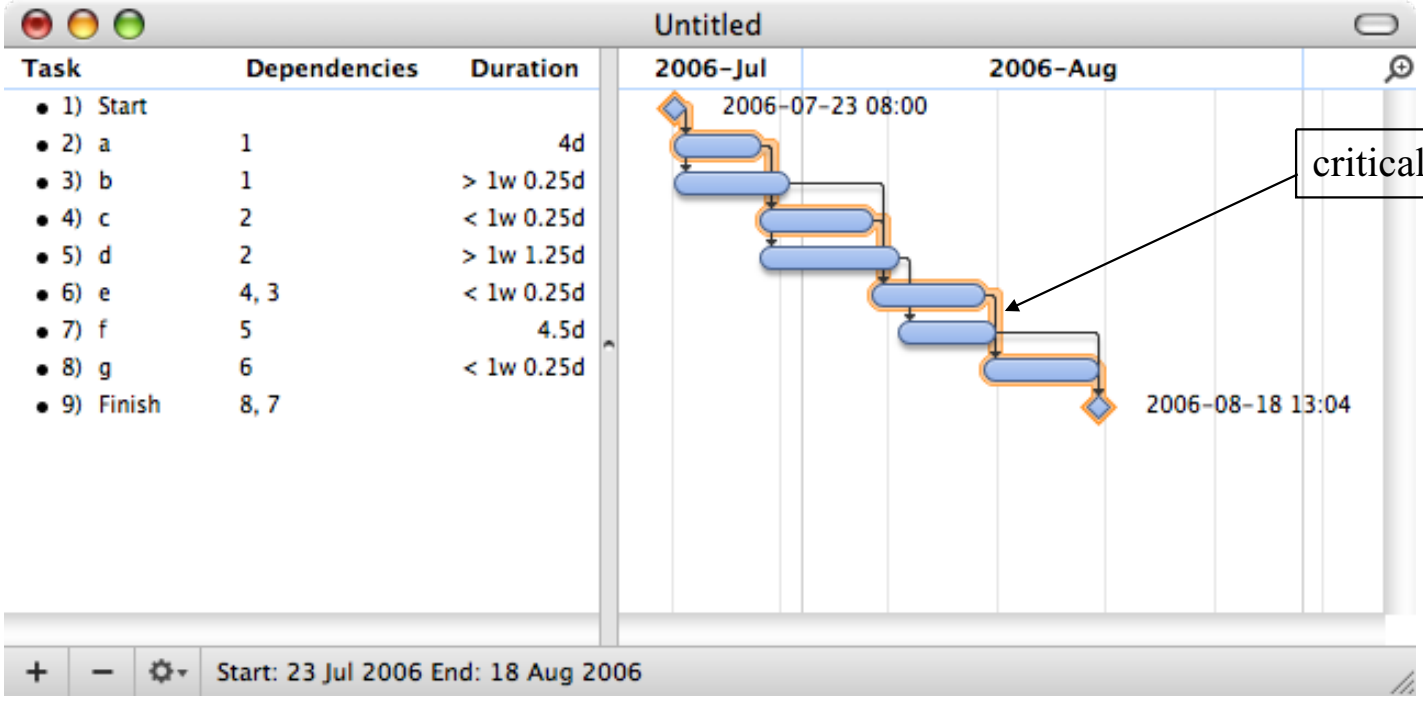


GANTT chart (MS Project)

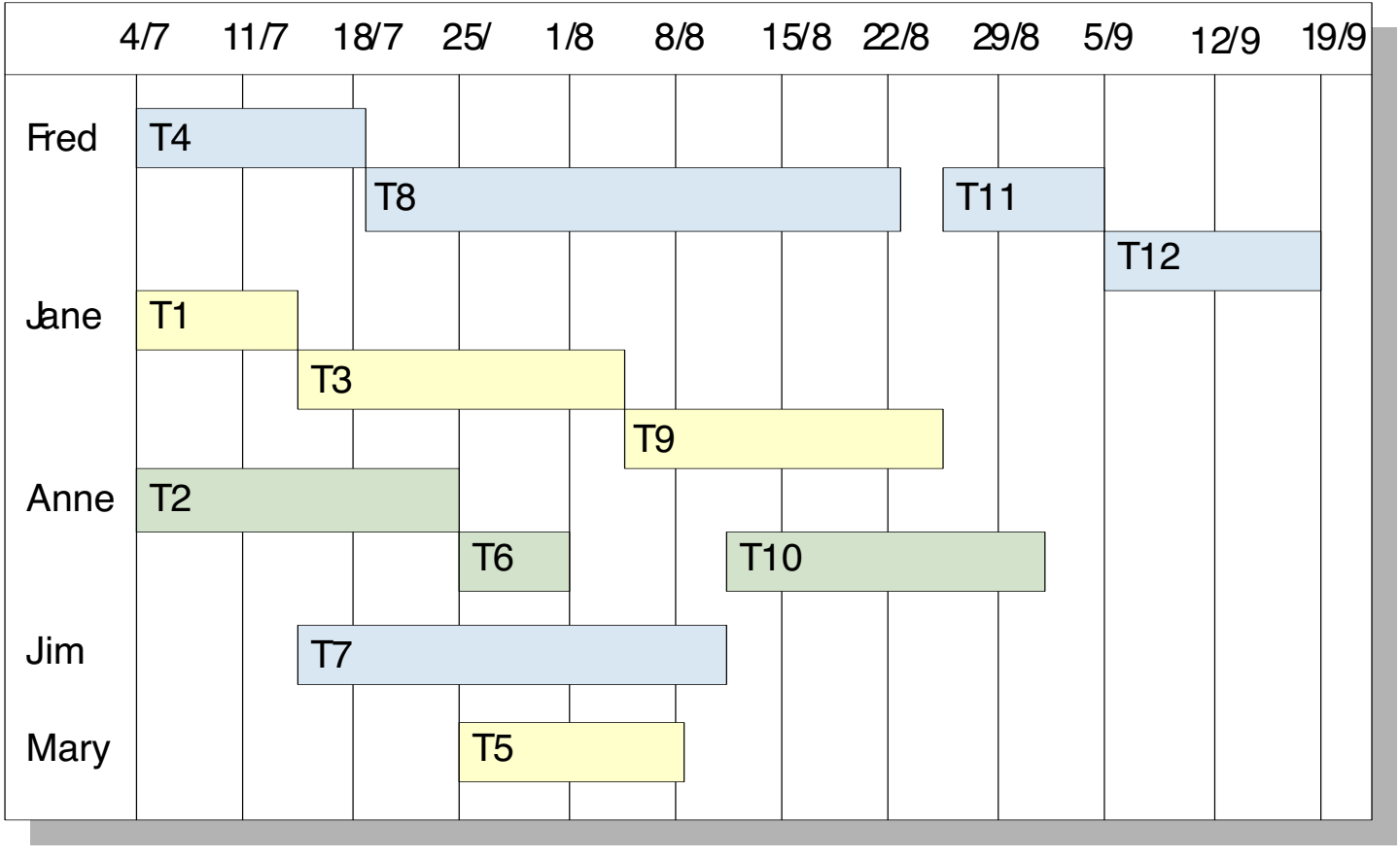


ID	Task Name	Predecessors	Duration
1	Start		0 days
2	a	1	4 days
3	b	1	5.33 days
4	c	2	5.17 days
5	d	2	6.33 days
6	e	3,4	5.17 days
7	f	5	4.5 days
8	g	6	5.17 days
9	Finish	7,8	0 days

GANTT chart (OmniPlan)



Staff allocation



RISK MANAGEMENT

→ il bravo manager ha la capacità di prevedere il rischio

Risk management

- Una delle attività più importanti del manager!!
- Risk management is concerned with identifying risks and drawing up plans to minimise their effect on a project.
- Software risk management is important because of the inherent uncertainties in software development.
- A risk is a probability that some adverse circumstance will occur.
- You have to anticipate risks, understand the impact of these risks on the project, the product and the business, and take steps to avoid these risks.

2 Classifications of Risks in a SW project

There are two dimensions of risk classification

1. The type of risk (technical, organizational, requirement, tools, estimation, …), cioè cosa effettivamente può andar male.

2. What is affected by the risk:
   - 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

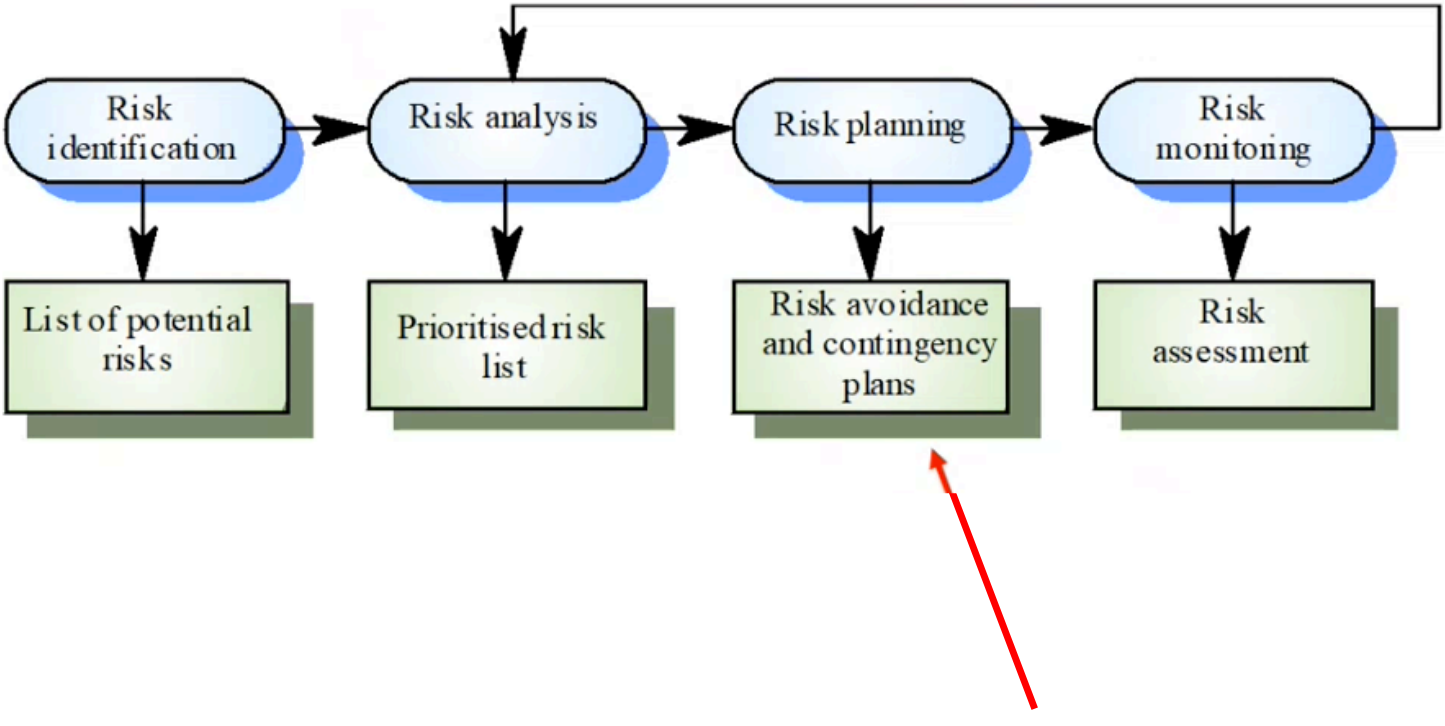
Software (Project, Product, Business) risks

Risk	Affects	Description
Staff turnover	Project	Experienced staff will leave the project before it is finished.
Management change	Project	There will be a change of organizational management with different priorities.
Hardware unavailability	Project	Hardware that is essential for the project will not be delivered on schedule.
Requirements change	Project and product	There will be a larger number of changes to the requirements than anticipated.
Specification delays	Project and product	Specifications of essential interfaces are not available on schedule.
Size underestimate	Project and product	The size of the system has been underestimated.
CASE tool underperformance	Product	CASE tools, which support the project, do not perform as anticipated.
Technology change	Business	The underlying technology on which the system is built is superseded by new technology.
Product competition	Business	A competitive product is marketed before the system is completed.

The risk management process

- Risk identification
  - Identify project, product and business risks
- Risk analysis
  - Assess the likelihood and consequences of these risks
- Risk planning
  - Draw up plans to avoid or minimise the effects of the risk
- Risk monitoring
  - Monitor the risks throughout the project

The risk management process



Risk identification

- May be a team activity (brainstorming) or based on the individual project manager's experience.
- A checklist of common risks may be used to identify risks in a project. Six types:
  - Technology risks
  - Tools risks
  - People risks
  - Organisational risks
  - Requirements risks
  - Estimation risks

Risks and risk types → faccio un'analisi dei rischi

Risk type	Possible risks
Estimation	The time required to develop the software is underestimated. (12) The rate of defect repair is underestimated. (13) The size of the software is underestimated. (14)
Organizational	The organization is restructured so that different management are responsible for the project. (6) Organizational financial problems force reductions in the project budget. (7)
People	It is impossible to recruit staff with the skills required. (3) Key staff are ill and unavailable at critical times. (4) Required training for staff is not available. (5)
Requirements	Changes to requirements that require major design rework are proposed. (10) Customers fail to understand the impact of requirements changes. (11)
Technology	The database used in the system cannot process as many transactions per second as expected. (1) Reusable software components contain defects that mean they cannot be reused as planned. (2)
Tools	The code generated by software code generation tools is inefficient. (8) Software tools cannot work together in an integrated way. (9)

Risk analysis: probability & effects

↳ valuto quanto probabile è che succeda? ie dammo?

- Assess **probability** and **seriousness** of each risk
- Probability may be very low (<10%), low (10-25%), moderate (25-50%), high (50-75%) or very high (>75%)
- Risk **effects** might be catastrophic, serious, tolerable or insignificant

- Then risks are ranked and the top 5-10-15 are considered
- Periodically, the analysis has to be repeated

Risk analysis

(Examples)

Risk	Probability	Effects
Organizational financial problems force reductions in the project budget (7).	Low	Catastrophic
It is impossible to recruit staff with the skills required for the project (3).	High	Catastrophic
Key staff are ill at critical times in the project (4).	Moderate	Serious
Faults in reusable software components have to be repaired before these components are reused. (2).	Moderate	Serious
Changes to requirements that require major design rework are proposed (10).	Moderate	Serious
The organization is restructured so that different management are responsible for the project (6).	High	Serious
The database used in the system cannot process as many transactions per second as expected (1).	Moderate	Serious

Risk analysis

(Examples - 2)

Risk	Probability	Effects
The time required to develop the software is underestimated (12).	High	Serious
Software tools cannot be integrated (9).	High	Tolerable
Customers fail to understand the impact of requirements changes (11).	Moderate	Tolerable
Required training for staff is not available (5).	Moderate	Tolerable
The rate of defect repair is underestimated (13).	Moderate	Tolerable
The size of the software is underestimated (14).	High	Tolerable
Code generated by code generation tools is inefficient (8).	Moderate	Insignificant

Risk planning: Che azioni fare? Che contromisure adottare?

- Consider each risk and develop a strategy to manage that risk ci 3 STRATEGIE:
- Avoidance strategies cercare di evitare
  - The **probability** that the risk will arise is reduced
- Minimisation strategies ridurre l'impatto
  - The **impact** of the risk on the project or product will be reduced
- Contingency plans prepararsi per quando succederà
  - If the risk arises, contingency plans are plans to deal with that risk

Risk management strategies

esempi:

	Risk	Strategy
Conting.	Organisational financial problems	Prepare a briefing document for senior management showing how the project is making a very important contribution to the goals of the business.
	Recruitment problems	Alert customer of potential difficulties and the possibility of delays, investigate buying-in components.
Minim..	Staff illness	Reorganise team so that there is more overlap of work and people therefore understand each other□s jobs
Avoid.	Defective components	Replace potentially defective components with bought-in components of known reliability.
	Requirements changes	Derive traceability information to assess requirements change impact, maximise information hiding in the design.
	Organisational restructuring	Prepare a briefing document for senior management showing how the project is making a very important contribution to the goals of the business.
	Database performance	Investigate the possibility of buying a higher-performance database.
	Underestimated development time	Investigate buying in components, investigate use of a program generator.

Risk monitoring

- (Periodically) assess each identified risks **regularly** to decide whether or not it is becoming less or more probable (→ through risk factors)
- Also assess whether the effects of the risk have changed
- Each key risk should be discussed at management progress meetings

Risk factors (indicators)

Useful for **early** identification of risks:

Risk type	Potential indicators
Technology	Late delivery of hardware or support software, many reported technology problems
People	Poor staff morale, poor relationships amongst team member, job availability
Organisational	organisational gossip, lack of action by senior management
Tools	reluctance by team members to use tools, complaints about CASE tools, demands for higher-powered workstations
Requirements	many requirements change requests, customer complaints
Estimation	failure to meet agreed schedule, failure to clear reported defects

Key points

- Good project management is essential for project success
- The intangible nature of software causes problems for management
- Managers have diverse roles but their most significant activities are planning, estimating and scheduling
- Planning and estimating are iterative processes which continue throughout the course of a project

Key points

- A project milestone is a predictable state where some formal report of progress is presented to management.
- Risks may be project risks, product risks or business risks
- Risk management is concerned with identifying risks which may affect the project and planning to ensure that these risks do not develop into major threats

Set 3.bis - Cosa ricordare: concetti, motivazioni, conseguenze, relazioni fra concetti, ecc.

- Quali le funzioni del manager? Criteri di successo Le 5 domande. Peculiarità del SW PM.
- Quali attività svolge il manager. Staffing, difficoltà tipiche. Planning e re-planning. Tipologie di piani. Processo generale di pianificazione. Struttura del piano.
- Milestone e deliverable. Scheduling e criteri generali per la schedulazione e difficoltà.
- Rappresentazioni grafiche: tabelle, bar chart, activity network, PERT, GANTT, tool di support.
- Gestione del Rischio. Classificazione dei vari tipi di rischio: natura del rischio e su cosa impatta il rischio
- Processo di Gestione del Rischio: sottoprocessi e organizzazione; r. identification, analysis, planning, monitoring. Probabilità e gravità di un rischio. Fattori/indicatori di rischio. Early identification of risk