IT Project Mangement

Goals:

Create competences for planning, execution, monitoring and finalizing IT projects

References /certifications

1. ***, *A Guide to Project Management Body of Knowledge PMBOK*, Project Management Institute, >> certification www.pmi.org

2. Joseph Phillips, *IT Project Management on the Track from Start to Finish*, >>certification www.comptia.org

Outline:

1. Introduction
2. Objective Management
3. Time Management
4. Risk Management
5. Quality Management
6. Human Resource Management
7. Cost Management
8. Communication Management
9. Procurement Management
10. Change Management

mp.ac.tuiasi.ro
user: student
password: st_mp

Top managers
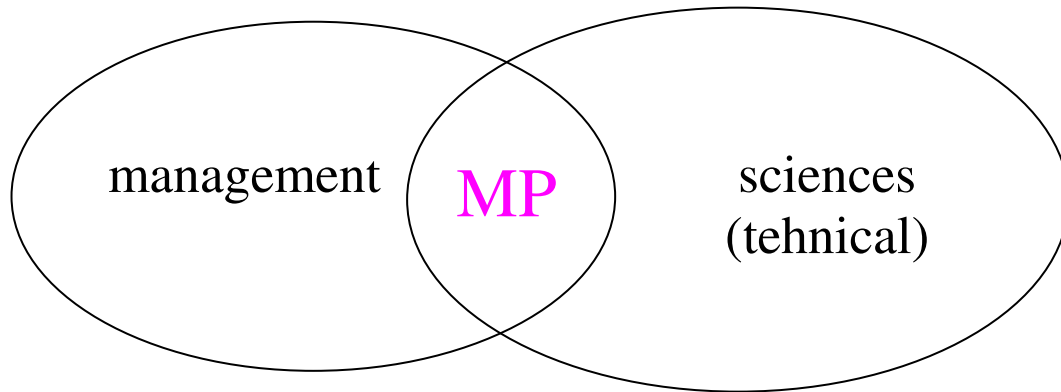
Results
Time
Cost
Quality

Vision $\Rightarrow$ **Plan**

**Motivating
Monitoring
Changes**

Clients

Results
Time
Cost
Quality
Empathy

management   MP   sciences (tehnical)

1. Introduction

1.1 History

1st project 1942-1946 Manhattan, US Army Corp of Engineers – nuclear bomb

1970s: army projects

1980s: reengineering (Michael Hammer, James Champy)

1990s: risk management

2000s: global, multi-national projects

1.2. Why MP is needed?

Many projects fail or are finalized with additional budget/time

Statistics (source ComptiA)

	1994	2004
Abandoned projects	31%	23%
Projects with significant budget and/or time increasing	88%	51%

Horror stories
- o Bank of America – a new accounting system: estimation 5 years and 23 mil $ (new); additional costs 60 mil $, finally abandoned, estimated loss 1000 mil $
- o Allstate Insurance – ERP system: estimation 5 years and 8 mil $; finalized in 12 years, with100 mil $
- o Therac 25 – medical instrumentation: undetected bugs – wrong diagnostics (...deceased..)

The main causes of failure:

o **Feasibility study** superficial (unsustainable business motivation and resources)

o **Requirements:** insufficiently detailed/understood, instable, unclear, sometimes „gold plated" + research focused >> wrong design

o **Client** –insufficiently involved during project development

o **Bad plan**
- Risking development models (avoid cascade t!!! preferred prototype, incremental, spiral) + lack of formal/ automatic approaches
- Omitting activities, bad effort estimation, exaggerated optimism, insufficient risk analysis

o Abandoning the plan under stress + Failing in managing project changes

o **Human resources:** unmotivated, too many juniors, frequent changes of the team, heroic behavior, conflicts

o **Technologies**: inadequate, too advanced, changed during the project

1. 3. Definitions: project, program, project management

Project = **temporary** endeavor meant for obtaining an **unique** product/ service

Project
- unique
- temporary
- dynamic, flexible (≠routine)
- it changes the *status quo*

≠

Common operation, process
- repetitive
- predictable
- imply to monitor (known standards, intermediary results)
- it does not change the *status quo*

Subproject = part of project
>> Separation done in compliance with the need of outsourcing/
collaboration with other functional departments

Program = group of projects coordinated together - with benefits than the stand-alone coordination

- can include common operations
- project ↔program: complexity, duration

Project Management

= the activity of the project manager: applying necessary knowledge, aptitudes, tools and techniques for reaching project targets

= the discipline which studies how to manage the available resources in order to deliver the work required for the accomplishment of the project according to imposed <u>objectives</u>, <u>time</u>, <u>budget</u>

!!! project management ≠ product management

Difficulties:

o it involves persons with different expectations

o conflicting requirements
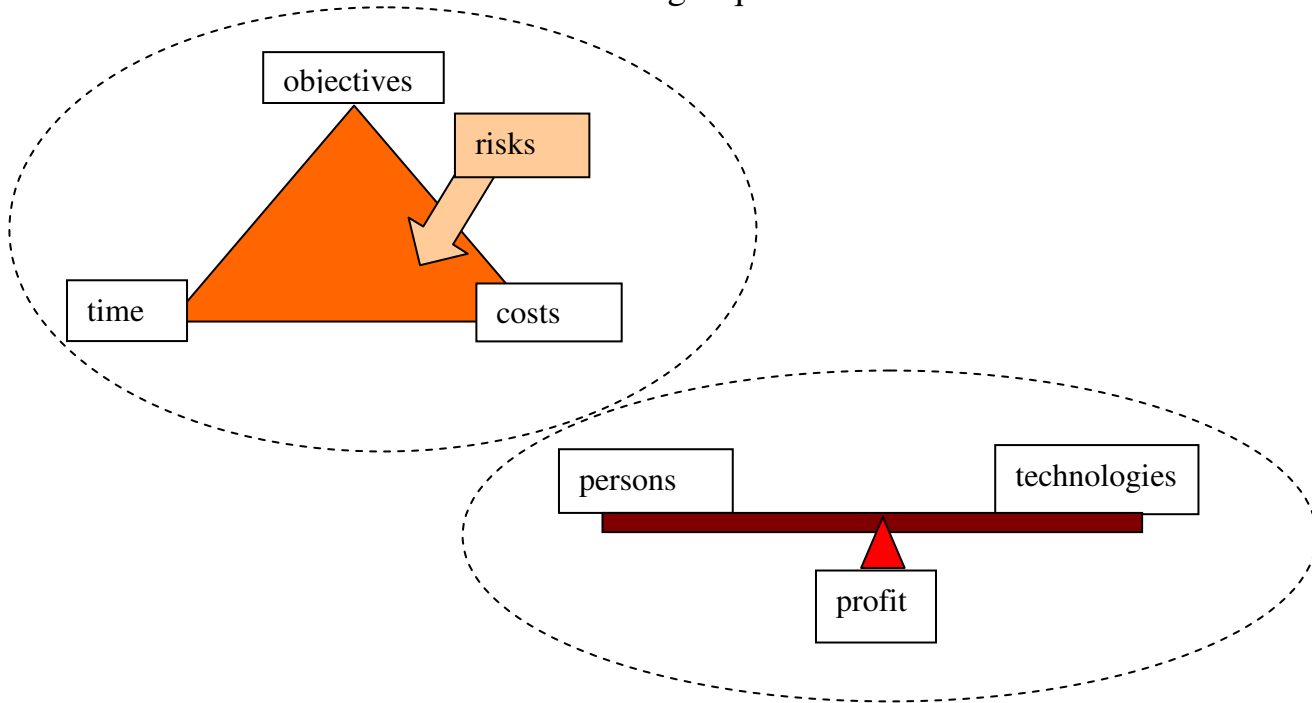
Managing the portfolio of projects/programs

= select and support the projects/programs according to the strategic plan of the company and the available resources

>>concurrency between projects!!!

Stakeholders

+ their interests are affected by the project   + they can influence the road of the project

- o **sponsor**. authorize the financing
- o **beneficiaries** – **users** (internal) or **clients** (external)
- o **project manager –** has the authority and the responsibility to manage the resources of the project
- o **team** – executes the project activities >> offers „functional skills"
- o **support groups** – offer specific support (e.g. accounting, marketing department)
- o **teams of other projects + other project managers** – if cooperation is required   (+ pay attention to the impact of your project!!!)

  >> the organization which develops the project

Recommendations

identify the real requirements/expectations of the stakeholders:

ensure a good communication with all of them

stimulate their involvement within the project (discussions)

solve the conflicts –the client should have the impression of winning

Project manager - abilities + knowledge for

o **leading** (≠ management): having a vision + gathering people around
o **negotiation**
o **problem solving**: analysis + decision
o **communication** as receiver and transmitter

+

o **influence within the organization**: understands the politics and the mechanisms of the organization
o **technical expertise**

1. 4. Project Context

1.4. 1. The organization which develops the project

A) experience obtained in projects' development
- it exists a department for projects management?
    >> it manages the portfolio of projects
    >> support: procedures, templates, soft, training, learned lessons

Remark - types of projects:

- some companies consider any routine operation as <u>a project</u> or organize their activity mainly by projects: IT, consultancy, constructions

- a project could aim important changes within the developing organization, itself

B) organization structure
- it indicates how the resources (including human resources) become available for the project

B. 1. Functional model
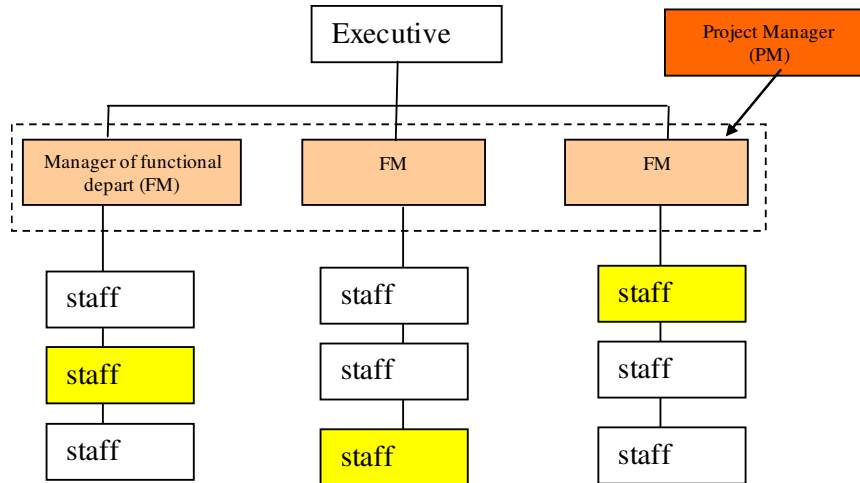
Characteristics: PM discusses with his team through the functional managers; the team is directly subordinated to FM

Advantages: reduced communication, the team works in a „natural" environment

Disadvantages: PM has limited possibilities

B. 2. Project-based organization
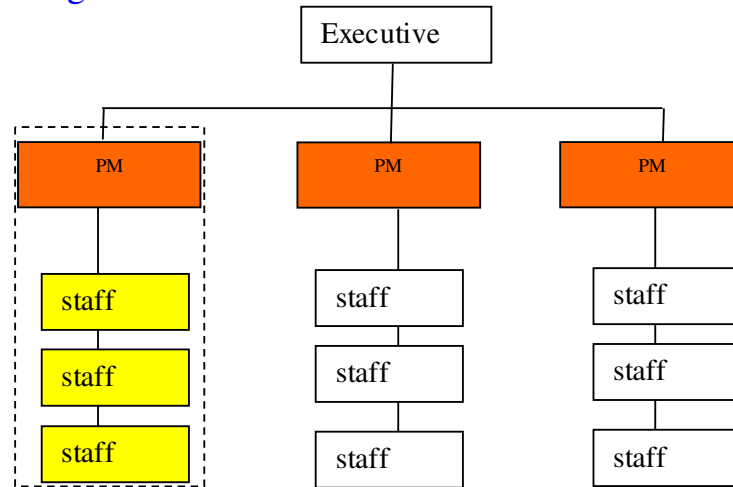
Characteristics: PM discuss directly with the team, the team reports to PM
Advantages: reduced amount of communication, strong PM, melt team
Disadvantages: redundancy inside the organization, risk of technical expertise
  decreasing for some team members

B.3. Matrix-based organization
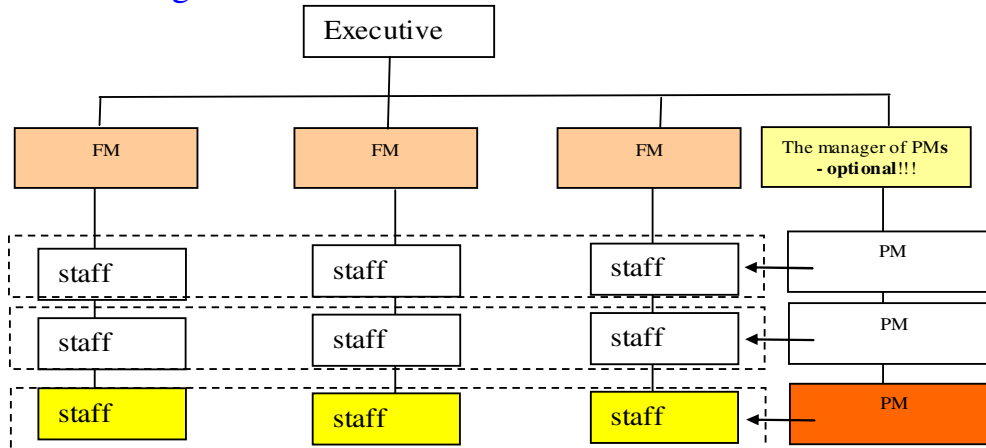
- balanced: PM=MF
- strong: PM>MF
- weak: PM<MF

Characteristics: the team includes people from different functional departments; team members report to FM and PM, PM cooperates with FMs

Disadvantage: large amount of communication is needed, PM has multiple possibilities, stronger team than in the case of B1

B. 4. Mixed organization

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                        ┌─────────────┐
                        │  Executive  │
                        └─────────────┘
         ┌──────────────┬──────┴───────┬──────────────────┐
    ┌─────────┐    ┌─────────┐    ┌─────────┐    ┌──────────────────┐
    │   FM    │    │   FM    │    │   FM    │    │ Manager of PMs   │
    │         │    │         │    │         │    │  Optional!!!     │
    └─────────┘    └─────────┘    └─────────┘    └──────────────────┘
    ┌─────────┐    ┌─────────┐    ┌─────────┐
    │  staff  │    │  staff  │    │  staff  │
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    │  staff  │    │  staff  │    │  staff  │       │    PM    │
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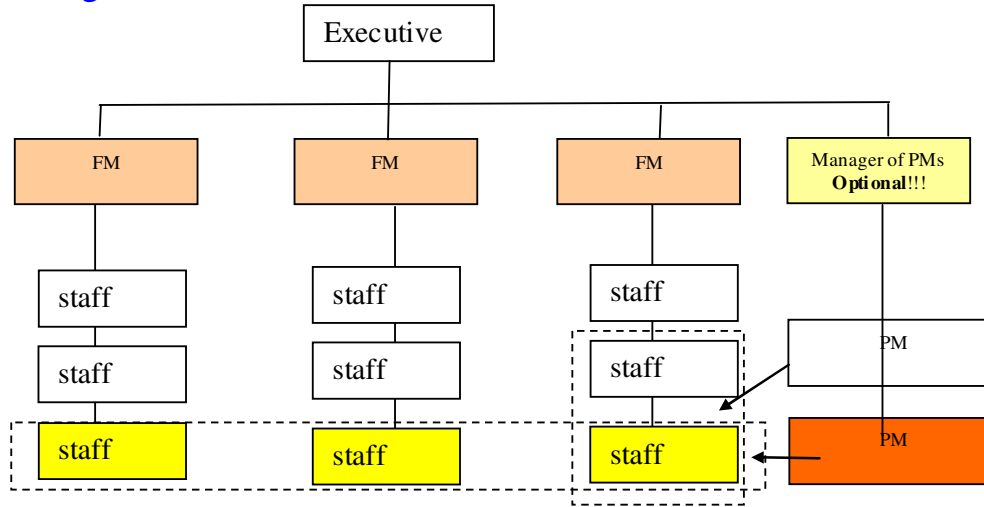
C) procedures-rules used by the organization: procurement (agreements), budgeting

1.4. 2. The impact of socio-economic environment

Influences of economic, social, cultural environment

Impact of the project on the society
      Economic   Positive
      Social   Negative
      Ecological

Globalization
      Differences of clime, hours, holidays, etc.
      Differences between politics, social and economic environment
      Additional communication needs

Standards and regulations
      Standard = document approved by a widely recognized organism including
          recommended rules and product characteristics – optional
      Regulation – mandatory

1.5. Project life cycle

Phase = stage of the project aiming the development of a deliverable which can be verified (e. g: feasibility study, prototype, design)

Project life cycle = the sequence of all phases developed from the beginning to the end of the project

      Attention: project life cycle ≠ product life cycle

Why separate the project development into phases?
- project monitoring + project controlling
- integrating the project with other projects/ processes of the organization

Remarks:
- the deliverables of the project are sequentially obtained during the chain of phases:

      - usually, before going to the next phase, the results/deliverables of the current phase are verified and validated

      - at the end of a stage one could decide if it is appropriate to continue the project (the end of a phase is called „stage gate", „phase exit", „kill point")

      - **fast tracking**: the project goes to the next phase before obtaining the validation for the previous one

- usually, the name of the phase is given by its main deliverable (Requirements, Design)

- life cycle characteristics
  - lower costs and smaller team the beginning and the end of the project
  - higher risks at the beginning

- recommendation de for software projects:

- o spiral model proposed by Muench- 4 levels, each level including the phases Requirements, Design, Implementation, Testing

  level 1 – conceptual level (business requirement/ conceptual design/ risk analyses)

  level 2 – system level (system requirements/logic design/ first implementations/preliminary evaluations)

  level 3 – subsystem/module level

  level 4 –unit level

  >>> deployment (production, support)

1.6. The processes of project management

Process = activities required for a specific result

- **process of project management** = process meant to organizing the endeavor within the project

- **product process oriented** = process which directly creates the product

Types of PM processes
A. Initiation – authorize a phase/project
B. Planning –determine the objectives and the available approaches
C. Execution – coordinate, manage the resources according to the plan
D. Control – monitor the variations from the plan and apply necessary corrective actions
E. Finalization – formalize the acceptance of the phase/project

Remarks:
- there are dependencies between different type of processes

| initiation | → | planning |

planning → execution

control ↔ execution

control → planning

control → finalization

P1 → P2 denotes that the outputs of P1 are inputs for P2
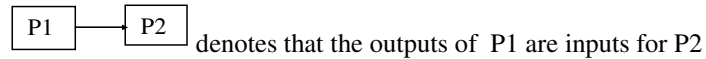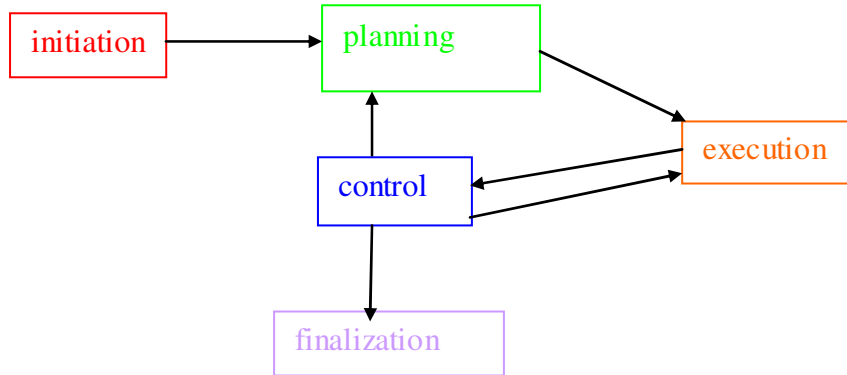
- temporal juxtapositions of processes are accepted during a phase

- each phase contains multiple types of processes

      - repeating the initiation process allows a good correlation with the change of business requirements

      - planning details what /how/ when must be carried out

      - during the current phase one can detail the plan for the next phases (,,rolling wave planning")

      - attention: a plan can be improved, but you always need a plan!!!!

Subfields of PM

      1. Integration

      2. Objectives

      3. Time

      4. Human Resources

      5. Costs

      6. Quality

      7. Risks

      8. Communication

      9. Procurement

Details concerning PM processes

A. Initiation processes
    - initiation (Objectives)

- kernel ones: used in a fix sequence, yet repeated even during a single phase

- scope planning (Objectives)

- scope definition = build WBS (Objectives)

- activity definition (Time)

- activity sequencing (Time)

- effort estimation (Time)

- schedule development (Time)

- risk management planning (Risks)

- resource planning: which resources are needed, in what quantity (Costs)

- costs estimation (Costs)

- cost budgeting: allocate the costs to activities, working packages (Costs)

- plan development= integrate all the plans in a coherent and consistent one
    (Integration)

- auxiliary ones: used when needed, without regularity; mandatory processes
  - quality planning– identify the quality standards and how these standards can be fulfilled (Quality)
  - risk identification (Risks)
  - quantitative /qualitative analysis of risks (Risks)
  - risk response development (Risks)
  - communication planning (Communication)
  - organizational planning (Human Resources)
  - human resource allocation (Human Resources)
  - procurement planning – what, how, when bye (Procurement)
  - solicitation planning – the requirements for all the products/services tat must be procured, list of potential providers (Procurement)

C. Execution processes

- project plan execution (Integration)

- quality assurance = regular monitoring of project performances in relation to
    the adopted quality plan (Quality)

- team development (Human Resources)

- information distribution (Communication)

- solicitation = obtain procurement offers (Procurement)

- source (provider) selection (Procurement)

- contract administration (Procurement)

D. Control processes

- objective verification = obtain the client accept (Objectives)

- scope change control (Objectives)

- time control (Time)

- cost control (Costs)

- quality control = monitor certain results and eliminate the causes of unadequate quality (Quality)

- risk monitoring and control(Risks)

- overall change control (Integration)

- performance report (Communication)

E. Finalizing processes:

- contract close-out (Procurement)

- administrative closure = collecting, aggregation and dissemination of information at the end of the phase/project (Communication)

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                    ┌──────────────────┐
                    │    Initiation    │
                    └──────────────────┘
                             │
                             ▼
              ┌──────────────────────────┐       • Vision
              │  What must be done?       │       • Analysis of the the current context: SWOT
              │      ("scope")            │       • Objectives SMART: "drill down" technique
              └──────────────────────────┘
                             │
                             ▼
       ┌──────────────────────────────────────────────────┐
       │  Explore the alternatives (e.g. with" brainstorming") │
       └──────────────────────────────────────────────────┘
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                             ▼
            ┌──────────────────────────────────────────────────┐
  ?         │  Preliminary planning: WBS, Gantt, resources&costs, risks, │
            │  procurement, quality, team, communication          │
            └──────────────────────────────────────────────────┘
                             │
                             ▼
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            │  Evaluate the approaches: cost/ profit     │
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       │  Select the best alternative: "grid analysis" (multi-objective decision) │
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            │                                         │ (dashed red box)
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            │  Detail the plan for the selected approach  │
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                             │
                             ▼
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            │  Implement  + monitor/control               │
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            │  Finalize                                   │
            └──────────────────────────────────────────┘
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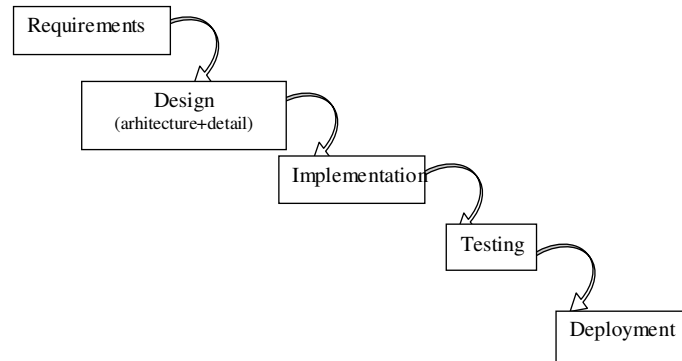
Software Model Development

- **waterfall**
  >> without iterations >> without phases overlaying

  ## Major disadvantages
  - the feedback is obtained at the end of the project, only
  - hard integration of changes
  - all the requirements should be set from the beginning (!?)

```
┌──────────────┐
│ Requirements │
└──────────────┘
      ┌────────────────────┐
      │      Design        │
      │ (arhitecture+detail)│
      └────────────────────┘
            ┌────────────────┐
            │ Implementation │
            └────────────────┘
                  ┌─────────┐
                  │ Testing │
                  └─────────┘
                        ┌────────────┐
                        │ Deployment │
                        └────────────┘
```

Concept -SW	Project Charter Doc. vision	Why?

Requirements	Document - Requirements	What?

Analysis	Functional requirements (top level) Flow diagrams, links between modules	How?

Design	Functional requirements Detailed models, Object diagrams	How?

Basic plan, risks,
quality plan

Implementation	Rules for coding & Code Unit testing	Execute!

Detailed testing plan
(integration, acceptance)

Testing	Integration tetsing, system tetsing Acceptance testing	OK?

Plan for maintenance
and installing

Installing /Deployment	Deplyment specifications Aplication, documentation Performance analysis Training proposal	Ready.OK?

Requirements

- *functional – use case*

- *non-functional*

  - usage (graphical interfaces, help, documentation)

  - liability (availability, error rate, critical errors)

  - performances (response time for certain operations, required resources)

  - supportability: maintenance, internationalization

  - installing

  - interfacing with other systems

  - security

  - others: laws, hardware requirements, packing

Recommendations regarding the project plan – rule 40-20-40

	Planning	Coding& Unit testing	System + Integration testing
Commercial	25%	40%	35%
Internet	55%	15%	30%
Real time	35%	25%	40%
Defense	40%	20%	40%

| Activity	Small projects (2.5K LOC)	Big projects (500K LOC)
Analysis/requirements	10%	30%
Design	20%	20%
Coding	25%	10%
Unit testing	20%	5%
Integration	15%	20%
System testing	10%	15%

- **prototype**

  First part of the project = prototype development

  - the prototype browses throughout the available alternatives, whenever there are uncertainties concerning the results and/or the path of the project

  - it should involve a fast and cheap development (use simulators, do not pay attention to execution speed, security, robustness)

  - iterative improvement until all necessary answers are found

  Second part of the project = software development

  - project development by improving/extending the prototype (evolutionary prototype) or by re-developing the software without using the code of the prototype (only the algorithm of the prototype is re-used)
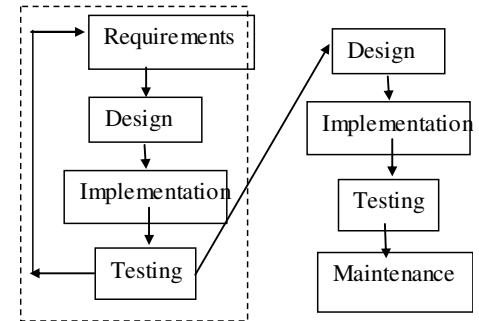
Advantages

- project risk smaller, shared with the client

Disadvantages – during prototype development:

- frequent changes
- huge risk of losing the confidence of the client (the prototype could be non-robust and could feature low performances)

Recommendations

- set the number of iterations per prototype
- pay attention to versioning

- **incremental** = the user receives increments of the product
  (each increment could be developed according to any model)

  ### Advantages
  - the user receives some deliverables earlier (this is helpful for avoiding the development of useless features or for omitting some important ones)
  - simple monitoring
  - avoid the risk of improper final integration of the modules (big-bang)

  ### Disadvantages
  - risk of inadequately planning the sequence of incremental development

- **spiral model**

    4 levels, each level including the phases Requirements, Design,
    Implementation, Testing

    > level 1 – conceptual level (business requirement/ conceptual
    >   design/ risk analyses)
    > level 2 – system level (system requirements/logic design/ first
    > implementations/preliminary evaluations)
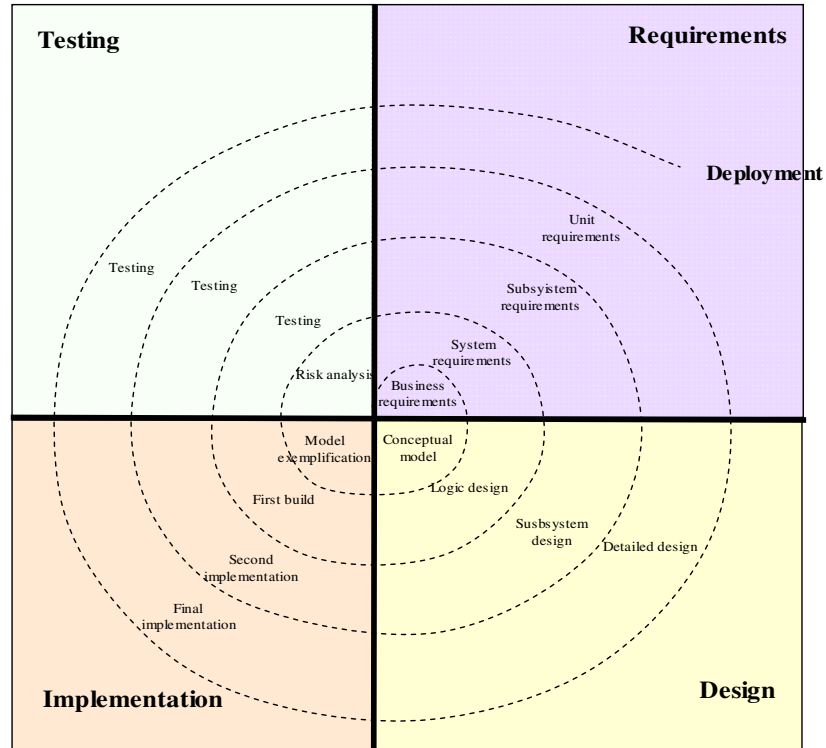   > level 3 – subsystem/module level
    > level 4 –unit level
    >   >>> deployment (production, support)

Advantages

  - better integrated change management

Downsides

  - risk of failure in achieving the desired product

Testing

Requirements

Deployment

Testing

Testing

Testing

Unit
requirements

Subsyistem
requirements

System
requirements

Risk analysis

Business
requirements

Model
exemplification

Conceptual
model

Logic design

First build

Susbsystem
design

Detailed design

Second
implementation

Final
implementation

Implementation

Design

- **RUP model**