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# SCIENTIFIC RESEARCH METHODOLOGIES AND TECHNIQUES

## Unit 8: RESEARCH PROJECT MANAGEMENT

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PhD PROGRAM IN ELECTRICAL AND COMPUTER ENGINEERING

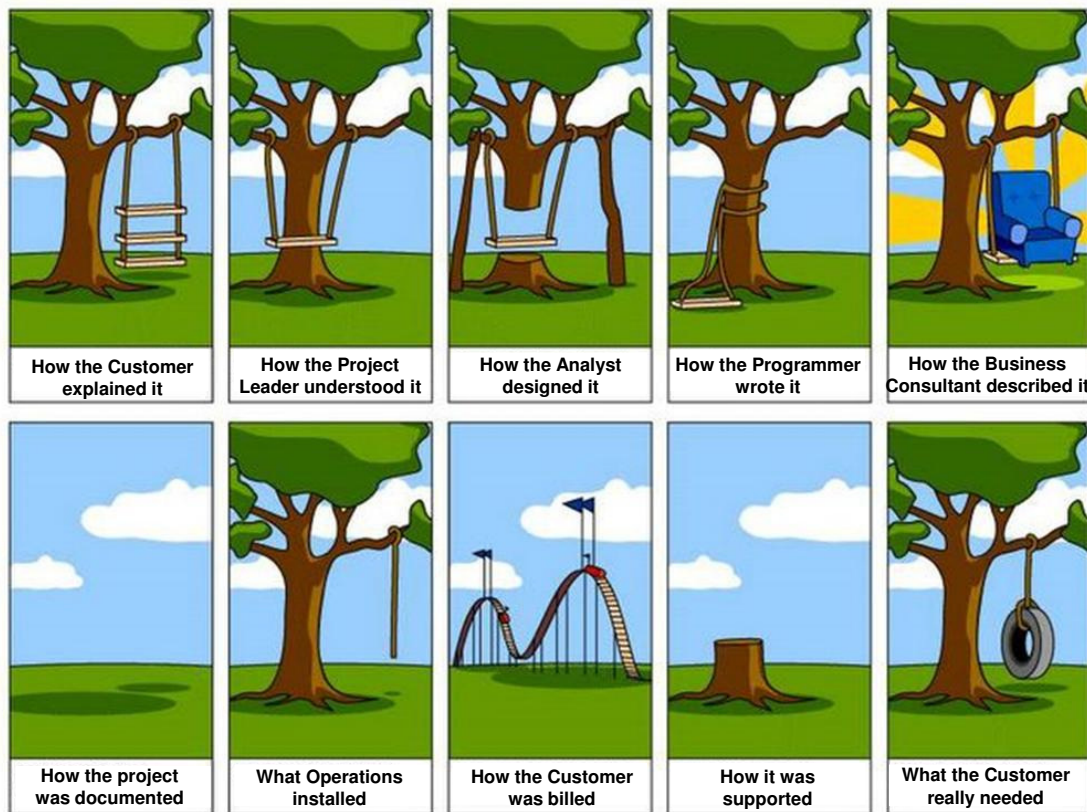
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## 1. BASICS

## Project views



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## What is it?

**Project management** is a method and a set of techniques based on the accepted principles of management used for **planning, estimating, and controlling** work activities to reach a desired end result on time, within budget, and according to specification

**“How does a project get to be a year behind schedule?  
- One day at a time.”**

*Fred Brooks, author of “The Mythical Man-Month”*

“Planning is an unnatural process;  
it is much more fun to do something.

The nice thing about not planning is that failure comes as a complete surprise, rather than being preceded by a period of worry and depression.”

*Sir John Harvey-Jones*

A **project** is any series of activities and tasks that together achieve pre-determined deliverables in accordance with:

- defined start and end dates
- funding limits
- a quality definition
- intermediate milestones
- utilization of resources such as equipment, materials, people

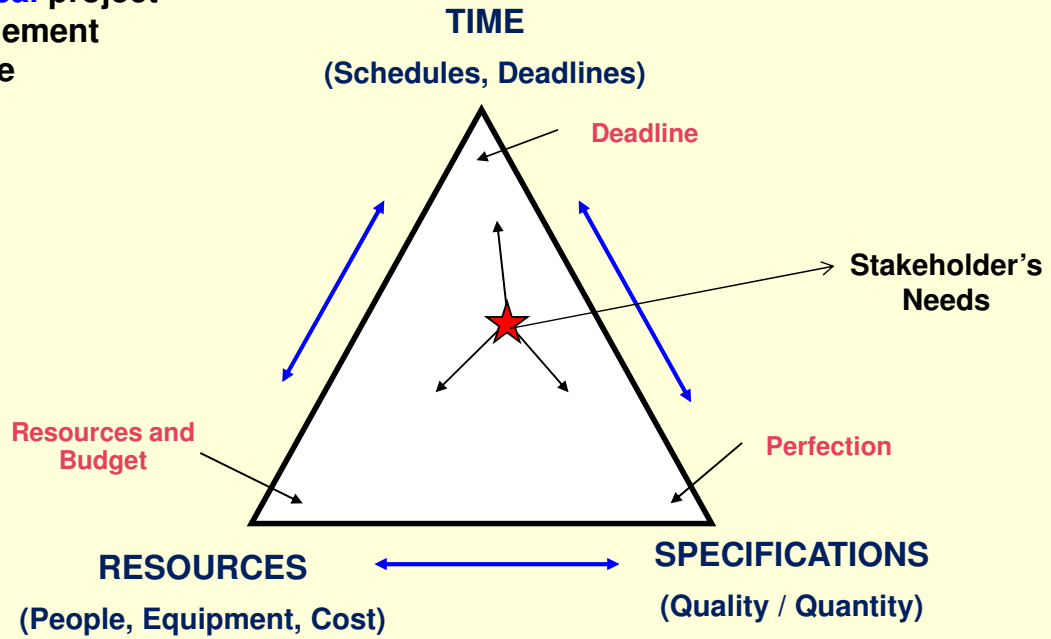
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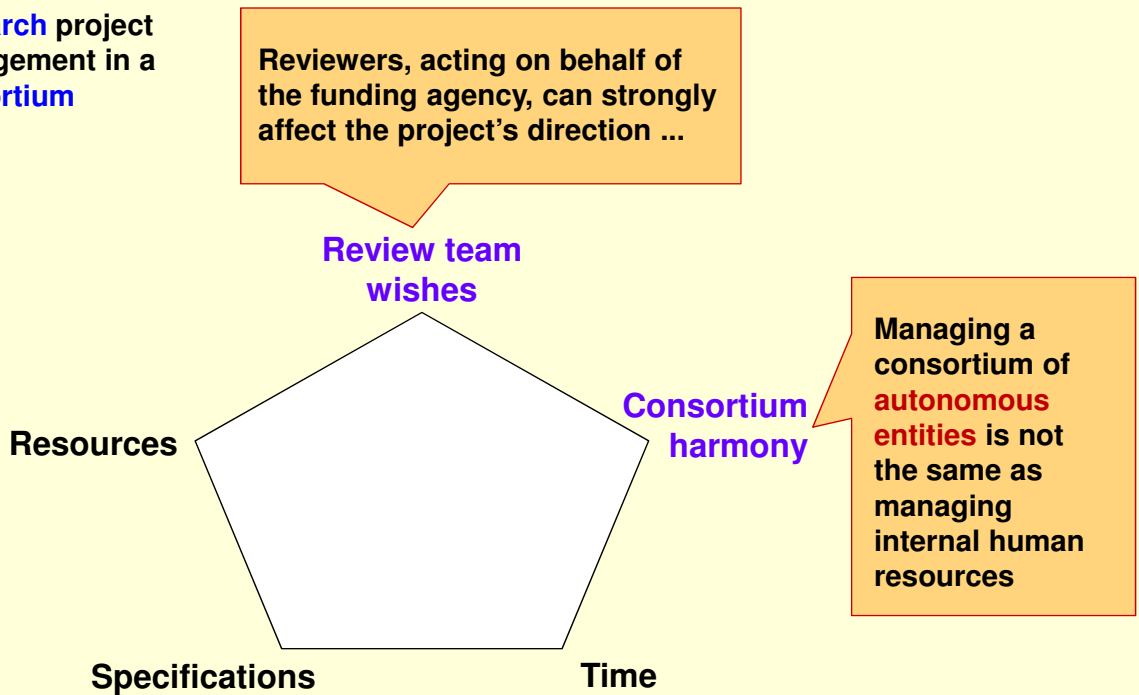
# Variables in tension

## Classical project management triangle



# Variables in tension ... A more realistic model

## Research project management in a consortium





## Knowledge areas



Processes that are required to ensure all the project's components are coordinated. It includes project plan development processes, project plan execution processes, and integrated change control processes

- \* **Integration Management**
- \* **Scope Management**
- \* **Time Management**
- \* **Cost Management**
- \* **Quality Management**
- \* **Human Resources Management**
- \* **Communications Management**
- \* **Risk Management**

Processes that limit and control the work included in a project. It includes the initiation process as well as all the processes related to the scoping of the project.



Processes required to ensure timely completion of the project.



Processes to ensure that a project is completed on time and within budget.



## Knowledge areas

Processes that ensure the result of a project meets the needs for which the project was executed - quality planning, assurance, and control



- \* **Integration Management**
- \* **Scope Management**
- \* **Time Management**
- \* **Cost Management**
- \* **Quality Management**
- \* **Human Resources Management**
- \* **Communications Management**
- \* **Risk Management**

Processes to manage the different people required at various times.



Processes to handle the information generation and communication in a timely manner



Processes for identifying, analyzing, and responding to project risks.





## Skills

### Examples:

- Interpersonal relations
- Network planning
- Strategic thinking
- Negotiation
- Meeting management
- Resource management
- Communication (written & oral)
- Conflict management
- Issue resolution / decision-making
- Monitoring
- Contractor management



- Inspires a Shared Vision
- Good Communicator
- Integrity
- Enthusiasm
- Empathy
- Competence
- Ability to Delegate Tasks
- Team-Building Skills
- Problem Solving Skills



## Skills ...

1. Imagination and vision.
2. Integrity and a selfless value system.
3. Trustworthiness and dependability.
4. Dedication and love of one's work which itself functions as an in-built reward.
5. Good public relations and ability to get along with people.
6. Good communication skills.
7. Ability and willingness to take calculated risks.
8. Being attentive and a good listener.
9. Ability to assess/predict human behaviour.
10. Good rapport, and sensitivity to the feelings of others.
11. Courage to make unpleasant decisions.
12. Courage to take a decision even in the face of limited information ("considered a decision is better than no decision at all").
13. Ability to evaluate objectively and reach a valid conclusion.
14. Practising the art of collective decision making.
15. Aiming at qualitative and quantitative performance.
16. Ability to build effective teams.
17. Ability to retain good people, and be surrounded by good people.
18. Self confidence and motivation to lead.
19. Ability and willingness to take responsibility and accountability.
20. Credibility.
21. Dependability.
22. Tenacity.
23. Stewardship-leaders are custodians of the interests and well-being of those they serve as leaders.
24. Loyalty.

### Leadership qualities

**Difficult to find in one person !  
Not many people want to take this job.**

**It might make sense to divide tasks  
e.g.  
- Management  
- Scientific coordination**



## Relevance for a PhD student?

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**An engineering Doctor is  
expected to lead research  
teams and innovation project  
teams !**



## Relevance for a PhD student? ...

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**As a part of his / her training, a  
PhD student is supposed to help  
writing proposals ... to support his own  
research work or the work of future  
students ... and to help managing  
research projects running in the host  
group !**

## 2. ADMINISTRATIVE MANAGEMENT

## Administrative management tasks

- Control the schedule, production of deliverables
- Control progress / prepare progress reporting
- Control / distribute resources
- Monitor agreement
- Solve conflicts
  
- Keep contacts with funding agency
- Deal with contract amendments
  
- Provide document management and communication platform
  
- Record keeping and traceability of records





## An example

The **project manager** is a representative of the coordinating partner and an experienced individual with good knowledge, expertise, and understanding of the content of the project. He has the full responsibility for the administrative management of the project.

Furthermore, a **management team** (from his own organisation) supports him in this work. This team will work closely together in the project office that consists of:

- A project facilitator supporting the daily monitoring and fulfilment of activities at the project level
- Project communication and assessment support
- Financial expert(s)
- Legal expert(s)
- Secretarial / Administrative support
- Other specialists will be added, as needed.

The responsibility of this team is to take care of keeping the project running according to decisions in the management board, the project plan and agreements, and to take care of all administrative, financial, legal, etc. work related to the project. The management will monitor and manage the project according to all requirements given to the project, including ethical, gender, and other social related issues.

A **management board** guides the management team. The management board consists of representatives from each of the focus areas of the project. Members of this board are individuals representing partners responsible for these areas, active in the project during its entire lifetime. The management board takes decisions on the general level, such as contractual issues and acceptance of new partners. It also makes decision about the concrete project plans and promotes gender equality.



## An example ...

### **Project Manager**

**Responsible for:**

- Overall responsibility for project management and administration
- Liaison with the EC, point of contact to the Commission
- Contractual matters towards the Commission and the partners
- Head of project office
- Chair of Management board
- Handling of conflicts (which are not solved at a lower level)
- Proposals for the modification of budgets
- Check of financial reports on used resources and costs
- Representing the project in different events  
(shared with the Scientific Director and Industrial Impact Manager, according to the events' scope)
- Definition of project management procedures  
(in collaboration with the project office).





## An instrument: Consortium agreement

**Purpose:** to regulate critical aspects of project governance not covered by the grant agreement between the funding agency and the project consortium.

**Key aspects** covered in consortium agreements are typically:

- **The internal organization of the consortium**  
(e.g. decision-making bodies, membership of management bodies, voting rights, settlement of disputes between partners);
- **The distribution of the financial contribution**  
(e.g. when should the project coordinator distribute advance payments from the funding agency to the other partners?);
- **Management of intellectual property and access rights to results**  
(e.g. when, and on what terms, should access to results be provided to other partners and their affiliates?);
- **Liability and confidentiality arrangements between partners**  
(e.g. the extent of liability of the partners to one another and towards third parties)
- **Applicable law**

An example template for FP7 (EC):  
DESCA: [www.desca-fp7.eu/about-desca/](http://www.desca-fp7.eu/about-desca/)



## Critical issues: Time management

Monitor project schedule according to the planned schedule, if necessary make changes but respecting the commitments (e.g. major milestones) and carefully justifying any change.

### Time monitoring:

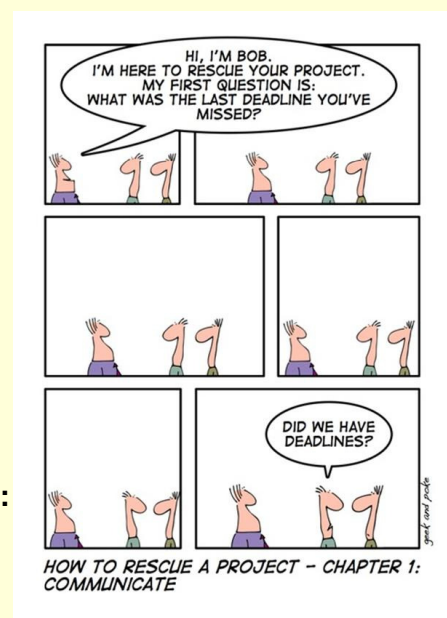
- Time sheets
  - Separation per activity
- Consistency with costs
- Alignment with plans

### Schedule monitoring:

- Deadlines
  - Starting – ending tasks
  - For deliverables
  - For milestones

### Lack of information:

- Managing time in a consortium is much more difficult:
  - Partners are autonomous
  - Information provided is not always accurate
  - Some times no information at all





## Critical issues: Reporting & Communication

**Reporting:** A task typically associated with the “bureaucracy” of projects ... that researchers hate!

- Some times funding agencies make this a heavy burden.
- When kept at a reasonable level, it plays an important role to keep project on track.
  - An instrument to make periodic assessments of the progress
  - An instrument to make all stakeholders aware of the progress & difficulties
- **Progress reports, cost statements, final reports, meeting minutes ... and more.**
- **Reporting ... also an art!**

**Communication:** a fundamental instrument to keep the consortium engaged. Also communication with other stakeholders !

- What to communicate, at what level of detail?
- Instruments: Newsletters, executive summaries, technical reports, presentations, portal, ...



## Critical issues: Project portal

Two main functions:

- **Internal** communication / work facilitation instrument
- **External** communication / dissemination instrument

“Internal” functionalities (minimum):

- Document management system (with access rights and version control)
- Users management
- CSCW facilities: forum, chat, application sharing, agenda, conferencing, etc.
- Workflow management, voting, ...
- News
- ...

“External” functionalities (minimum):

- General information about the project
- News – newsletter, public events, ...
- Public deliverables and publications
- ...

Some tools

- Joomla
- GForge
- ...

## Critical issues: Resources management

**Resources:** People, equipment, materials, .... → funds

- Resources allocation
- Monitoring of resources' usage
  - Needs vs consumption
  - Compliance with funding rules
  - Keeping proper documentation
- Managing tensions / requests for further resources
- In a consortium:  
Making sure that essential activities are not in danger  
e.g.  
Resources for attending meetings, implementation of joint demonstrators, etc.



*"Sure, we need more research in alchemy, necromancy, and sorcery, but where is the money going to come from?"*

## Critical issues: Conflict resolution

Conflicts in project management are **inevitable**.

- Differences in values, culture, attitudes, needs, expectations, perceptions, resources, and personalities.
- In large consortia, potential for conflicts increase exponentially.
- e.g. conflict occurs between parties whose tasks are interdependent, who are angry with each other, who perceive the other party as being at fault, and whose actions cause a business problem.

Conflict resolution **mechanisms** to be defined in the Consortium Agreement

**Mechanisms to be associated with the management structure**

Different problems to be (attempted to be) solved at different levels.

It is good to know different languages ...





## Conflict resolution approaches

### **CONFRONTATION** when:

- Both parties need to win.
- You want to decrease cost.
- You want to create a common power base.
- Skills are complementary.
- Time is sufficient.
- Trust is present.
- Learning is the ultimate goal.

### **COMPROMISING** when:

- Both parties need to win.
- You are in a deadlock.
- Time is not sufficient.
- You want to maintain the relationship among the involved parties.
- You will get nothing if you do not compromise.
- Stakes are moderate.

[Ohlendorf, 2001]

[www.umsl.edu/~sauterv/analysis/488\\_f01\\_papers/Ohlendorf.htm](http://www.umsl.edu/~sauterv/analysis/488_f01_papers/Ohlendorf.htm)

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### **SMOOTHING** when:

- Goal to be reached is overarching.
- You want to create obligation for a trade-off at a later time.
- Stakes are low.
- Liability is limited.
- Any solution is adequate.
- You want to be harmonious and create good will.
- You would lose anyway.
- You want to gain time.

### **FORCING** when:

- A "do or die" situation is present.
- Stakes are high.
- Important principles are at stake.
- Relationship among parties is not important.
- A quick decision must be made.

### **AVOIDING** when:

- You can not win.
- Stakes are low.
- Stakes are high, but you are not prepared.
- You want to gain time.
- You want to maintain neutrality or reputation.
- You think the problem will go away.
- You win by delaying.

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## 3. SCIENTIFIC COORDINATION

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## Scientific coordination tasks

- Keeping the scientific vision and ambition of the project
- Coordination of technical activities
- Preparation of technical progress reports
- Planning modifications to the plan of activities
- Organization of technical meetings
- Coordination of deliverables preparation
- Technical “representation” of the project
- Coordination of preparation for reviews



## An example

**Scientific director** - an individual expert in the field who is responsible for the overall strategic and scientific direction of the project.

A **strategic scientific board** supports the scientific director with this task. This board consists of one expert per focus area of the project.

The membership to the scientific board is based on personal merits and not necessarily partner organization specific.

If necessary, the strategic scientific board may form sub-committees, i.e. work package (focus area) specific sub-committees. The main task of this board is to follow the scientific/strategic results of the project and give input for the revision of the project direction, suggest new directions, next steps, and define important open areas.

Also decisions about the IP rights are decided in this board, in the case that its related conflicts cannot be solved at the sub-project level. The main approach for the strategic planning is the continuous update of the project vision and the related road-mapping process. When appropriate, concrete updating tasks will be given to relevant research projects.

Dissemination of scientific results and contacts with other projects and networks of excellence as well as with other scientific bodies will be managed by this board.



## An example ...

### Scientific Director

Responsible for:

- Overall responsibility for strategic and scientific direction of the project
- Initiation of new sub-projects and research directions
- Chair of Strategic Scientific Board
- Member of Management Board
- Coordination of scientific dissemination
- Contacts with scientific bodies, other projects, and networks of excellence
- Management of scientific assessment / reviews
- Representing the project in different events (shared with the Project Manager, and Industrial Impact Manager, according to the event's scope)
- Reporting of scientific achievements.



## Team management

Large, complex projects require the participation of many people throughout the development process

→ demand both high-level and detailed guidelines to assist in the channeling of the individual results into an *integrated final outcome*.

Human factors (teams):

- Communication
- Transformation
- Leadership
- Team Building
- Team Leadership
- Matrix Teams & Core Teams
- High Performance
- Heavy-weight Teams
- Education:  
Core Competencies





## Keeping the vision

- In large projects, often the members have only **partial views** (at the beginning).
- When in the critical development phases people tend to **focus on their specific tasks**.
  - It is the Technical Coordinator that has to keep and promote the **global vision** !

**In the case of projects in consortia, some partners only invest till the moment the project is funded !**

Scientific coordinator faces the **challenge** of achieving the project goals under some tension

- Having less real resources than “officially” allocated to the project
- Keeping the enthusiasm of the active partners ... even to make up for lack of performance of other partners
- Having to deal with the “normal” conflicts among participants



## Technical meetings

In spite of the advances in remote collaboration tools, **meetings are fundamental**.

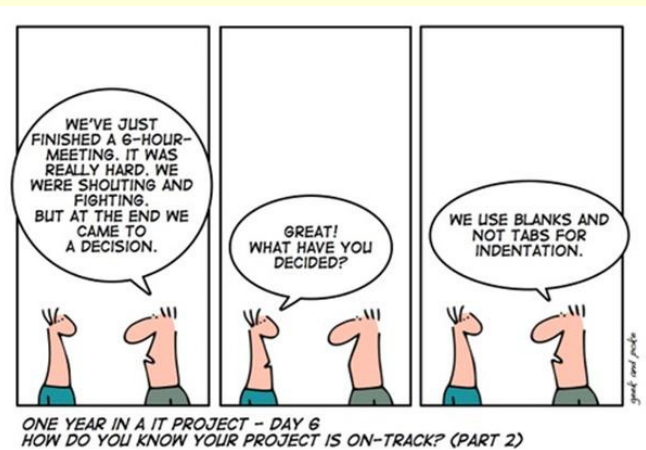
Nothing replaces **face-to-face** meetings !

- ◆ To make a more realistic assessment of the progress
- ◆ To detect problems
- ◆ To reach a common understanding
- ◆ To reach firmer commitments
- ◆ To improve “synchronization” of activities

### Preparation

Success of a meeting depends on:

- Clear agenda defined in advance
- Assignment of preparatory tasks to participants (1 or 2 weeks in advance)
- Careful leadership during the meeting
  - ◆ Reminding the vision & goals
  - ◆ Facilitator role
  - ◆ Avoiding conflicts
  - ◆ Summarizing achievements in a positive / exciting way
  - ◆ Clearly defining follow-up action points, responsible partners, and deadlines





## Deliverables: quality assurance

**Deliverables**, not activities, are what matters !

Projects are assessed by reviewers mainly based on the deliverables.

Technical coordination needs to ensure:

- Responsible partners contribute on a timely basis
- Final versions of deliverables are available by the deadlines.
- Quality of contents is appropriate
  - ◆ Level of desired innovation is kept
  - ◆ Consistency with work plan is guaranteed
  - ◆ Good integration of contributions (from multiple contributors)

**A common mistake:**

Producing deliverables “for the reviewers” and full of “project logistics” information (“process details”).

*Technical / scientific deliverables of **good quality** should be free from project details and offer reusable new knowledge ... an outcome that will remain after the project ends... **suitable for publication!***



## Project “representation”

An important activity during a project execution is the **communication of intermediate (and final) results** to the external stakeholders

- Academic community
- Potential users (industry, services, ...)
- Funding entities
- Public in general

as part of the impact creation strategy.

Technical coordinator / scientific director is who, normally, makes public **presentations of the project as a whole** ... on behalf of the consortium.

Other partners typically make presentations on their particular contributions.

Important to consider:

- ◆ Giving **credits** to all contributors
- ◆ Balance between knowledge **protection** issues and the benefit /duty of **dissemination** (when public funding is involved)
- ◆ Have a dissemination strategy & clear publication rules.







## 4. REVIEW PREPARATION



## Reviews

Project reviews are primarily a **tool for monitoring progress** at a practical level. They also consider current and potential problems and can be used to consider **corrective action**, where appropriate (including project cancellation, if no recovery action can be foreseen).

In the case of projects supported by funding agencies, reviews are conducted by **external experts** (peer reviewing) hired by and acting on behalf of the funding agency.

Reviews coincide, normally, with major project **milestones** (e.g. On annual or semester basis).

It is a task for the project management bodies to coordinate the preparation for the reviews

- Administrative issues
- Technical / scientific progress



## Which preparation

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### Some important activities:

1. **Submit deliverables and progress reports on time**
2. **Negotiate review agenda with funding agency**
3. **Define what to present, how to present, and who will present**
4. **Organize at least one preparation / rehearsal meeting**
5. **In case of demonstrations, go through an extensive and careful preparation and rehearsal**
6. **Prepare hand-out materials (copies for reviewers)**
7. **Brainstorm on weaknesses and strategies to overcome them**  
Get all partners aligned with a common “defense strategy”

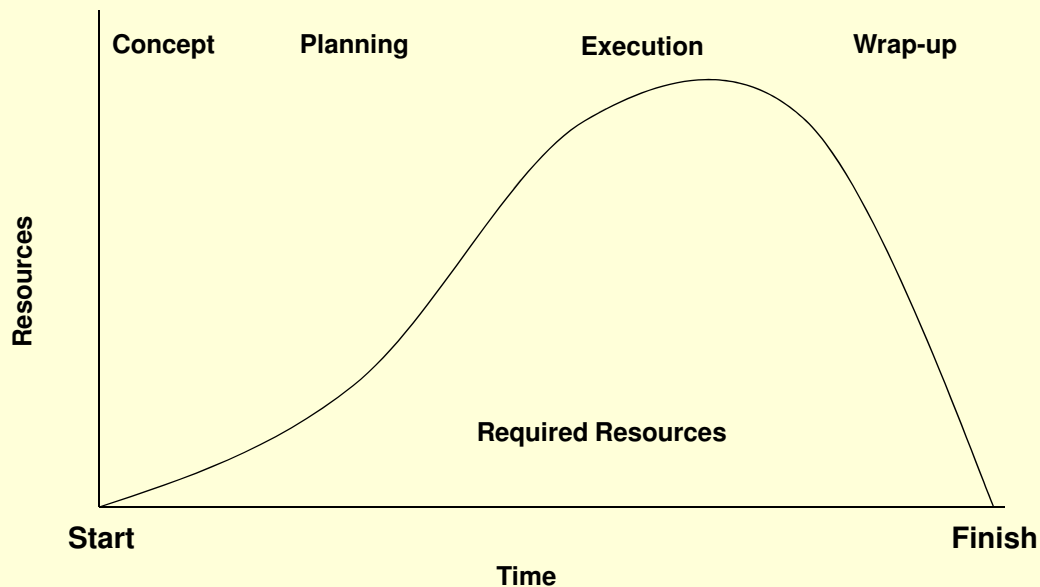


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## 5. LIFECYCLE



## Typical execution model



## Difficulties per phase

The typical **distribution of efforts** along the various phases is not uniform, while participants might need to have a more or less constant amount of people involved.

Not easy to hire / fire researchers as project needs!

**Enthusiasm and commitment** of participants tends to be quite different along the various phases

- High enthusiasm, perhaps low alignment, in the early phases.
- Better understanding, but very high potential for conflicts when the workload needs increase (middle phase)
- Some “abandonment” towards the end ... as many participants start looking for new projects (or even leave the organization), leaving a few people with the responsibility of finishing the project (often a heavy task of integrating results into a common demonstrator).
- Almost nobody is willing to help with final reporting when project ends ... The coordinator(s) get the full job!



## 6. TOOLS



## Standard tools

There are many support tools for standard project management ... But not always useful in the case of research projects

