SCIENTIFIC RESEARCH METHODOLOGIES AND TECHNIQUES

Unit 8: RESEARCH PROJECT MANAGEMENT

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1. BASICS

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"

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

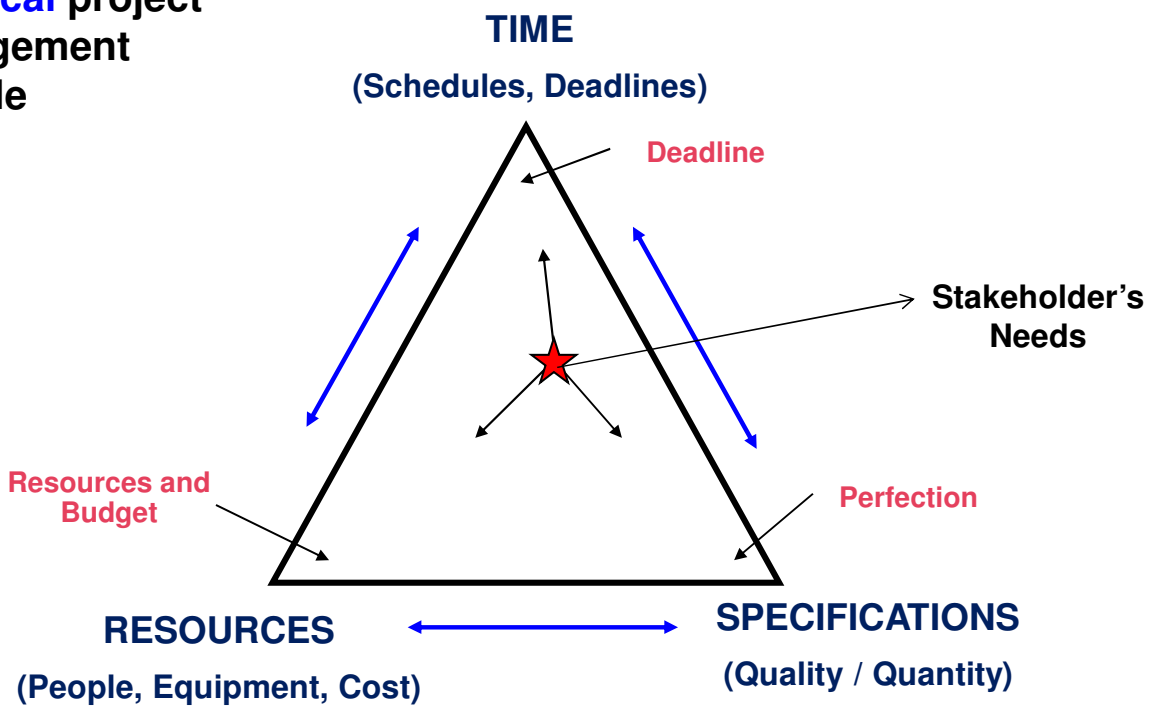
"Planning is an unnatural process;
it is much more fun to do something.

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

Variables in tension

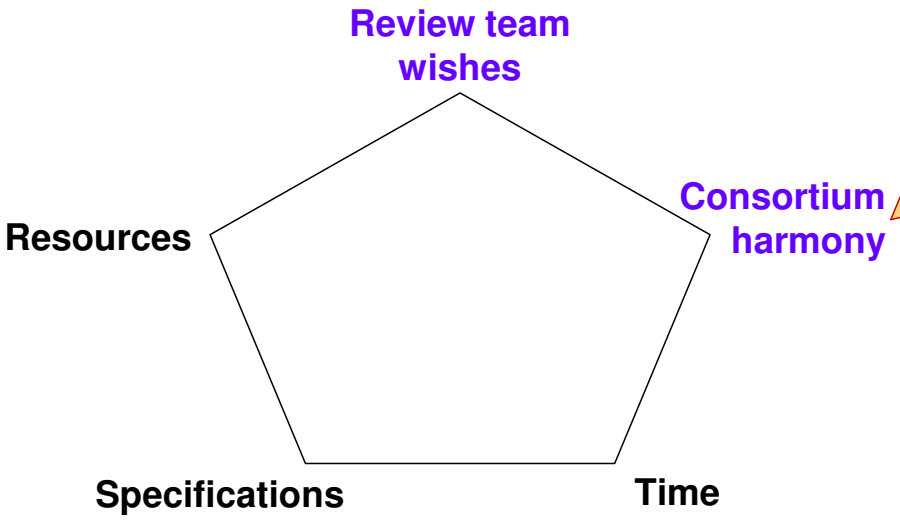
Classical project management triangle



Variables in tension ... A more realistic model

Research project management in a **consortium**

Reviewers, acting on behalf of the funding agency, can strongly affect the project's direction ...



Managing a consortium of autonomous entities is not the same as managing internal human resources

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**.

[yancy.org]

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**.

[yancy.org]

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

[Timothy R. Barry]

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. Practicing 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.

[searo]

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?

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

Relevance for a PhD student? …

As a part of his / her training, a PhD student is supposed to help writting 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

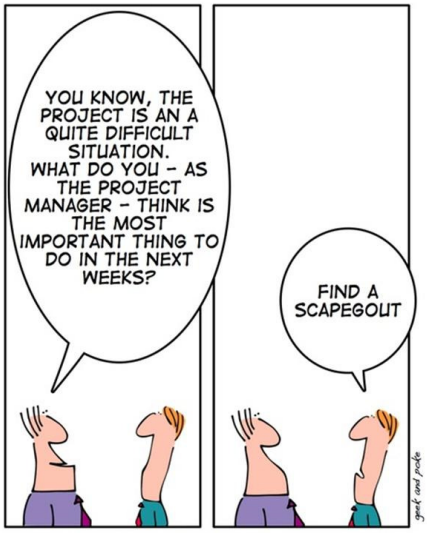
Administrative management tasks

- Control the schedule, production of deliverables
- Control progress / prepare progress reporting
- Control / distribute resources
- Monitor agreements
- Solve conflicts

- Keep contacts with funding agency
- Deal with contract amendments

- Provide document management and communication platform

- Record keeping and traceability of records



HOW TO RESCUE A PROJECT - CHAPTER 2: MAKE SURE THE KEY PLAYERS ALWAYS PARTICIPATE

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.

[ECOLEAD project]

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).

[ECOLEAD project]

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

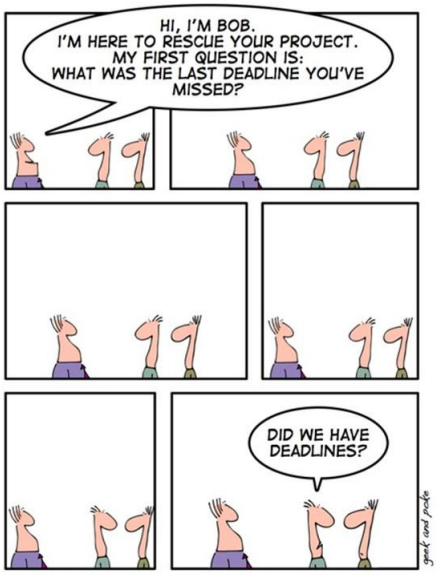
Critical issues: Time management

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



HOW TO RESCUE A PROJECT – CHAPTER 1: COMMUNICATE

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, social media tools, ...

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
- LifeRay
- ...

Many more:
www.cmsmatrix.org

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 differen 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

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.**

3. SCIENTIFIC COORDINATION

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.

[ECOLEAD project]

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.**

[ECOLEAD project]

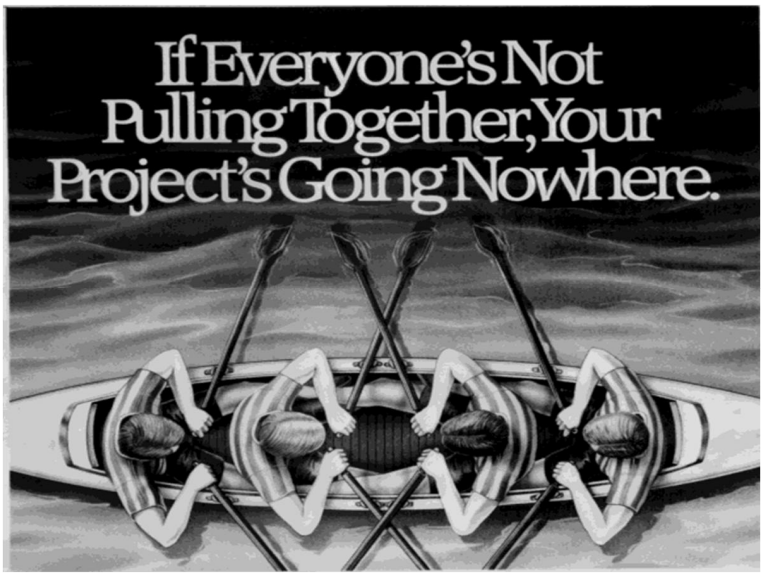
Team management

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 will the "normal" conflicts among participants**

Technical meetings

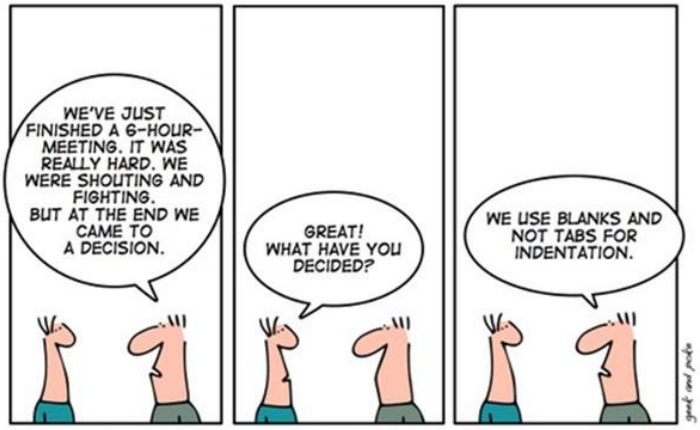
Despite the advances in remote collaboration tools, meetings are fundamental.
Nothing replaces face-to-face meetings !

- To make a more realistic assessment of the progress
- To detect problems
- To reach a common understanding
- To reach firmer commitments [remember: partners have several other activities]
- 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



ONE YEAR IN A IT PROJECT – DAY 6
HOW DO YOU KNOW YOUR PROJECT IS ON-TRACK? (PART 2)

Deliverables: quality assurance

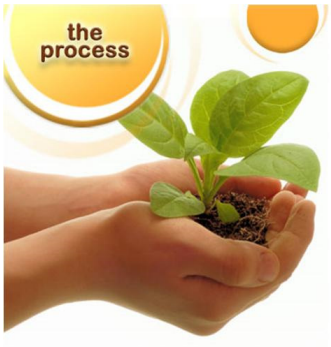
Deliverables, not activities, are what matters !

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

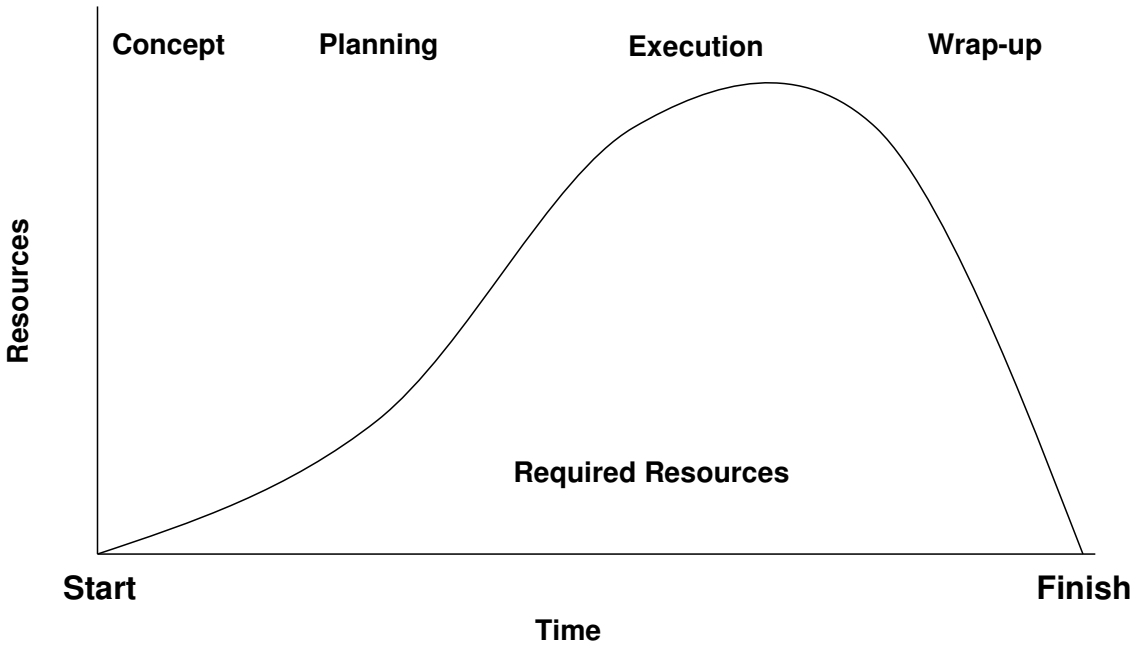
Which preparation

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”

5. LIFECYCLE

Typical execution model



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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!

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6. TOOLS

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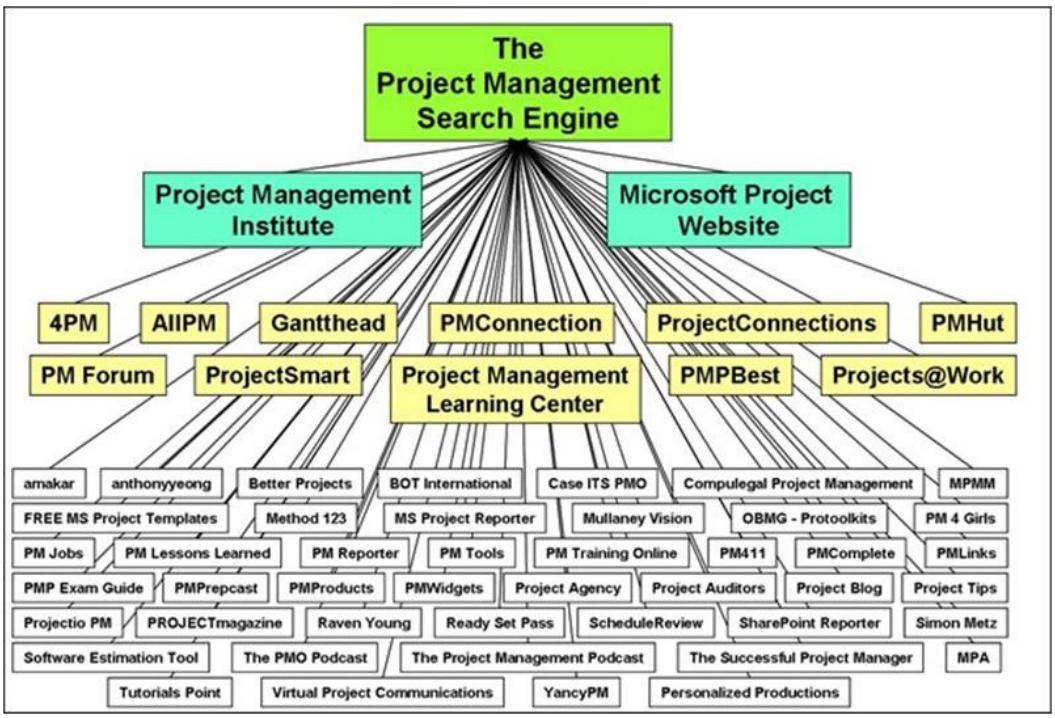
Standard tools

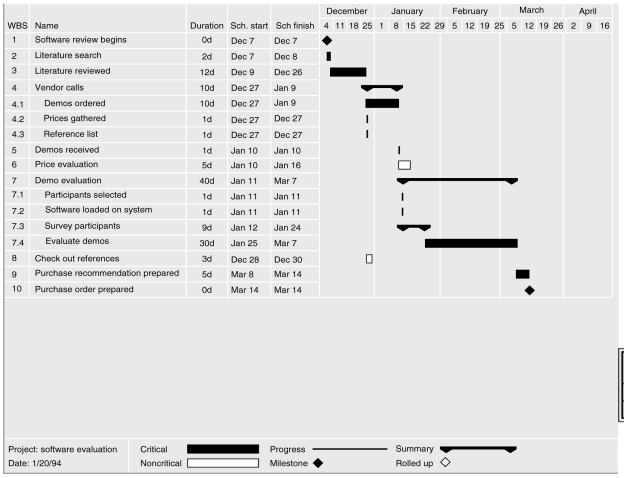
There are many support tools for standard project management ... But not always useful in the case of research projects



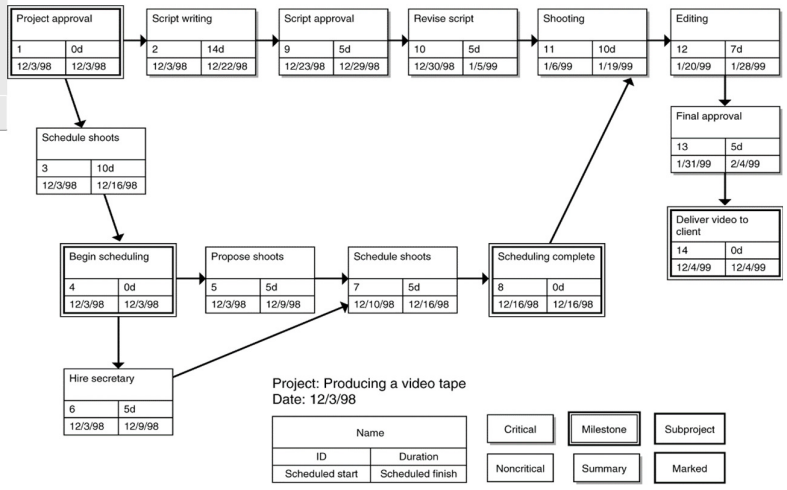
http://www.pmconnection.com/modules.php?name=Google_Search

Tools: Example

Microsoft Project's Gantt Chart



Pert Chart Generated by Microsoft Project



Tools: Some Platforms

kantree

Trello

slack

asana

Jira

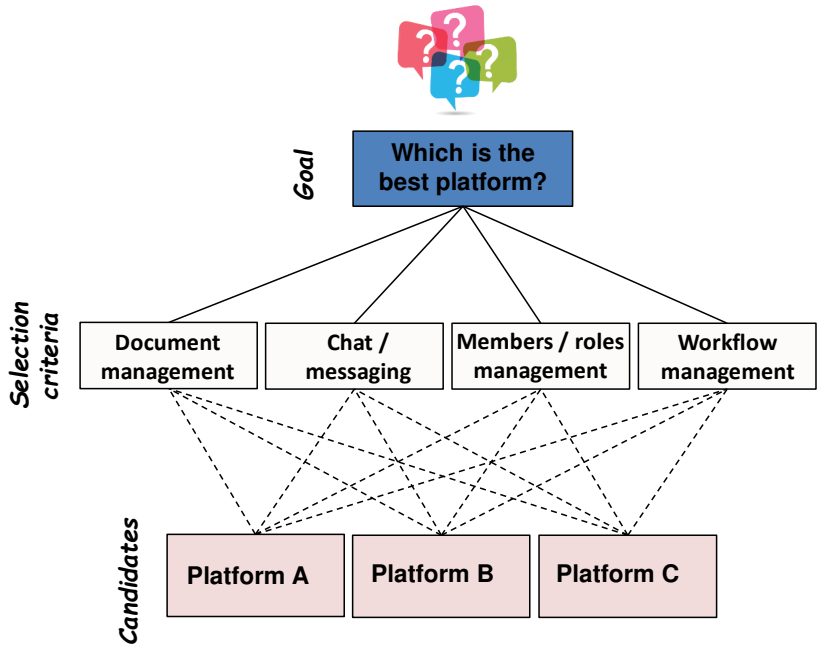
ActiveCollab

teamwork projects

https://www.getapp.com/project-management-planning-software/project-management/

SELECTING A TECHNOLOGY

Example



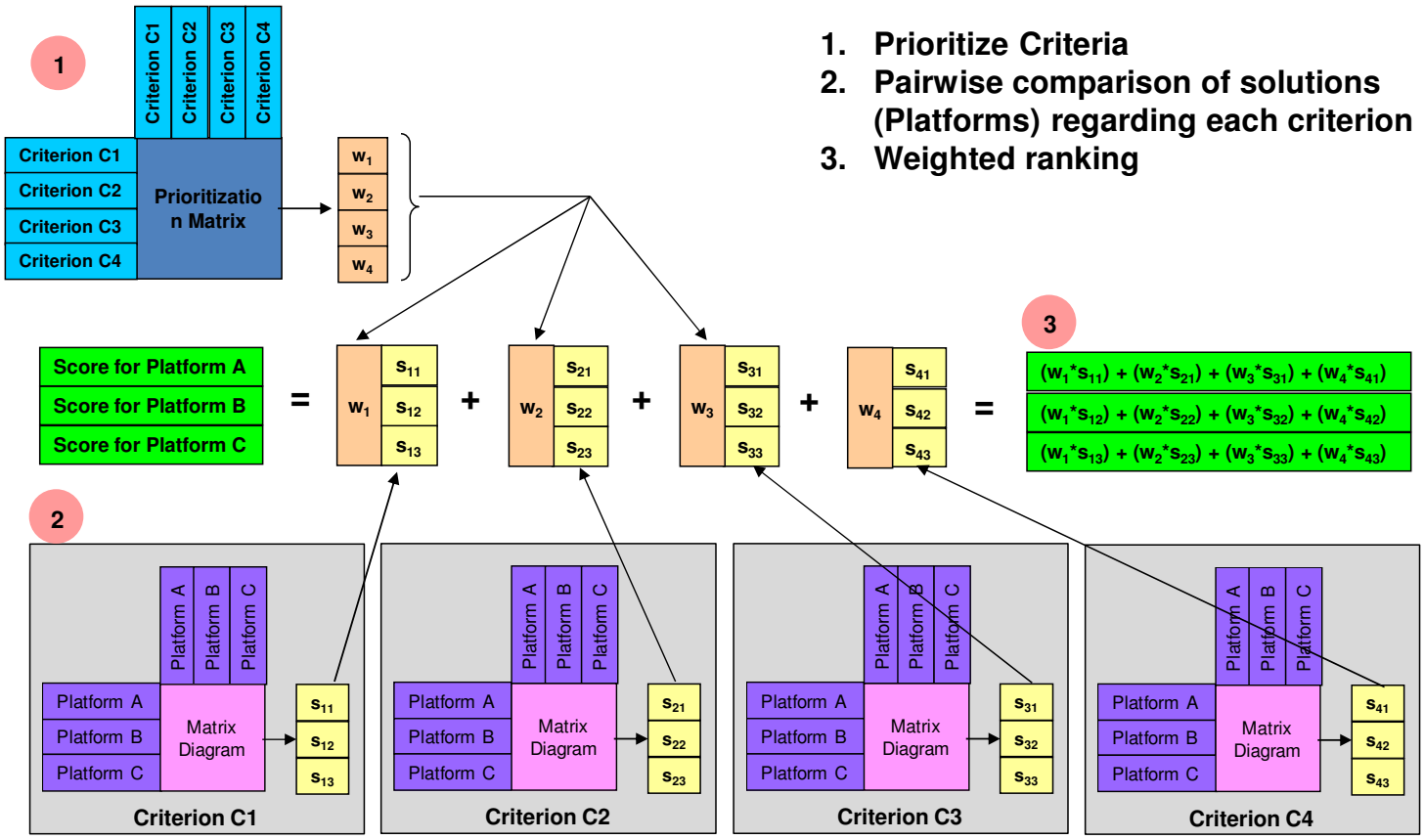
A multi-criteria decision problem

Some methods

AHP
TOPSIS
....

AHP – Analytic Hierarchy Process

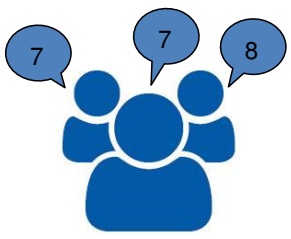
1. Prioritize Criteria
2. Pairwise comparison of solutions (Platforms) regarding each criterion
3. Weighted ranking



AHP – Prioritization of criteria

AHP Weighting Scale

9	Extremely Prefer
8	Very strongly to extremely prefer
7	Very Strongly Prefer
6	Strongly to very strongly prefer
5	Strongly Prefer
4	Moderately to strongly prefer
3	Moderately Prefer
2	Equally to moderately prefer
1	Neutral



Prioritization matrix

i

	Criterion C1	Criterion C2	Criterion C3	Criterion C4
Criterion C1: Document management	1	3	2	2
Criterion C2: Chat / Messaging	1/3	1	1/4	1/4
Criterion C3: Members/roles management	1/2	4	1	1/2
Criterion C4: Workflow management	1/2	4	2	1

C1 is 3 times more relevant than C2

ii

	2.33	12	5.25	3.75

iii

Criterion C1:	0.429	0.250	0.381	0.533
Criterion C2:	0.143	0.083	0.048	0.067
Criterion C3:	0.214	0.333	0.190	0.133
Criterion C4:	0.214	0.333	0.381	0.267

AVG

iv

Final Score weights

0.398
0.085
0.218
0.299

(normalized matrix)

AHP – Pairwise comparison

Pairwise Comparison **Criterion C1**	Platform A	Platform B	Platform C
Platform A	1	2	8
Platform B	1/2	1	6
Platform C	1/8	1/6	1
X is n times better than Y regarding criterion C1	1.625	3.167	15

Normalized **Criterion C1**	Platform A	Platform B	Platform C	Average
Platform A	0.615	0.632	0.533	0.593
Platform B	0.308	0.316	0.400	0.341
Platform C	0.077	0.053	0.067	0.066

Pairwise Comparison **Criterion C2**	Platform A	Platform B	Platform C
Platform A	1	1/3	1/4
Platform B	3	1	1/2
Platform C	4	2	1

Normalized **Criterion C2**	Platform A	Platform B	Platform C	Average
Platform A	0.125	0.100	0.143	0.123
Platform B	0.375	0.300	0.286	0.320
Platform C	0.500	0.600	0.571	0.557

Pairwise Comparison **Criterion C3**	Platform A	Platform B	Platform C
Platform A	1	1/4	1/6
Platform B	4	1	1/3
Platform C	6	3	1

Normalized **Criterion C3**	Platform A	Platform B	Platform C	Average
Platform A	0.091	0.059	0.111	0.087
Platform B	0.364	0.235	0.222	0.274
Platform C	0.545	0.706	0.667	0.639

Pairwise Comparison **Criterion C4**	Platform A	Platform B	Platform C
Platform A	1	1/3	4
Platform B	3	1	7
Platform C	1/4	1/7	1

Normalized **Criterion C4**	Platform A	Platform B	Platform C	Average
Platform A	0.235	0.225	0.333	0.265
Platform B	0.706	0.677	0.583	0.655
Platform C	0.059	0.097	0.083	0.080

AHP – Ranking

Score for Platform A	=	0.398	0.593	+	0.085	0.123	+	0.218	0.087	+ 0.299	0.265
Score for Platform B			0.341			0.320			0.274		0.655
Score for Platform C			0.066			0.557			0.639		0.080

=	0.345
	0.418
	0.237