The DAME Program Management

Strategy, Tools and Organization

Massimo Brescia

What is a Project?

A general organization develops a series of jobs:
- Tasks
- Activities (operations)
- Both share resource limits, planning, execution, control …

But:
Activities are repetitive and continuous;
Projects are unique and time limited;

A project is a series of time limited activities with a same goal: to create a new product/service

Glossary

DESIGN: feature definition and structure elaboration of some component or product;
ENGINEERING: design (in technical terms) with particular care to the realization phases and functional aspects of a product or a component;
DRAWING: technical design of a component or a product;
PROJECT: a series of activities finalized to the design and realization of a unique target/goal. It basically consists of a serialized/parallel design of activity blocks, called WBS (Work Breakdown Structures);

Project Features

- Defined goals
- Unique
- Time limited
- Multidisciplinary
- Resource limited

In particular time limited means that a project has always a starting point (kick off) and an end point (Kill Point).

A project can be very long time, but always limited! Also when it produces services that remain active after the end of the project.

Goal of a project

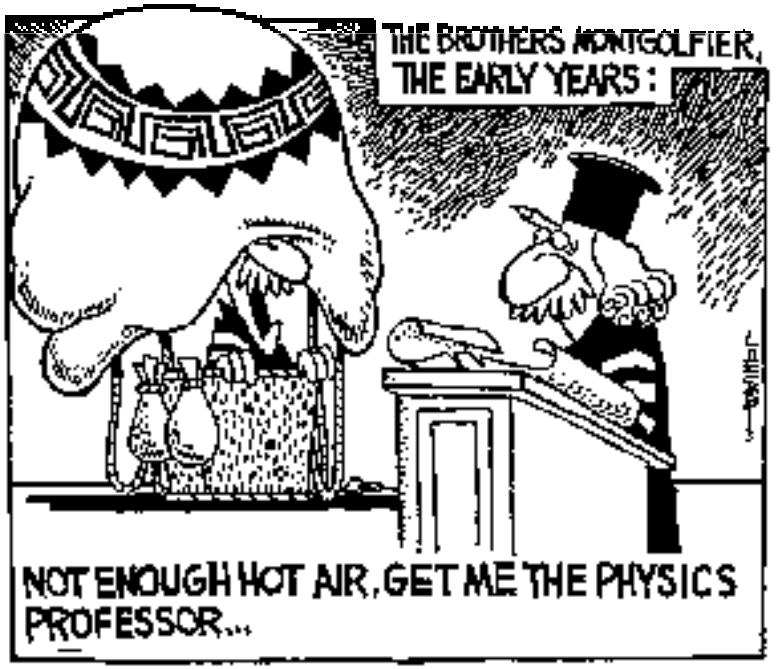
A project should develope a unique and original product/service (it can be similar to others in the same category, but never the same!)

The nature of unicity implies that a project should always be realized progressively.

“realized” means well and fine designed, while “progressively” means step-by-step.

“Quelli che s'innamoran di pratica sanza scienza, son come 'l nocchiere, ch'entra in navilio sanza timone o bussola, che mai ha certezza di dove si vada”

Leonardo da Vinci



Project Management - PM

It means:
Knowledge application, experience, capability, devices and techniques to plan activities finalized to satisfy requirements and expectations of the project goals.

The application of the systemic approach to the handling of technologically complex activities, whose targets are fixed in terms of costs and performances

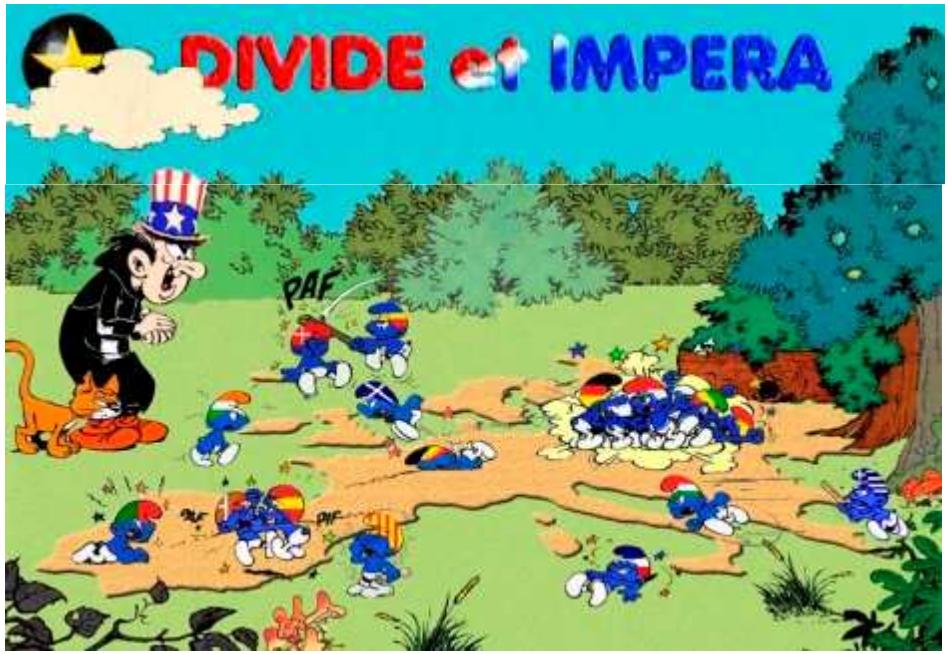
To plan, organize, supervise and control the available resources for the completion of the project. The PM uses the systemic approach to the handling of the activities by assigning tasks to the personnel (vertical hierarchy)

The role of a project manager should not be oriented to recommendations, but to decisions, because a project is always oriented to results.

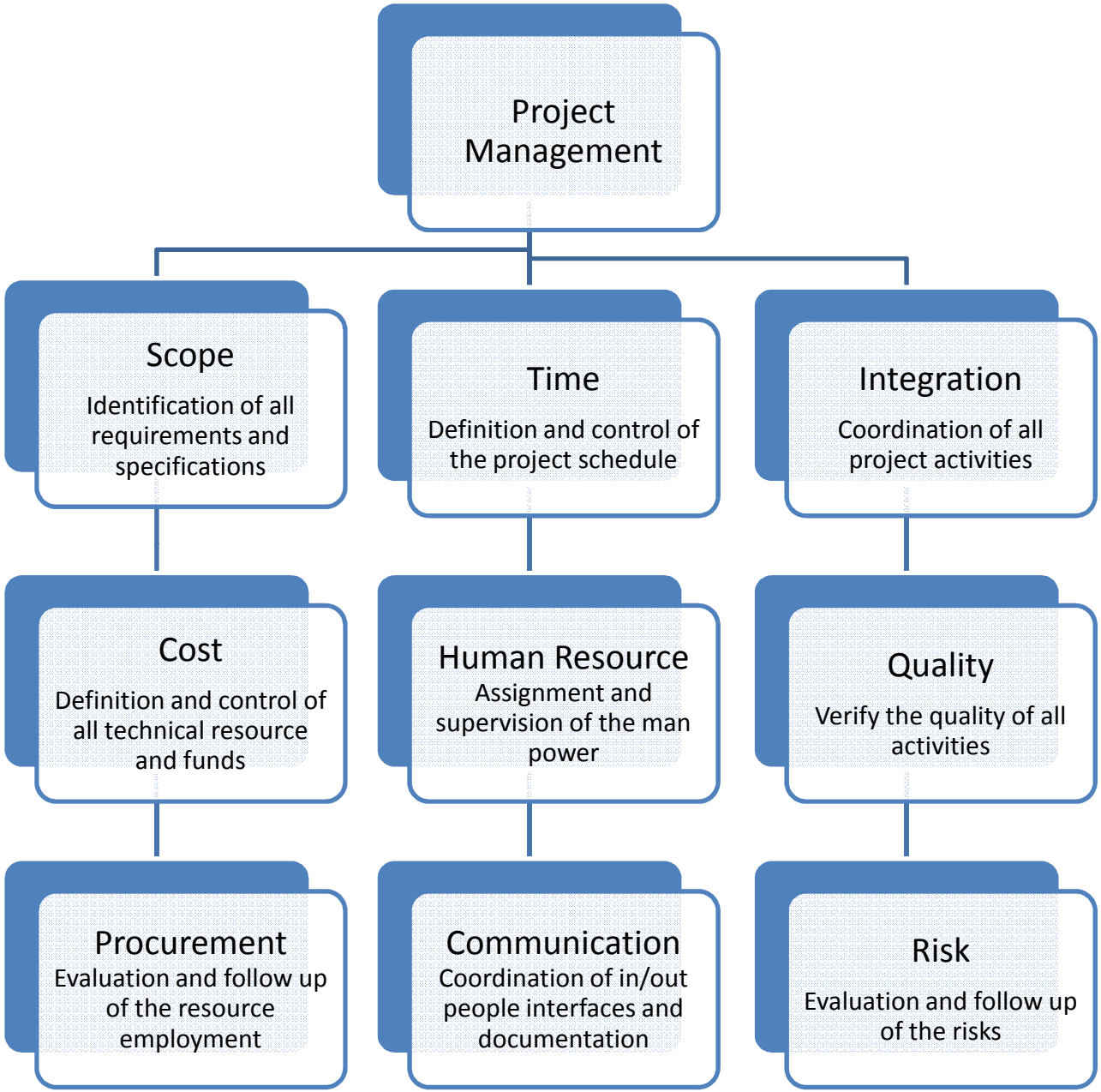
The PM control activity

Control in a PM scenario implies:

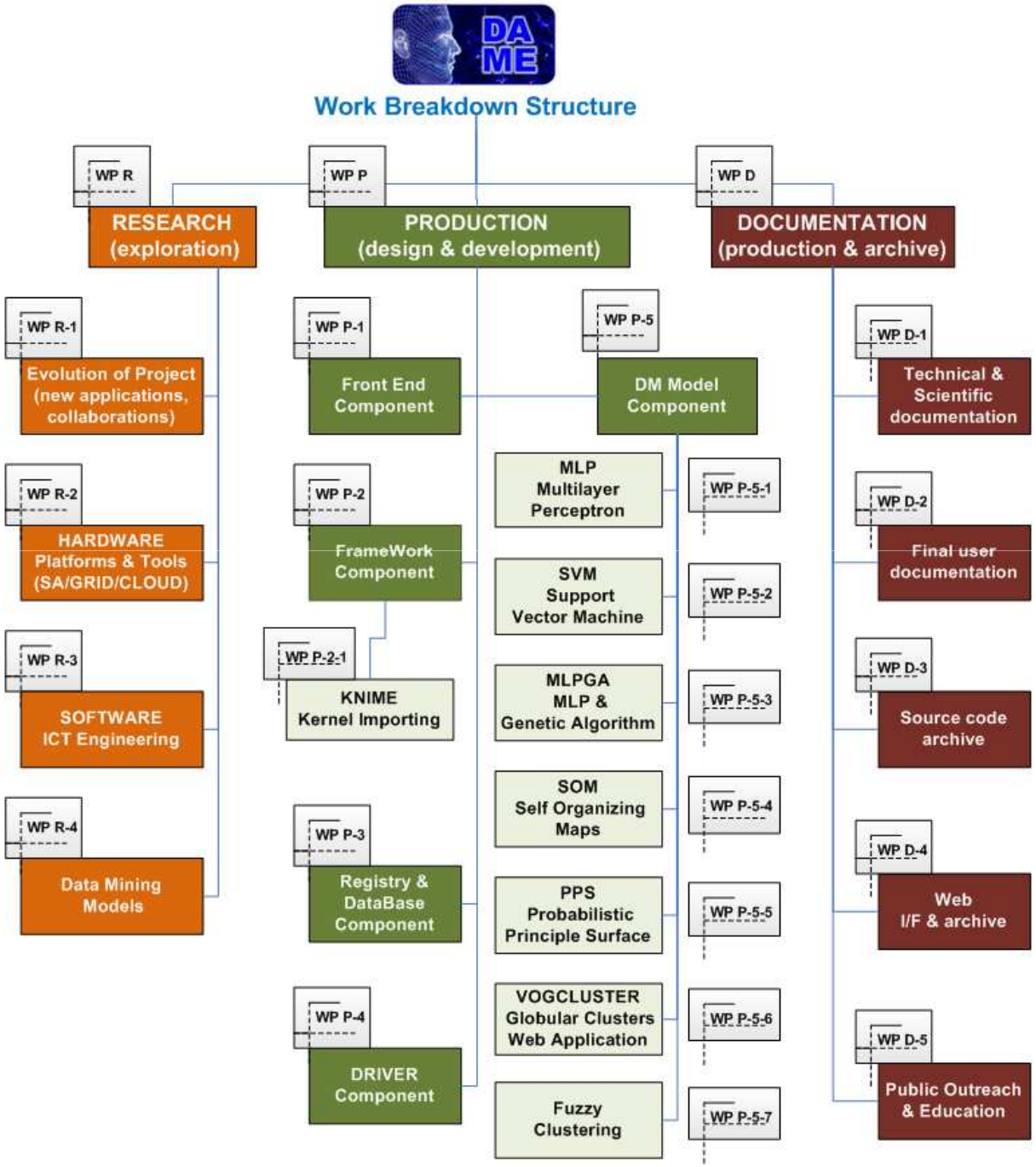
- The observation of the project evolution (scheduling, man power, tasks, quality, feasibility etc..);
- regulation of activities and resource employment, re-modulation of time, requirements, specifications, costs, etc…);



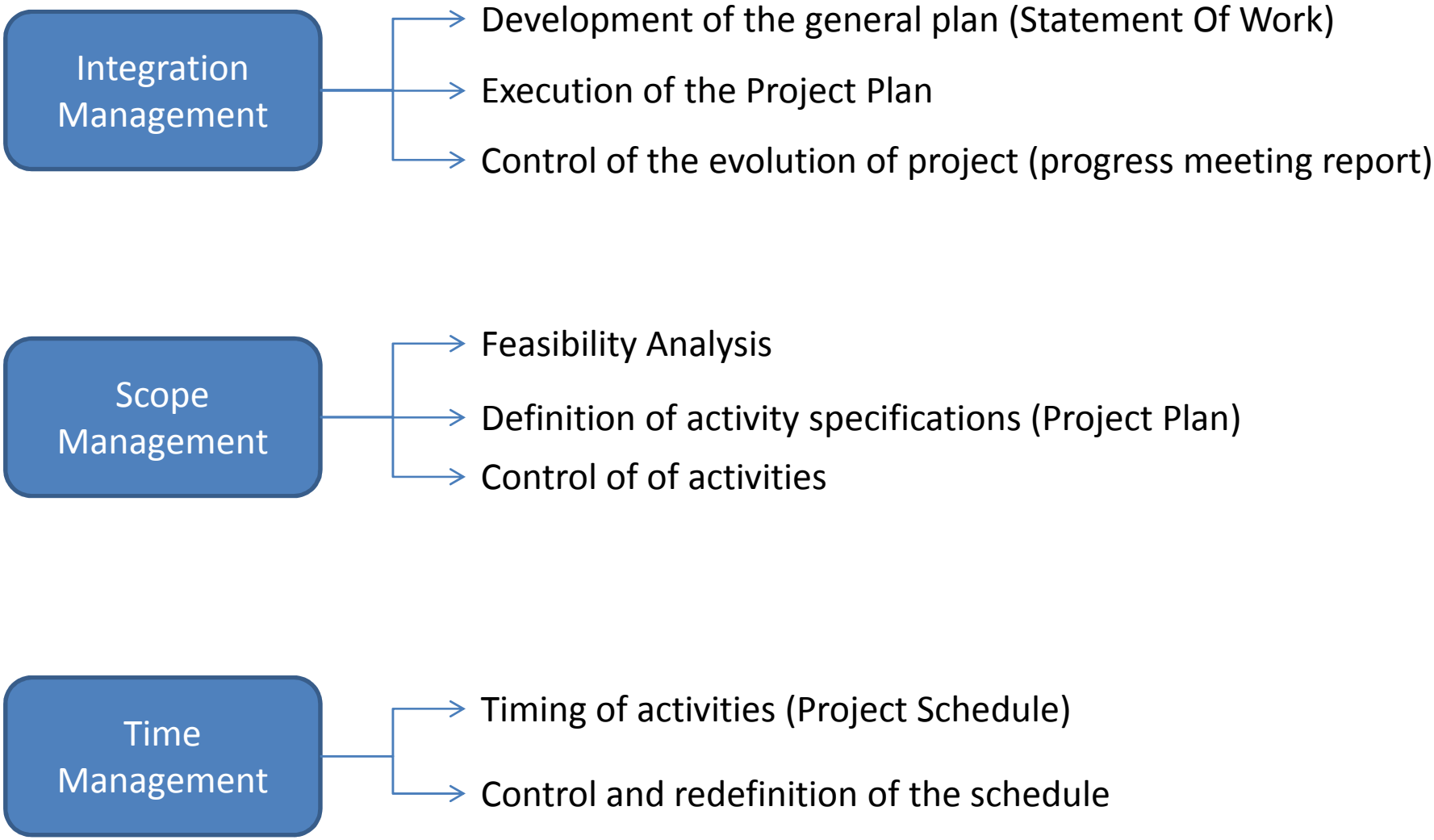
WBS (Work Breakdown Structure) of PM Activities



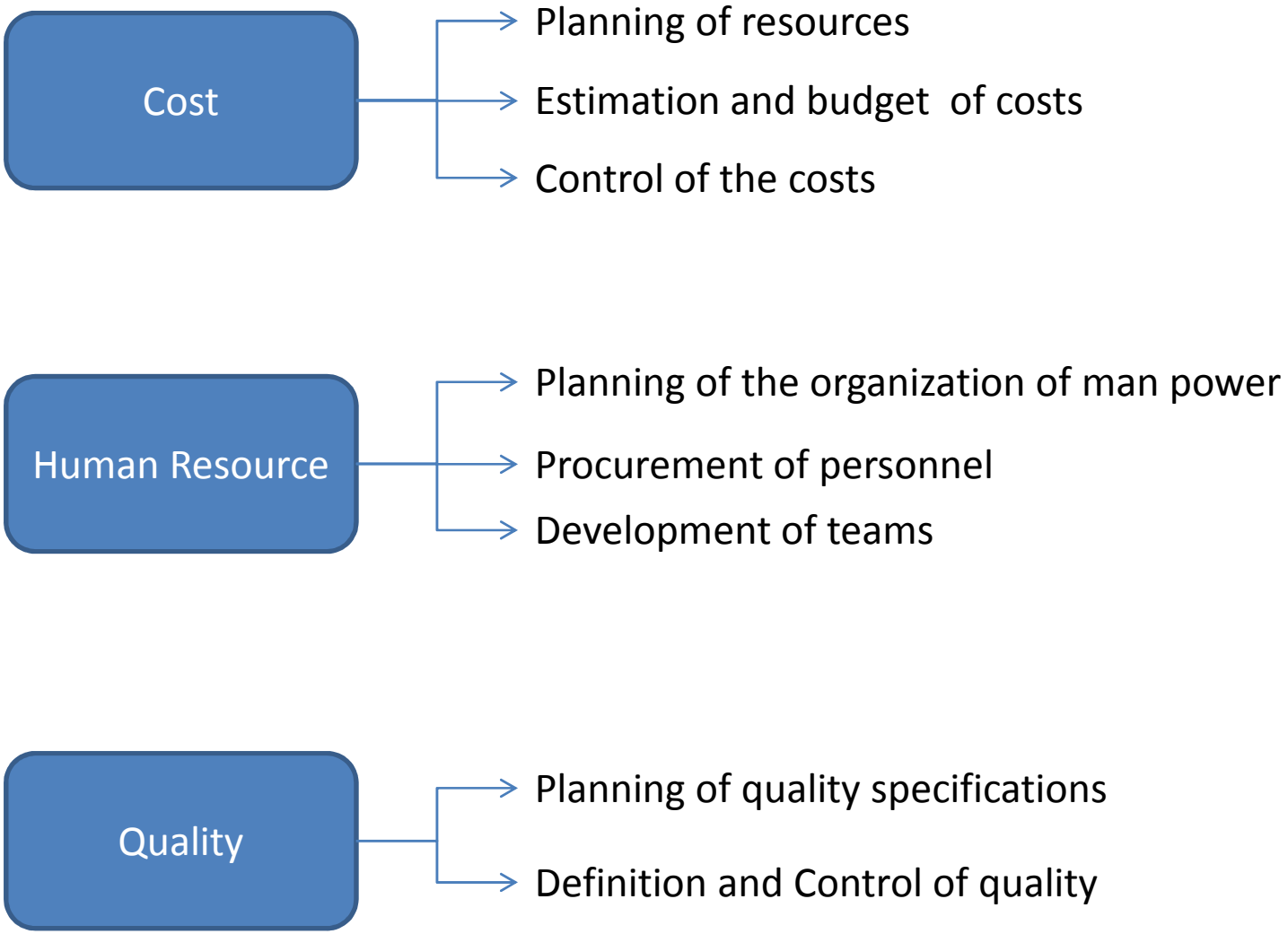
WBS (Work Breakdown Structure) of DAME



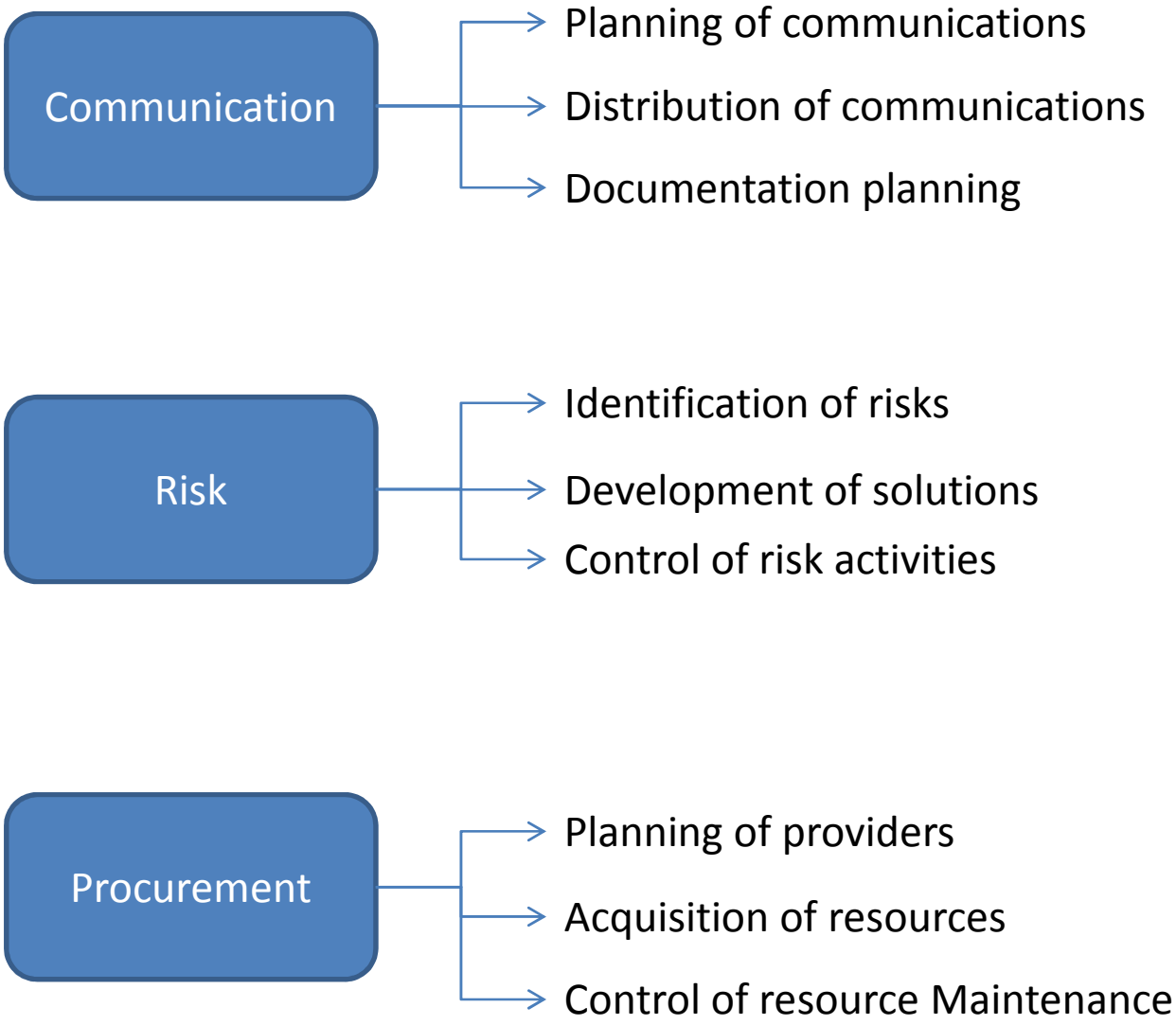
PM Main Activities



PM First Level Activities



PM Second Level Activities



Extension of PM: **Program** Management

Sometimes, during project development, some extensions are requested. Extension means the introduction of a new project, technically connected and related with the original project, but requiring a parallel organization and supervision.

In such cases, the Project Management evolves into Program Management.

Program Management means:

- program for development of a series of related projects;
- periodical revision of current open projects connected by the program;
- parallel projects oriented to a unique main goal at the end of the program;

In these cases, a Program can be an ensemble of projects, or sub-projects. There should be provided a Project Manager for each sub-project, all coordinated by a Program Manager.

Program Management – Five (5) Modules +

Mobilization:

Defines the governance, organizations, boundaries, & financial management

Program Office:

Establishes the administration and support function

Infrastructure:

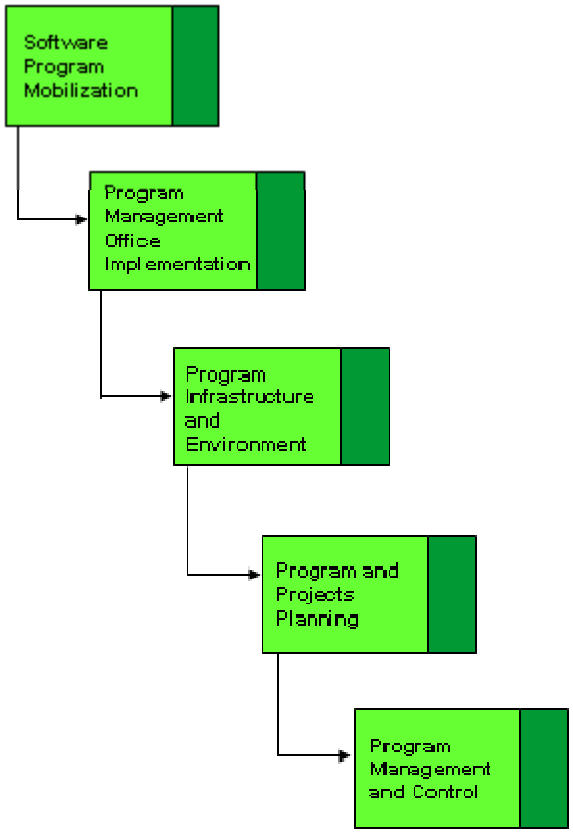
Provides the resources, facilities, tools & technical environment

Planning:

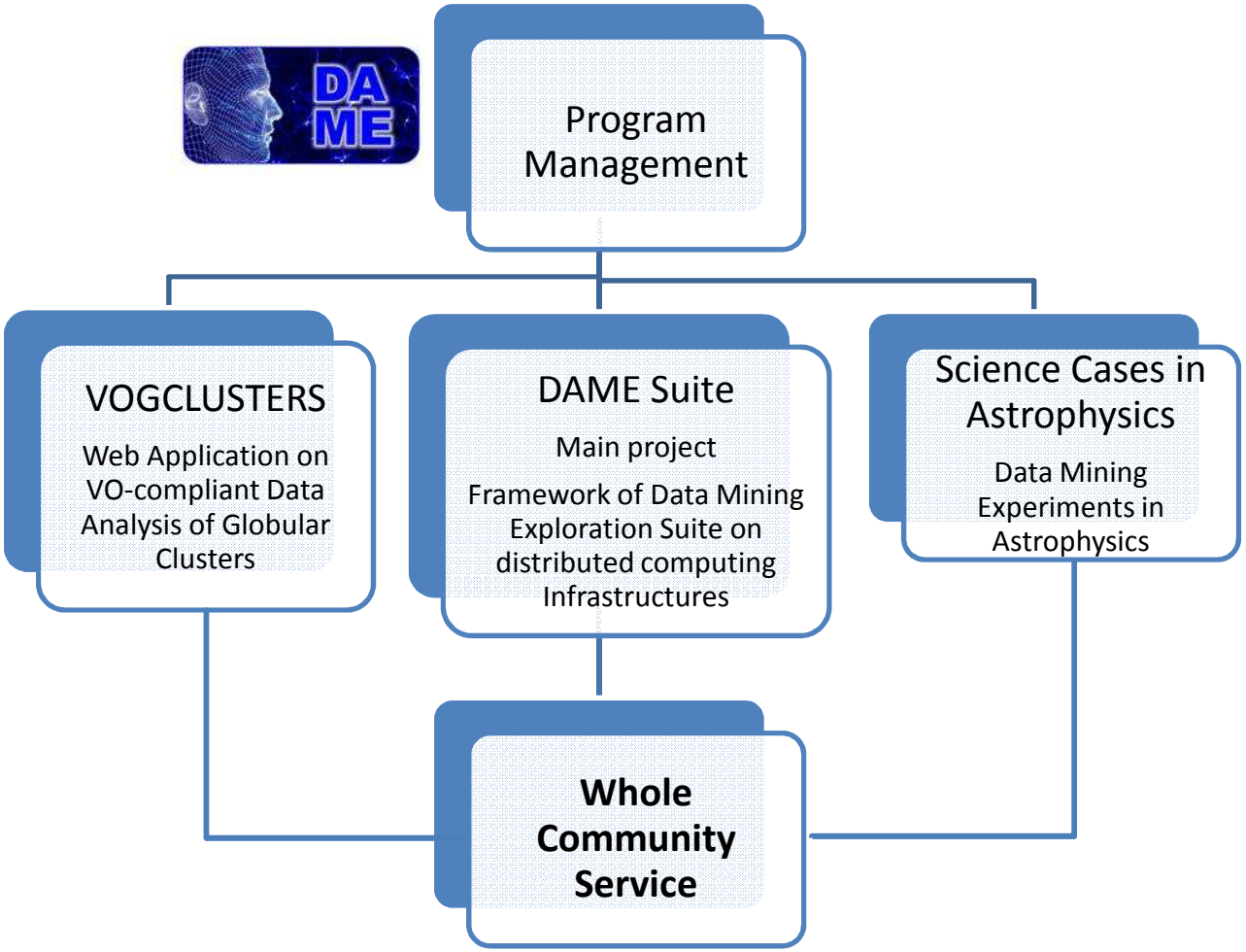
Defines the process and produces individual project plans and a Program plan

Controls:

Sets up management / control practices and reporting



Program Management Example: DAME case



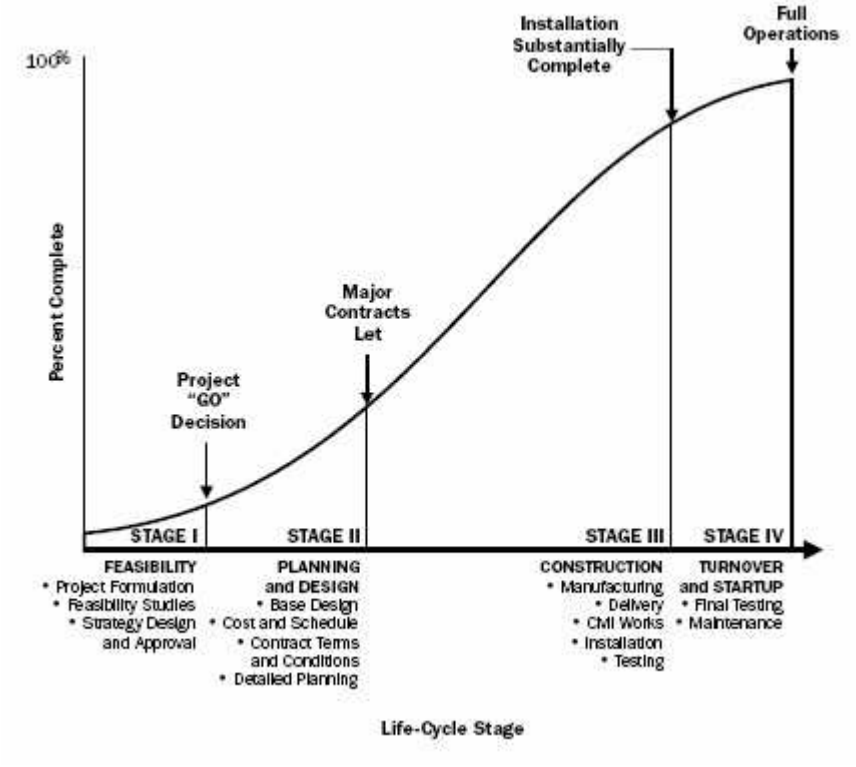
Phases of a Project

By dividing a project into a sequence of phases, it is possible to:

- prevent and recover possible occurrences of external perturbations;
- simplify project analysis, control and maintenance;

Each phase finishes with the realization of a **deliverable** which consists of some product, device, document, application startup etc…

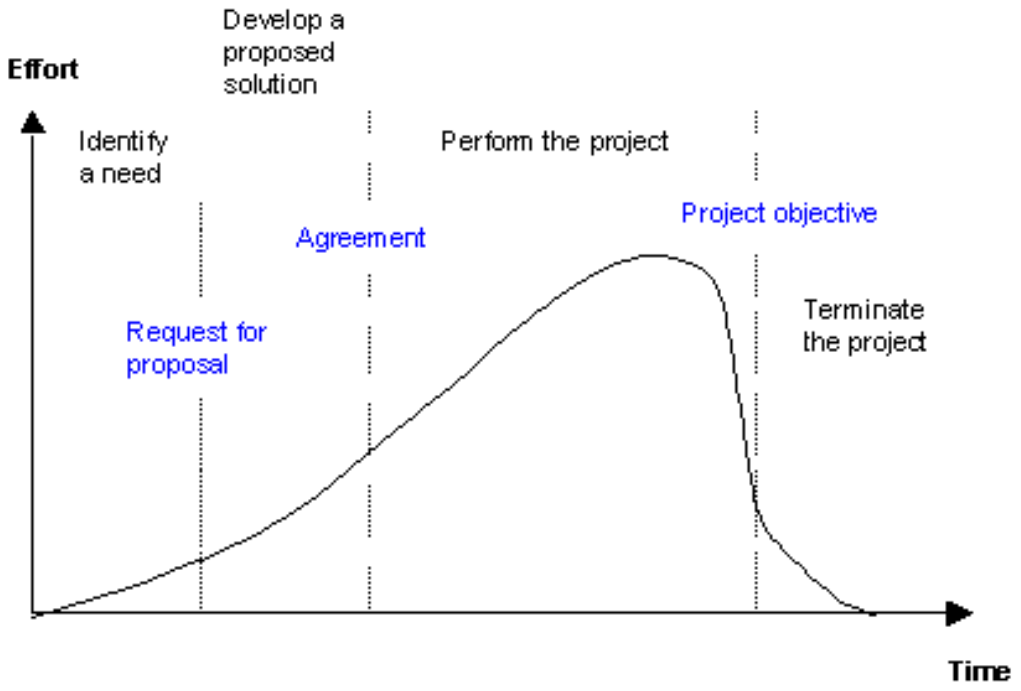
At the end of each phase, it is foreseen an analysis of results and the possibility to proceed to next planned phase. If the end of the project is reached, the analysis consists of the verification of the commissioned product as a whole. The end of a project is often defined as **Stage Gate** or **Kill Point**.



Project Life Cycle

The project life cycle defines the contours of the project and possible links to current activities. **It must define entities and deliverables for each phase and can be more or less detailed.** Normally it must reflect the following considerations:

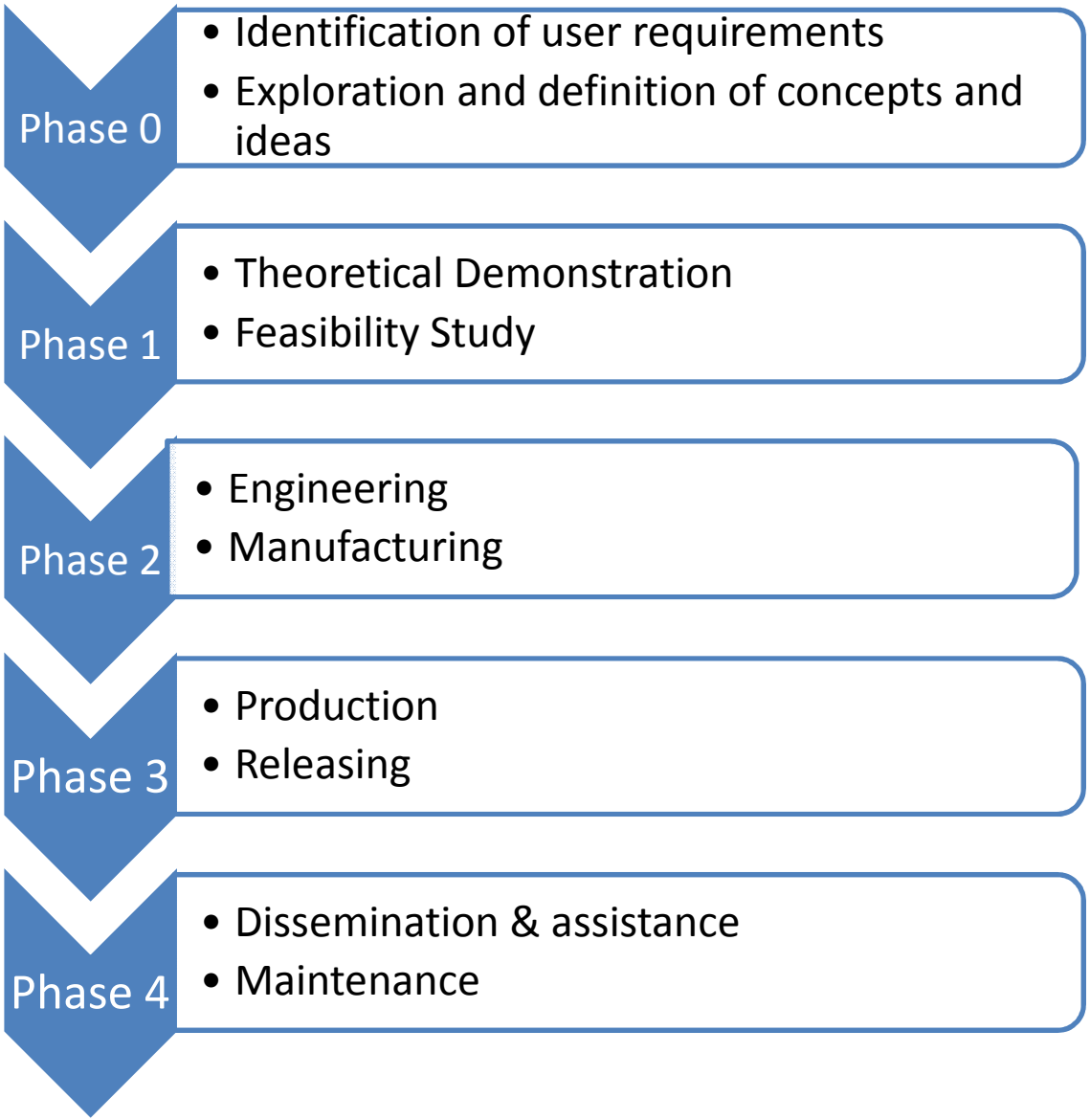
- **costs** and **staff** people required at the beginning, results progressively reduced at the intermediate stages and fall down at the end;
- the **probability of success** are low at the beginning and (reasonably) grows up during the process;
- the conditioning of **change requests** to the project requirements during the process dramatically affect the costs and resources.



Phases of a Project

4 main phases can be defined:

- **Concept**: Huge impact on the project cost. It requires creativity and expertise. It is based on a description of the project without details;
- **Definition**: High impact on the project cost. It requires analytical capability. It is based on a detailed configuration of the project following requirements and specifications;
- **Realization**: Direct impact on the project cost. It requires management and technical capability. It is based on a frozen configuration of the project aspects;
- **Release**: low impact on the project cost. It requires management capability. It is based on the fixed configuration;



Life Cycle of a project in Software

Planning

The important task in creating a software product is extracting the requirements or requirements analysis. Customers typically have an abstract idea of what they want as an end result, but not what software should do. Incomplete, ambiguous, or even contradictory requirements are recognized by skilled and experienced software engineers at this point. Frequently demonstrating live code may help reduce the risk that the requirements are incorrect.

Once the general requirements are gleaned from the client, an analysis of the scope of the development should be determined and clearly stated. This is often called a Project Description Document (P.D.D.).

Implementation, testing and documenting

Implementation is the part of the process where software engineers actually program the code for the project. Software testing is an integral and important part of the software development process. This part of the process ensures that bugs are recognized as early as possible. Documenting the internal design of software for the purpose of future maintenance and enhancement is done throughout development.

Deployment and maintenance

Deployment starts after the code is appropriately tested, is approved for release and sold or otherwise distributed into a production environment.

Maintenance and enhancing software to cope with newly discovered problems or new requirements can take far more time than the initial development of the software. It may be necessary to add code that does not fit the original design to correct an unforeseen problem or it may be that a customer is requesting more functionality and code can be added to accommodate their requests. In that case, management should consider the option of rebuilding the system (or portions) before maintenance cost is out of control.

Bug Tracking System tools should be deployed at this stage of the process. It is a fundamental device!

Documenting a project

'No great pyramid was built in a day nor shall be any great software without documentation.''

Linus Torvald (Linux inventor)

In strict sense, programming is only the last part of the overall software development project; documenting it is a nightmare that makes it feasible.

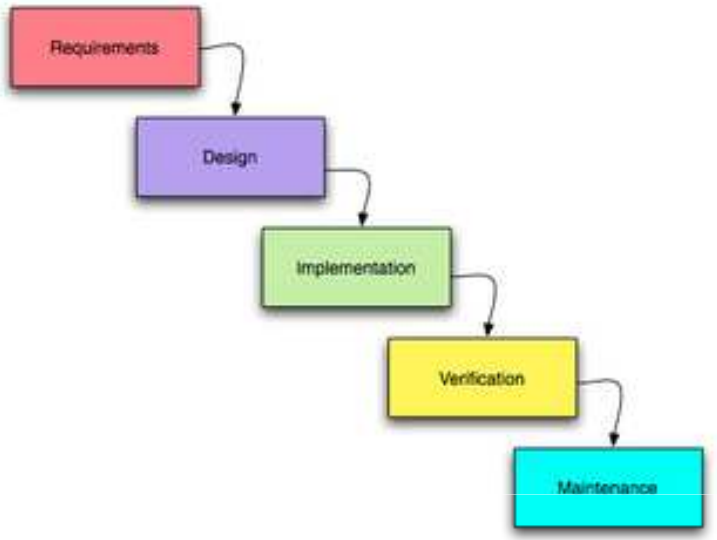
"It's a one up, 3,627 down."

IEEE Project Documentation Standards			
SOW	Statement Of Work	project study and goals	PM
PDD	Project Description Document	stakeholder feedback	Board
PP	Project Plan	main operative plan and WBS	PM
SCH	Project Schedule	activity and man power timing	PM
SRS	Software Requirement Specification	requirement analysis	team
SDD	Software Design Description	tools and development design	team
PRO	Technical and Test Procedure	configuration an test plan	Board
TRE	Technical Report	output of development	team
VER	Test Verification report	report on debug and test	team
MAN	User and Maintenance Manual	user and administration guide	Board

Life Cycle of a project in Software – **Waterfall Model**

The waterfall model shows a process, where developers are to follow these phases in order:

Requirements specification (Requirements Analysis)
Design
Implementation (or Coding)
Integration
Testing (or Validation)
Deployment (or Installation)
Maintenance



In a strict Waterfall model, after each phase is finished, it proceeds to the next one.
Reviews may occur before transitioning to the next phase which allows for the possibility of changes (which may involve a formal change control process).

However, it discourages revisiting and revising any prior phase once it's complete.

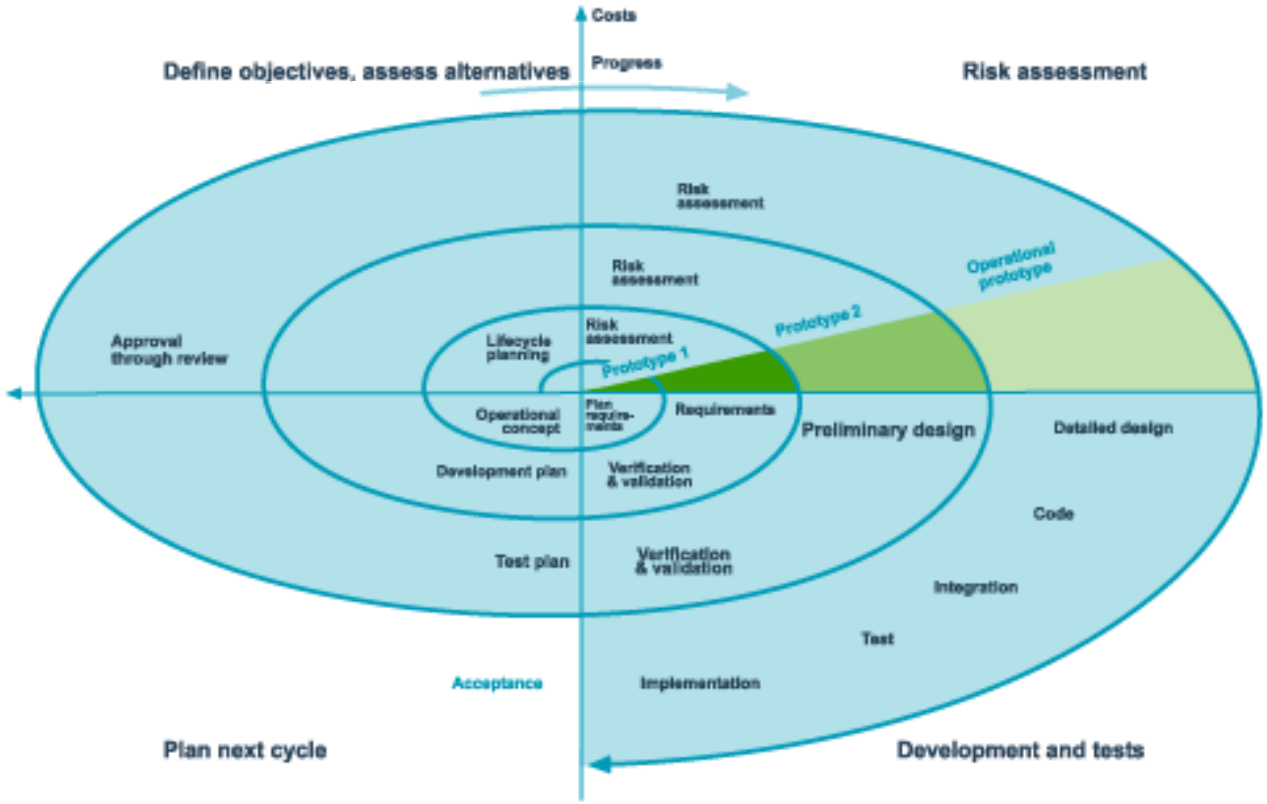
This "inflexibility" in a pure Waterfall model has been a source of criticism by other more "flexible" models.

Life Cycle of a project in Software – **Spiral Model**

The **spiral model** is a software development process combining elements of both design and prototyping-in-stages, in an effort to combine advantages of top-down and bottom-up concepts. Also known as the spiral lifecycle model (or spiral development), it is a systems development method (SDM) used in information technology (IT).

This model of development combines the features of the prototyping model and the waterfall model. The spiral model is intended for large, expensive and complicated projects.

As originally envisioned, the iterations were typically 6 months to 2 years long.
Each phase starts with a design goal and ends with the client (who may be internal) reviewing the progress thus far.
Analysis & Engineering efforts are applied at each phase of the project, with an eye toward the end goal of the project.



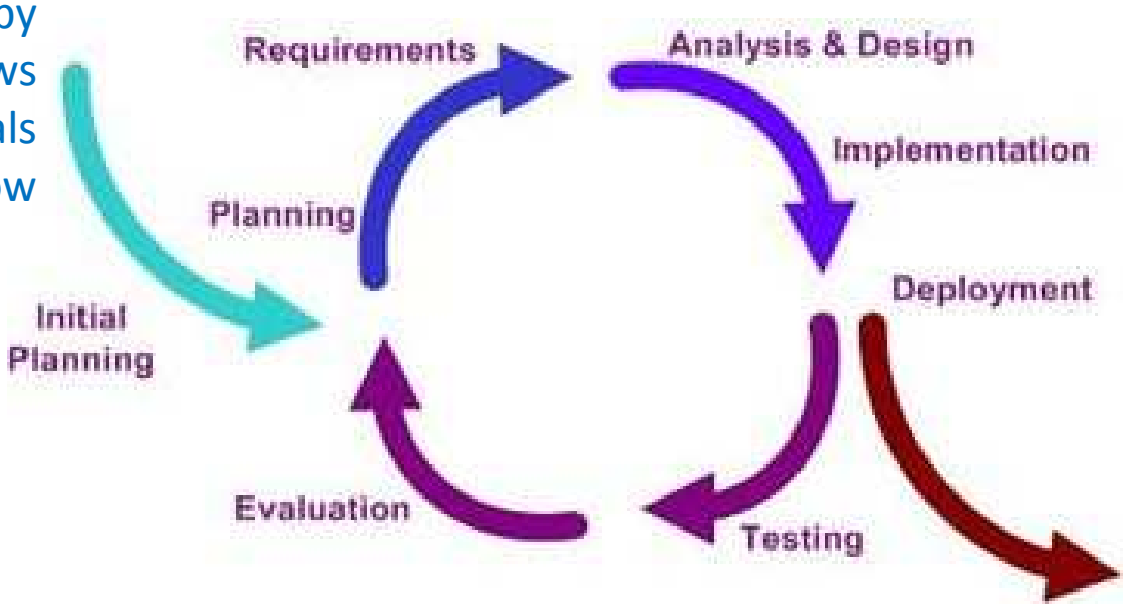
Life Cycle of a project in Software – **Iterative Model**

Iterative and Incremental development is a cyclic software development process developed in response to the weaknesses of the waterfall model. It starts with an initial planning and ends with deployment with the cyclic interaction in between.

The iterative and incremental development is an essential part of the Rational Unified Process, the Dynamic Systems Development Method, Extreme Programming and generally the agile software development frameworks.

Iterative development prescribes the construction of initially small but ever larger portions of a software project to help all those involved to uncover important issues early before problems or faulty assumptions can lead to disaster.

Iterative processes are preferred by commercial developers because it allows a potential of reaching the design goals of a customer who does not know how to define what they want.



Life Cycle of a project in Software – eXtreme Programming

Agile software development refers to a group of software development methodologies based on iterative development, where requirements and solutions evolve through collaboration between self-organizing cross-functional teams. The term was coined in the year 2001 when the Agile Manifesto was formulated.

Agile methods generally promote a disciplined project management process that encourages frequent inspection and adaptation, a leadership philosophy that encourages teamwork, self-organization and accountability, a set of engineering best practices intended to allow for rapid delivery of high-quality software, and a business approach that aligns development with customer needs and company goals.

Extreme Programming (XP) is a software development methodology which is intended to improve software quality and responsiveness to changing customer requirements. As a type of agile software development, it advocates frequent "releases" in short development cycles (timeboxing), which is intended to improve productivity and introduce checkpoints where new customer requirements can be adopted.

Like other agile software development methods, XP attempts to reduce the cost of change by having multiple short development cycles, rather than one long one. In this doctrine changes are a natural, inescapable and desirable aspect of software development projects, and should be planned for instead of attempting to define a stable set of requirements.

The **Stakeholder** Concept

Stakeholders are people involved in a project, whose feedback on project results has an important impact on the project itself.

They are typically:

- The Principal Investigator;
- The Project Manager;
- The Project Board;
- the Commitment members;
- the working group members;
- the sponsors;
- the final users;

To satisfy all of them is difficult, due to their very diversified needs, requirements, expectations. They are different by nature and role. Basic successful feedback is the one coming from final users, but not only…!

Project Cost Estimation

The realization of the cost evaluation is based on experience and parameterization based on a cost index (i.e. USD/code line in a software project, USD/kW for an hardware infrastructure).

The cost evaluation takes into account a "scale factor":

$$C = C_0 \left(\frac{P}{P_0} \right)^M$$

C, P Cost and Potentiality of available tools

C_0, P_0 Cost and Potentiality of referenced tools

M scale factor (typically between 0.6 and 0.9)

The estimation of the unitary cost is then based on a linear regression on historical data (of similar projects or direct experience), by operating with logarithms:

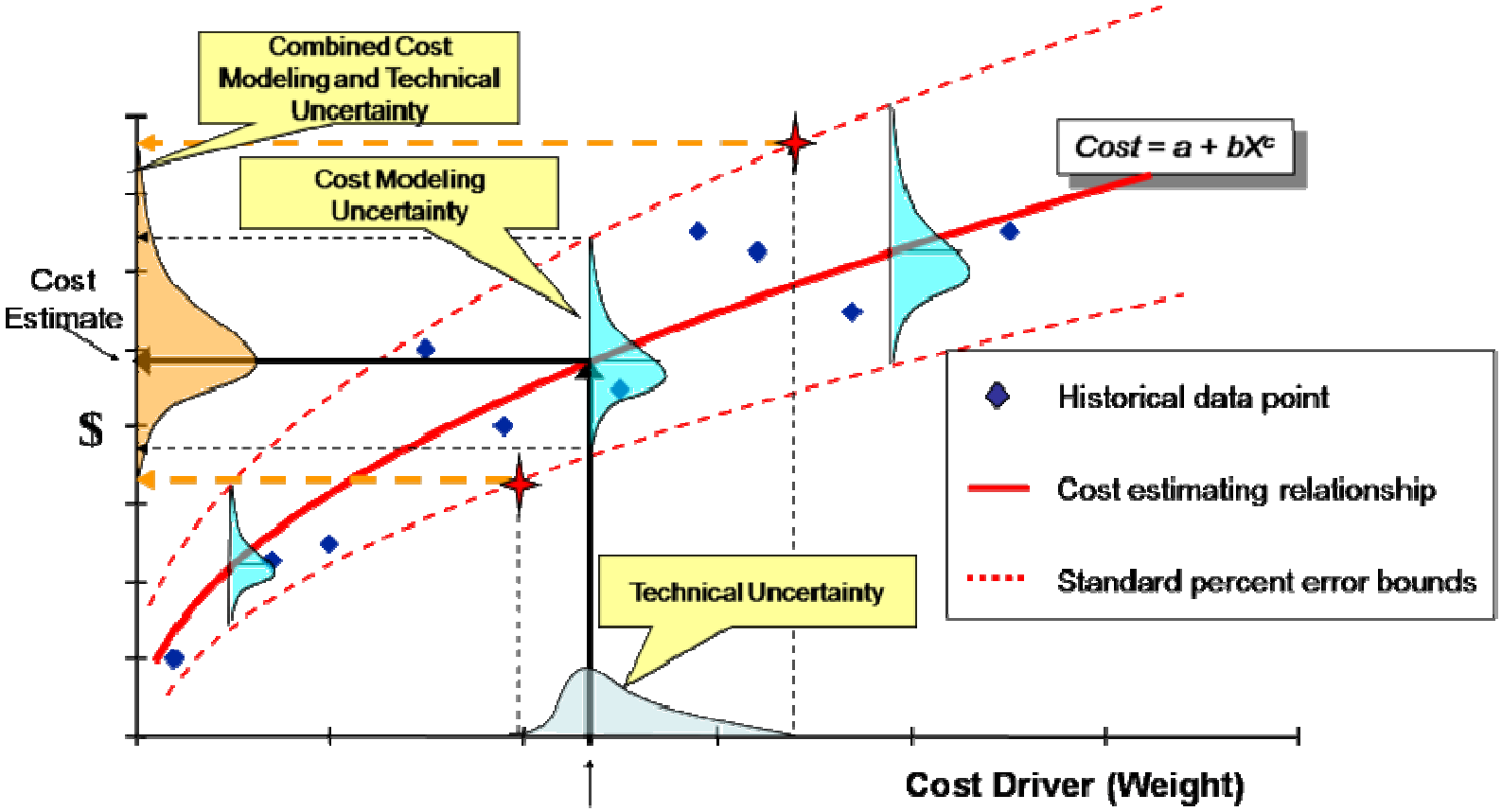
C / P is the unitary cost

$$\log \frac{\mathrm{C}}{\mathrm{P}} = \log C_0 - M \log P_0 + (M+1) \log P$$

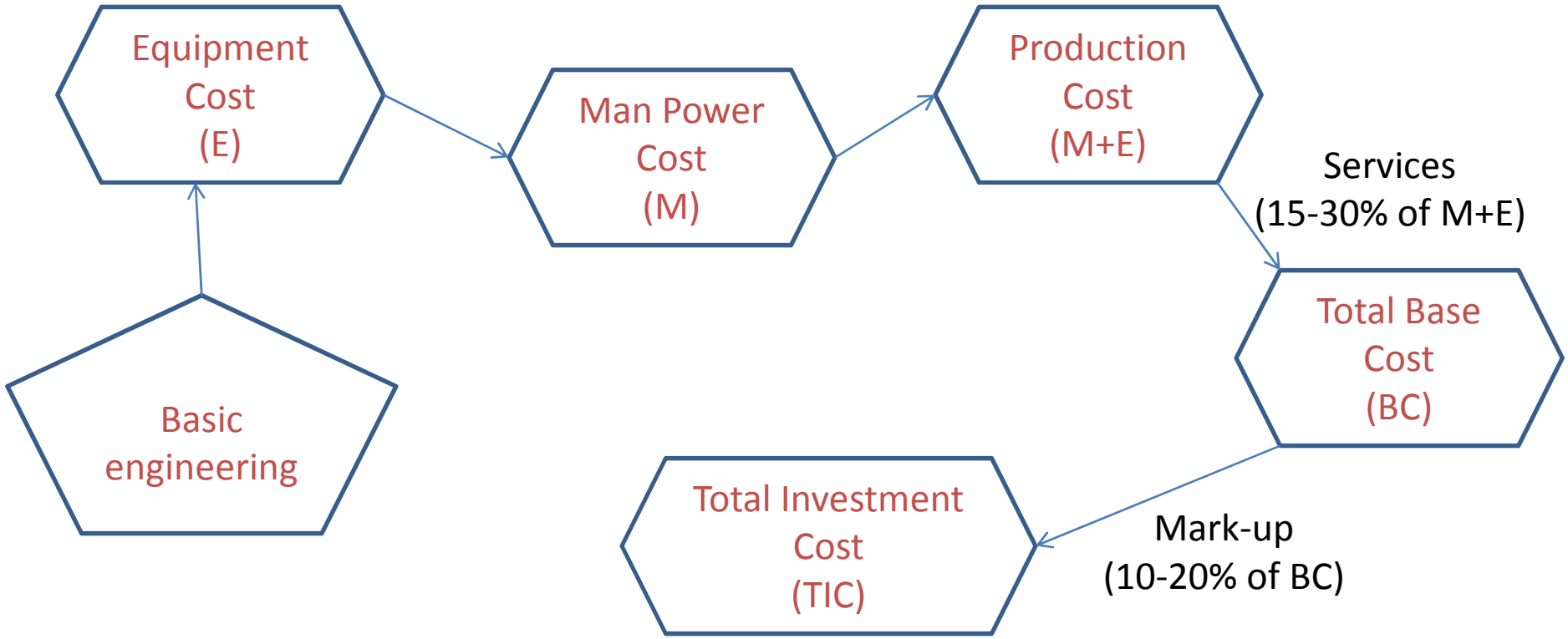
Estimation of project costs

The estimation depends on the typology and dimension of the product and it is based on the scale factor, corrected by the following parameters:

- **Logistic Factor**: impact from the location and distribution of working group and infrastructure;
- **Escalation Factor**: impact due to the growing of realization time;
- **Contingency Factor**: impact from possible contingencies;
- **Risk Factor**: whole impact of the previous three on the project results;



Semi-analytical Estimation



Key Concepts and Problems in X-oriented projects

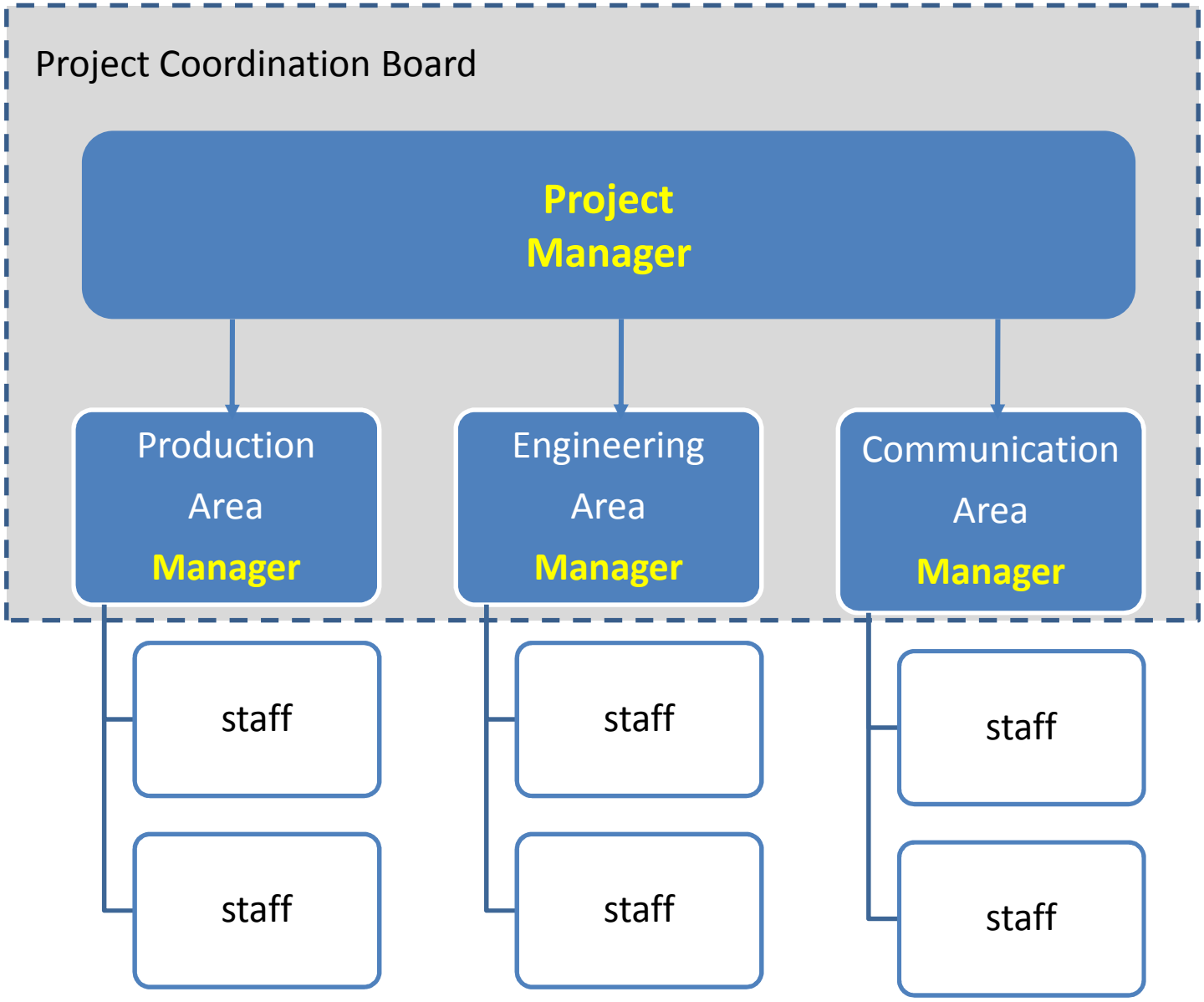
The PM-O (Project Management)-Oriented strategy foresees people involved full-time as administrators and managers. This implies:

- high action freedom of the Project Manager ➔ pyramidal structure of man power;
- hierarchical structure of responsibilities ➔ manager and area sub-managers;
- Careful control and evaluation policy for performances ➔ restricted operation procedures;
- strict correspondence between Work Breakdown Structure and Man power hierarchy;
- correct balancing between power, responsibility and needs in order to ensure fast decisions and weighted choices;

The P-O (Project-Oriented) approach is exactly the opposite. It implies:

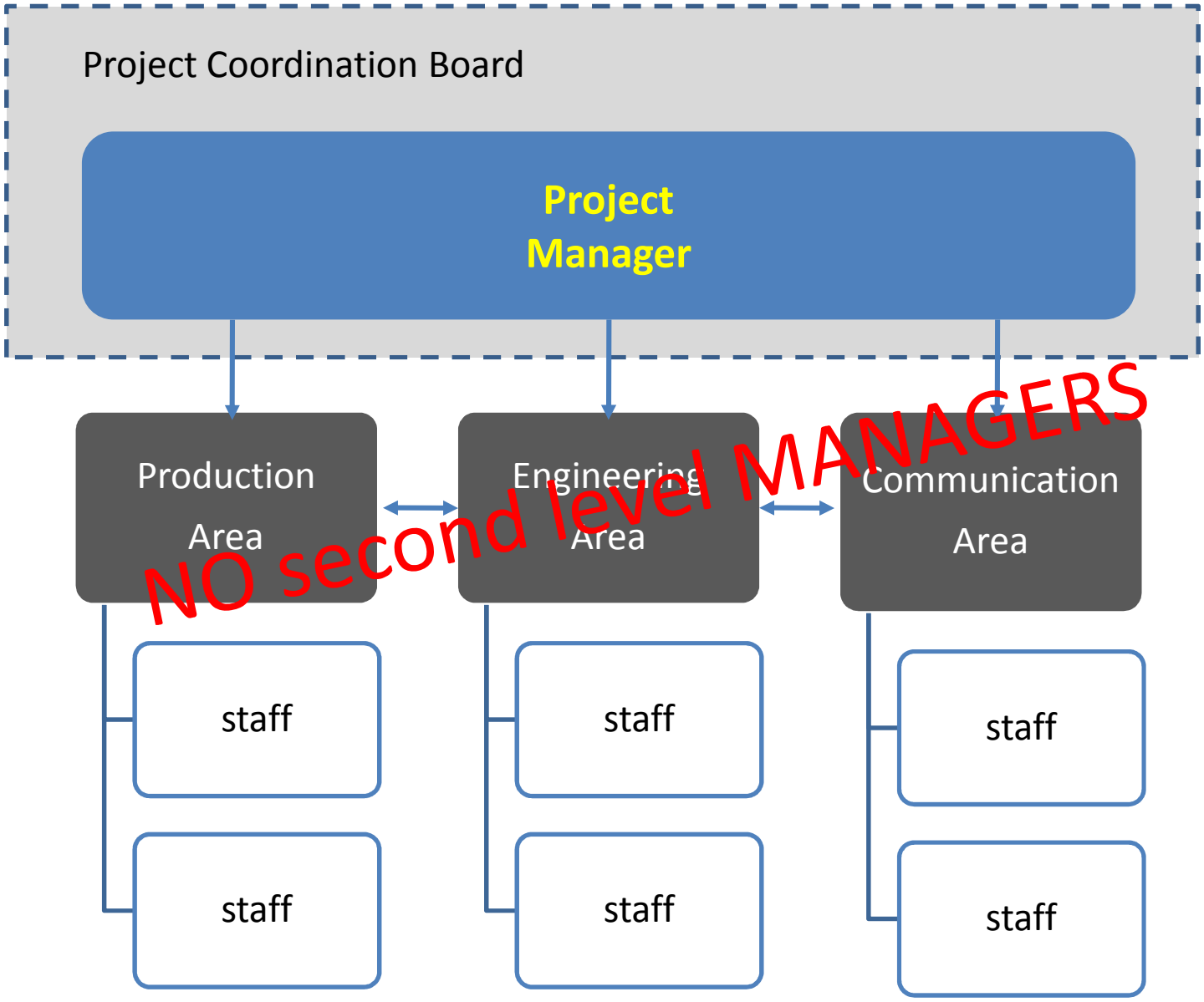
- the man power is frequently re-distributed on the base of needs of the project;
- each WG member replies directly to the unique Project Manager;
- Possible divisions are often dedicated to particular services and in any case the main responsible remains the Project Manager.

PM-O Scheme



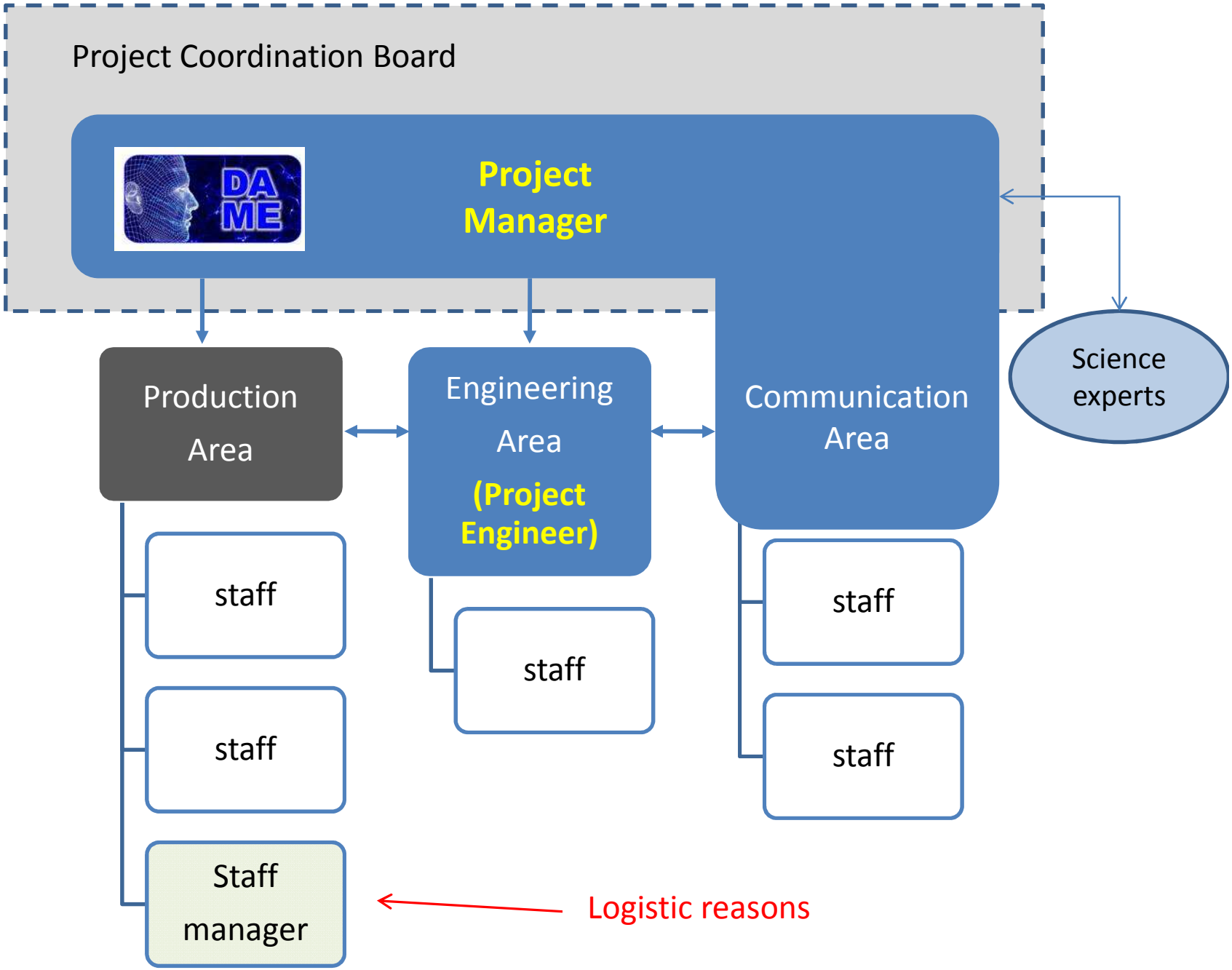
This was the first approach in DAME

P-O Scheme

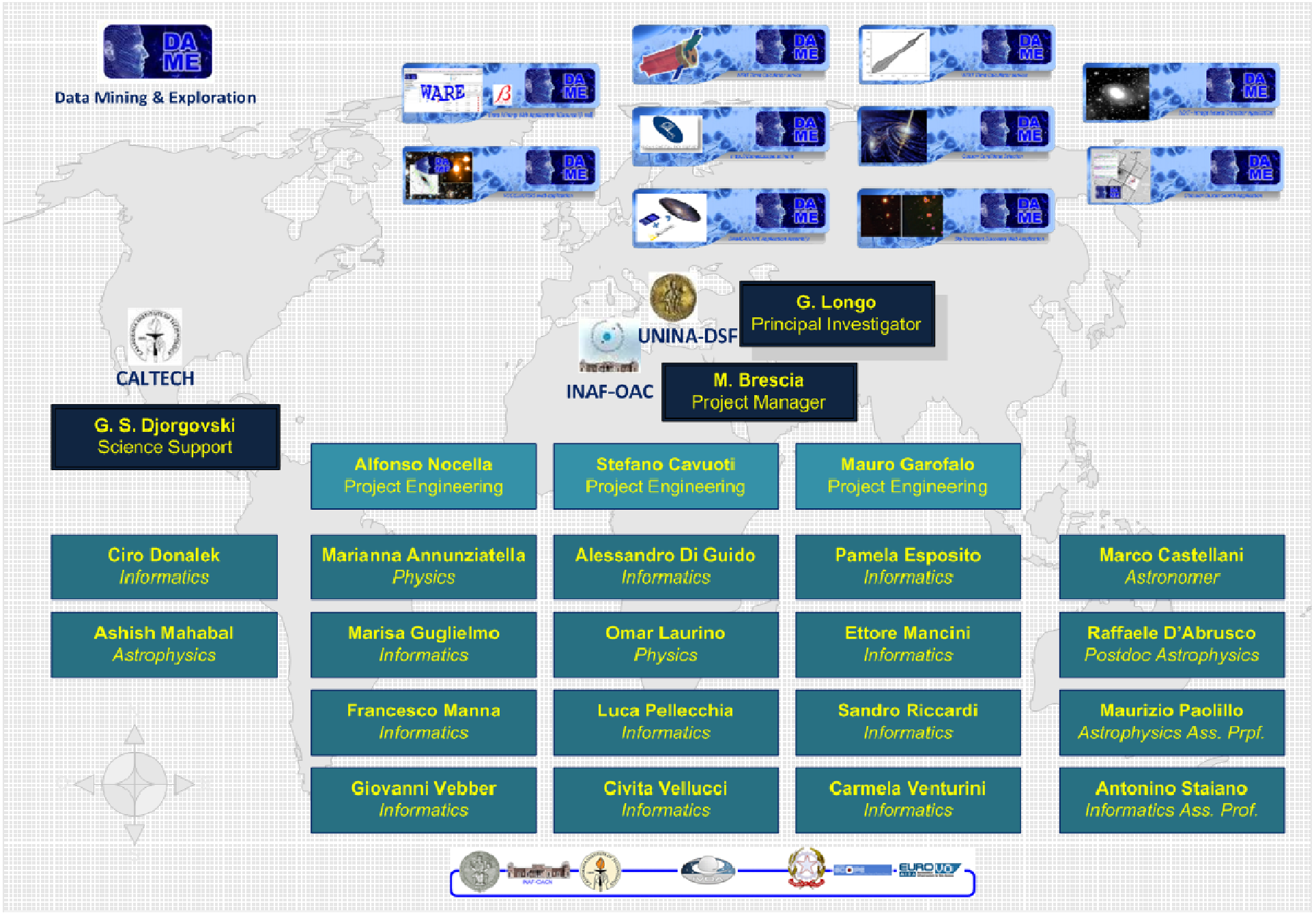


This was the recovery approach in DAME in a second phase, but not feasible for logistic reasons

Hybrid P-O Scheme – **The Final DAME case**



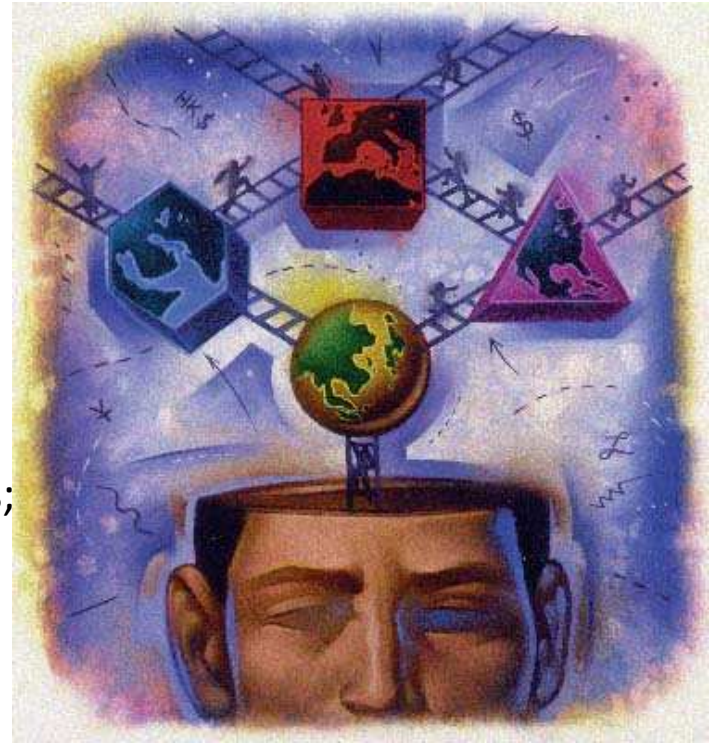
The DAME Working Group Organization



Properties of a Project Manager

The PM must have:

- experience;
- sufficient (not too much) technical knowledge on the required skill for the project;



- capability to:
  - define strategies at short, medium and long time levels;
  - evaluate goals, time, resources, costs and risks;
  - build and maintain efficient communication;
  - organize and supervise meetings;
  - manage activities in parallel;
  - delegate tasks, by recognizing man power skill levels and expertise;
  - supervise man power (align, motivate, stimulate, inspire);
  - take fast decisions;
  - use management tools (schedules, action items, documentation, etc..);
  - build working groups;
  - present and disseminate information at different layers (education, professional, politics);
  - handle conflicts;

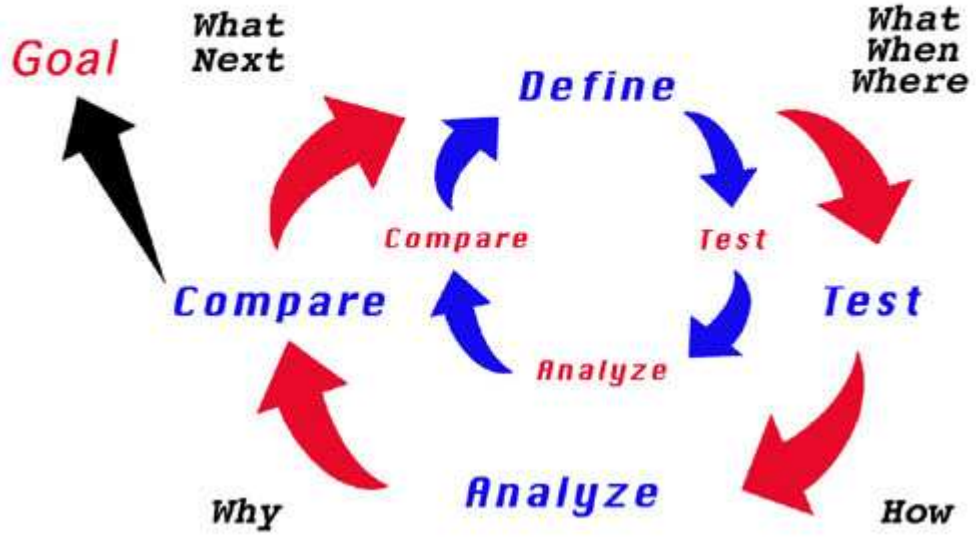
Problem Solving & Project manager

The techniques of Problem Solving should be applied along all the project life cycle. It is based on two key aspects:

- **Problem Definition**: to distinguish between causes and effects and to identify them properly;
- **Decision Making**: critical analysis of the contingent situation and fast reaction;

An important aspect is the **internationalization** of the project (both methodologies and goals of the project). This “globalization” on the one hand grows up the competition problems, but on the other hand, it can be an opportunity to find new collaborations, support, products and services, funds etc…

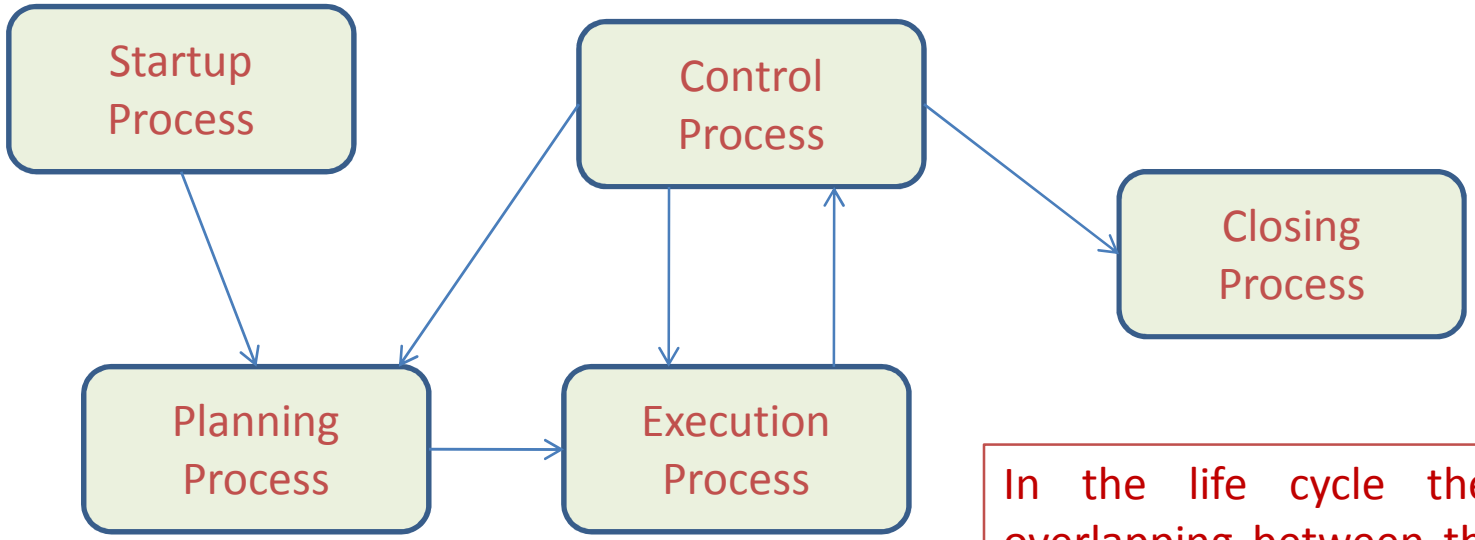
The Project Manager is responsible of the successful application of these techniques and must supervise the proper roadmap to adopt techniques, methodologies and instruments to solve all problems.



Project Management Processes

The Processes of the project management can be organized in five groups:

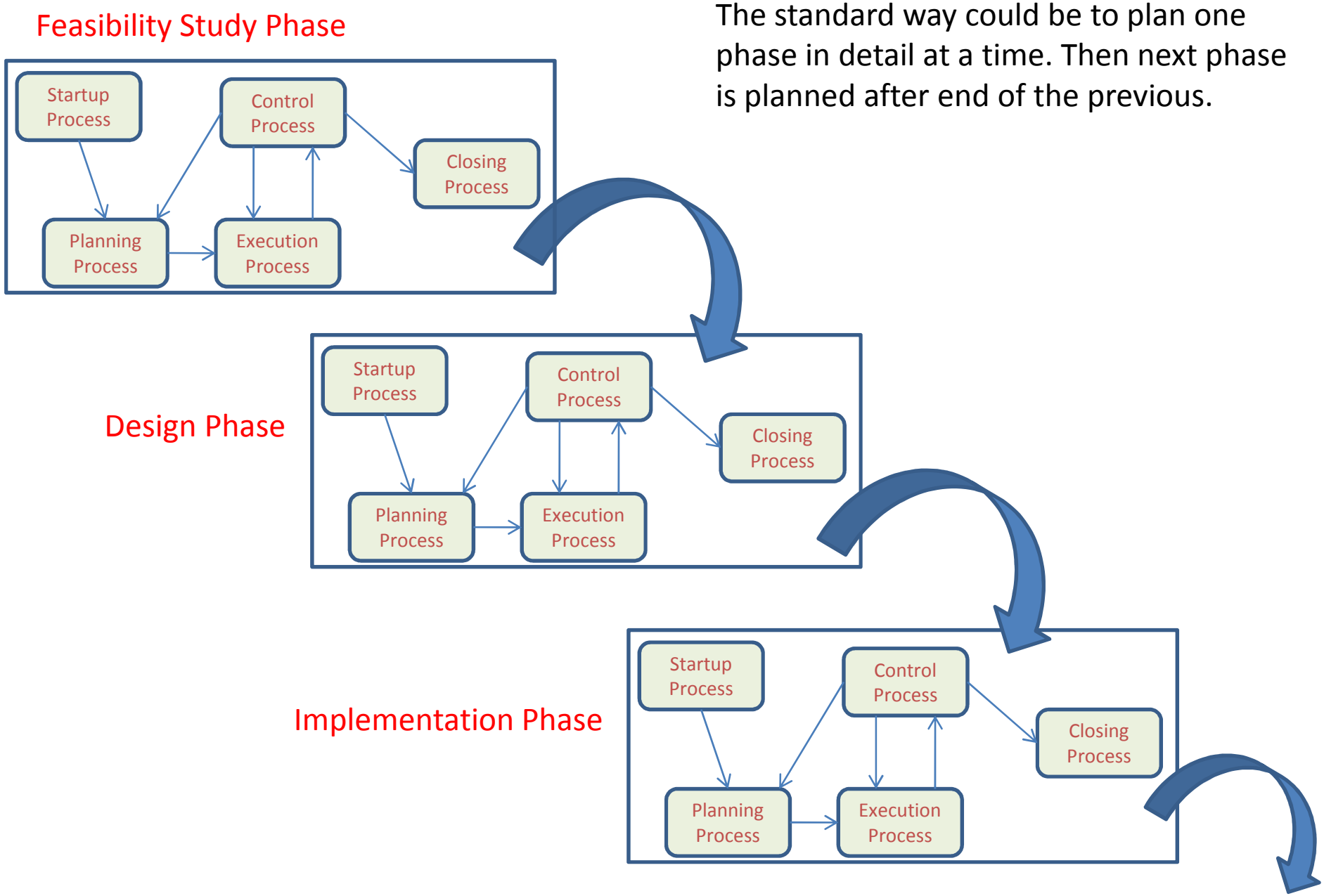
1. Startup Process: to identify the possible startup of the entire project or single activities/phases, and to make feasible its starting procedure;
2. Planning Process: to plan and organize a working scheme in order to reach the goals;
3. Execution Process: to coordinate people and resources in order to operatively apply the plan;
4. Control Process: to measure the performances and to monitor the situation in order to be able to take fast and efficient decisions and recovery actions;
5. Closing Process: to formalize the acceptance of a phase or the entire product of the project;



In the life cycle there is always an overlapping between these processes. The PM must be able to navigate these overlaps.

Interaction between Life Cycle phases

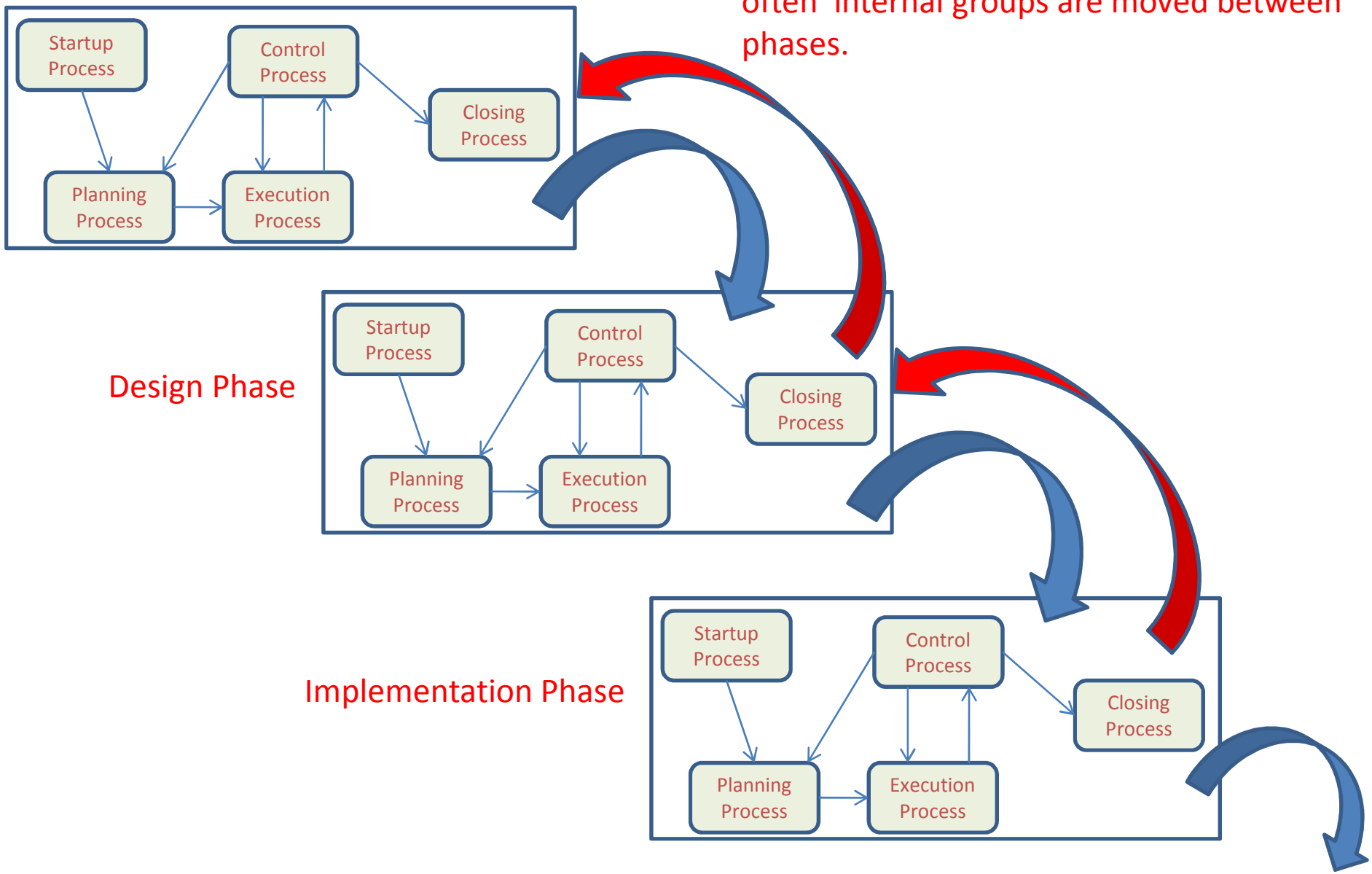
The standard way could be to plan one phase in detail at a time. Then next phase is planned after end of the previous.



Interaction between Life Cycle phases

Feasibility Study Phase

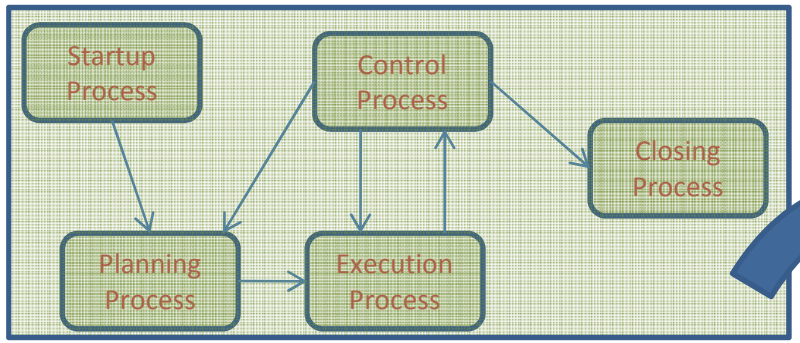
In practice it is more complicated because often internal groups are moved between phases.



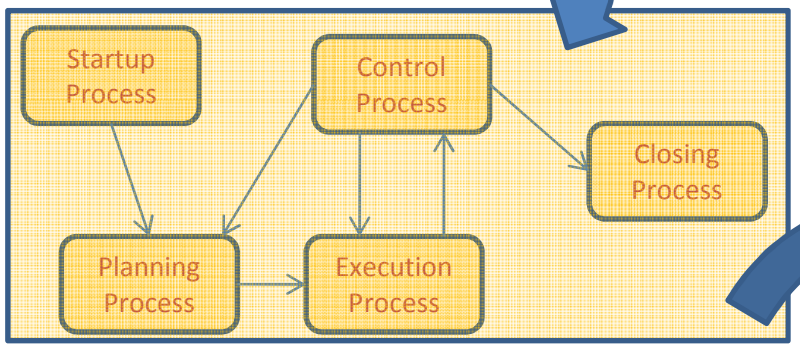
Interaction between Life Cycle phases

The solution is the ***Rolling Wave Planning.***
(One phase plan + next phase draft)…

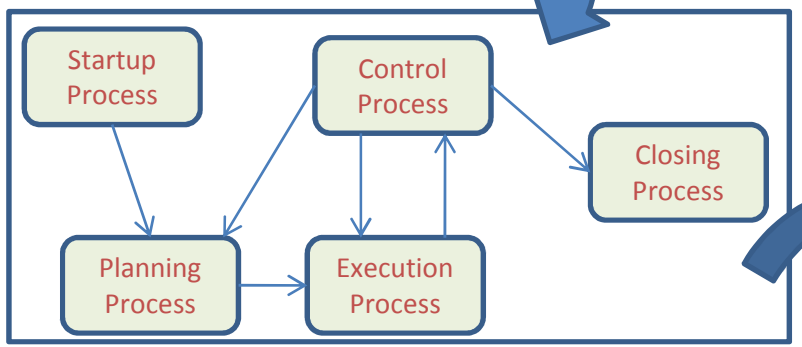
Feasibility Study Phase



Design Phase



Implementation Phase

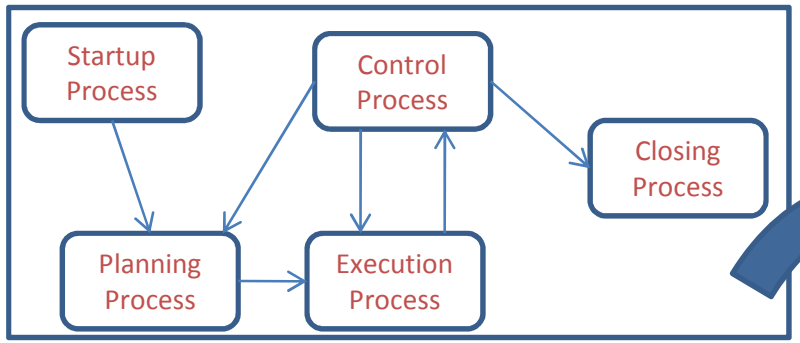


Interaction between Life Cycle phases

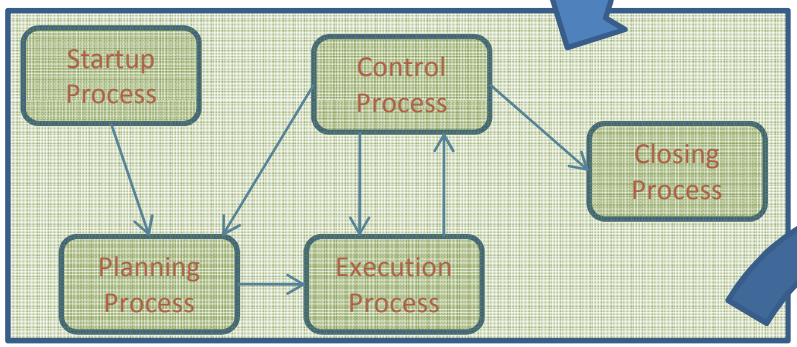
The solution is the ***Rolling Wave Planning.***
(One phase plan + next phase draft)…

…the hot water discovery!

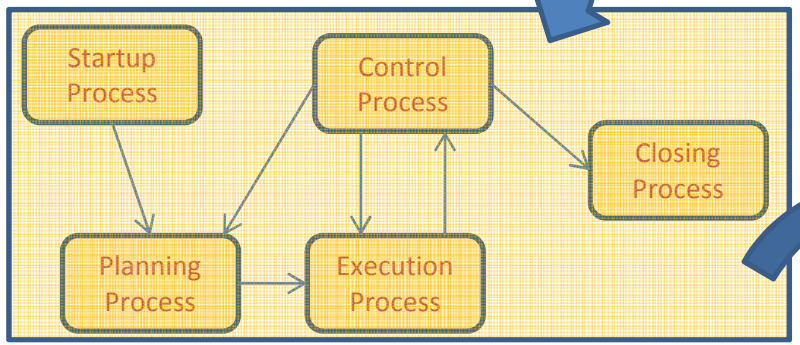
Feasibility Study Phase



Design Phase



Implementation Phase



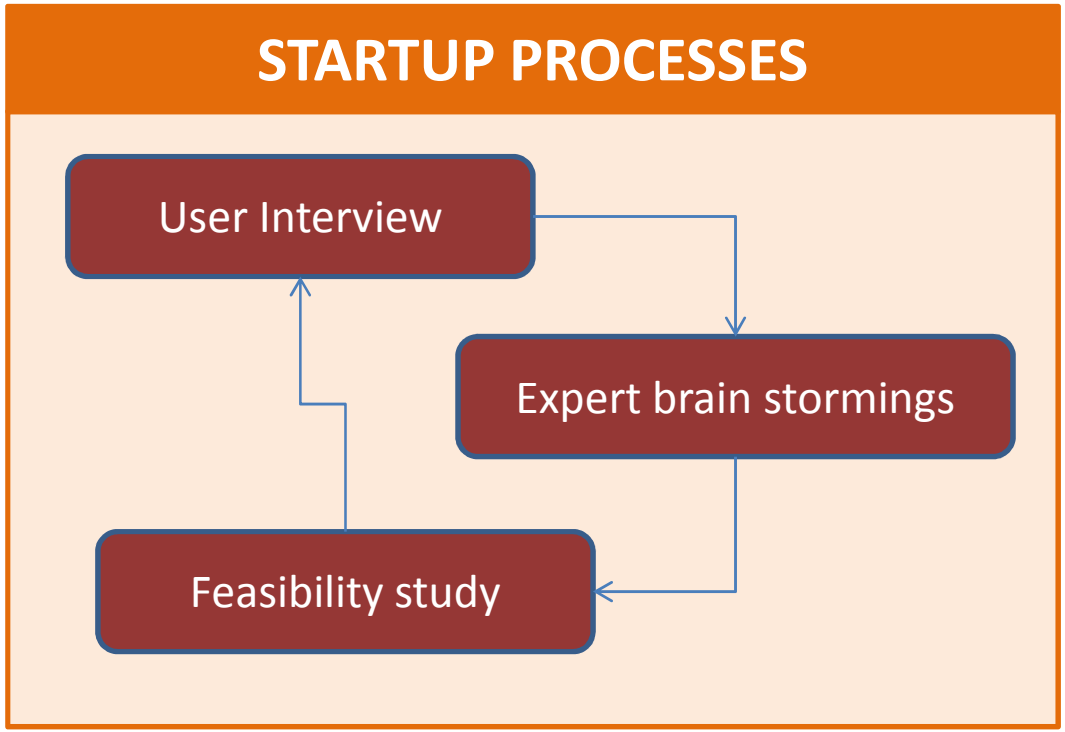
Interaction between Groups

The interactions between groups or between single processes are based on the direct connection between:

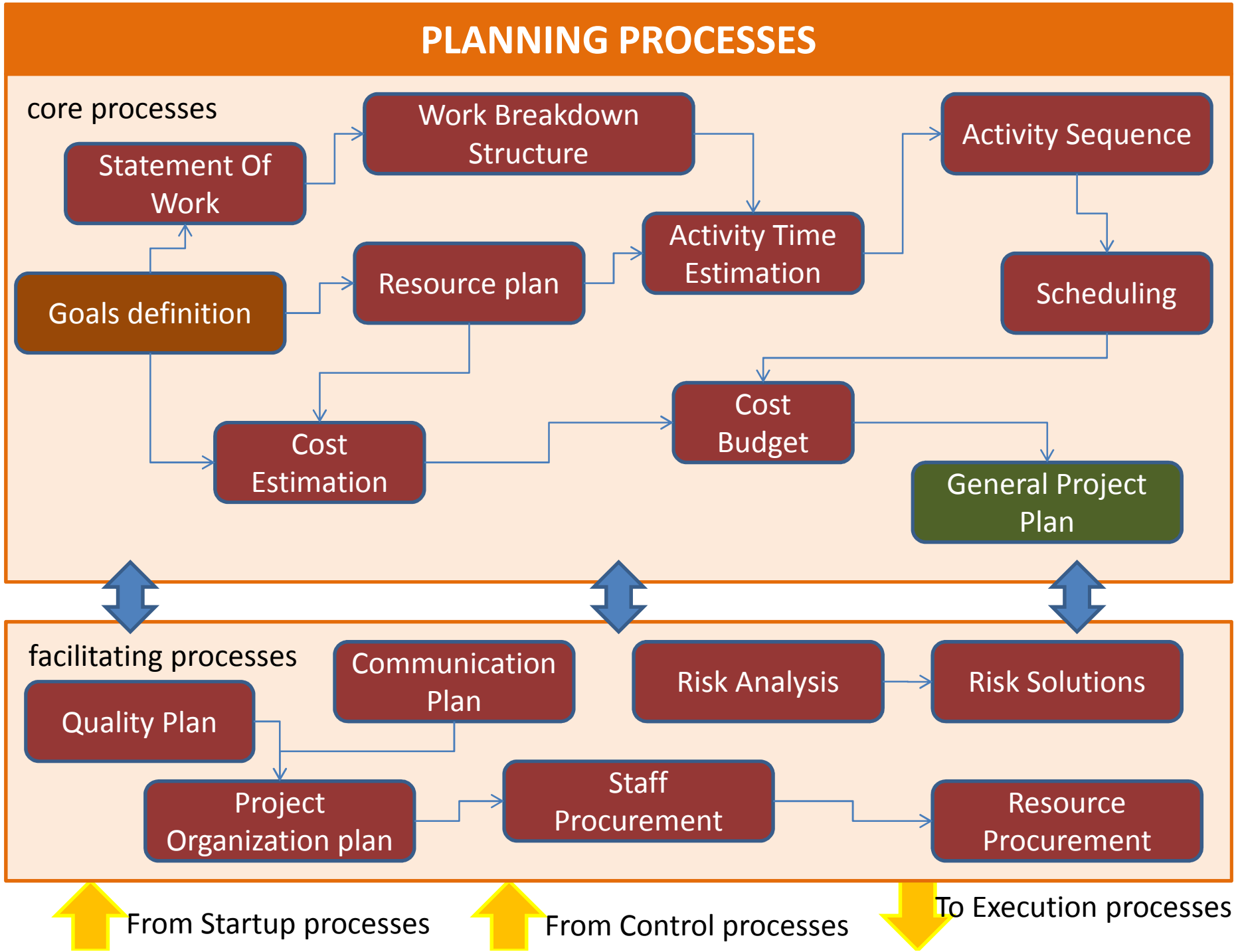
- Input: documents, tools required at the process startup;
- Output: documents, products of some process;
- Tools & Techniques: mechanisms that provide input-output relationships;

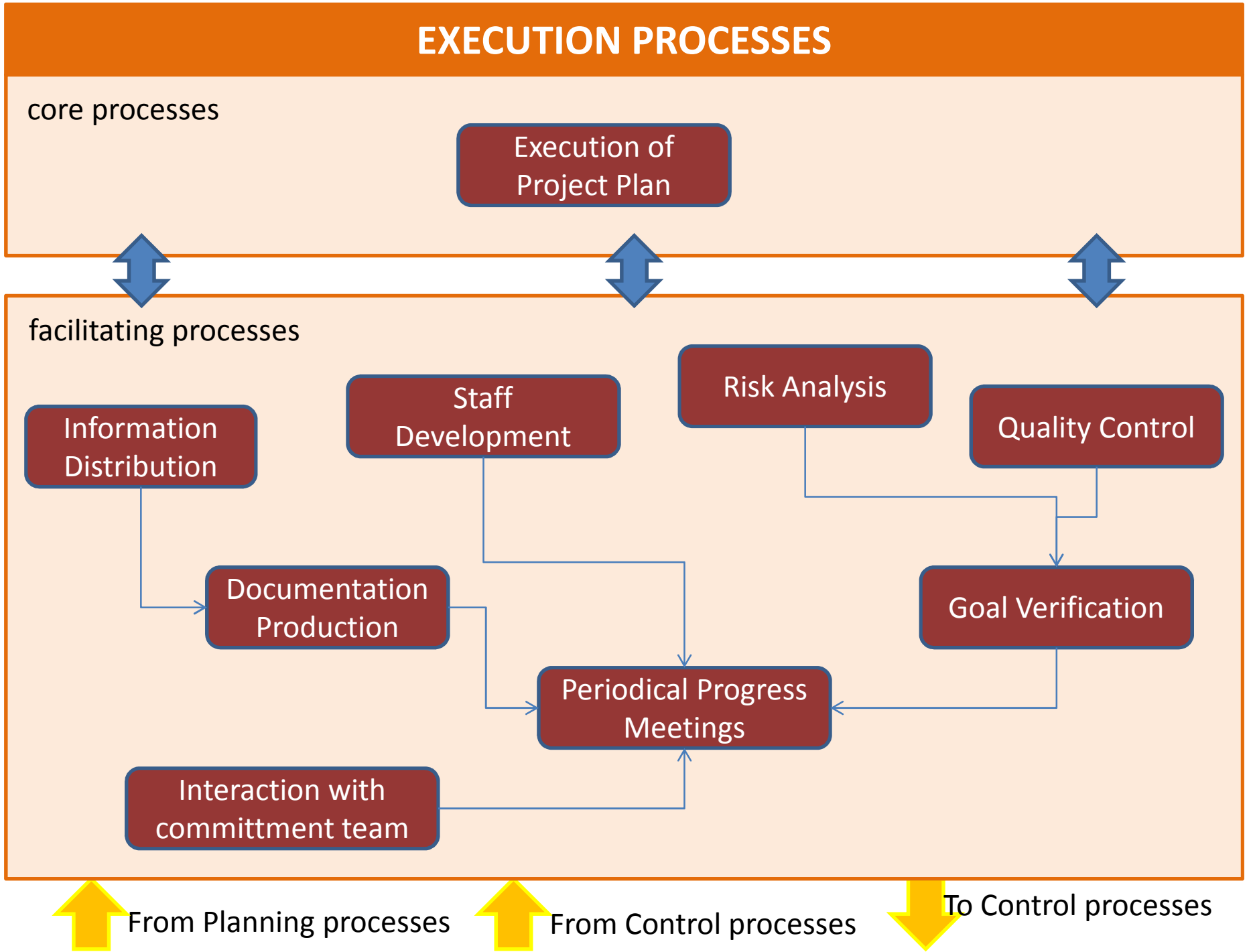
It is obviously important to spread the knowledge of processes and techniques, but it is always mandatory to maintain and preserve the single expertise, harmonized in a multidisciplinary environment.

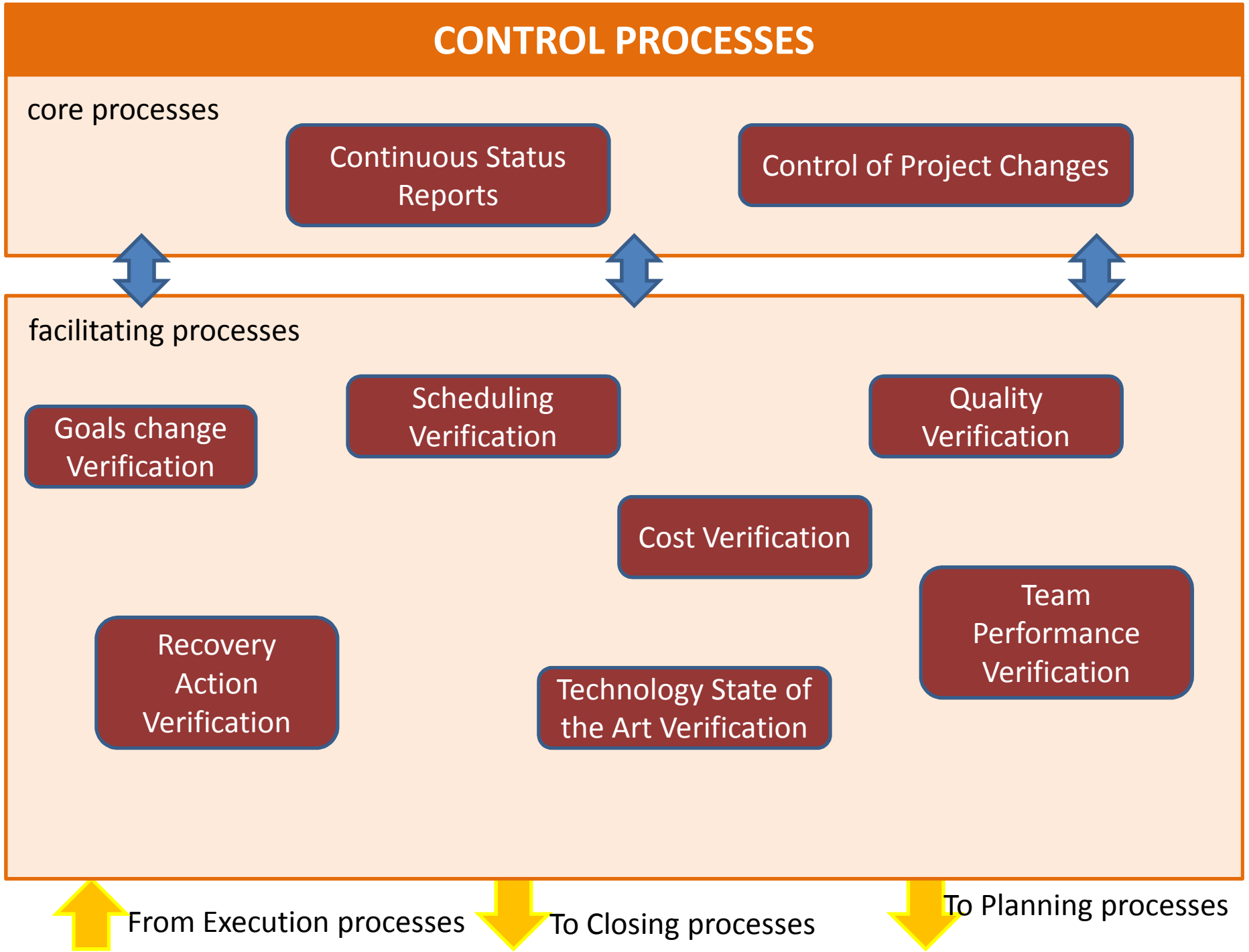
Startup Processes



To planning processes

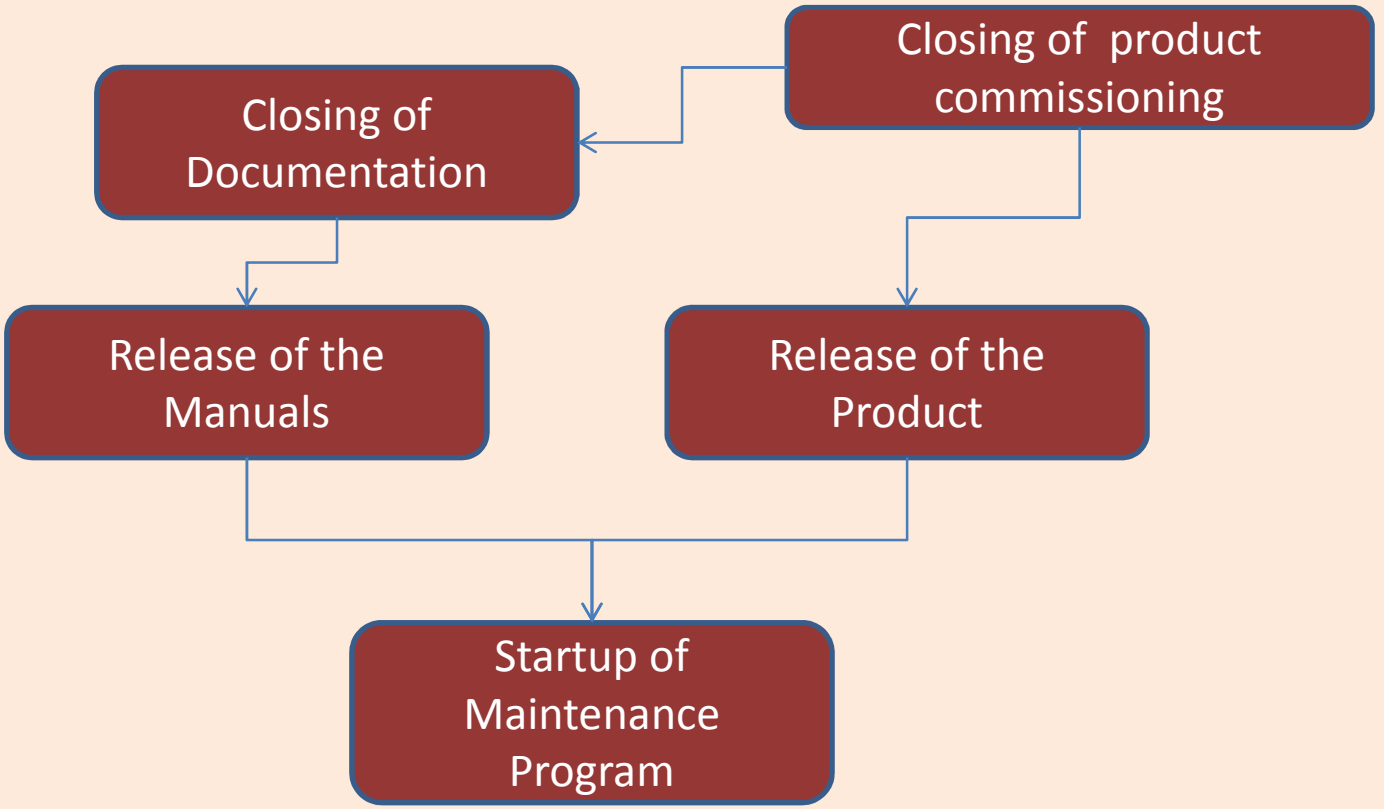

PLANNING PROCESSES
core processes
Statement Of Work
Work Breakdown Structure
Activity Sequence
Goals definition
Resource plan
Activity Time Estimation
Scheduling
Cost Estimation
Cost Budget
General Project Plan
facilitating processes
Communication Plan
Quality Plan
Risk Analysis
Risk Solutions
Project Organization plan
Staff Procurement
Resource Procurement
From Startup processes
From Control processes
To Execution processes


EXECUTION PROCESSES
core processes
Execution of Project Plan
facilitating processes
Information Distribution
Staff Development
Risk Analysis
Quality Control
Documentation Production
Goal Verification
Periodical Progress Meetings
Interaction with committment team
From Planning processes
From Control processes
To Control processes


CONTROL PROCESSES
core processes
Continuous Status Reports
Control of Project Changes
facilitating processes
Goals change Verification
Scheduling Verification
Quality Verification
Cost Verification
Team Performance Verification
Recovery Action Verification
Technology State of the Art Verification
From Execution processes
To Closing processes
To Planning processes

CLOSING PROCESSES

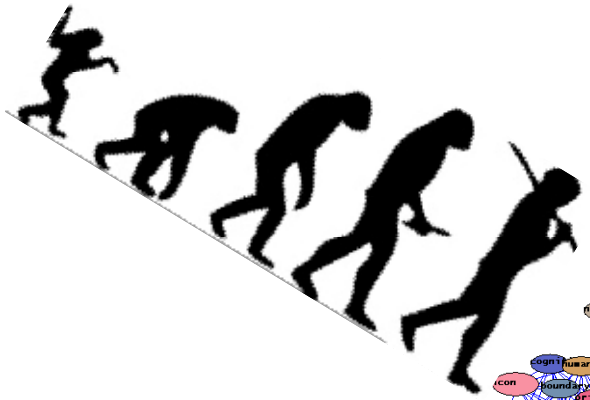
core processes



From Control processes

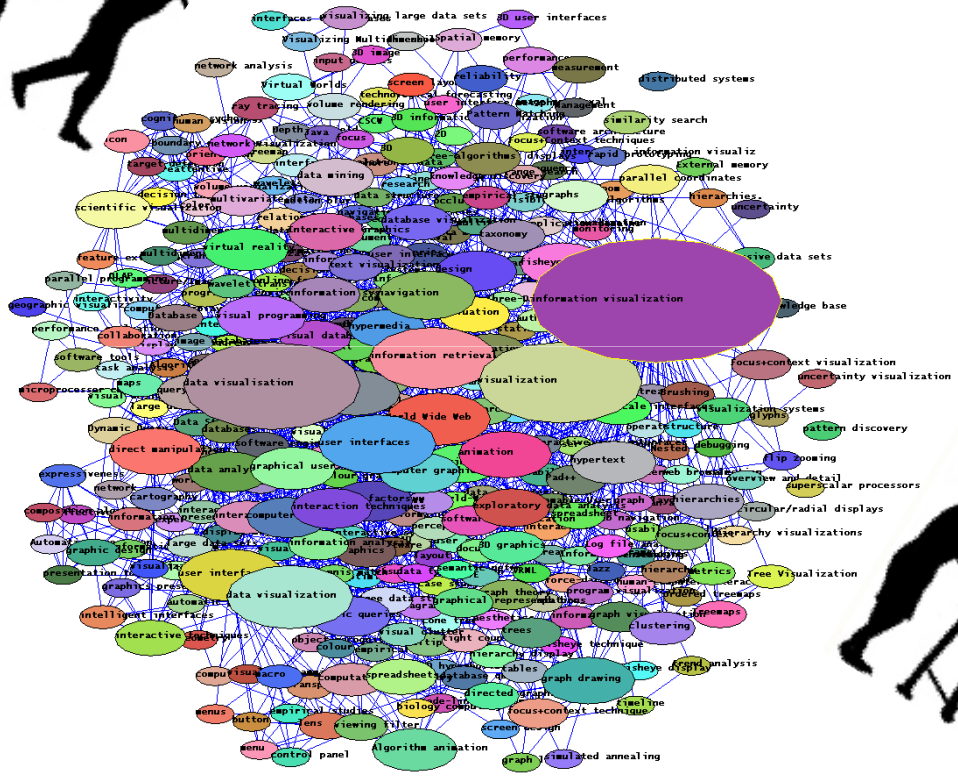
To Planning processes

Nature Process makes difference in a human project



The processes in a project are phenomena usually requiring:

- Human Resources with specific background;
- scientific, technical and operative experience;



But the processes in a project are phenomena usually driven by:

- causality;
- contingencies;