

# D 53v20

## Project management

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**Objective of the module:** Master project management to be able to:

- guarantee the financial success of the project
  - optimize costs and deadlines
  - reduce uncertainties

## 1 The project

### 1.1 History

The word project comes from the Latin: pro, which means “forward” and jacere, which means “to throw”

#### **Succeeding in a project means accomplishing a dream**

Every project is based on an expressed need and a team that provides an original solution.

The most marvelous projects date back to the dawn of time, such as the Great Wall of China, the pyramids of Giza, the city of Petra, the Colosseum, the Taj Mahal and the Eiffel Tower.

One of the essential concepts of work organization began in the 15th century with the interchangeability of parts, created by Johannes Gutenberg.

The genius of the Renaissance, Leonardo da Vinci, conceived and developed countless projects centuries ahead of his time.

In the 17th century, Jean-Baptiste Colbert desired and established quality regulations in manufacturing and commerce.

Adam Smith, in the 18th century, advocated the division of labor as a source of wealth and the market as a regulator of economic life.

Closer to modern times at the end of the 19th century, Frederick Taylor carried out detailed analyses of work (scientific organization of work).

Taylor's associate, Henry Gantt, is known for his (Gantt) chart used since the beginning of the 20th century.

In 1916, Henri Fayol published his famous text “Industrial and general administration” in which the five main functions of the industrial management of the company are listed: predict, organize, command, coordinate and control (POCCC).

In 1965, the International Project Management Association ([IPMA](#)) was created.

In 1969, the Project Management Institute ([PMI](#)) was created. The first edition of the PMBOK (Project Management Body Of Knowledge) - body of knowledge in project management dates back to 1987.

In 1989, the British government developed the PRINCE2 (Project In Controlled Environment) method.

In 2012, the [ISO](#) (International Organization for Standardization) published the ISO 21500 standard (Guidelines on project management).

In 2020, a new version was published under the title [ISO 21502](#) (2020) Project, program and portfolio management — Guidance on project management.

The ISO 21502 (2020) standard differs from ISO 21500 (2012) by the format (from the process approach to the practices approach) and modifications relating to the addition of:

- overseeing and management activities of the sponsor
- making profits
- the organizational context
- the environment favorable to success
- the life cycle of projects
- issues to be treated
- practices regarding benefits management and change control
- pre and post project activities

Any activity and practice can be represented by a process and vice versa; they are synonyms.

A project has three main characteristics:

- it is unique:
  - it is a specific response to a need
  - it has a product, service or event as a deliverable
  - it includes uncertainties
  - it has objectives to achieve
  - its context is specific
  - it has constraints
- it requires means (resources) such as:
  - competent people
  - time
  - finances
  - materials
  - work
  - support from top management (or a sponsor)
- it has a beginning and an end:
  - is made up of steps (stages)
  - ends with a positive financial solution (usually)

**Deliverable (expected result):** *any unique and verifiable product, result or capability to perform a service that must be produced to complete a process, phase, or project (PMBOK)*

Any project includes the control of:

- the organization of the team
- stakeholders
- the scope
- material resources
- improving staff knowledge and experience
- delays
- costs
- risks
- performance measurement
- purchases
- communication

The projects are countless. Some examples of generic projects:

- build:
  - a house
  - a building

- a highway
- a pyramid
- a nuclear power plant
- become:
  - a craftsman
  - an author
  - a composer
  - an interpreter
  - an actor
  - a translator
  - a developer
- create:
  - a business
  - a program for a group of people
  - a tool
  - software
  - a game
  - equipment
  - a machine
  - an instrument
  - a dish
  - a drink
- organize:
  - a show
  - an event:
    - birthday
    - marriage
    - exam
    - vacation
  - a campaign
  - adaptation to climate change
- launch:
  - a product
  - a store
  - a rocket
- provide:
  - a service:
    - audit a management system
    - outsource a process
- finance:
  - a business
  - research

Table 1-1 shows differences and common points between a project and a process.

*Table 1-1. Project and process*


<b>A project</b>	<b>A process</b>	<b>Common point</b>
is unique, new, responsive, exceptional	is repetitive, under control	added value
has a start date and an end date	regularly starts and finishes	steps
has a temporary structure	has a stable structure	a structure

involves inevitable changes	avoids changes	changes
aims to obtain a specific result only once	aims to always obtain the same result	a result
includes an unknown risk, often high	includes an identified risk, often low	a risk
requires a significant investment	generates a profit	money
requires a multidisciplinary team	requires a competent team	a team
requires significant preparation (planning)	requires continual preparation, it is routine	preparation
establishes a set of specific documents	uses validated documents	documents

## 1.2 Scope

**The more precise the scope, the fewer problems will have to be solved later**

**Scope:** *description of what must be done to obtain the expected results*

The scope (perimeter, content) of a project, cf. annex 01, often includes: 

- the department:
  - direction
  - methods
  - design office
  - quality
  - purchases
  - logistics
  - manufacturing
  - reception
- the need (project description)
- the context:
  - external issues
  - internal issues
- deliverables:
  - the product
  - the service
- requirements:
  - the characteristics
  - the functionalities
  - acceptance criteria
- what the product will and will not do:
  - inclusions
  - exclusions
- constraints
- the works
- technology
- the tests

The ISO 215002 standard provides recommendations only on project management. For recommendations on program and portfolio management, please consult the ISO 21503 and ISO 21504 standards.

The performance of a project, shown in figure 1-1, can be represented by a triangle and its three objectives (quality, costs, deadlines), which can also be considered as constraints.



Figure 1-1. The performance of a project

When you are asked to choose two of the three objectives of the project, “good, fast or cheap”, know that this is a tricky question! Any priority given to two of the objectives will be to the detriment of the third and this is often a bad omen.

Anyone with skills and some experience can earn a certificate in project management. The most popular are:

- PRINCE2 by AXELOS:
  - Foundation
  - Practitioner
- PMI (Project Management Institute):
  - CAPM (Certified Associate in Project Management)
  - PMP (Project Management Professional)
  - PgMP (Program Management Professional)
- IPMA with versions A, B, C and D of IPMA (International Project Management Association)

Project management is used in many areas such as:

- the company
- construction
- the research
- insurance
- the bank
- the army
- energy
- aerospace
- trade
- medicine
- transportation
- communication

### 1.3 Benefits

## **There is no project without risk, but, for a company, the greatest risk is not having a project**

Expected benefits of exemplary project management:

- improved stakeholder confidence
- improvement of project performance
- improvement of the company's reputation
- added value for the company
- obtaining a competitive advantage
- increased likelihood of achieving objectives
- increase in opportunities to be seized
- creation of something unique each time
- reduction of the risk of project failure
- decrease in losses
- establishment of an adequate framework for the implementation in a controlled manner of any activity
- establishment of a reliable basis for decision-making
- identification of gaps
- less work to redo
- optimization of resource use
- protection of company assets
- effective response to changes
- reduction of costs and deadlines
- reduction of operational surprises
- increased visibility of the responsibilities of each staff member

### **Managing a project means avoiding making mistakes**

But a project can be poorly or even very poorly managed, cf. annex 02. 

According to studies by the Standish Group, the abandonment rate of a project is closely linked to its efficiency rate as shown in figure 1-2.

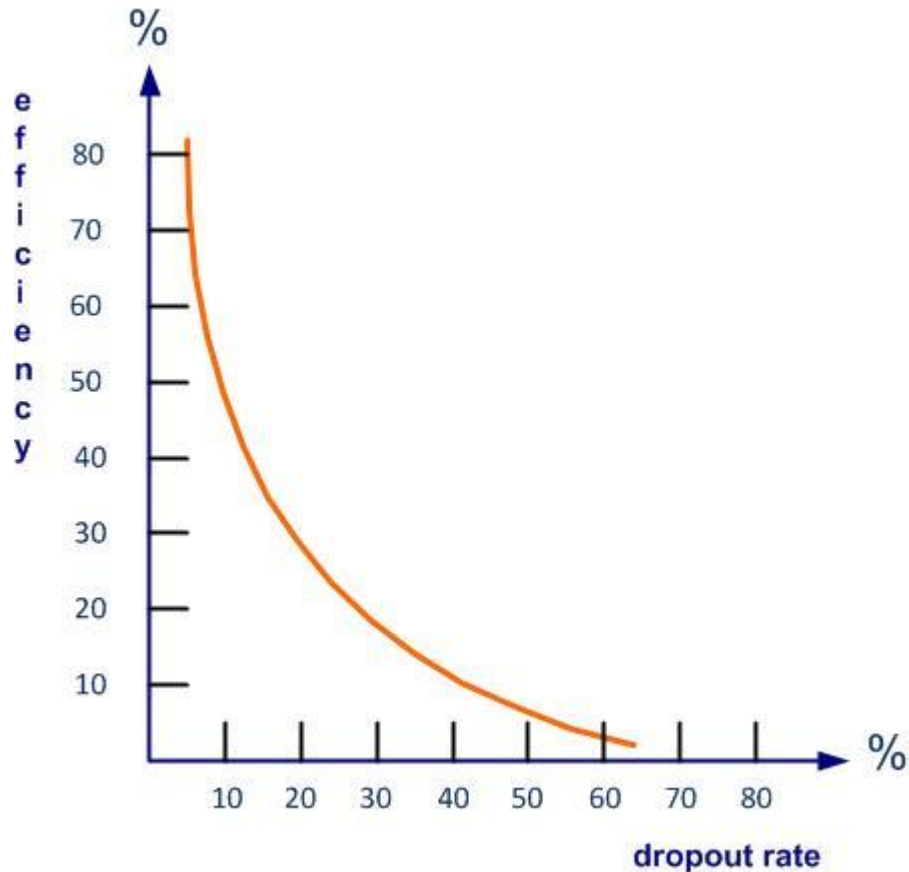


Figure 1-2. Efficiency and abandonment



Examples of root causes of failures:

- lack of:
  - resources
  - monitoring
- poorly planned and insufficient budget
- poorly understood requirements
- inconsistent specifications
- unrealistic objectives
- unplanned activities
- unassessed risks
- insufficient support from top management

### Who apologizes accuses himself

Common excuses for failure:


- it was the responsibility of top management
- this was not an explicit requirement in the contract
- how could I have an effective plan in the face of so many potential problems?
- give me enough time and everything will be sorted
- in the event of a serious emergency situation, the implication will be completely different
- there was not enough time
- there was no staff available
- there are more important things to do
- I was sure we could cope
- I didn't realize it was so serious



- I didn't think it was a key process
- I didn't think this would happen
- insurance had to take care of this situation
- the contract was already signed
- you cannot plan for the unexpected
- we had not done this simulation

According to some studies, nearly 30% of projects are doomed to failure and more than 50% of projects exceed their initial budget.

**Project science consists of preventing difficulties in execution. Luc de Vauvenargues**

A list of project management successes and failures can be found in annex 03. 

## 2 Standards, definitions, books

### 2.1 Standards

The main standards related to project management:



- ISO 21500 (2021) Project, program and portfolio management - [Context and concepts](#)
- ISO 21502 (2020): Project, program and portfolio management – [Guidance on project management](#)
- ISO 21503 (2022): Project, program and portfolio management – [Guidance on program management](#)
- ISO 21504 (2022): Project, program and portfolio management – [Guidance on portfolio management](#)
- ISO 21505 (2017): Project, program and portfolio management – [Guidance on governance](#)
- ISO/TR 21506 (2018): Project, program and portfolio management - [Vocabulary](#)
- ISO 21508 (2018): [Earned value management in project and program management](#)
- ISO 21511 (2018): [Work breakdown structures for project and program management](#)
- ISO 55000 (2014): Asset management - [Overview, principles and terminology](#)
- ISO 55001 (2014): Asset management - Management systems - [Requirements](#)
- IEC 62198 (2013): Managing risk in projects – [Application guidelines](#)
- PRINCE2 (2017): [Managing Successful Projects with PRINCE2](#)
- ISO 10006 (2017): Quality management - [Guidelines for quality management in projects](#)
- PMBOK (2017): [A Guide to the project management body of knowledge](#)
- ISO 10005 (2018): Quality management - [Guidelines for quality plans](#)
- ISO 31000 (2018): Risk management - [Guidelines](#)
- [Practice Standard for Work Breakdown Structures](#) (2019)

Some French references:



- X50-105 (1991): Project management – [Concepts](#)
- FD X50-116 (2003): Project management: [Management by projects](#) - Presentation and implementation recommendations
- FD X50-117 (2003): Project management - Risk management - [Project risk management](#)
- FD X50-137 (2006): Project management - [Cost management](#)
- FD X50-138 (2006): Project management - [Deadline management](#). Organization, planning, coordination
- NF X50-115 (2017): [Project and program management](#) - General presentation


And also:

- ISO 9000 (2015): Quality management systems – [Fundamentals and vocabulary](#)
- ISO 9001 (2015): Quality management systems - [Requirements](#)

**Project Management Body of Knowledge**: *set of standard terminology and guidelines (a body of knowledge) for project management*

For simplicity, this module is based on ISO 21502. This standard does not contain requirements (there is no verb “shall”). They are recommendations on project management. Verbs are, for example:

- should
- could
- can
- it suits
- it is important
- it is recommended
- it is possible
- it is necessary
- it is essential
- it is accepted
- there occurs

The correspondences between the ISO 21502, ISO 21500, ISO 10006 and PMBOK standards are shown in annex 04. To go further, you can use the “Project Management Body of Knowledge” guide. If your interest is mainly focused on the quality of a project, you should use ISO 10006. 

None of these standards are obligatory but as Deming said:

**It is not necessary to change. Survival is not mandatory**

## 2.2 Definitions

**The beginning of wisdom is the definition of terms. Socrates**

There are multiple definitions of the word “project”. Some examples:

- image of a situation, of a state that we think we will achieve (Robert Dictionary)
- a problem whose solution is planned (Joseph Juran)
- temporary business initiated with the aim of providing a unique product, service or result (PMBOK)
- unique process, consisting of a set of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective conforming to specific requirements, including the constraints of time, cost and resources ( ISO 9000)
- temporary organization that is created for the purpose of delivering one or more commercial products in accordance with an agreed business case (PRINCE2)
- unique process undertaken to achieve an objective (ISO 10006)

Our preference:

**Project:** *temporary effort initiated with the goal of solving a problem*

Some definitions and acronyms:

**Activity (step, phase):** *set of tasks to obtain a deliverable*

**Benchmarking:** *comparative analysis method in connection with one or more competitors*

**Brainstorming:** *method allowing the development of ideas from the participants in order to find solutions*

**Business case:** *document supporting decision-making relating to a project*

**Cf.:** *confer (from Latin), compare, see*

**Constraint:** *factor that limits the completion of a project*

**Control:** *see inspection*

**Critical activity:** *any activity that impacts a project as a whole*

**Deliverable:** result of a project

**Duration:** work period necessary to finalize an activity

**Effort:** cost necessary to finalize an activity in people/days

**Enterprise risk management:** global approach to controlling uncertainties and their interactions in business

**FIFO:** First in, first out

**FMEA:** Failure Modes and Effects Analysis. Technical risk prevention approach

**Hazard:** situation that could lead to an incident

**Identify the hazard:** ask yourself what could go wrong

**Impact:** consequence of an event affecting the objectives

**Inspection:** actions of measuring, testing and examining a product, service, process or material to determine conformity with requirements

**Likelihood:** possibility that something happens

**Management system:** set of processes allowing objectives to be achieved

**Milestone:** significant point or event

**MS:** management system

**Non-quality:** gap between expected quality and perceived quality

**NVA:** Non-Value Added. What the customer is not ready to pay

**Opportunity:** uncertain event that may have a favorable impact

**Project life cycle:** all phases from start to finish of a project

**Project management:** the use of specific knowledge, skills, tools and techniques to deliver something of value to people (PMI)

**Quality:** ability to meet requirements

**Requirement:** implicit or explicit need or expectation

**Responsibility:** ability to make a decision on your own

**Risk analysis:** risk assessment activity to understand the nature of a risk and determine its impact

**Risk assessment:** risk identification, analysis and evaluation process

**Risk factor (peril, danger):** element likely to cause a risk

**Risk identification:** assessment activity to find and describe risks

**Risk level:** criticality of the risk according to the impact and likelihood

**Risk management plan:** risk management planning including approach, steps, methods, resources

**Risk management system:** set of processes enabling the risk objectives to be achieved

**Risk management:** activities to restrict the possibility that something goes wrong

**Risk measurement:** set of possibilities with quantified probabilities and losses

**Risk owner:** person with responsibility and authority to manage risk

**Risk prevention:** activities based on decreasing risk likelihood of occurrence

**Risk protection:** activities based on reducing risk impacts

**Risk severity:** measurement of risk impact

**Risk threshold:** acceptance limit (below) or non-tolerance limit (above)

**Risk treatment:** risk modification activities

**Risk:** likelihood of occurrence of a threat or opportunity

**Safety:** absence of unacceptable risk

**Schedule (of the project):** activities with planned dates, durations, milestones and resources

**Sponsor (of the project):** person or group ordering and recipient of the project

**Stakeholder:** person, group or organization that can affect or be affected by a company

**Strategy:** total approach to achieve objectives

**Surveillance:** set of planned actions to ensure the effectiveness of control measures

**SWOT:** Strengths, Weaknesses, Opportunities, Threats. Tool for structuring a risk analysis

**System:** set of interactive processes

**Task (action, operation):** any work during a period leading to a result

**Threat:** uncertain event that could have a negative impact on objectives

**Uncertainty:** existence of more than one possibility

**Work breakdown structure:** *breaking down a project into work elements*

In the terminology of management systems, do not confuse:

- accident and incident:
  - an accident is an unexpected serious event
  - an incident is an event that can lead to an accident
- activity, deliverable and task:
  - an activity is a set of tasks
  - a deliverable is the result of an activity
  - a task is a series of simple operations
- anomaly, defect, dysfunction, failure, nonconformity, reject and waste:
  - an anomaly is a deviation from what is expected
  - a defect is the non-fulfillment of a requirement related to an intended use
  - a dysfunction is a degraded function that can lead to a failure
  - a failure is when a function has become unfit
  - a nonconformity is the non-fulfillment of a requirement in production
  - a reject is a nonconforming product that will be destroyed
  - a waste is when there are added costs but no value
- audit program and plan
  - an audit program is the annual planning of the audits
  - an audit plan is the description of the audit activities
- audit, inspection, auditee and auditor
  - an audit is the process of obtaining audit evidence
  - an inspection is the conformity verification of a process or product
  - an auditee is the one who is audited
  - an auditor is the one who conducts the audit
- cause and symptom
  - the cause is the circumstance leading to a failure
  - the symptom is the character linked to a state
- complex and complicated project
  - a project is complex when information is unknown to us (reproducing an air flow)
  - a project is complicated when the difficulty is technical (building a rocket)
- control and optimize
  - to control is to meet the objectives
  - to optimize is to search for the best possible results
- customer, external provider and subcontractor
  - a customer receives a product
  - an external provider provides a product on which specific work is done
  - a subcontractor provides a service or product on which specific work is done
- duration and effort
  - duration is the period during which the activity is carried out
  - effort is the time spent by a person to complete an activity
- effectiveness and efficiency
  - effectiveness is the level of achievement of planned results
  - efficiency is the ratio between results and resources
- follow-up and review
  - follow-up is the verification of the obtained results of an action
  - review is the analysis of the effectiveness in achieving objectives
- hazard, problem and risk
  - a hazard is the state, the situation, the source which can lead to an accident
  - a problem is the gap between the actual situation and the desired situation
  - a risk is the measure, the consequence of a hazard and it is always a potential problem

- inform and communicate
  - to inform is to give someone meaningful data
  - to communicate is to pass on a message, to listen to the reaction and discuss
- mapping and organization chart
  - mapping is the graphic presentation of processes and their interactions in a company
  - the organization chart is the graphic presentation of the departments and their links in a company
- objective and indicator
  - an objective is a sought-after commitment
  - an indicator is the information on the difference between the pre-set objective and the achieved result
- operation and project
  - an operation is carried out by a stable team using repetitive processes
  - a project is carried out by a temporary team using a unique process
- organization and enterprise, society, company
  - organization is the term used by ISO standards as the entity between the supplier and the customer
  - an enterprise, society and company are examples of organizations
- prevention and protection, cf. figure 2-1
  - prevention is the means to reduce the likelihood and frequency of occurrence of a risk (checking tire pressure)
  - protection is the means to limit the impact of a risk (fastening your seat belt)
- probability, uncertainty and likelihood
  - probability expresses the quantitative analysis of uncertainty
  - uncertainty is the imprecision of predicting
  - likelihood expresses the qualitative analysis of uncertainty
- process, procedure, product, activity and task
  - a process is how we satisfy the customer using people to achieve the objectives
  - a procedure is the description of how we should conform to the rules
  - a product is the result of a process
  - an activity is a set of tasks
  - a task is a sequence of simple operations
- program and portfolio
  - a program brings together projects and other activities
  - a portfolio is a set of project programs and other activities
- project client and sponsor
  - the project client is the customer of the project
  - the sponsor is the boss of the project
- schedule and plan
  - a schedule is a plan and resources
  - a plan is the set of activities and durations

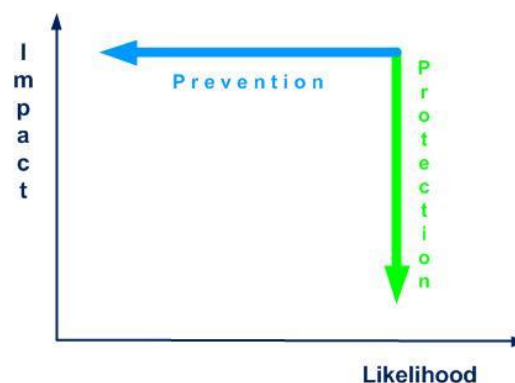


Figure 2-1. Prevention and protection

*Remark 1: between project manager and project leader, our preference is for project manager*

*Remark 2: between risk owner and risk driver our preference is for risk owner*

*Remark 3: between scope, content and perimeter our preference is for scope*



*Remark 4: between likelihood and probability, our preference is for likelihood (of appearance)*

*Remark 5: a risk can have negative impacts (we speak of threats) or positive impacts (we speak of opportunities). Seizing an opportunity is taking risks, but not seizing an opportunity can expose us to risk. Risk is often assimilated with hazard and commonly used instead of threat.*

*Remark 6: each time you use the expression “opportunity for improvement” instead of non-conformity, dysfunction or failure you will gain a little more trust from your interlocutor (external or internal customer)*














*Remark 7: the use of ISO 9000, ISO 19011 and ISO/TR 21506 definitions is recommended. The most important thing is to determine a common and unequivocal language for everyone in the company.*

For other definitions, comments, explanations and interpretations that you don't find in this

module and in annex 06, you can consult:  

- ISO [Online Browsing platform](#) (OBP)
- IEC [Electropedia](#)

The icons used in the module:

-  explanation, example, detail, rule
-  purpose (goal)
-  other
-   input
-  practice (activity)
-   output
-  process
-  record
-  procedure (documented)
-  question (to ask or ask yourself)
-  joke



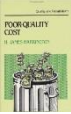

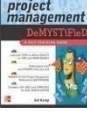

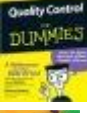


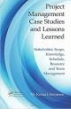
-  game
-  trap to avoid

## 2.3 Books


**When I think of all the books still left for me to read, I am certain of further happiness. Jules Renard**



Books for further reading on project management:

-  Eliyahu Goldratt, Jeff Cox, [The Goal, A Process of Ongoing Improvement](#), North River Press, 1984
-  Masaaki Imai, [KAIZEN, The Key to Japan's Competitive Success](#), McGraw-Hill, 1986
-  James H. [Harrington, Poor-Quality Cost](#), Dekker, 1987
-  Taiichi Ohno, [Toyota Production System: Beyond Large-Scale Production](#), Productivity Press, 1988
-  Sid Kemp, [Project Management Demystified](#), McGraw-Hill, 2004
-  Nancy Tague, [The Quality Toolbox](#), ASQ Quality Press, 2005
-  Larry Webber, Michael Wallace, [Quality Control for Dummies](#), Wiley, 2007
-  Dennis Lock, [The Essentials of Project Management](#), Routledge, 2014
-  Team, [Project Risk Management Guidelines: Managing Risk with ISO 31000 and IEC 62198](#), Wiley, 2014
-  Kemal Atesmen, [Project Management Case Studies and Lessons Learned](#), Routledge, 2014



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• Gary Heerkens, [Project management](#), McGraw-Hill, 2014
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• Kory Kogon et al, [Project Management for the Unofficial Project Manager](#), BenBella Books, 2015
- 
• Cynthia Snyder Dionisio, [A Project Manager's Book of Tools and Techniques](#), Wiley, 2018
- 
• PMI, [The Standard for Risk Management in Portfolios, Programs, and Projects](#), PMI, 2019
- 
• Ready Set Agile, [Being an Effective Project Manager](#): Your Guide to Becoming a Project Management Rock Star: Best Practices, Methodology, and Success Principles for a Project Leader, Independently published, 2020
- 
• Erik Larson, Clifford Gray, [ISE Project Management](#): The Managerial Process, McGraw-Hill Education, 2021
- 
• PMI, [A Guide to the Project Management Body of Knowledge \(PMBOK® Guide\)](#) – Seventh Edition, PMI, 2021
- 
• Antonio Nieto-Rodriguez, [Harvard Business Review Project Management Handbook](#): How to Launch, Lead, and Sponsor Successful Projects, HBR Handbooks Series, 2021
- 
• Stanley Portny et al, [Project Management For Dummies](#), For Dummies, 2022
- 
• Harold Kerzner, [Project Management](#): A Systems Approach to Planning, Scheduling, and Controlling, Wiley, 2022
- 
• Chris Croft (Author), [Project Management QuickStart Guide](#): The Simplified Beginner's Guide to Precise Planning, Strategic Resource Management, and Delivering World Class Results, ClydeBank Media LLC, 2022
- 
• Joseph Heagney, [Fundamentals of Project Management](#), HarperCollins Leadership, 2022



- Orlando Casabonne, [Effective Project Sponsorship](#): A Quick but Comprehensive Guide to Governing and Directing a Project: according to the international norm ISO 21502 for Project Management, Independently published, 2023



- Orlando Casabonne, [Project Management for Project Managers](#): according to the international norm ISO 21502 for Project Management (Project Management according to the ... Project, Program and Portfolio Management), Independently published, 2023



- Jack Hayden, [Project Management Mastery](#): A comprehensive guide to successfully implementing the core principles of project planning and scope management from concept to completion, EB Publishing House, 2023

### 3 Process approach

#### 3.1 Process types

**If you cannot describe what you are doing as a process, you do not know what you're doing. Edwards Deming**

The word process comes from the Latin root *procedere* = go, development, progress (Pro = forward, *cedere* = go). Each process transforms inputs into outputs, creating added value and potential nuisances.

A process has three basic elements: inputs, activities and outputs.



**Process:** *activities that transform inputs into outputs*

A process can be very complex (launch a rocket) or relatively simple (audit a product).

A process is:

- repeatable
- foreseeable
- measurable
- definable
- dependent on its context
- responsible for its external providers

A process is, among other things, determined by its:

- title and type
- purpose (why?)
- beneficiary (for whom?)
- scope and activities
- initiators
- documents and records
- inputs
- outputs (intentional and not intentional)
- restraints
- people
- material resources
- objectives and indicators
- person in charge (owner) and actors (participants)
- means of inspection (monitoring, measurement)
- mapping
- interaction with other processes
- risks and potential deviations
- opportunities for continual improvement

A process review is conducted periodically by the process owner (cf. [annex 05](#)).



The components of a process are shown in figure 3-1:



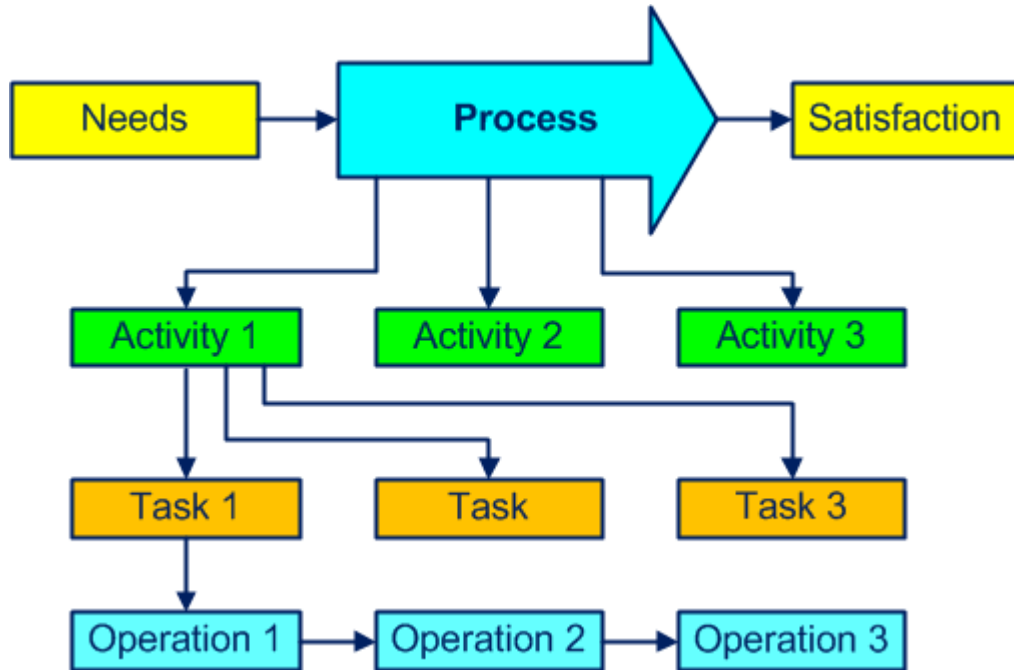


Figure 3-1. Components of a process

Figure 3-2 shows an example that helps to answer some questions:



- which materials, which documents, which tooling? (inputs)
- which title, what objective, which activities, requirements, constraints? (process)
- which products, which documents? (outputs)
- how, which inspections? (methods)
- what is the level of performance? (indicators)
- who, with what competence? (people)
- with what, which machines, which equipment? (material resources)

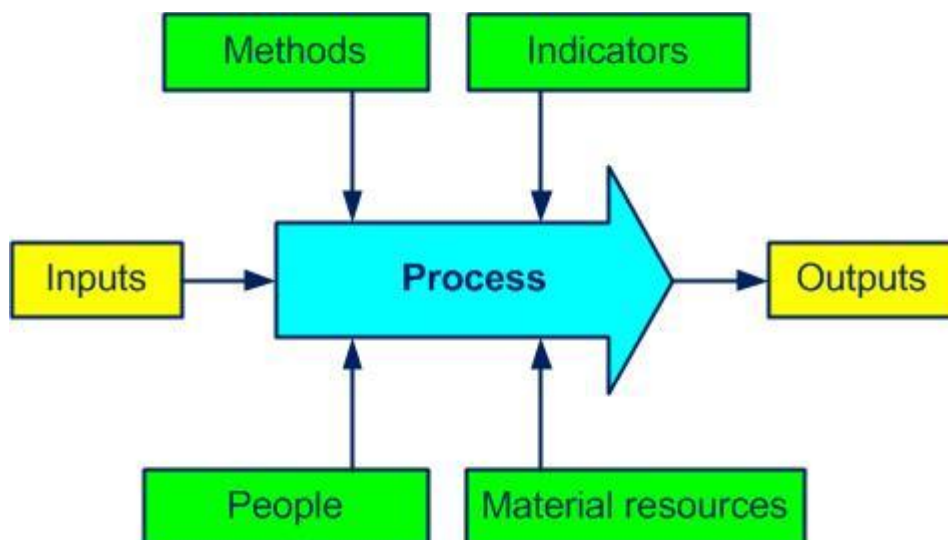


Figure 3-2. Some elements of a process

Often the output of a process is the input of the next process.

You can find some examples of process sheets in the document pack [D.02](#).

Any organization (company) can be considered as a macro process, with its purpose, its inputs (customer needs and expectations) and its outputs (products/services to meet customer requirements).

Our preference is to identify a process using a verb (buy, produce, sell) instead of a noun (purchases, production, sales) to differentiate the process from the company's department or documented information to maintain and recall the purpose of the process.

The processes are (as we shall see in the following paragraphs) of management, realization and support types. Do not attach too much importance to process categorizing (sometimes it's very relative) but ensure that all the company's activities at least fall into one process.

### 3.1.1 Management processes

Management processes are also known as piloting, decision, key or major processes. They take part in the overall organization and include elaboration of the policy, deployment of the objectives and all needed checks. They are the glue holding together all of the realization and support processes.

The following processes can be part of this family:

- develop strategy
- manage risk:
  - plan
  - assess:
    - identify
    - analyze
    - evaluate
  - treat
- develop policy
- establish process ownership
- improve
- conduct an audit
- communicate
- plan the MS
- acquire and manage resources
- conduct management review
- measure stakeholder satisfaction
- negotiate contract
- analyze data

### 3.1.2 Realization processes

The realization (operational) processes are related to the product, increase the added value and contribute directly to customer satisfaction.

They are mainly:

- lead a project
- design and develop
- purchase components
- sell products
- inspect production

- maintain equipment
- implement traceability (identify and keep history)
- receive, store and deliver
- control nonconformities (NC)
- implement corrective actions

### 3.1.3 Support processes

The support processes provide the resources necessary for the proper functioning of all other processes. They are not directly related to a contribution of the product's added value, but are still essential.

The support processes are often:

- control documentation
- provide information
- acquire and maintain infrastructure
- provide training
- manage inspection means
- keep accountability
- manage staff

## 3.2 Process mapping

**Without mapping it is difficult to have a global vision of the company**

Process mapping is par excellence a multidisciplinary work. This is not a formal recommendation of either ISO 21502 or ISO 9001 but mapping is always welcome.

The three types of processes and some interactions are shown in figure 3-3.

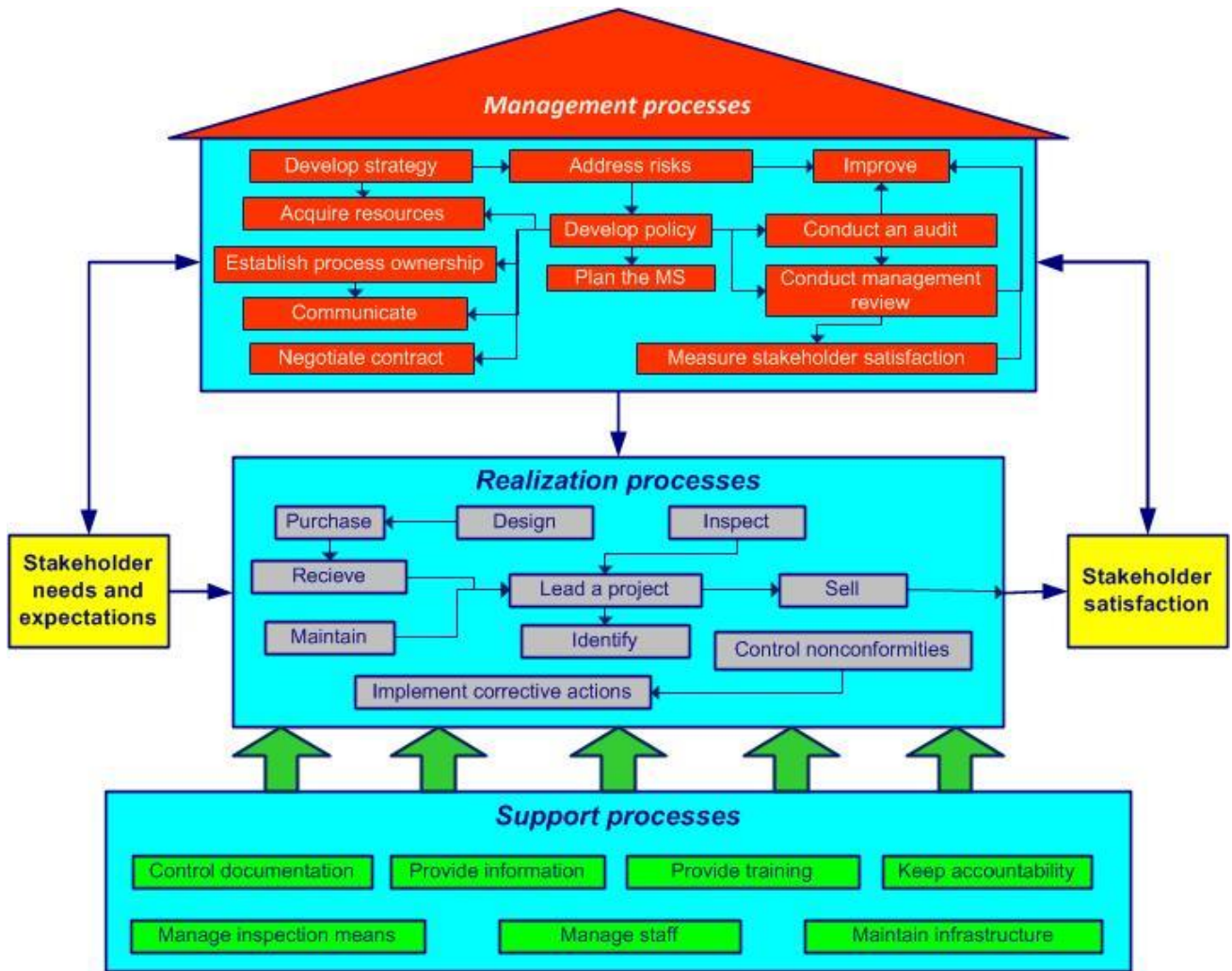


Figure 3-3. The process house

Mapping, among other things, allows you to:

- obtain a global vision of the company
- identify the beneficiaries (customers), flows and interactions
- define rules (simple) for communication between processes

To obtain a clearer picture, you can simplify by using a total of about 15 core processes. A core process can contain several sub-processes: for example, the process “develop the

MS” can involve:

- develop strategy
- address risks
- develop policy
- plan the MS
- deploy objectives
- acquire resources
- establish process ownership
- improve

### 3.3 Process approach

### Simple solutions for now, perfection for later

The fourth principle of quality management is “Process approach”, cf. ISO 9000, 2.3.4. Some benefits:

- obtain a global vision of the company thanks to mapping
- identify and manage responsibilities and resources
- achieve effective business management by relying on process indicators
- manage risks that could influence objectives

**Process approach:** *management by the processes to better satisfy customers, improve the effectiveness of all processes and increase global efficiency*

When the process approach is integrated during the development, implementation and continual improvement of a quality management system, it allows one to achieve objectives that are related to customer satisfaction, as is shown in figure 3-4.

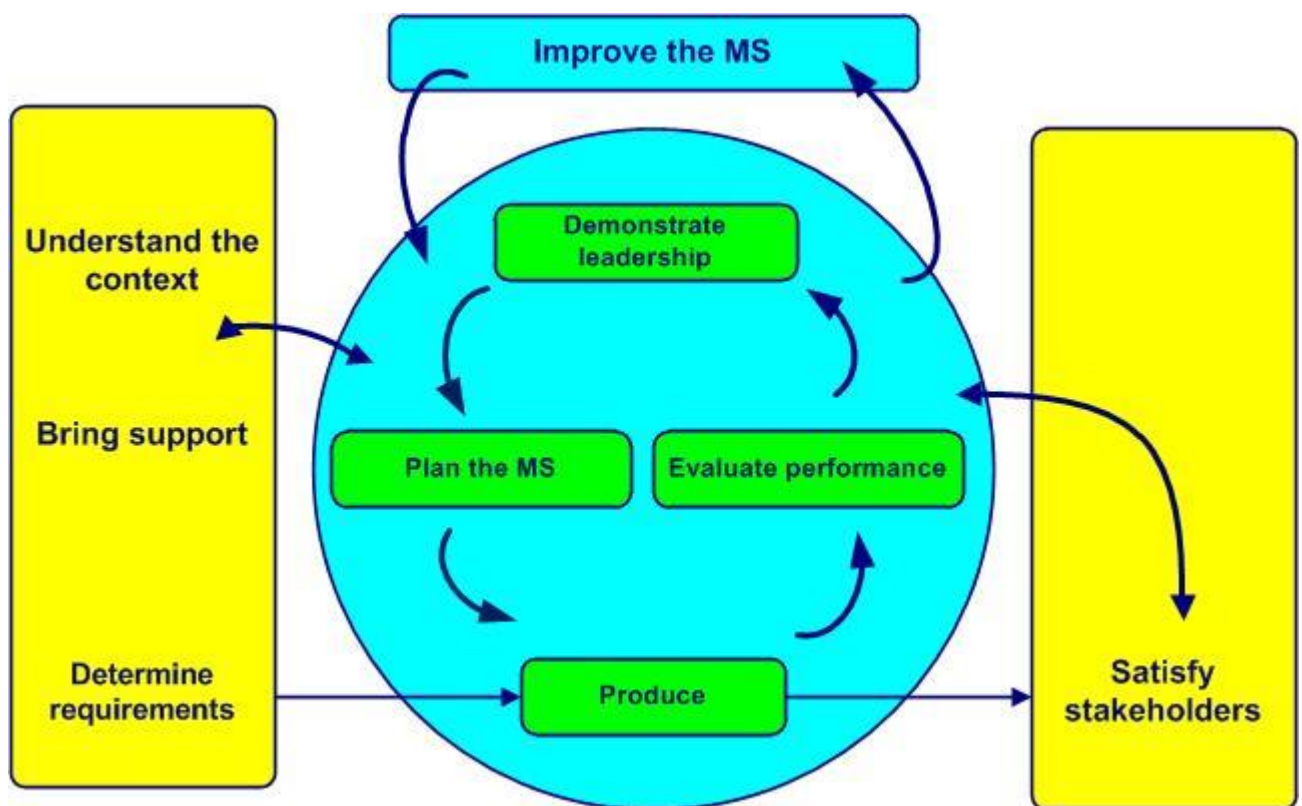



Figure 3-4. Model of a MS based on process approach and continual improvement

The process approach (cf. annex 07): 

- emphasizes the importance of:
  - understanding and complying with customer requirements
  - prevention so as to react to unwanted elements such as:
    - customer returns
    - waste
  - measuring process performance, effectiveness and efficiency
  - permanently improving objectives based on pertinent measurements
  - process added value
- relies on:



- methodical identification
- interactions
- the sequence and
- process management, which consists of:
  - determining objectives and their indicators
  - piloting related activities
  - analyzing obtained results
  - permanently undertaking improvements
- allows one to:
  - better view inputs and outputs and their relationship
  - clarify roles and responsibilities
  - judiciously assign necessary resources
  - break down barriers between departments
  - decrease costs, delays and waste
- and ensures in the long run:
  - control
  - monitoring and
  - continual improvement of processes

The process approach **is not**:

- crisis management (“You will not solve the problems by addressing the effects”)
- blaming people (“Poor quality is the result of poor management.” Masaaki Imai)
- prioritizing investments (“Use your brain, not your money.” Taiichi Ohno)

## 4 Concepts

### 4.1 Overview

#### 4.1.1 General

**The ultimate goal of a project is very simple: to make money or save money. Gary Heerkens**

Figure 4-1 shows the context and environment of a project. A project can be independent or part of a program or portfolio.

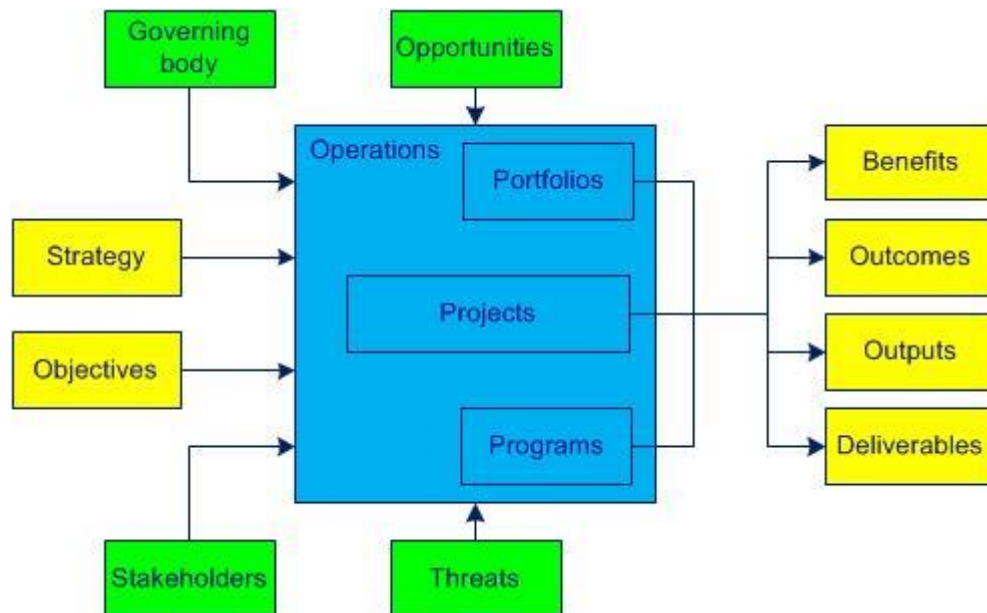


Figure 4-1. The project management environment

#### 4.1.2 Projects

The work (operations) of each company aims to achieve the set objectives. The project is unique and temporary, while the operations are permanent and reproducible (manufacture a product, provide a service).

The objective of a project is to obtain results and make profits.

Some factors that contribute to differentiating projects are, for example:

- the context, the environment
- stakeholders
- objectives
- deliverables
- the resources
- constraints
- the methods

#### 4.1.3 Project management

Project management includes practices to initiate, plan, manage, implement, control, monitor and close the project.


Resource management and team member motivation practices are part of all project management processes.


## 4.2 Context

### 4.2.1 Impact of context

To successfully carry out a project, you must understand and evaluate everything that can influence the performance of the project. It is appropriate to engage in reflection after a few essential activities:

- identify, understand and evaluate the needs of stakeholders (see § 4.5.10)
- analyze the factors (obstacles) that can influence the achievement of objectives
- draw up an in-depth diagnosis of the unique context in which the company finds itself, taking into account the issues (factors):
  - external such as the environment:
    - social
    - regulatory
    - economical
    - technological
    - competitive
  - internal like:
    - specific aspects of corporate culture:
      - vision
      - reason for being, purpose, mission
      - essential values
    - the needs and expectations of:
      - workers
      - stakeholders
    - products and services
    - infrastructure
    - working conditions
    - organization of work
- regularly monitor and review any information relating to external and internal issues

PESTEL and SWOT analyses can be useful for a relevant analysis of the business context (see annex 08). 

In annex 08 you can also find tools for problem solving such as: 

- 5 W
- 8 D
- A 3
- Root cause analysis
- Fault tree analysis
- Brainstorming

A list of external and internal issues can be produced by a multidisciplinary team. Each issue is identified by its level of influence and control. Priority is given to issues that are very influential and not at all controlled.

### 4.2.2 Strategy

## **In business, strategy ought to mean just one thing: generating a sustainable competitive advantage. Robert Waterman**

The strategic direction of the company is based on:

- the vision – our purpose (what we want to become)
- mission – our reason for being (what we do to achieve our vision)
- corporate culture - our values (what we believe in)

Any successful project contributes to creating added value by seizing opportunities and obtaining benefits for stakeholders and therefore contributes to the achievement of strategic objectives.

Added value for the company is created when the benefits of the project make investments profitable.

Entering the wonderful world of projects often means satisfying your ambitions and making your dreams come true.

Examples of opportunities:

- a need:
  - from the customer
  - of the company
  - from the supplier
- market demand
- a legal requirement

### **True story**

*In 1993, Microsoft launched the Encarta universal encyclopedia project, with the contribution of hundreds of individuals from around the world. The encyclopedia was sold on CD and DVD then on the Internet from 2000 and was available in eight languages. Encarta was shut down in 2009 because visits to its online encyclopedia in the United States were only 1.27% compared to 97% for Wikipedia.*

*Wikipedia is a general and multilingual encyclopedia created in 2001 under the GNU General Public License. It allows everyone to write and modify articles, hence its definition as a participatory encyclopedia or free work of massive non-profit collaboration. Wikipedia has become the most visited online encyclopedia in the world with more than 58 million articles in more than 300 languages.*

*For any project the contribution of millions of volunteers is an unbeatable force.*

## **4.2.3 Customers and suppliers**

### **This is exactly what I asked for, but it's not what I want. Customer**

A project can be considered as coming from a customer or a sponsor but also can be entrusted to a supplier or subcontractor. An example is the construction of roads, railways or a computer system.

Sometimes customer-supplier relationships are a source of confusion because these relationships are multi-directional.

In order to reduce conflicts, each part of the contract can identify:

- governance and its framework
- the structure of the project team
- project stakeholders
- working practices (linked to the project life cycle and its delivery)

**Contract:** *a legally binding agreement between two or more parties that specifies the work to be performed, the deliverables to be produced, and the terms and conditions of the relationship*

### True story

*“In a typical business, if you have a meeting, no matter how important, there is always one party that is not represented: the customer. It is therefore very easy within the company to forget the customer.” Jeff Bezos.*

*To remedy this problem of forgetting, he got into the habit of placing an empty chair at each meeting.*

#### 4.2.4 Constraints

Project outcomes are often dependent on the following constraints:

- the delivery date of the project
- the allocated budget
- the availability of:
  - financing
  - people
  - material resources
- the safety and health of personnel
- the level of acceptable risk
- the social, environmental and ecological impacts of the project
- the requirements of laws and regulations
- quality standards

**Budget:** *estimate of all project expenses and revenues*

Constraints are often interdependent; understanding them and reviewing them regularly is a prerequisite for the success of every project.

Creating a list of constraints by priority is an advantage in order to make the right decisions at the right time.

#### 4.2.5 Project, program and portfolio

A project can be independent, part of a program or a portfolio, cf. ISO 21503 and ISO 21504 (§ 2.1).

As shown in figure 4-2, when the project is part of a portfolio or program, its objectives and governance are aligned directly to the portfolio or program.

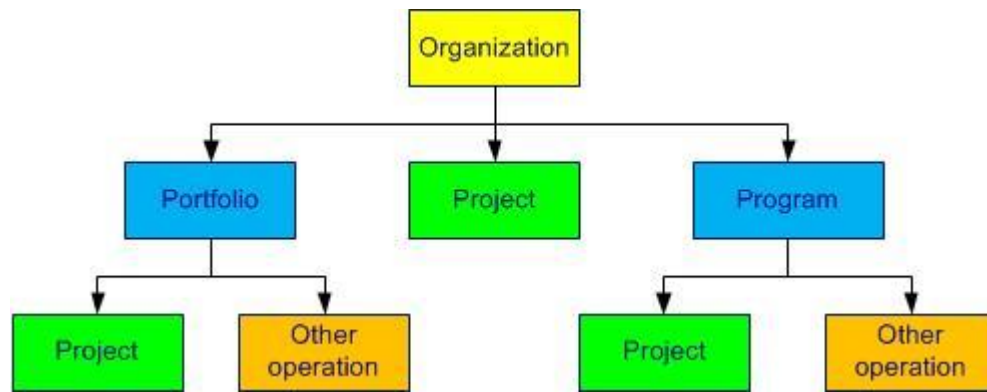


Figure 4-2. The project, program and portfolio

## 4.3 Governance

**There are two major aspects of project management: the art - directing people on the project and the science - defining and coordinating the work to be done. Gary Heerkens**

### 4.3.1 Governance framework

It is recommended that the governance framework include the principles, policies and frameworks by which the company directs, authorizes and controls the project.

It is important for governance to oversee topics like:

- policies, processes and methods used for project management activities and practices
- framework management (e.g., the project life cycle, see § 4.4)
- roles and responsibilities (e.g., limits for decision-making, see § 4.5)

Responsibility for maintaining project governance is often assigned to the project sponsor (see § 4.5.4) or the project board (see § 4.5.3).

### 4.3.2 Business case

The business case provides a basis for project governance. It is necessary for the business case to be used to justify the launch and continuation of a project and to include (or reference):

- the objectives to be achieved
- strategic alignment
- the potential profits to be made
- the measures defined to assess the value created
- the company's acceptable level of risk
- budget, schedule and quality requirements
- disturbances to other company operations
- stakeholder engagement and relationship management
- the use of staff and material resources
- the required skills, knowledge and abilities
- the targeted scope
- the presentation of scenarios
- the proposed management approach

- the ability to maintain business and organizational activities through change

#### 4.4 Life cycle

It is recommended that the following considerations be taken into account when defining the project life cycle:

- organizational and project governance
- the nature of the project
- the risks
- constraints
- internal and external factors

An example of stages and gates (milestones) - G of a project life cycle is shown in Figure 4-3 and the relationships to integrated and project practices.

It is important for each stage to have a beginning and an end, and for each gate (decision point) to be linked to a decision, deliverables and outcomes. Authorization to proceed to the next stage should be linked to the validation of specific criteria.

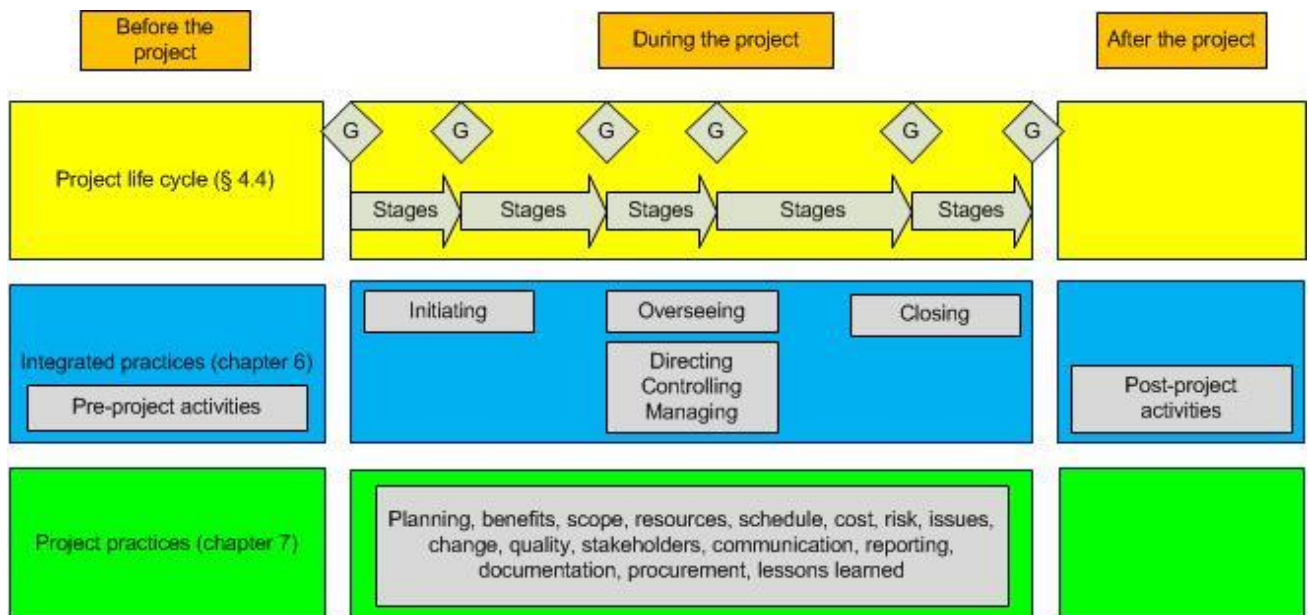


Figure 4-3. Project life cycle, integrated practices and project practices

#### 4.5 Organization

##### 4.5.1 Project organization

### Mastering an organization is an art, not a science



The purpose of project organization is to define the roles, responsibilities and authorities of the stakeholders by giving each role a name.

The customer, supplier or subcontractor can actively participate in the organization of the project.

The “Define project organization” process is shown in figure 4-4.








Figure 4-4. The process Define the project organization








- sponsoring organization, § 4.5.2
- project sponsor, § 4.5.4
- project board, § 4.5.3
- project office, § 4.5.7

- work breakdown structure, cf. annex 22 
- list of stakeholders, cf. annex 16 
- list of activities, cf. annex 24 



- define, assign and communicate responsibilities and authorities:
  - establish the project organization chart
  - establish job descriptions
- determine who is responsible:
  - project resources
  - the progress of the work
  - work overseeing
  - validation of work
  - reports
- obtain validation from the sponsor



- work package leader, § 4.5.8
- team members, § 4.5.9
- project stakeholders, § 4.5.10
- other roles, § 4.5.11
- reports, § 7.15
- job description, cf. annex 17 
- project organization chart, cf. annex 15 
- progress report, cf. annex 38 
- closing report, cf. annex 47 
- inspection report, cf. annex 49 



- have you defined the job description of each team member?



- is there a conflict of interest for certain roles?
- who is responsible for monitoring the progress of the work?
- who is responsible for validating the work?
- is the project organization chart updated?

#### 4.5.2 Sponsoring organization

The sponsoring organization is the higher authority. It provides resources and guidance for the project. The sponsoring organization is responsible for managing risks and addressing major issues.

For a project within a portfolio or program, the sponsoring organization may be the portfolio or program manager.

Details on integrated project management practices can be found in chapter 6.

#### 4.5.3 Project board

The project board, if necessary, can contribute to the project by providing guidance and advice to the project sponsor. The project board may include:

- a governing body, a higher authority to which the project sponsor is responsible (accountability)
- a board, chaired by the project sponsor, which provides high-level advice

The project board should:

- monitor the progress and prospects of the project to confirm that the interests of the company are respected
- provide a forum to contribute to strategic decisions, remove obstacles and resolve issues

If a project is common to two companies, the project board may include representatives from each company.

#### 4.5.4 Project sponsor

The project sponsor has the obligation to report to the higher authority on the achievement of the project objectives, the achievement of outcomes and the realization of the required benefits.

The project sponsor should be the pilot or manager of the business case and be responsible for the governance of the project, including audits, reviews and assurance (see ISO 21505).

Examples of project sponsor responsibilities:

- validate the justification of the project throughout its life cycle
- confirm the qualification and competence of the project manager and his team
- provide the project manager with decisions, guidance and advice to meet the business need
- confirm the company's preparation and commitment to organizational or societal change and that change is occurring (see § 7.14)
- resolve the issues to be addressed and the risks that have arisen

- involve key stakeholders
- make decisions within delegated authority
- report risks and issues to be addressed to higher authority
- implement the cultural and ethical aspects of the project

The project sponsor can be a member of the project board.

#### **4.5.5 Project assurance**

Although the project sponsor is responsible for audits, reviews, and assurance, these activities may be assigned to one or more individuals independent of the project manager.

#### **4.5.6 Project manager**

The project manager has the obligation to report to the project sponsor or the project board on the definition of the scope, on the leadership and on management of the project team.

Examples of project manager activities:

- establish the management approach in accordance with the agreed governance approach
- motivate the project team
- ensure daily verification
- demonstrate leadership
- define the team's approach, responsibilities, scope of work and objectives
- monitor, forecast and report overall progress against project planning (see § § 7.2 and 7.15)
- manage risks (see § 7.8) and issues (see § 7.9);
- control and manage project changes (see § 7.10);
- manage supplier performance as defined in the relevant contracts (see § 7.17);
- ensure that stakeholder engagement (see § 7.12) and communication (see § 7.13) take place as planned
- validate the deliverables and results provided by the project

The project manager can be assisted by a project management team on planning, cost control and quality.

#### **4.5.7 Project office**

The project office, if necessary, can have its role, responsibilities and reporting management defined.

Examples of activities that a project office can perform to support the project manager and the project team:

- carry out analyzes
- define and administer governance
- standardize project methods and processes
- train in project management
- plan and carry out follow-ups
- manage information
- provide administrative support

A project office can also support multiple projects and manage programs or portfolios.

A project office can also take on roles such as project manager, project sponsor and project board, and act as a center of competence or center of excellence in project management.

#### 4.5.8 Work package leader

A work package leader has an obligation to report to the project manager on the direction, management and delivery of assigned outputs or outcomes, as defined in a work package. The work package leader or team leader may be part of the sponsoring organization or a third-party organization, such as a subcontractor.

Examples of work package leader responsibilities:

- confirm that work packages are completed to the required quality, on time and within budget
- contribute to and review important management documents
- plan, monitor, forecast and report overall progress against the work package plan
- manage the resolution of risks and issues to be addressed and escalate those that exceed the level of decision-making authority
- manage changes to the work scope and request authorization for changes that are outside of their authority
- manage and optimize the use of resources
- deliver final outputs to the project team or project manager

The project manager may assume the role of work package leader.

#### 4.5.9 Team members

Project team members carry out project activities and are accountable to the work package leader or project manager regarding the completion of their assigned activities and resulting deliverables.

#### 4.5.10 Stakeholders

Project stakeholders are people, groups, or organizations that have interests in, can affect, be affected by, or perceive themselves to be affected by any aspect of the project. Project stakeholders can be internal or external to the project and the company.

Examples of stakeholders:

- shareholder
- customer
- project board
- project sponsor
- employee
- sponsoring organization
- supplier
- finance provider
- interest group
- member of the project team
- governing body
- certification body
- business partner
- project manager
- work package leader

- user

#### 4.5.11 Other roles

Other roles may be defined depending on the needs of the work required.

Examples may include those managing output development, agile roles such as delivery, service and operation management, organizational and societal change, communications, and various engineering disciplines.

#### 4.6 Competence

**You should adapt people's missions to their Talents, not their skills to their position. Jacques Lebeau**

Examples of project staff competence:

- technical skills as concepts and practices, in order to lead, manage, plan and carry out a project in a structured way
- behavioral skills associated with personal relationships such as leadership, team building, people management, coaching, negotiation and conflict management
- business and other skills related to project management in the organizational, contractual and external environment

Project team members not directly involved in project management should be competent (roles and responsibilities) in a relevant area.

It is recommended to consider any gap between required and available skills as a constraint or risk to the project. The skills and abilities of team members can be improved or increased through ongoing personal and professional development.



The purpose of the “Manage competence” process is to monitor and optimize the performance of team members. The process is shown in figure 4-5.

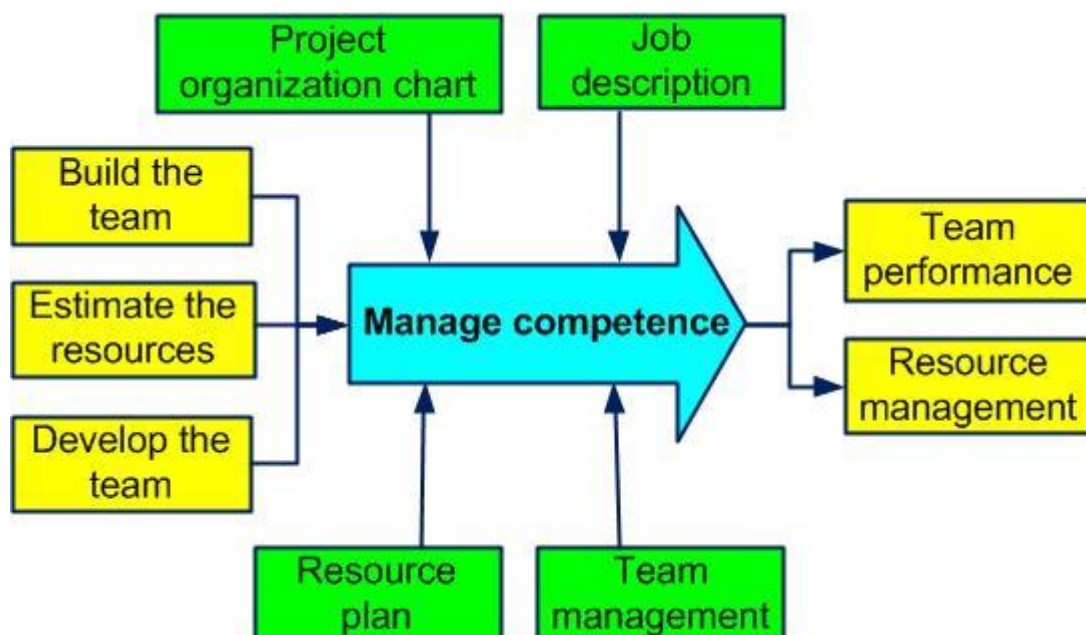








Figure 4-5. The Manage Skills process





- estimate the resources 
- build the team 
- develop the team 
- project organization chart, cf. annex 15 
- job description, cf. annex 17 
- resource plan, cf. annex 25 



- select team members with appropriate skills
- define the moment of integration and the moment of exit of the team
- update team members, if necessary
- establish good mutual communication
- create the conditions favoring the involvement, motivation and consolidation of the team
- establish the ethical rules to follow
- encourage everyone's participation
- consult team members on:
  - ideas
  - suggestions
  - problems
- process feedback regarding the team
- help develop skills
- resolve issues related to team members
- improve communication within the team
- appreciate the team's performance



- team performance
- resource management, cf. § 7.5
- list of team members, cf. annex 18 
- team performance, cf. annex 42 

Everyone knows that personnel are the main condition for the success of a project. But are we paying enough attention to each person's needs, desires, wishes and concerns every day? How do we help each member connect their work to the customer's final smile?

**The first responsibility of a leader is to define reality. The last is to say “thank you”.  
Between the two, the leader is a servant. Max de Pree**

Responsibilities of the project manager (project leader) in relation to:


- the project:
  - define:

- the goal
  - functional requirements
  - the objectives
  - the plan
  - develop:
    - the schedule
    - the budget
  - respect:
    - deadlines
    - prices
    - quality
  - monitor performance via regular reviews
  - validate and communicate documents
- to the organization:
  - communicate regularly with:
    - the team
    - top management
  - control the changes
  - detect weak signals of future concerns very early
  - monitor and report progress
  - control risks
- to the team:
  - choose and appoint team members
  - unite the team to solve problems
  - coordinate the work
  - overcome obstacles
  - inform about:
    - the project
    - the roles of each member
    - requirements
    - constraints
  - facilitate the development of each member
  - recognize the work accomplished
  - guarantee the right to make mistakes
  - participate in decisions
- to the customer:
  - talk about needs and not solutions
  - clarify requirements as early as possible
  - know:
    - customer priorities
    - their level of satisfaction
  - inform the customer regularly
- to stakeholders:
  - identify all stakeholders
  - obtain the support of stakeholders as soon as possible
  - establish partnerships with suppliers and subcontractors

**Project managers don't create anything: they produce efficiency. Louis Schweitzer**


Skills of the project manager (project leader, project responsible):

- in leadership:
  - give the example:
    - honesty

- integrity
  - experience
  - trust
  - enthusiasm
- lead the team like a conductor
- assess customer needs
- pilot:
  - quality
  - the budget
  - the schedule
- create the project overview
- manage:
  - production
  - human relations
  - the risks
  - uncertain situations
  - conflicts
  - ambiguous signals
  - contradictory data
  - uncertainty
- meet the conditions for the team's involvement
- negotiate
- clarify roles
- know how to:
  - use common sense
  - take a step back
  - think before acting
  - communicate clearly and easily
  - coordinate
  - find the balance between:
    - rigor and flexibility
    - the permit and constraints
  - delegate
  - lead a meeting
  - surround yourself with experts
- resolve problems, cf. annex 23 
- help and support
- tolerate mistakes
- accept and apply changes
- make the most of lessons learned
- have a positive attitude
- always be available
- in the project process:
  - transform:
    - an idea into requirements
    - requirements into objective
  - master the:
    - project management tools
    - techniques of:
      - planning
      - risk control
    - systems
    - methods

- always know how to:
  - answer the question “why?”
  - justify your choices
  - work in a team
  - report to:
    - the sponsor
    - top management
- in technology:
  - master project management software
  - develop and design
  - industrialize:
    - prototypes
    - initial samples
    - mass production
  - document the steps (stages)
  - validate and keep all working documents up-to-date
- in corrective actions:
  - know how to choose the right time (neither too early nor too late)
  - clearly communicate the problem
  - encourage participation of team members
  - support suggestions

The difference between project manager and department head is that a project is always unique and always limited in time. The project manager ensures the conditions in which staff will be involved and motivated. These people come from different departments, have different specialties and often the project manager does not have obvious administrative authority over them.

The project manager uses different tools without moderation. Many books are exclusively devoted to project management tools and methods, cf. § 2.3. See also the project tools in annex 09. 

**When the project is a success, it is the responsibility of the entire team. When it is a failure, it is the responsibility of the team leader**

*(Almost) true story*

*It's the legend of the pig and the chicken wanting to open a restaurant. The name proposed by the chicken was: Ham and Eggs. After reflection, the pig refused, justifying that he should not have to commit while the chicken was only getting involved.*

*Moral: there is a difference between commitment and involvement. Committing means being responsible (deciding and answering for your actions); getting involved means making a one-off contribution (an egg).*



Example of a complete team:





- how do you select team members?
- what training must certain team members follow?
- does the candidate have, for this job:
  - the qualification
  - knowledge
  - skills
  - experience
- does the candidate have the desire and attitude to join the team?
- does the candidate understand and accept the job description?
- is the candidate compatible with the corporate culture?
- how does each member know their responsibilities and authorities?
- are all the necessary skills reunited?
- how do you manage changes in staff competence requirements?
- what conditions promote the motivation of team members?



Minute of relaxation. See the "[Every Wednesday?](#)" joke.