



# Detailed Plans Up Front

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# Project

## Definition

A project is a **temporary endeavor undertaken to create a unique product, service, or result.** *PMBok 6th Ed.*

- The temporary nature of projects indicates that a **project has a definite beginning and end.**
- The end is reached when the **project's objectives have been achieved** or when the project is terminated because **its objectives will not or cannot be met**, or when the **need for the project no longer exists**, or **no further fundings** are available
- A project may also be **terminated if the client** (customer, sponsor, or champion) **wishes to terminate the project**
- Temporary does not necessarily mean the duration of the project is short. It refers to the project's engagement and its longevity
- **Temporary does not typically apply to the product, service, or result** created by the project; most projects are undertaken to create a lasting outcome

# Project Management

Characteristics of considered projects:

- non-routine tasks are involved
- planning is required
- specific objectives are to be met or specific product is to be created
- predetermined time span
- work is carried on for someone other than yourself
- work involves several specialisms
- people are formed into a temporary work group
- work is carried out in several phases
- resources that are available for use on the project are constrained
- the project is large or complex

Projects are often utilized as a **means of directly or indirectly achieving objectives** within an organization's strategic plan. Projects are typically authorized as a result of one or more of the following strategic considerations:

- **Market demand** (e.g., a car company authorizing a project to build more fuel-efficient cars in response to gasoline shortages);
- **Strategic opportunity/business need** (e.g., a training company authorizing a project to create a new course to increase its revenues);
- **Social need** (e.g., a nongovernmental organization in a developing country authorizing a project to provide potable water systems, latrines, and sanitation education to communities suffering from high rates of infectious diseases);
- **Environmental consideration** (e.g., a public company authorizing a project to create a new service for electric car sharing to reduce pollution);
- **Customer request** (e.g., an electric utility authorizing a project to build a new substation to serve a new industrial park);
- **Technological advance** (e.g., an electronics firm authorizing a new project to develop a faster, cheaper, and smaller laptop based on advances in computer memory and electronics technology); and
- **Legal requirement** (e.g., a chemical manufacturer authorizing a project to establish guidelines for proper handling of a new toxic material).

# Factors leading to Project Creation

Specific Factor	Examples of Specific Factors	Meet Regulatory, Legal, or Social Requirements	Satisfy Stakeholder Requests or Needs	Create, Improve, or Fix Products, Processes, or Services	Implement or Change Business or Technological Strategies
<b>New technology</b>	An electronics firm authorizes a new project to develop a faster, cheaper, and smaller laptop based on advances in computer memory and electronics technology			X	X
<b>Competitive forces</b>	Lower pricing on products by a competitor results in the need to lower production costs to remain competitive				X
<b>Material issues</b>	A municipal bridge developed cracks in some support members resulting in a project to fix the problems	X		X	
<b>Political changes</b>	A newly elected official instigating project funding changes to a current project				X
<b>Market demand</b>	A car company authorizes a project to build more fuel-efficient cars in response to gasoline shortages		X	X	X
<b>Economic changes</b>	An economic downturn results in a change in the priorities for a current project				X
<b>Customer request</b>	An electric utility authorizes a project to build a substation to serve a new industrial park		X	X	
<b>Stakeholder demands</b>	A stakeholder requires that a new output be produced by the organization		X		
<b>Legal requirement</b>	A chemical manufacturer authorizes a project to establish guidelines for the proper handling of a new toxic material	X			
<b>Business process improvements</b>	An organization implements a project resulting from a Lean Six Sigma value stream mapping exercise			X	
<b>Strategic opportunity or business need</b>	A training company authorizes a project to create a new course to increase its revenues			X	X
<b>Social need</b>	A nongovernmental organization in a developing country authorizes a project to provide potable water systems, latrines, and sanitation education to communities suffering from high rates of infectious diseases		X		
<b>Environmental considerations</b>	A public company authorizes a project to create a new service for electric car sharing to reduce pollution			X	X

## Definition

Project management is the **application of knowledge, skills, tools, and techniques** to project activities to meet the project requirements. Project management is accomplished through the appropriate application and **integration of the project management processes identified for the project**. Project management enables organizations to execute projects **effectively and efficiently**. *PMBok 6th Ed.*

At the macro level the management of a software project typically requires to activate the following “process groups”:

- **Initiating**
- **Planning**
- **Executing**
- **Monitoring and Controlling**
- **Closing**

# Benefits of effective PM

Effective project management helps individuals, groups, and public and private organizations to:

- Meet business objectives;
- Satisfy stakeholder expectations;
- Be more predictable;
- Increase chances of success;
- Deliver the right products at the right time;
- Resolve problems and issues;
- Respond to risks in a timely manner;
- Optimize the use of organizational resources;
- Identify, recover, or terminate failing projects;
- Manage constraints (e.g., scope, quality, schedule, costs, resources);
- Balance the influence of constraints on the project (e.g., increased scope may increase cost or schedule); and
- Manage change in a better manner.

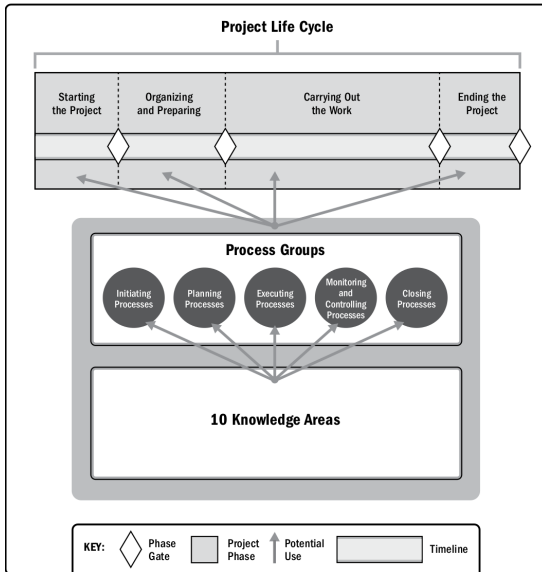
# Issues resulting from poorly managed projects

Poorly managed projects or the absence of project management may result in:

- Missed deadlines,
- Cost overruns,
- Poor quality, Rework,
- Uncontrolled expansion of the project,
- Loss of reputation for the organization,
- Unsatisfied stakeholders,
- Failure in achieving the objectives for which the project was undertaken.



# PMBoK key components in Projects



# PMBok Project Management Knowledge Areas (1-5)

- **Project Integration Management.** Includes the processes and activities to identify, define, combine, unify, and coordinate the various processes and project management activities within the Project Management Process Groups.
- **Project Scope Management.** Includes the processes required to ensure the project includes all the work required, and only the work required, to complete the project successfully.
- **Project Schedule Management.** Includes the processes required to manage the timely completion of the project.
- **Project Cost Management.** Includes the processes involved in planning, estimating, budgeting, financing, funding, managing, and controlling costs so the project can be completed within the approved budget.
- **Project Quality Management.** Includes the processes for incorporating the organization's quality policy regarding planning, managing, and controlling project and product quality requirements, in order to meet stakeholders' expectations.

# PMBok Project Management Knowledge Areas (6-10)

- **Project Resource Management.** Includes the processes to identify, acquire, and manage the resources needed for the successful completion of the project.
- **Project Communications Management.** Includes the processes required to ensure timely and appropriate planning, collection, creation, distribution, storage, retrieval, management, control, monitoring, and ultimate disposition of project information.
- **Project Risk Management.** Includes the processes of conducting risk management planning, identification, analysis, response planning, response implementation, and monitoring risk on a project.
- **Project Procurement Management.** Includes the processes necessary to purchase or acquire products, services, or results needed from outside the project team.
- **Project Stakeholder Management.** Includes the processes required to identify the people, groups, or organizations that could impact or be impacted by the project, to analyze stakeholder expectations and their impact on the project, and to develop appropriate management strategies for effectively engaging stakeholders in project decisions and execution.

# Project Manager

## Definition

The **project manager** is the person assigned by the performing organization to lead the team that is responsible for achieving the project objectives. *PMBok 6th Ed.*

In addition to any area-specific skills and general management proficiencies required for the project, effective project management requires that the project manager possess the following competencies:

- **Knowledge:** Refers to what the project manager knows about project management.
- **Performance:** Refers to what the project manager is able to do or accomplish while applying his or her project management knowledge.
- **Personal:** Refers to how the project manager behaves when performing the project or related activity. Personal effectiveness encompasses attitudes, core personality characteristics, and leadership, which provides the ability to guide the project team while achieving project objectives and balancing the project constraints.

# Project Manager skills

Project managers accomplish work through the project team and other stakeholders. Effective project managers acquire a **balance of technical, interpersonal, and conceptual skills** that help them analyze situations and interact appropriately.

Important interpersonal skills are:

- **Leadership**: focusing the efforts of a group of people toward a common goal and enabling them to work as a team
- **Team building**: helping a group of individuals, bound by a common purpose
- **Motivation**: creating an environment to meet project objectives while providing maximum satisfaction related to what people value most
- **Communication**: identifying various communication channels, understand what information they need to provide, what information they need to receive, and which interpersonal skills will help them communicate effectively with various project stakeholders.
- **Influencing**: sharing power and relying on interpersonal skills to get others to cooperate towards common goals

# Project Manager skills . . . continued

- **Decision making:** There are four basic decision styles normally used by project managers: command, consultation, consensus, and coin flip (random). There are four major factors that affect the decision style: time constraints, trust, quality, and acceptance
- **Political and cultural awareness:** The skillful use of politics and power helps the project manager to be successful
- **Negotiation:** is a strategy of conferring with parties of shared or opposed interests with a view toward compromise or reaching an agreement.
- **Trust building:** The ability to build trust across the project team and other key stakeholders is a critical component
- **Conflict management:** Managing conflict in a project environment involves building the trust necessary for all involved parties to be open and honest, and to engage in seeking a positive resolution to the situation creating the conflict
- **Coaching:** helping people recognize their potential through empowerment and development

# Classes of projects

- Compulsory v. Voluntary users
- Informative vs. Embedded systems
- Objectives vs. Product driven

# Is software project management different?

## Peculiarities for SPM:

- **Invisibility** – intangible product, progress difficult to judge
- **Complexity** – highest complexity per euro
- **Conformity** – continuously changing contexts
- **Flexibility** – “easy” to change



# Feasibility

Is it worth starting the project?

- Identification of a business case
- Market analysis and strategies
- Cost assessment (accuracy at this level cannot be high)

A small prototype could be developed to clarify project needs

Different situations can change the recipe

- You act as the Contractor
- In house software (build or buy): software that you need to run your business
- Participation to research and innovation proposals
  - Feasibility is “somehow assumed” once you deliver the proposal
  - the proposal generally includes detailed planning

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# Feasibility study or the Business Case

A document reporting the effort of feasibility study generally includes:

- Introduction and background
- The proposed project
- The market
- Organizational and operational infrastructure
- The benefits
- Outline of the implementation plan
- Costs assessment
- The financial case
- Risk analysis
- Management plan

# Project Execution

Project execution refer to the real performance of the activities foreseen in the plan and it includes the activities of **monitoring** and **control**

# Project planning

## Planning

Thinking **carefully** about something before you do it - even with uncertain projects this is worth doing as long as plans are **seen as provisional**

Planning requires to define at **best the work** to be performed by teams in order to reach the **project objectives** in minimum time and cost

- express objectives as kind of “**post conditions**” - e.g. “*customers should be able to get hot drinks*” is better than “*develop a coffee machine*”
- objectives are detailed in sub-objectives. Well defined objectives are “**SMART**”
  - **Specific** – concrete and well defined
  - **Measurable**
  - **Achievable**
  - **Relevant**
  - **Time Constrained**

# Step Wise method

The **Step Wise** method is a PM method covering the planning of a project that is compatible with Prince2:

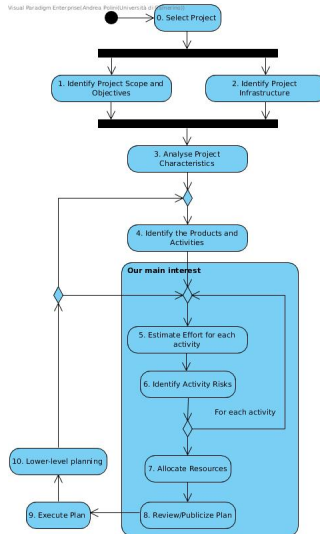


Bob Hughes and Mike Cotterell

*Software Project Management, 5th Ed.*

McGraw-Hill, 2009

# Steps in Step Wise



# Step 0: Select Project

## Product portfolio management

Provides an overview of **all the projects** that an organization is undertaking or is considering. It **prioritizes the allocation of resources** to projects and decides which new project should be accepted

Company management decides which projects should start on the base of strategic objectives



# Step 1: Identify project scope and objectives

- 1 Identify **objectives** (what the project must achieve) and **practical measures** of the effectiveness in meeting those objectives
- 2 Establish a **project authority** – **Project Management Board (PMB)**, has the responsibility for setting, monitoring and modifying decisions?
- 3 **Stakeholder analysis** - identify all stakeholders in the project and their interests
  - Internal to the project team
  - Internal to the organization
  - External to the organization (i.e. customers)
- 4 **Modify objectives** in the light of stakeholder analysis
- 5 **Establish methods of communication** with all parties

## Step 2: Identify project infrastructure

- 1 Identify relationship between the **project and strategic planning**
- 2 Identify installation standards and procedures
  - **change control and configuration management**
  - **quality standards and procedures**
  - **measurement programme**
  - ...
- 3 Identify project team organization

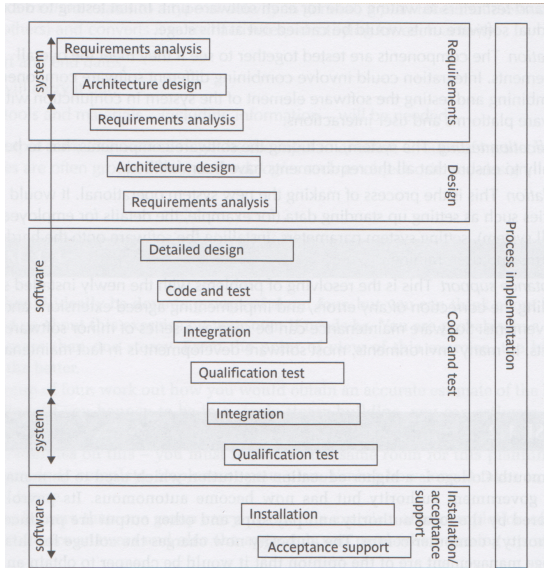
## Step 3: Analyse project characteristics

- 1 Distinguish the project as either objective or product driven
- 2 Analyse other project characteristics (e.g. safety critical?)
- 3 Identify high level project risks - e.g. acceptance from users
- 4 Take into account user requirements concerning implementation and methodologies
- 5 **Select development methodology and life-cycle approach**
- 6 Review overall resource estimates

## Step 4: Identify project product and activities

- 1 Identify and describe project products (or **deliverables**)
  - **work will produce intermediate products** - documents, software, test suites, etc . . .
  - **Product Breakdown Structure (PBS)**
  - to each product should be described with a name, purpose, derivation, composition, form, standards, quality criteria to decide if it is acceptable
- 2 **Document generic product flows** - relations to be described with Product Flow Diagram (PFD)
- 3 Recognize product instances
- 4 **Produce ideal activity network**
- 5 **Modify the ideal to take into account need for stages and checkpoints**

# ISO 12207 software development life cycle



## Step 5: Estimate effort for each activity

- 1 Carry out bottom up estimates - elapsed time vs. effort
- 2 Revise plan to create controllable activities
  - long activities make project control difficult
  - activities should not be running when checkpoints have been defined - it is generally a good idea to align activity reporting with monitoring and controlling activities

## Step 6: Identify activity risks

- 1 Identify and quantify activity based risks
- 2 Plan risk reduction and contingency measures where appropriate
- 3 Adjust overall plans and estimate to take account of risks

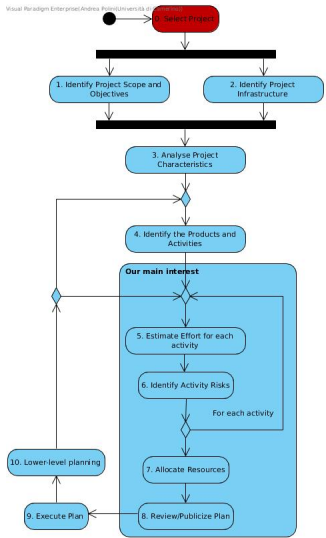
## Step 7: Allocate resources

- 1 Identify and allocate resources
- 2 Revise plans and estimate to take into account resource constraints - a needed expert could be fully booked in certain period



## Step 8: Review publicize plan

- 1 Review quality aspects of the project plan - which are the conditions that **establish when an activity can be closed**
- 2 Document plans and obtain agreement



# Step 0 – Select Project

## Concerns:

- identify which project proposal are worth implementation
- assessing the amount of risk failure
- decide how to share limited resources (staff time, finance) between projects
- being aware of dependencies between projects
- ensure to not duplicate work
- ensure to not miss necessary developments
- Program and project management focus on doing programs and projects the “right” way
- Portfolio management focuses on doing the “right” programs and projects.

# Portfolio, Program, Projects

The relationship among **portfolios, programs, and projects** is such that a portfolio refers to a collection of projects, programs, subportfolios, and operations managed as a group to achieve strategic objectives.

Programs are grouped within a portfolio and are comprised of subprograms, projects, or other work that are managed in a **coordinated fashion** in support of the portfolio. Individual projects that are either within or outside of a program are still considered part of a portfolio.

Although the **projects or programs within the portfolio may not necessarily be interdependent or directly related**, they are linked to the organization's strategic plan by means of the organization's portfolio.

# Portfolio, Program, Projects

Organizational Project Management			
	Projects	Programs	Portfolios
<b>Definition</b>	A project is a temporary endeavor undertaken to create a unique product, service, or result.	A program is a group of related projects, subsidiary programs, and program activities that are managed in a coordinated manner to obtain benefits not available from managing them individually.	A portfolio is a collection of projects, programs, subsidiary portfolios, and operations managed as a group to achieve strategic objectives.
<b>Scope</b>	Projects have defined objectives. Scope is progressively elaborated throughout the project life cycle.	Programs have a scope that encompasses the scopes of its program components. Programs produce benefits to an organization by ensuring that the outputs and outcomes of program components are delivered in a coordinated and complementary manner.	Portfolios have an organizational scope that changes with the strategic objectives of the organization.
<b>Change</b>	Project managers expect change and implement processes to keep change managed and controlled.	Programs are managed in a manner that accepts and adapts to change as necessary to optimize the delivery of benefits as the program's components deliver outcomes and/or outputs.	Portfolio managers continuously monitor changes in the broader internal and external environments.
<b>Planning</b>	Project managers progressively elaborate high-level information into detailed plans throughout the project life cycle.	Programs are managed using high-level plans that track the interdependencies and progress of program components. Program plans are also used to guide planning at the component level.	Portfolio managers create and maintain necessary processes and communication relative to the aggregate portfolio.
<b>Management</b>	Project managers manage the project team to meet the project objectives.	Programs are managed by program managers who ensure that program benefits are delivered as expected, by coordinating the activities of a program's components.	Portfolio managers may manage or coordinate portfolio management staff, or program and project staff that may have reporting responsibilities into the aggregate portfolio.
<b>Monitoring</b>	Project managers monitor and control the work of producing the products, services, or results that the project was undertaken to produce.	Program managers monitor the progress of program components to ensure the overall goals, schedules, budget, and benefits of the program will be met.	Portfolio managers monitor strategic changes and aggregate resource allocation, performance results, and risk of the portfolio.
<b>Success</b>	Success is measured by product and project quality, timeliness, budget compliance, and degree of customer satisfaction.	A program's success is measured by the program's ability to deliver its intended benefits to an organization, and by the program's efficiency and effectiveness in delivering those benefits.	Success is measured in terms of the aggregate investment performance and benefit realization of the portfolio.

# Evaluation of individual projects

- Technical assessment – can the required functionality be delivered with current affordable technologies?
- Cost-benefit analysis
  - Cost and benefit identification
  - Cost and benefit quantification
    - development costs
    - setup costs
    - operational costs
- Cash-flow forecasting

# Cost-benefit evaluation techniques

- **Net profit** – difference between the total costs and the total income over the life of a project
- **Payback period** – time taken to pay back the initial investment
- **Return on Investment (ROI)**

$$ROI = \frac{\text{average annual profit}}{\text{total investment}} \times 100$$

- **Net Present Value (NPV)** – with  $r$  as discount rate

$$\text{Present value} = \frac{\text{value in year } t}{(1+r)^t}$$

- **Internal Rate of Return (IRR)** – rate at which it is not worthwhile to invest elsewhere – calculated as the discount rate leading to an NPV equal to zero.

## Assessing projects financially

Consider the following cash flow projections for 4 different projects, and then compute the various indexes:

Year	Project 1	Project 2	Project 3	Project 4
0	-100,000	-1,000,000	- 100,000	-120,000
1	10,000	200,000	30,000	30,000
2	10,000	200,000	30,000	30,000
3	10,000	200,000	30,000	30,000
4	20,000	200,000	30,000	30,000
5	100,000	300,000	30,000	75,000

[Go to the on-line spreadsheet]



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Consider the following cash flow projections for 4 different projects, and then compute the various indexes:

Year	Project 1	Project 2	Project 3	Project 4
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2	10,000	200,000	30,000	30,000
3	10,000	200,000	30,000	30,000
4	20,000	200,000	30,000	30,000
5	100,000	300,000	30,000	75,000

Assessment based on static scenarios are not reliable....**uncertainty** has to be considered in **cost-benefit analysis**

[Go to the on-line spreadsheet]

# Portfolio Mgmt - Conclusions

Selecting the project to start is not an easy task. Any way some general rules can be identified:

- Project must be evaluated on strategic, technical, and economic grounds
- Many projects are not justified on their own, but as part of a broader programme that implements the organization's strategy
- Not all benefits can be precisely quantified in financial values
- Economic assessment involves the identification of all costs and income over the lifetime of the system
- Money received in the future is worth less than the same amount of money in hand now
- the uncertainty surrounding estimated future returns lowers their real value measured now
- discounted cash flow techniques help in considering value of costs and earnings