



Project Management Fundamentals

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WHAT IS A PROJECT?

Organizations perform work. Work generally could be classified into either operations or projects, although in some cases both of them may overlap. Both operations and projects share many characteristics in common like:

- ❑ People perform both the activities.
- ❑ Both are constrained by limited resources.
- ❑ Both are planned, executed, and controlled.

However operations and projects differ primarily in its repeatability. Operations are ongoing and repetitive whereas projects are temporary and unique. A project is thus defined in terms of its distinctive characteristics—*a project is a **temporary** endeavor undertaken to create a **unique** product or service.* **Temporary** means that every project has a definite beginning and a definite end. **Unique** means that the product or service is different in some distinguishing way from all other products or services. For many organizations, projects are a means to respond to requests that cannot be addressed within the organization's normal operational limits.

Projects are undertaken at all levels of the organization. They may involve a single person or many thousands. Their duration ranges from a few weeks to a few years. Projects may involve a single unit of one organization or may cross-organizational boundaries. As projects are often implemented as a means of achieving an organization's strategic plan they are critical for the organizations growth. Examples of projects could include:

- ❑ Developing a new product or service.
- ❑ Effecting a change in structure, staffing, or style of an organization.
- ❑ Developing a new or modified information system.
- ❑ Implementing a new business procedure or process.

WHAT IS PROJECT MANAGEMENT?

Project management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements. Project management is accomplished through the use of the following 5 processes:

- ❑ Initiation
- ❑ Planning
- ❑ Execution
- ❑ Controlling and
- ❑ Closure

The project team manages the various activities of the project, and the activities typically involve:

- ❑ Competing demands for: scope, time, cost, risk, and quality.
- ❑ Managing expectations of stakeholders.
- ❑ Identifying requirements.

It is important to note that many of the processes within project management are iterative in nature. This is partly due to the existence of and the necessity for

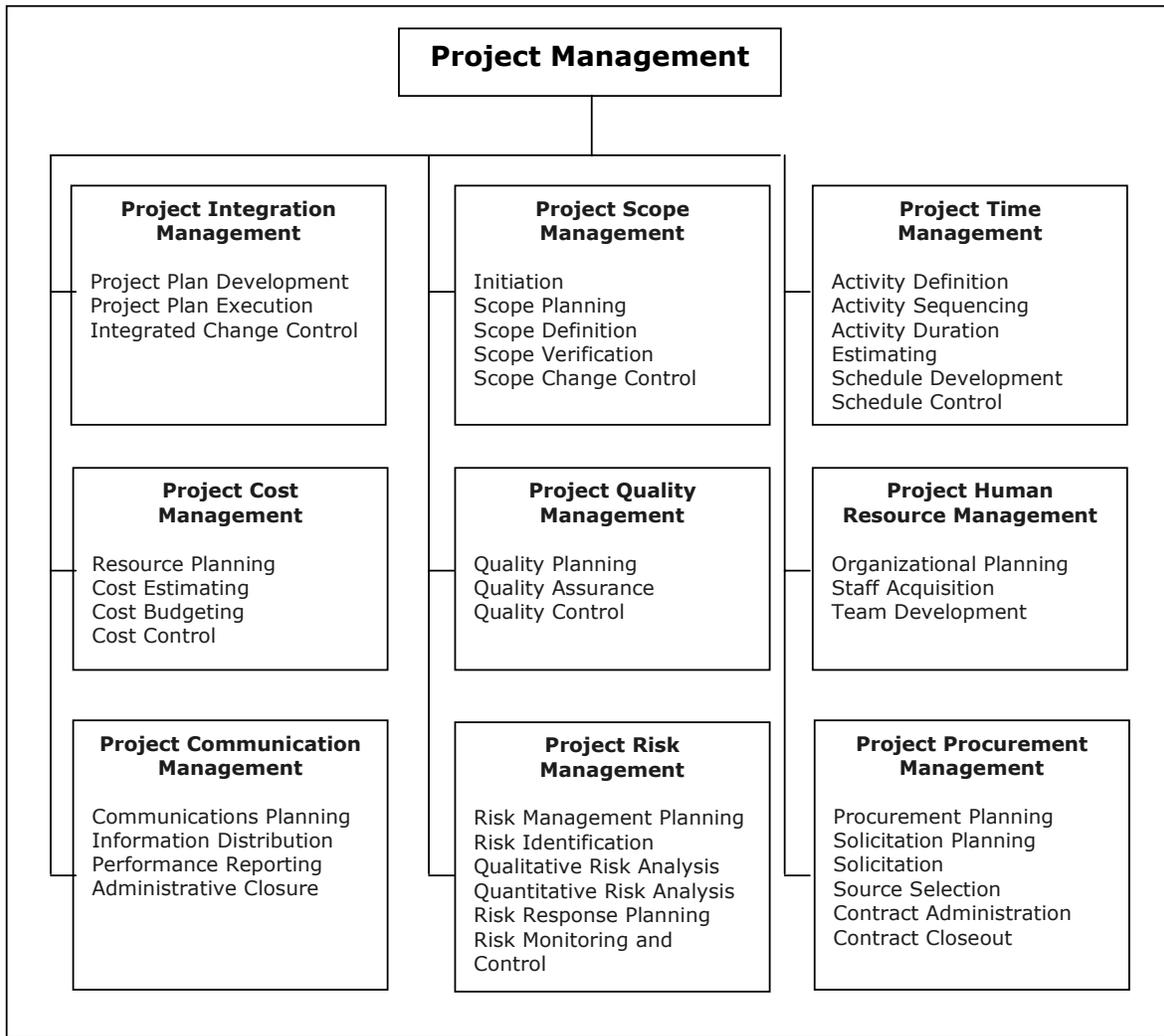
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progressive elaboration¹ in a project throughout the project life cycle; i.e., the more you know about your project, the better you are able to manage it.

The term “**project management**” is sometimes used to describe an organizational approach to the management of ongoing operations. This approach treats many aspects of ongoing operations as projects to apply project management techniques to them. A detailed discussion of the approach itself is outside the scope of this document.

Project Management Knowledge Areas

The Project Management Knowledge Areas describes project management knowledge and practice in terms of the various component processes. These processes have been organized into **nine knowledge areas**, as described below and as illustrated in figure below.



¹ *Progressively* means “proceeding in steps; continuing steadily by increments,” while *elaborated* means “worked out with care and detail; developed thoroughly”

Project Integration Management describes the processes required to ensure that the various elements of the project are properly coordinated. It consists of project plan development, project plan execution, and integrated change control.

Project Scope Management describes the processes required to ensure that the project includes all the work required, and only the work required, to complete the project successfully. It consists of initiation, scope planning, scope definition, scope verification, and scope change control.

Project Time Management describes the processes required to ensure timely completion of the project. It consists of activity definition, activity sequencing, activity duration estimating, schedule development, and schedule control.

Project Cost Management describes the processes required to ensure that the project is completed within the approved budget. It consists of resource planning, cost estimating, cost budgeting, and cost control.

Project Quality Management describes the processes required to ensure that the project will satisfy the needs for which it was undertaken. It consists of quality planning, quality assurance, and quality control.

Project Human Resource Management describes the processes required to make the most effective use of the people involved with the project. It consists of organizational planning, staff acquisition, and team development.

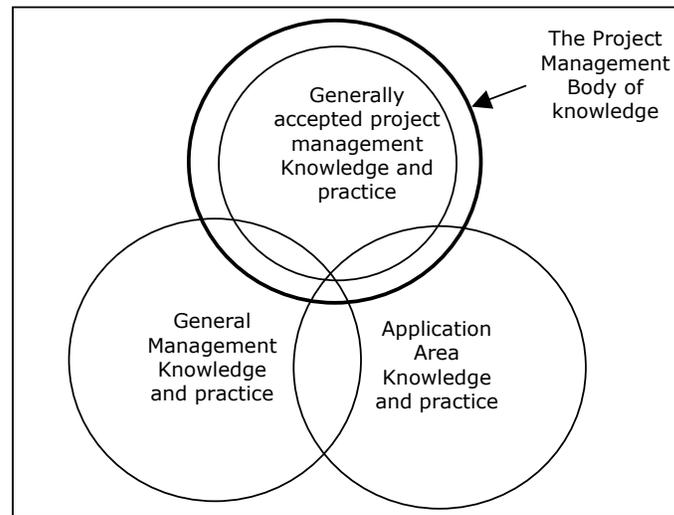
Project Communications Management describes the processes required to ensure timely and appropriate generation, collection, dissemination, storage, and ultimate disposition of project information. It consists of communications planning, information distribution, performance reporting, and administrative closure.

Project Risk Management describes the processes concerned with identifying, analyzing, and responding to project risk. It consists of risk management planning, risk identification, qualitative risk analysis, quantitative risk analysis, risk response planning, and risk monitoring and control.

Project Procurement Management describes the processes required to acquire goods and services from outside the performing organization. It consists of procurement planning, solicitation planning, solicitation, source selection, contract administration, and contract closeout.

Relationship To Other Management Disciplines

General management encompasses planning, organizing, staffing, executing, and controlling the operations of an ongoing enterprise. General management also includes supporting disciplines such as law, strategic planning, logistics, and human resources management. The current discussion of project management (Figure given below) overlaps and in certain cases even modifies the general management principles in many areas such as organizational behavior, financial forecasting, and planning techniques, to name just a few.



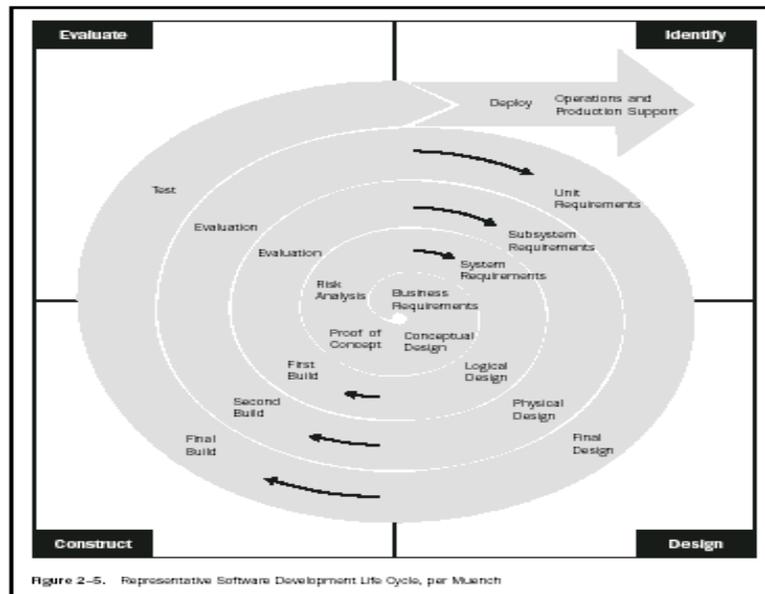
Application areas are categories of projects that have common elements significant in such projects, but are not needed or present in all projects. Application areas are usually defined in terms of:

- ❑ Functional departments and supporting disciplines, such as legal, production and inventory management, marketing, logistics and personnel.
- ❑ Technical elements, such as software development, pharmaceuticals, water and sanitation engineering, or construction engineering.
- ❑ Management specializations, such as government contracting, community development, or new product development.
- ❑ Industry groups, such as automotive, chemicals, agriculture, or financial services.

Representative Project Life Cycles In Software

There are a number of software life-cycle models in use such as the waterfall model. Muench, et al. describe a spiral model for software development with four cycles and four quadrants, as illustrated in figure given below:

- ❑ Proof-of-concept cycle—capture business requirements, define goals for proof of concept, produce conceptual system design and logic design, and construct the proof of concept, produce acceptance test plans, conduct risk analysis, and make recommendations.
- ❑ First-build cycle—derive system requirements, define goals for first build, produce logical system design, design and construct the first build, produce system test plans, evaluate the first build, and make recommendations.
- ❑ Second-build cycle—derive subsystem requirements, define goals for second build, produce physical design, construct the second build, produce subsystem test plans, evaluate the second build, and make recommendations.
- ❑ Final cycle—complete unit requirements and final design, construct final build, and perform unit, subsystem, system, and acceptance tests.



Related Endeavors

Certain types of endeavors are closely related to projects. There is often a hierarchy of strategic plan, program, project, and subproject, in which a program consisting of several associated projects will contribute to the achievement of the overall strategic plan. These related undertakings are described below.

Programs: A *program* is a group of projects managed in a coordinated way to obtain benefits not available from managing them individually. Many programs also include elements of ongoing operations. For example:

- The “XYZ airplane program” includes either the project or projects to design and develop the aircraft, as well as the ongoing manufacturing and support of that craft in the field.
- Many electronics firms have program managers who are responsible for both individual product releases (projects) and the coordination of multiple releases over time (an ongoing operation).

Programs may also involve a series of repetitive or cyclical undertakings for example:

- Utilities often speak of an annual “construction program,” a regular, ongoing operation that involves many projects.
- Many nonprofit organizations have a “fundraising program,” an ongoing effort to obtain financial support that often involves a series of discrete projects, such as a membership drive or an auction.
- Publishing a newspaper or magazine is also a program—the periodical itself is an ongoing effort, but each individual issue is a project.

In some application areas, program management and project management are treated as synonyms; in others, project management is a subset of program management. This diversity of meaning makes it imperative that any discussion

of *program* management versus *project* management must be preceded by agreement on a clear and consistent definition of each term.

Subprojects: Projects are frequently divided into more manageable components or subprojects. *Subprojects* are often contracted to an external enterprise or to another functional unit in the performing organization. Examples include:

- ❑ Subprojects based on the project process, such as a single phase.
- ❑ Subprojects, according to human resource skill requirements, such as the installation of plumbing or electrical fixtures on a construction project.
- ❑ Subprojects involving technology, such as automated testing of computer programs on a software development project. Subprojects are typically referred to as projects and managed as such.

Project Portfolio Management: Project portfolio management refers to the selection and support of projects or program investments. The organization's strategic plan and available resources guide these investments in projects and programs.

PROJECT CHARACTERIZATIONS

Project Phases

Each project phase is marked by completion of one or more deliverables. A *deliverable* is a tangible, verifiable work product such as a feasibility study, a detail design, or a working prototype. The deliverables, and hence the phases, are part of a generally sequential logic designed to ensure proper definition of the product of the project.

The conclusion of a project phase is generally marked by a review of both key deliverables and project performance to date, to a) determine if the project should continue into its next phase and b) detect and correct errors cost effectively. These phase-end reviews are often called *phase exits*, *stage gates*, or *kill points*.

Each project phase normally includes a set of defined deliverables designed to establish the desired level of management control. The majority of these items are related to the primary phase deliverable, and the phases typically take their names from these items: requirements, design, build, test, startup, turnover, and others, as appropriate.

Project Life Cycle

The project life cycle serves to define the beginning and the end of a project. For example, when an organization identifies an opportunity to which it would like to respond, it will often authorize a needs assessment and/or a feasibility study to decide if it should undertake the project. The project life-cycle definition will determine whether the feasibility study is treated as the first project phase or as a separate, standalone project.

The project life-cycle definition will also determine which transitional actions at the beginning and the end of the project are included and which are not. In this manner, the project life-cycle definition can be used to link the project to the ongoing operations of the performing organization.

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The phase sequence defined by most project life cycles generally involves some form of technology transfer or handoff such as requirements to design, construction to operations, or design to manufacturing. Deliverables from the preceding phase are usually approved before work starts on the next phase. However, a subsequent phase is sometimes begun prior to approval of the previous phase deliverables when the risks involved are deemed acceptable. This practice of overlapping phases is often called *fast tracking*.

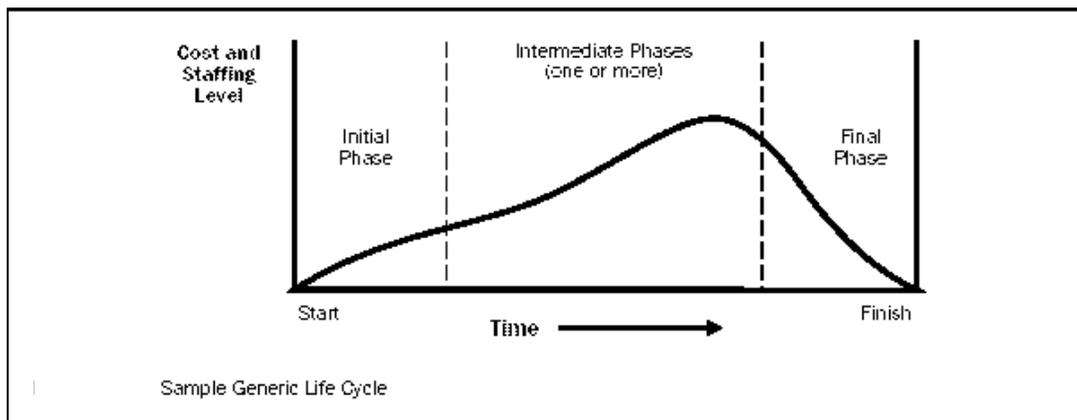
Project life cycles generally define:

- What technical work should be done in each phase (e.g., is the work of the analyst part of the definition phase or part of the execution phase)?
- Who should be involved in each phase (e.g., resources who need to be involved with requirements and design)?

Project life-cycle descriptions may be very general or very detailed. Highly detailed descriptions may have numerous forms, charts, and checklists to provide structure and consistency. Such detailed approaches are often called *project management methodologies*.

Most project life-cycle descriptions share a number of common characteristics:

- Cost and staffing levels are low at the start, higher toward the end, and drop rapidly as the project draws to a conclusion. This pattern is illustrated in the figure below:



- The probability of successfully completing the project is lowest, and hence risk and uncertainty are highest, at the start of the project. The probability of successful completion generally gets progressively higher as the project continues.
- The ability of the stakeholders to influence the final characteristics of the project's product and the final cost of the project is highest at the start and gets progressively lower as the project continues. A major contributor to this phenomenon is that the cost of changes and error correction generally increases as the project continues.

Care should be taken to distinguish the *project* life cycle from the *product* life cycle. For example, a project undertaken to bring new banking software to market is but one phase or stage of the product life cycle.

KEY GENERAL MANAGEMENT SKILLS

General management is a broad subject dealing with every aspect of managing an ongoing enterprise. Among other topics, it includes:

- ❑ Finance and accounting, sales and marketing, research and development, and manufacturing and distribution.
- ❑ Strategic planning, tactical planning, and operational planning.
- ❑ Organizational structures, organizational behavior, personnel administration, compensation, benefits, and career paths.
- ❑ Managing work relationships through motivation, delegation, supervision, team building, conflict management, and other techniques.
- ❑ Managing oneself through personal time management, stress management, and other techniques.

General management skills provide much of the foundation for building project management skills. They are often essential for the project manager. On any given project, skill in any number of general management areas may be required.

This section describes key general management skills that are *highly likely to affect most projects*. These skills are well documented in the general management literature, and their application is fundamentally the same on a project.

Leading: Kotter distinguishes between *leading* and *managing* while emphasizing the need for both: one without the other is likely to produce poor results. He says that managing is primarily concerned with “consistently producing key results expected by stakeholders,” while leading involves:

- ❑ Establishing direction—developing both a vision of the future and strategies for producing the changes needed to achieve that vision.
- ❑ Aligning people—communicating the vision by words and deeds to all those whose cooperation may be needed to achieve the vision.
- ❑ Motivating and inspiring—helping people energize themselves to overcome political, bureaucratic, and resource barriers to change.

On a project, particularly a larger project, the project manager is generally expected to be the project’s leader as well. Leadership is not, however, limited to the project manager: many different individuals may demonstrate it at many different times during the project. Leadership must be demonstrated at all levels of the project (project leadership, technical leadership, and team leadership).

Communicating: “90% of the Project Managers’ time goes in carrying out various communications”. *Communicating* involves the exchange of information. The sender is responsible for making the information clear, unambiguous, and complete so that the receiver can receive it correctly. The receiver is responsible for making sure that the information is received in its entirety and understood correctly. Communicating has many dimensions:

- ❑ Written and oral, listening and speaking.
- ❑ Internal (within the project) and external (to the customer, the media, the public, etc.).
- ❑ Formal (reports, briefings, etc.) and informal (memos, ad hoc conversations, etc.).
- ❑ Vertical (up and down the organization) and horizontal (with peers and partner organization).

The general management skill of communicating is related to, but not the same as, Project Communications Management. Communicating is the broader subject and involves a substantial body of knowledge that is not unique to the project context, for example:

- ❑ Sender-receiver models—feedback loops, barriers to communications, etc.
- ❑ Choice of media—when to communicate in writing, when to communicate orally, when to write an informal memo, when to write a formal report, etc.
- ❑ Writing style—active versus passive voice, sentence structure, word choice, etc.
- ❑ Presentation techniques—body language, design of visual aids, etc.
- ❑ Meeting management techniques—preparing an agenda, dealing with conflict, etc.

Project Communications Management is the application of these broad concepts to the specific needs of a project—for example, deciding how, when, in what form, and to whom to report project performance.

Negotiating: Negotiating involves conferring with others to come to terms with them or reach an agreement. Agreements may be negotiated directly or with assistance; mediation and arbitration are two types of assisted negotiation.

Negotiations occur around many issues, at many times, and at many levels of the project. During the course of a typical project, project staff is likely to negotiate for any or all of the following:

- ❑ Scope, cost, and schedule objectives.
- ❑ Changes to scope, cost, or schedule.
- ❑ Contract terms and conditions.
- ❑ Assignments.
- ❑ Resources.

Problem Solving: Problem solving involves a combination of problem definition and decision-making. Problem definition requires distinguishing between causes and symptoms. Problems may be internal (a key employee is reassigned to another project) or external (a permit required to begin work is delayed). Problems need not necessarily be technical in nature (differences of opinion about the best way to design a product), they may pertain to managerial (a functional group is not producing according to plan), or interpersonal (personality or style clashes) issues.

Decision-making includes analyzing the problem to identify viable solutions, and then making a choice from among them. Decisions can be made or obtained (from the customer, from the team, or from a functional manager). Once made, decisions must be implemented. Decisions also have a time element to them—the “right” decision may not be the “best” decision if it is made too early or too late.

Influencing the Organization: Influencing the organization involves the ability to “get things done.” It requires an understanding of both the formal and informal structures of all the organizations involved—the performing organization, customer, partners, contractors, and numerous others, as appropriate. Influencing the organization also requires an understanding of the mechanics of power and politics. Both power and politics are used here in their positive senses. Pfeffer defines power as “the potential ability to influence behavior, to change the course of events, to overcome resistance, and to get people to do things that they would not otherwise do.” In similar fashion, Eccles says “politics is about getting collective action from a group of people who may have quite different interests. It is about being willing to use conflict and disorder creatively. The negative sense, of course, derives from the fact that attempts to

reconcile these interests result in power struggles and organizational games that can sometimes take on a thoroughly unproductive life of their own.”

With globalization, increasingly firms have started outsourcing their non-core activities to other countries. As a result of this phenomenon, Indian software industry has seen a major boom over the last two decades. This has increasingly led to rise of a number of international projects. An international is a project that involves multiple locations, entities, organizations, and business units. Due to the presence of multiple delivery locations a number of cross-cultural factors have to be addressed by a project manager. They are

- ❑ Understanding of local culture and language
- ❑ Techniques and work methods unique to a particular location
- ❑ Standardization of work practices
- ❑ Infrastructure replication across locations
- ❑ Control from remote locations on a more or less real time basis
- ❑ Offer flexibility in offering products and services

Like general management, socioeconomic influences include a wide range of topics and issues. The project management team must understand that current conditions and trends in this area may have a major effect on its project: a small change in this can translate, usually with a time lag, into cataclysmic upheavals in the project itself.

PROCESSES AND CUSTOMIZATIONS

Project Management Processes

To help understanding the integrative nature of project management, and to emphasize the importance of integration, project management has been defined in terms of the various component processes and their interactions. This section provides an introduction to the concept of project management as a number of interlinked processes.

Project Processes: Projects are composed of processes. A *process* is “a series of actions bringing about a result”. Project processes are performed by people and generally fall into one of two major categories:

- ❑ *Project management processes* describe, organize, and complete the work of the project.
- ❑ *Product-oriented processes* specify and create the project’s product. Product-oriented processes are typically defined by the project life and vary by application area.

Project management processes and product-oriented processes overlap and interact throughout the project. For example, the scope of the project cannot be defined in the absence of some basic understanding of how to create the product.

Process Groups: Project management processes can be organized into five groups of one or more processes each:

- ❑ **Initiating processes** — authorizing the project or phase.
- ❑ **Planning processes** — defining and refining objectives and selecting the best of the alternative courses of action to attain the objectives that the project was undertaken to address.
- ❑ **Executing processes** — coordinating people and other resources to carry out the plan.

- ❑ **Controlling processes** — ensuring that monitoring and measuring progress regularly to identify variances from plan so that corrective action can be taken when necessary meet project objectives.
- ❑ **Closing processes** — formalizing acceptance of the project or phase and bringing it to an orderly end.

Process Interactions: Within each process group, the individual processes are linked by their inputs and outputs. By focusing on these links, we can describe each process in terms of its:

- ❑ Inputs - documents or documentable items that will be acted upon.
- ❑ Tools and techniques - mechanisms applied to the inputs to create the outputs.
- ❑ Outputs - documents or documentable items that are a result of the process.

The project management processes common to most projects in most application areas are described here. The process interactions illustrated here are also typical of most projects in most application areas.

- ❑ **Initiating Processes:** Authorizing the project or phase is part of project scope management.
- ❑ **Planning Processes:** Planning is of major importance to a project because the project involves doing something that has not been done before. As a result, there are relatively more processes in this section. However, the number of processes does not mean that project management is primarily planning—the amount of planning performed should be commensurate with the scope of the project and the usefulness of the information developed. Planning is an ongoing effort throughout the life of the project.

Core processes: Some planning processes have clear dependencies that require them to be performed in essentially the same order on most projects. For example, activities must be defined before they can be scheduled or costed. These core-planning processes may be iterated several times during any one phase of a project.

They include:

- ❑ Scope Planning - developing a written scope statement as the basis for future project decisions.
- ❑ Scope Definition - subdividing the major project deliverables into smaller, more manageable components.
- ❑ Activity Definition - identifying the specific activities that must be performed to produce the various project deliverables.
- ❑ Activity Sequencing - identifying and documenting interactivity dependencies.
- ❑ Activity Duration Estimating - estimating the number of work periods that will be needed to complete individual activities.
- ❑ Schedule Development - analyzing activity sequences, activity durations, and resource requirements to create the project schedule.
- ❑ Risk Management Planning - deciding how to approach and plan for risk management in a project.
- ❑ Resource Planning - determining what resources (people, equipment, materials) and what quantities of each should be used to perform project activities.
- ❑ Cost Estimating - developing an approximation (estimate) of the costs of the resources required to complete project activities.
- ❑ Cost Budgeting - allocating the overall cost estimate to individual work activities.

- ❑ Project Plan Development - taking the results of other planning processes and putting them into a consistent, coherent document.

Facilitating processes: Interactions among the other planning processes are more dependent on the nature of the project. For example, on some projects, there may be little or no identifiable risk until after most of the planning has been done and the team recognizes that the cost and schedule targets are extremely aggressive and thus involve considerable risk. Although these facilitating processes are performed intermittently and as needed during project planning, they are not optional.

They include:

- ❑ Quality Planning - identifying which quality standards are relevant to the project and determining how to satisfy them.
- ❑ Organizational Planning - identifying, documenting, and assigning project roles, responsibilities, and reporting relationships.
- ❑ Staff Acquisition - getting the human resources needed assigned to and working on the project.
- ❑ Communications Planning - determining the information and communications needs of the stakeholders: who needs what information, when will they need it, and how will it be given to them.
- ❑ Risk Identification - determining which risks might affect the project and documenting their characteristics.
- ❑ Qualitative Risk Analysis - performing a qualitative analysis of risks and conditions to prioritize their effects on project objectives.
- ❑ Quantitative Risk Analysis - measuring the probability and impact of risks and estimating their implications for project objectives.
- ❑ Risk Response Planning - developing procedures and techniques to enhance opportunities and to reduce threats to the project's objectives from risk.
- ❑ Procurement Planning - determining what to procure, how much to procure, and when.
- ❑ Solicitation Planning - documenting product requirements and identifying potential sources.

Executing Processes: The executing processes include core processes and facilitating processes.

- ❑ Project Plan Execution - carrying out the project plan by performing the activities included therein.
- ❑ Quality Assurance - evaluating overall project performance on a regular basis to provide confidence that the project will satisfy the relevant quality standards.
- ❑ Team Development - developing individual and group competencies to enhance project performance.
- ❑ Information Distribution - making needed information available to project stakeholders in a timely manner.
- ❑ Solicitation - obtaining quotations, bids, offers, or proposals as appropriate.
- ❑ Source Selection - choosing from among potential sellers.
- ❑ Contract Administration - managing the relationship with the seller.

Controlling Processes: Project performance must be monitored and measured regularly to identify variances from the plan. Variances are fed into the control processes in the various knowledge areas. Adjustments are made to the plan to the extent of the variances observed (i.e., those that jeopardize the project objectives). For example, a missed activity finish date may require adjustments to the current staffing plan, reliance on overtime, or tradeoffs between budget and schedule

objectives. Controlling also includes taking preventive action in anticipation of possible problems. The controlling process group contains core processes and facilitating processes.

They various interactions between core and facilitating processes are:

- ❑ Integrated Change Control - coordinating changes across the entire project.
- ❑ Scope Verification - formalizing acceptance of the project scope.
- ❑ Scope Change Control - controlling changes to project scope.
- ❑ Schedule Control - controlling changes to the project schedule.
- ❑ Cost Control - controlling changes to the project budget.
- ❑ Quality Control - monitoring specific project results to determine if they comply with relevant quality standards and identifying ways to eliminate causes of unsatisfactory performance.
- ❑ Performance Reporting - collecting and disseminating performance information. This includes status reporting, progress measurement, and forecasting.
- ❑ Risk Monitoring and Control - keeping track of identified risks, monitoring residual risks and identifying new risks, ensuring the execution of risk plans, and evaluating their effectiveness in reducing risk.

Closing Processes: The following components make the closing process.

- ❑ Contract Closeout - completion and settlement of the contract, including resolution of any open items.
- ❑ Administrative Closure - generating, gathering, and disseminating information to formalize phase or project completion, including evaluating the project and compiling lessons learned for use in planning future projects or phases.

Customizing Process Interactions

The above processes and interactions meet the test of general acceptance - they apply to most projects most of the time. However, not all of the processes will be needed on all projects, and not all of the interactions will apply to all projects.

Mapping Of Project Management Processes

Given below (source: *PMBOK® Guide*) is the table that reflects the mapping of the thirty-nine project management processes to the five project management process groups of initiating, planning, executing, controlling, and closing and the nine project management knowledge areas that has been discussed previously.

Project Management Fundamentals

	Initiating	Planning	Executing	Controlling	Closing
Project Integration Management		Project Plan Development	Project Plan Execution	Integrated Change Control	
Project Scope Management	Initiation	Scope Planning Scope Definition		Scope Verification Scope Change Control	
Project Time Management		Activity Definition Activity Sequencing Activity Duration Estimation Schedule Development		Schedule Control	
Project Cost Management		Resource Planning Cost Estimating Cost Budgeting		Cost Control	
Project Quality Management		Quality Planning	Quality Assurance	Quality Control	
Project Human Resource Management		Organizational Planning Staff Acquisition	Team Development		
Project Communications Management		Communications Planning	Information Distribution	Performance Reporting	Administrative Closure
Project Risk Management		Risk Management Planning Risk Identification Qualitative Risk Analysis Quantitative Risk Analysis Risk Response Planning		Risk Monitoring and Control	
Project Procurement Management		Procurement Planning Solicitation Planning	Solicitation Source Selection Contract Administration		Contract Closeout

Inputs & Outputs of Knowledge Areas

The inputs, tools & techniques for measurement and the corresponding outputs in each of the nine project management knowledge areas discussed above are listed below:

Project Integration Management:

	Project Plan Development	Project Plan Execution	Integrated Change Control
Input	Other planning outputs Historical information Organizational policies Constraints Assumptions	Project plan Supporting detail Organizational policies Preventive action Corrective action	Project plan Performance reports Change requests
Tools & Techniques	Project planning methodology Stakeholder skills and knowledge Project management information system (PMIS) Earned value management (EVM)	General management skills Product skills and knowledge Work authorization system Status review meetings Project management information system Organizational procedures	Change control system Configuration management Performance measurement Additional planning Project management information system
Output	Project plan Supporting detail	Work results Change requests	Project plan updates Corrective action Lessons learned

Project Management Fundamentals

Project Scope Management:

	Initiation	Scope Planning	Scope Definition	Scope Verification	Scope Change Control
Input	Product description Strategic plan Project selection criteria Historical information	Product description Project charter Constraints Assumptions	Scope statement Constraints Assumptions Other planning outputs Historical information	Work results Product documentation Work breakdown structure Scope statement Project plan	Work breakdown structure Performance reports Change requests Scope management plan
Tools & Techniques	Project selection Methods Expert judgment	Product analysis Benefit/cost analysis Alternatives identification Expert judgment	Work breakdown structure templates Decomposition	Inspection	Scope change control System Performance measurement Additional planning
Output	Project charter Project manager identified/assigned Constraints Assumptions	Scope statement Supporting detail Scope management plan	Work breakdown structure Scope statement updates	Formal acceptance	Scope changes Corrective action Lessons learned Adjusted baseline

Project Time Management:

	Activity Definition	Activity Sequencing	Activity Duration Estimation	Schedule Development	Schedule Control
Input	Work breakdown structure Scope statement Historical information Constraints Assumptions Expert judgment	Activity list Product description Mandatory dependencies Discretionary dependencies External dependencies Milestones	Activity list Constraints Assumptions Resource requirements Resource capabilities Historical information Identified risks	Project n/w diagrams Activity duration estimates Resource Req Resource pool description Calendars Constraints Assumptions Leads and lags Risk Mgmt plan Activity attributes	Project schedule Performance reports Change requests Schedule management plan
Tools & Techniques	Decomposition Templates	Precedence diagramming method (PDM) Arrow diagramming method (ADM) Conditional diagramming methods Network templates	Expert judgment Analogous estimating Quantitatively based durations Reserve time (contingency)	Mathematical analysis Duration compression Simulation Resource leveling heuristics Project management software Coding structure	Schedule change control system Performance measurement Additional planning Project management software Variance analysis
Output	Activity list Supporting detail Work breakdown structure updates	Project network diagrams Activity list updates	Activity duration estimates Basis of estimates Activity list updates	Project schedule Supporting detail Schedule Mgmt plan Resource req. updates	Schedule updates Corrective action Lessons learned

Project Management Fundamentals

Project Cost Management:

	Resource Planning	Cost Estimating	Cost Budgeting	Cost Control
Input	Work breakdown structure Historical information Scope statement Resource pool description Organizational policies Activity duration estimates	Work breakdown structure Resource requirements Resource rates Activity duration estimates Estimating publications Historical information Chart of accounts Risks	Cost estimates Work breakdown structure Project schedule Risk management plan	Cost baseline Performance reports Change requests Cost management plan
Tools & Techniques	Expert judgment Alternatives identification PM software	Analogous estimating Parametric modeling Bottom-up estimating Computerized tools Other cost est. methods	Cost budgeting tools and techniques	Cost change control system Performance measurement Earned value management (EVM) Additional planning Computerized tools
Output	Resource requirements	Cost estimates Supporting detail Cost management plan	Cost baseline Resource Planning	Revised cost estimates Budget updates Corrective action Estimate at completion Project closeout Lessons learned

Project Quality Management:

	Quality Planning	Quality Assurance	Quality Control
Input	Quality policy Scope statement Product description Standards and regulations Other process outputs	Quality management plan Results of quality control measurements Operational definitions	Work results Quality management plan Operational definitions Checklists
Tools & Techniques	Benefit/cost analysis Benchmarking Flow-charting Design of experiments Cost of quality	Quality planning tools and techniques Quality audits	Inspection Control charts Pareto diagrams Statistical sampling Flow-charting Trend analysis
Output	Quality management plan Operational definitions Checklists Inputs to other processes	Quality improvement	Quality improvement Acceptance decisions Rework Completed checklists Process adjustments

Project Human Resource Management:

	Organizational Planning	Staff Acquisition	Team Development
Input	Project interfaces Staffing requirements Constraints	Staffing management plan Staffing pool description Recruitment practices	Project staff Project plan Staffing management plan Performance reports External feedback
Tools & Techniques	Templates Human resource practices Organizational theory Stakeholder analysis	Negotiations Pre-assignment Procurement	Team-building activities General management skills Reward and recognition systems Collocation Training
Output	Role and responsibility assignments Staffing management plan Organization chart Supporting detail	Project staff assigned Project team directory	Performance improvements Input to performance appraisals

Project Communication Management:

	Communications Planning	Information Distribution	Performance Reporting	Administrative Closure
Input	Communications requirements Communications technology Constraints Assumptions	Work results Communications management plan Project plan	Project plan Work results Other project records	Performance measurement documentation Product documentation Other project records
Tools & Techniques	Stakeholder analysis	Communications skills Information retrieval systems Information distribution methods	Performance reviews Variance analysis Trend analysis Earned value analysis Information distribution tools and techniques	Performance reporting tools and techniques Project reports Project presentations
Output	Communications management plan	Project records Project reports Project presentations	Performance reports Change requests	Project archives Project closure Lessons learned

Project Risk Management:

	Risk Management Planning	Risk Identification	Qualitative Risk	Quantitative Risk Analysis	Risk Response Planning	Risk Monitoring and Control
Input	Project charter Organization's risk mgmt. policies Defined roles - responsibilities Stakeholder risk tolerances Template for the org's risk mgmt. plan Work breakdown structure (WBS)	Risk management plan Project planning outputs Risk categories Historical information	Risk mgmt plan Identified risks Project status Project type Data precision Scales of probability and impact Assumptions	Risk management plan Identified risks List of prioritized risks List of risks for additional analysis and management Historical information Expert judgment Other planning outputs	Risk management plan List of prioritized risks Risk ranking of the project Prioritized list of quantified risks Probabilistic analysis of the project Probability of achieving the cost and time objectives List of potential responses Risk thresholds Risk owners Common risk causes Trends in qualitative and quantitative risk analysis results	Risk management plan Risk response plan Project communication Additional risk identification and analysis Scope changes
Tools & Techniques	Planning meetings	Documentation reviews Information-gathering techniques Checklists Assumptions analysis Diagramming techniques	Risk probability and impact Probability/impact risk rating matrix Project assumptions testing Data precision ranking	Interviewing Sensitivity analysis Decision tree analysis Simulation	Avoidance Transference Mitigation Acceptance	Project risk response audits Periodic project risk reviews Earned value analysis Technical performance measurement Additional risk response planning

Project Management Fundamentals

	Risk Management Planning	Risk Identification	Qualitative Risk	Quantitative Risk Analysis	Risk Response Planning	Risk Monitoring and Control
Output	Risk management plan	Risks Triggers Inputs to other processes	Overall risk ranking for the project List of prioritized risks List of risks for additional analysis and management Trends in qualitative risk analysis results	Prioritized list of quantified risks Probabilistic analysis of the project Probability of achieving the cost and time objectives Trends in quantitative risk analysis results	Risk response plan Residual risks Secondary risks Contractual agreements Contingency reserve amounts needed Inputs to other processes Inputs to a revised project plan	Workaround plans Corrective action Project change requests Updates to the risk response plan Risk database Updates to risk identification checklists

Project Procurement Management:

	Procurement Planning	Solicitation	Planning Solicitation	Source Selection	Contract Administration	Contract Closeout
Input	Scope statement Product description Procurement resources Market conditions Other planning outputs Constraints Assumptions	Procurement management plan Statement(s) of work Other planning outputs	Procurement documents Qualified seller lists	Proposals Evaluation criteria Organizational policies	Contract Work results Change requests Seller invoices	Contract documentation
Tools & Techniques	Make-or-buy analysis Expert judgment Contract type selection	Standard forms Expert judgment	Bidder conferences Advertising	Contract negotiation Weighting system Screening system Independent estimates	Contract change control system Performance reporting Payment system	Procurement audits
Output	Procurement management plan Statement(s) of work	Procurement documents Evaluation criteria Statement of work updates	Proposals	Contract	Correspondence Contract changes Payment requests	Contract file Formal acceptance and closure

EXISTING STANDARDS & CERTIFICATIONS

Currently, there are two best practices for project management that are used widely prevalent in the industry. They are Prince2 and the PMI framework.

PMI (**P**roject **M**anagement **I**nstitute) was established in 1969 and is headquartered in Pennsylvania, USA. It is the world's leading not-for-profit professional association serving project management with nearly 150,000 members worldwide. Their premiere standards document, ***A Guide to the Project Management Body of Knowledge (PMBOK® Guide)***, is recognized throughout the world as a standard for managing projects in today's marketplace. The PMBOK® Guide is approved as an American National Standard (ANS) by the American National Standards Institute (ANSI).

PRINCE (**P**rojects **I**N **C**ontrolled **E**nvironments) is a structured method for effective project management. It is a de facto standard used extensively by the UK Government and is widely recognized and used in the private sector, both in the UK and

internationally. PRINCE, the method, is in the public domain, offering non-proprietary best-practice guidance on project management. PRINCE is, however, a registered trademark of OGC.

CONCLUSION

Finally as a practicing project manager it would be a folly on my part not to add a note on the numerous project failures. Project failures are all too common - some make the headlines whereas the vast majorities are quickly forgotten. The reasons for failure are wide and varied. These failures could be listed into four areas: People related or Process related or Product related or Technology related. I have listed below the various issues in the above four areas. Though the list is not exhaustive but it is comprehensive.

People Related	Process Related	Product Related	Technology Related
Undermined motivation	Optimistic schedules	Requirements gold-plating	Silver-bullet syndrome
Weak personnel	Insufficient risk management	Gilding the lily	Overestimated savings from new tools and methods
Uncontrolled problem employees	Insufficient planning	Feature creep	Fad warning
Adding people to a late project	Abandonment of plan under pressure	Developer gold-plating	Switching tools in mid-project
Customer-Developer friction	Wasted time during fuzzy front end	Beware the pet project	Lack of automated source-code control
Unrealistic expectations	Shortchanged upstream activities	Push-me, pull-me negotiation	
Politics over substance	Inadequate design	Research-oriented development	
Wishful thinking	Shortchanged quality assurance		
Lack of effective project sponsorship	Insufficient management controls		
Lack of stakeholder buy-in	Omitting necessary tasks from estimates		
Lack of user input	Planning to catch-up later		

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