Project management

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Jump to: navigation, search

Project management is the discipline of planning, organizing and managing resources to bring about the successful completion of specific project goals and objectives.

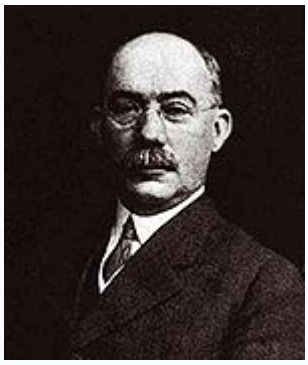
SimulTrain : Example of a Project Management Simulator.

A project is a finite endeavor (having specific start and completion dates) that requires the organization and coordination of a group of two or more people, to create a unique product or service which brings about beneficial change or added value. This finite characteristic of projects stands in sharp contrast to processes, or operations, which are permanent or semi-permanent functional work to repetitively produce the same product or service. In practice, the management of these two systems is often found to be quite different, and as such requires the development of distinct technical skills and the adoption of separate management.

The primary challenge of project management is to achieve all of the project goals and objectives while honoring the project constraints. Typical constraints are scope, time and budget. The secondary—and more ambitious—challenge is to optimize the allocation and integration of inputs necessary to meet pre-defined objectives.

Contents

[edit] History of project management



Henry Gantt (1861-1919), the father of planning and control techniques.

As a discipline, Project Management developed from different fields of application including construction, engineering and defense. In the United States, the two forefathers of project management are Henry Gantt, called the father of planning and control

techniques, who is famously known for his use of the Gantt chart as a project management tool, and Henry Fayol for his creation of the 6 management functions, which form the basis for the body of knowledge associated with project and program management.

Henri Fayol (1841–1925).

Both Gantt and Fayol were known as being associates of Frederick Winslow Taylor's theories of scientific management,[1] and for his study of the work and management of Navy ship building. His work is the forerunner to many modern project management tools including the work breakdown structure (WBS) and resource allocations.

The 1950s marked the beginning of the modern Project Management era. Again, in the United States, prior to the 1950s, projects were managed on an *ad hoc* basis using mostly Gantt Charts, and informal techniques and tools. At that time, two mathematical project scheduling models were developed: (1) the "Program Evaluation and Review Technique" or PERT, developed by Booz-Allen & Hamilton as part of the United States Navy's (in conjunction with the Lockheed Corporation) Polaris missile submarine program;[2] and (2) the "Critical Path Method" (CPM) developed in a joint venture by both DuPont Corporation and Remington Rand Corporation for managing plant maintenance projects. These mathematical techniques quickly spread into many private enterprises.

At the same time, technology for project cost estimating, cost management, and engineering economics was evolving, with pioneering work by Hans Lang and others. In 1956, the American Association of Cost Engineers (now AACE International; the Association for the Advancement of Cost Engineering) was formed by early practitioners of project management and the associated specialties of planning and scheduling, cost estimating, and cost/schedule control (project control). AACE has continued its pioneering work and in 2006 released the first ever integrated process for portfolio, program and project management (Total Cost Management Framework).

In 1969, the Project Management Institute (PMI) was formed to serve the interests of the project management industry. The premise of PMI is that the tools and techniques of project management are common even among the widespread application of projects

from the software industry to the construction industry. In 1981, the PMI Board of Directors authorized the development of what has become *A Guide to the Project Management Body of Knowledge* (PMBOK Guide), containing the standards and guidelines of practice that are widely used throughout the profession.

The International Project Management Association (IPMA), founded in Europe in 1967, has undergone a similar development and instituted the IPMA Competence Baseline (ICB). The focus of the ICB also begins with knowledge as a foundation, and adds considerations about relevant experience, interpersonal skills, and competence. Both organizations are now participating in the development of an ISO project management standard.

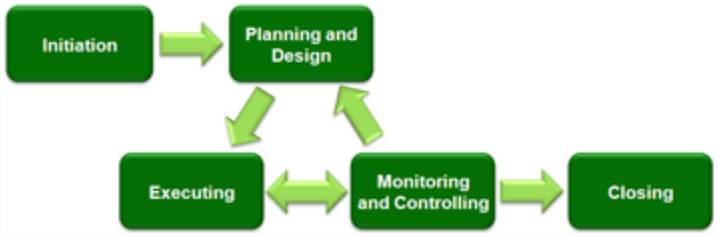
[edit] Project management approaches

There are several approaches that can be taken to managing project activities including agile, interactive, incremental, and phased approaches.

Regardless of the approach employed, careful consideration needs to be given to clarify surrounding project objectives, goals, and importantly, the roles and responsibilities of all participants and stakeholders.

[edit] The traditional approach

A traditional phased approach identifies a sequence of steps to be completed. In the "traditional approach", we can distinguish 5 components of a project (4 stages plus control) in the development of a project:



Typical development phases of a project

- Project initiation stage;
- Project planning or design stage;
- Project execution or production stage;
- Project monitoring and controlling systems;
- Project completion stage.

Not all the projects will visit every stage as projects can be terminated before they reach completion. Some projects probably don't have the planning and/or the monitoring. Some projects will go through steps 2, 3 and 4 multiple times.

Many industries utilize variations on these stages. For example, in bricks and mortar architectural design, projects typically progress through stages like Pre-Planning, Conceptual Design, Schematic Design, Design Development, Construction Drawings (or Contract Documents), and Construction Administration. In software development, this approach is often known as "waterfall development", i.e., one series of tasks after another in linear sequence. In software development many organizations have adapted the Rational Unified Process (RUP) to fit this methodology, although RUP does not require or explicitly recommend this practice. Waterfall development can work for small tightly defined projects, but for larger projects of undefined or unknowable scope, it is less suited. The Cone of Uncertainty explains some of this as the planning made on the initial phase of the project suffers from a high degree of uncertainty. This becomes specially true as software development is often the realization of a new or novel product, this method has been widely accepted as ineffective for software projects where requirements are largely unknowable up front and susceptible to change. While the names may differ from industry to industry, the actual stages typically follow common steps to problem solving — "defining the problem, weighing options, choosing a path, implementation and evaluation."

[edit] Critical Chain Project Management

Critical Chain Project Management (CCPM) is a method of planning and managing projects that puts more emphasis on the resources required to execute project tasks. It is an application of the Theory of Constraints (TOC) to projects. The goal is to increase the rate of throughput (or completion rates) of projects in an organization. Applying the first three of the five focusing steps of TOC, the system constraint for all projects is identified as resources. To exploit the constraint, tasks on the critical chain are given priority over all other activities. Finally, projects are planned and managed to ensure that the critical chain tasks are ready to start as soon as the needed resources are available, subordinating all other resources to the critical chain.

For specific projects, the project plan should undergo Resource Leveling, and the longest sequence of resource-constrained tasks is identified as the critical chain. In multi-project environments, resource leveling should be performed across projects. However, it is often enough to identify (or simply select) a single "drum" resource—a resource that acts as a constraint across projects—and stagger projects based on the availability of that single resource.

Planning and feed back loops in Extreme Programming (XP) with the time frames of the multiple loops.

[edit] Extreme Project Management

In critical studies of Project Management, it has been noted that several of these fundamentally PERT-based models are not well suited for the multi-project company environment of today. Most of them are aimed at very large-scale, one-time, non-routine projects, and nowadays all kinds of management are expressed in terms of projects.

Using complex models for "projects" (or rather "tasks") spanning a few weeks has been proven to cause unnecessary costs and low maneuverability in several cases. Instead, project management experts try to identify different "lightweight" models, such as Agile Project Management methods including Extreme Programming for software development and Scrum techniques.

The generalization of Extreme Programming to other kinds of projects is extreme project management, which may be used in combination with the process modeling and management principles of human interaction management.

[edit] Event chain methodology

Event chain methodology is the next advance beyond critical path method and critical chain project management.

Event chain methodology is an uncertainty modeling and schedule network analysis technique that is focused on identifying and managing events and event chains that affect project schedules. Event chain methodology helps to mitigate the negative impact of psychological heuristics and biases, as well as to allow for easy modeling of uncertainties in the project schedules. Event chain methodology is based on the following major principles.

- Probabilistic moment of risk: An activity (task) in most real life processes is not a continuous uniform process. Tasks are affected by external events, which can occur at some point in the middle of the task.

- Event chains: Events can cause other events, which will create event chains. These event chains can significantly affect the course of the project. Quantitative analysis is used to determine a cumulative effect of these event chains on the project schedule.
- Critical events or event chains: The single events or the event chains that have the most potential to affect the projects are the “critical events” or “critical chains of events.” They can be determined by the analysis.
- Project tracking with events: If a project is partially completed and data about the project duration, cost, and events occurred is available, it is possible to refine information about future potential events and helps to forecast future project performance.
- Event chain visualization: Events and event chains can be visualized using event chain diagrams on a Gantt chart.

[edit] PRINCE2

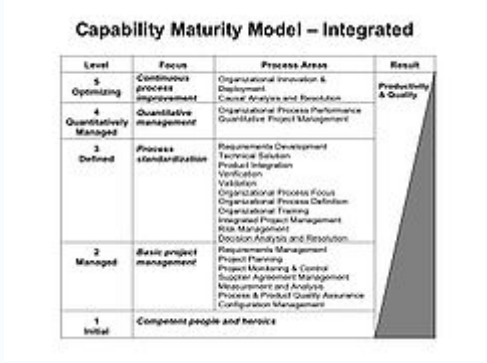
The PRINCE2 process model

PRINCE2 is a structured approach to project management, released in 1996 as a generic project management method. It provides a method for managing projects within a clearly defined framework. PRINCE2 describes procedures to coordinate people and activities in a project, how to design and supervise the project, and what to do if the project has to be adjusted if it doesn’t develop as planned.

In the method each process is specified with its key inputs and outputs and with specific goals and activities to be carried out, which gives an automatic control of any deviations from the plan. Divided into manageable stages, the method enables an efficient control of resources. On the basis of close monitoring the project can be carried out in a controlled and organized way.

PRINCE2 provides a common language for all participants in the project. The various management roles and responsibilities involved in a project are fully described and are adaptable to suit the complexity of the project and skills of the organization.

[edit] Process-based management



Capability Maturity Model, predecessor of the CMMI Model.

Also furthering the concept of project control is the incorporation of process-based management. This area has been driven by the use of Maturity models such as the CMMI (Capability Maturity Model Integration) and ISO/IEC15504 (SPICE - Software Process Improvement and Capability Determination), which have been far more successful.

Agile Project Management approaches based on the principles of human interaction management are founded on a process view of human collaboration. This contrasts sharply with traditional approach. In the agile software development or flexible product development approach, the project is seen as a series of relatively small tasks conceived and executed as the situation demands in an adaptive manner, rather than as a completely pre-planned process.

[edit] Rational Unified Process

The Rational Unified Process (RUP) is an iterative software development process framework created by the Rational Software Corporation, a division of IBM since 2003. RUP is not a single concrete prescriptive process, but rather an adaptable process framework, intended to be tailored by the development organizations and software project teams that will select the elements of the process that are appropriate for their needs. The following are phases of RUP, which align to business activities intended to drive successful delivery and deployment of projects. It also provides the taxonomy for blue printing and producing enterprise architecture artifacts across its different domains.

1. Inception - Identify the initial scope of the project, a potential architecture for the system, and obtain initial project funding and stakeholder acceptance.
2. Elaboration - Prove the architecture of the system.
3. Construction - Build working software on a regular, incremental basis which meets the highest-priority needs of project stakeholders.
4. Transition - Validate and deploy the system into the production environment

The open source version of RUP is OpenUP.

[edit] Project development stages

The project development stages.[3]

Traditionally, project development includes a number of elements: four to five stages, and a control system. Regardless of the methodology used, the project development process will have the same major stages:

- initiation,
- planning or development,
- production or execution,
- monitoring and controlling, and
- closing.

[edit] Initiation

Initiating Process Group Processes.[3]

The initiation stage determines the nature and scope of the development. If this stage is not performed well, it is unlikely that the project will be successful in meeting the business's needs. The key project controls needed here are an understanding of the business environment and making sure that all necessary controls are incorporated into the project. Any deficiencies should be reported and a recommendation should be made to fix them.

The initiation stage should include a cohesive plan that encompasses the following areas:

- Study analyzing the business needs in measurable goals.
- Review of the current operations.
- Conceptual design of the operation of the final product.
- Equipment and contracting requirements including an assessment of 'long-lead' items.
- Financial analysis of the costs and benefits including a budget.

- Stakeholder analysis, including users, and support personnel for the project.
- Project charter including costs, tasks, deliverables, and schedule.

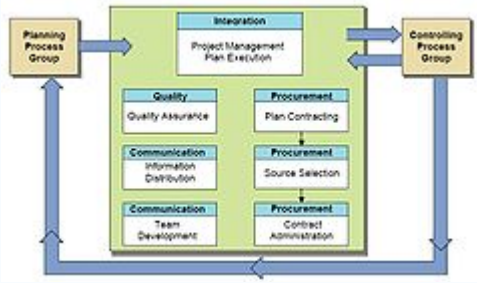
[edit] Planning and design

Planning Process Group Activities.[3]

After the initiation stage, the system is designed. Occasionally, a small prototype of the final product is built and tested. Testing is generally performed by a combination of testers and end users, and can occur after the prototype is built or concurrently. Controls should be in place that ensure that the final product will meet the specifications of the project charter. The results of the design stage should include a product design that:

- Satisfies the project sponsor, end user, and business requirements.
- Functions as it was intended.
- Can be produced within quality standards.
- Can be produced within time and budget constraints.

[edit] Executing



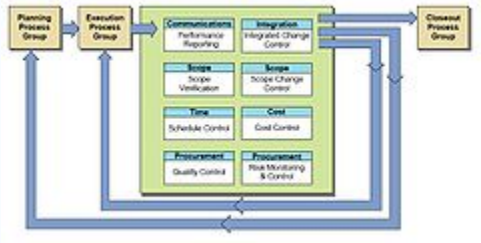
Executing Process Group Processes.[3]

Executing consists of the processes used to complete the work defined in the project management plan to accomplish the project's requirements. Execution process involves coordinating people and resources, as well as integrating and performing the activities of the project in accordance with the project management plan. The deliverables are

produced as outputs from the processes performed as defined in the project management plan.

[edit] Monitoring and Controlling

Monitoring and Controlling consists of those processes performed to observe project execution so that potential problems can be identified in a timely manner and corrective action can be taken, when necessary, to control the execution of the project. The key benefit is that project performance is observed and measured regularly to identify variances from the project management plan.



Monitoring and Controlling Process Group Processes.[3]

Monitoring and Controlling includes:

- Measuring the ongoing project activities (*where we are*);
- Monitoring the project variables (cost, effort, ...) against the project management plan and the project performance baseline (*where we should be*);
- Identify corrective actions to properly address issues and risks (*How can we get on track again*);
- Influencing the factors that could circumvent integrated change control so only approved changes are implemented

In multi-phase projects, the Monitoring and Controlling process also provides feedback between project phases, in order to implement corrective or preventive actions to bring the project into compliance with the project management plan.

Project Maintenance is an ongoing process, and it includes:

- Continuing support of end users
- Correction of errors
- Updates of the software over time

Monitoring and Controlling cycle

In this stage, auditors should pay attention to how effectively and quickly user problems are resolved.

Over the course of any construction project, the work scope changes. Change is a normal and expected part of the construction process. Changes can be the result of necessary design modifications, differing site conditions, material availability, contractor-requested changes, value engineering and impacts from third parties, to name a few. Beyond executing the change in the field, the change normally needs to be documented to show what was actually constructed. This is referred to as Change Management. Hence, the owner usually requires a final record to show all changes or, more specifically, any change that modifies the tangible portions of the finished work. The record is made on the contract documents – usually, but not necessarily limited to, the design drawings. The end product of this effort is what the industry terms as-built drawings, or more simply, "asbuilts." The requirement for providing them is a norm in construction contracts.

When changes are introduced to the project the viability of the project has to be assessed again. It is important not to lose sight of the initial goals and targets of the projects. When the changes accumulate, the forecasted end result may not justify the proposed investment.

[edit] Closing

Closing Process Group Processes.[3]

Closing includes the formal acceptance of the project and the ending thereof. Administrative activities include the archiving of the files and documenting lessons learned. Closing phase consist of two parts:

- Close project: to finalize all activities across all of the process groups to formally close the project or a project phase

- Contract closure: necessary for completing and settling each contract, including the resolution of any open items, and closing each contract applicable to the project or a project phase.

[edit] Project control systems

Project control is that element of a project that keeps it on-track, on-time and within budget. Project control begins early in the project with planning and ends late in the project with post-implementation review, having a thorough involvement of each step in the process. Each project should be assessed for the appropriate level of control needed: too much control is too time consuming, too little control is very risky. If project control is not implemented correctly, the cost to the business should be clarified in terms of errors, fixes, and additional audit fees.

Control systems are needed for cost, risk, quality, communication, time, change, procurement, and human resources. In addition, auditors should consider how important the projects are to the financial statements, how reliant the stakeholders are on controls, and how many controls exist. Auditors should review the development process and procedures for how they are implemented. The process of development and the quality of the final product may also be assessed if needed or requested. A business may want the auditing firm to be involved throughout the process to catch problems earlier on so that they can be fixed more easily. An auditor can serve as a controls consultant as part of the development team or as an independent auditor as part of an audit.

Businesses sometimes use formal systems development processes. These help assure that systems are developed successfully. A formal process is more effective in creating strong controls, and auditors should review this process to confirm that it is well designed and is followed in practice. A good formal systems development plan outlines:

- A strategy to align development with the organization's broader objectives
- Standards for new systems
- Project management policies for timing and budgeting
- Procedures describing the process

[edit] Project management topics

[edit] Project managers

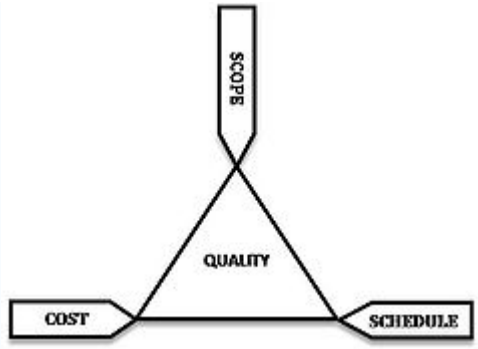
A project manager is a professional in the field of project management. Project managers can have the responsibility of the planning, execution, and closing of any project, typically relating to construction industry, architecture, computer networking, telecommunications or software development. Many other fields in the production, design and service industries also have project managers.

A project manager is the person accountable for accomplishing the stated project objectives. Key project management responsibilities include creating clear and attainable

project objectives, building the project requirements, and managing the triple constraint for projects, which is cost, time, and scope.

A project manager is often a client representative and has to determine and implement the exact needs of the client, based on knowledge of the firm they are representing. The ability to adapt to the various internal procedures of the contracting party, and to form close links with the nominated representatives, is essential in ensuring that the key issues of cost, time, quality and above all, client satisfaction, can be realized.

[edit] Project Management Triangle



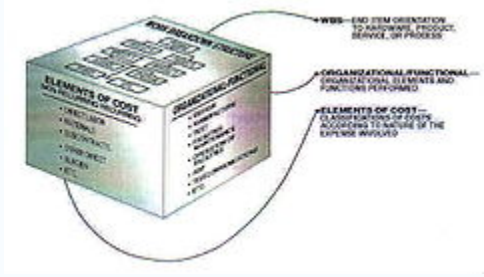
The Project Management Triangle.

Like any human undertaking, projects need to be performed and delivered under certain constraints. Traditionally, these constraints have been listed as "scope," "time," and "cost".[4] These are also referred to as the "Project Management Triangle," where each side represents a constraint. One side of the triangle cannot be changed without affecting the others. A further refinement of the constraints separates product "quality" or "performance" from scope, and turns quality into a fourth constraint.

The time constraint refers to the amount of time available to complete a project. The cost constraint refers to the budgeted amount available for the project. The scope constraint refers to what must be done to produce the project's end result. These three constraints are often competing constraints: increased scope typically means increased time and increased cost, a tight time constraint could mean increased costs and reduced scope, and a tight budget could mean increased time and reduced scope.

The discipline of Project Management is about providing the tools and techniques that enable the project team (not just the project manager) to organize their work to meet these constraints.

[edit] Work Breakdown Structure



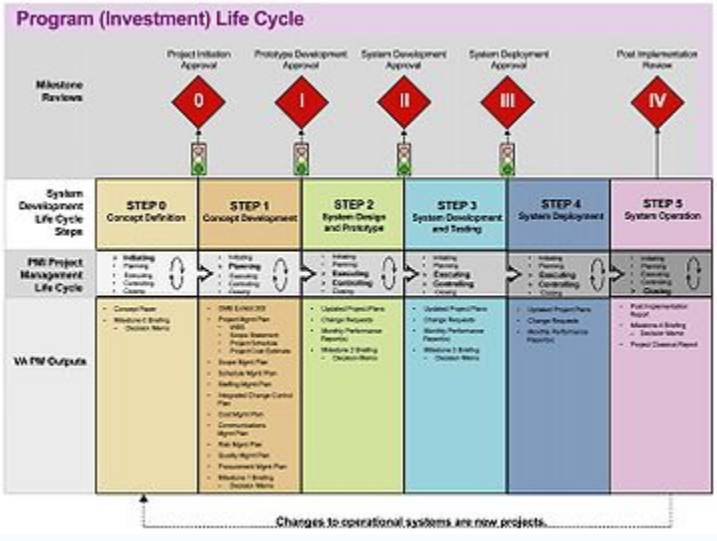
Example of a Work breakdown structure applied in a NASA reporting structure.[5]

The Work Breakdown Structure (WBS) is a tree structure, which shows a subdivision of effort required to achieve an objective; for example a program, project, and contract. The WBS may show hardware, product, service, or process oriented. In a project of contract, the WBS is developed by starting with[5] :

- the end objective and
- successively subdividing it into manageable components
- in terms of size, duration, and responsibility (e.g., systems, subsystems, components, tasks, subtasks, and work packages)
- which include all steps necessary to achieve the objective.

The Work Breakdown Structure provides a common framework for the natural development of the overall planning and control of a contract and is the basis for dividing work into definable increments from which the statement of work can be developed and technical, schedule, cost, and labor hour reporting can be established.[5]

[edit] Project Management Framework



Example of an IT Project Management Framework.[3]

The Program (Investment) Life Cycle integrates the project management and system development life cycles with the activities directly associated with system deployment and operation. By design, system operation management and related activities occur after the project is complete and are not documented within this guide.[3]

For example, see figure, in the US United States Department of Veterans Affairs (VA) the program management life cycle is depicted and describe in the overall VA IT Project Management Framework to address the integration of OMB Exhibit 300 project (investment) management activities and the overall project budgeting process. The VA IT Project Management Framework diagram illustrates Milestone 4 which occurs following the deployment of a system and the closing of the project. The project closing phase activities at the VA continues through system deployment and into system operation for the purpose of illustrating and describing the system activities the VA considers to be part of the project. The figure illustrates the actions and associated artifacts of the VA IT Project and Program Management process.[3]

[edit] Project control variables

Project Management tries to gain control over variables such as risk. Potential points of failure: Most negative risks (or potential failures) can be overcome or resolved, given enough planning capabilities, time, and resources. According to some definitions (including PMBOK Third Edition) risk can also be categorized as "positive--" meaning that there is a potential opportunity, e.g., complete the project faster than expected.

Customers (either internal or external project sponsors) and external organizations (such as government agencies and regulators) can dictate the extent of three variables: time, cost, and scope. The remaining variable (risk) is managed by the project team, ideally based on solid estimation and response planning techniques. Through a negotiation process among project stakeholders, an agreement defines the final objectives, in terms of time, cost, scope, and risk, usually in the form of a charter or contract.

To properly control these variables a good project manager has a depth of knowledge and experience in these four areas (time, cost, scope, and risk), and in six other areas as well: integration, communication, human resources, quality assurance, schedule development, and procurement.

[edit] International standards

There have been several attempts to develop Project Management standards, such as:

- A Guide to the Project Management Body of Knowledge
- HERMES method, Swiss general project management method, selected for use in Luxembourg and international organisations.
- The ISO standards ISO 9000, a family of standards for quality management systems, and the ISO 10006:2003, for Quality management systems and guidelines for quality management in projects.

- PRINCE2, PRojects IN Controlled Environments.
- Capability Maturity Model from the Software Engineering Institute.
- Total Cost Management Framework, AACE International's Methodology for Integrated Portfolio, Program and Project Management)
- V-Modell, an originally systems development method.
- GAPPS, Global Alliance for Project Performance Standards- an open source standard describing COMPETENCIES for project and program managers. [1]

[edit] See also

Lists

- Glossary of project management
- List of project management topics
- List of project management software

Related fields

- Architectural engineering
- Construction management
- Cost engineering
- Earned value management
- Human factors
- Project workforce management
- Portfolio management
- Software project management

Related subjects

- Project+
- Project accounting
- Project governance
- Program management
- Project management software
- Project Management Institute
- Process architecture

[edit] References

1. ^ The Principles of Scientific Management
2. ^ Booz Allen Hamilton - History of Booz Allen 1950s
3. ^ a b c d e f g h i VA Office of Information and Technology (2003) Project Management Guide US DEPARTMENT OF VETERANS AFFAIRS. March 3, 2005.
4. ^ (Chatfield, Carl. "A short course in project management". Microsoft. http://office.microsoft.com/en-us/project/HA102354821033.aspx.)
5. ^ a b c NASA (2001). NASA NPR 9501.2D. May 23, 2001.

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[edit] External links

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- The Project Management Institute (PMI)
- The International Project Management Association (IPMA)
- Max Wideman's "Open Source" Comparative Glossary of Project Management Terms
- Global Alliance for Project Performance Standards (GAPPS) "Open Source" project and program mamagers competency standards
- Association for the Advancement of Cost Engineering International (AACEI) and their Integrated Asset, Operations (Program) and Project Management Methodology (open source document)

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Software engineering

Fields	Requirements analysis • Software design • Computer programming • Formal methods • Software testing • Software deployment • Software maintenance
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