Practice of leading the work of a team to achieve goals and criteria at a specified time Not to be confused with Product management. Look up project management in Wiktionary, the free dictionary. Business administration Management of a business Accounting Management accounting Financial accounting Audit Business entity (list) Corporate group Corporation sole Company Conglomerate Holding company Cooperative Corporation Joint-stock company Limited liability company Partnership Privately held company Sole proprietorship State-owned enterprise Corporate governance Annual general meeting Board of directors Supervisory board Advisory board Audit committee Corporate law Commercial law Constitutional documents Contract Corporate crime Corporate liability Insolvency law International trade law Mergers and acquisitions Corporate title Chairman Chief business officer/Chief brand officer Chief executive officer/Chief operating officer Chief financial officer Chief human resources officer Chief information officer/Chief marketing officer Chief product officer/Chief technology officer Economics Commodity Public economics Labour economics Development economics International economics Mixed economy Planned economy Econometrics Environmental economics Open economy Market economy Knowledge economy Microeconomics Macroeconomics Economic development Economic statistics Finance Financial statement Insurance Factoring Cash conversion cycle Insider dealing Capital budgeting Commercial bank Derivative Financial statement analysis Financial risk Public finance Corporate finance Managerial finance International finance Liquidation Stock market Financial market Tax Financial institution Capital management Venture capital Types of management Asset Brand Business Business intelligence Business development Capacity Capability Change innovation Commercial Marketing Communications Configuration Conflict Content Customer relationship Distributed Earned value Electronic business Enterprise resource planning information system Financial Human resource development Incident Knowledge Legal Materials Network administrator Office Operations services Performance Power Process Product life-cycle Product Project Property Quality Records Resource Risk crisis Sales Security Service Strategic Supply chain Systems administrator Talent Technology Organization Architecture Behavior Communication Culture Conflict Development Engineering Hierarchy Patterns Structure Trade Business analysis Business ethics Business plan Business judgment rule Consumer behaviour Business operations International business Business model International trade Trade route Business process Business statistics Business and economics portal vte Project management is the process of supervising the work of a team to achieve all project goals within the given constraints.[1] This information is usually described in project documentation, created at the beginning of the development process. The primary constraints are scope, time and budget.[2] The secondary challenge is to optimize the allocation of necessary inputs and apply them to meet predefined objectives. The objective of project management is to produce a complete project which complies with the client's objectives. In many cases, the objective of project management is also to shape or reform the client's brief to feasibly address the client's objectives. Once the client's objectives are established, they should influence all decisions made by other people involved in the project– for example, project managers, designers, contractors and subcontractors. Ill-defined or too tightly prescribed project management objectives are detrimental to the decisionmaking process. A project is a temporary and unique endeavor designed to produce a product, service or result with a defined beginning and end (usually time-constrained, often constrained by funding or staffing) undertaken to meet unique goals and objectives, typically to bring about beneficial change or added value.[3][4] The temporary nature of projects stands in contrast with business as usual (or operations),[5] which are repetitive, permanent or semi-permanent functional activities to produce products or services. In practice, the management of such distinct production approaches requires the development of distinct technical skills and management strategies.[6] Until 2001, civil engineering projects were generally managed by creative architects, engineers, and master builders themselves, for example, Vitruvius (first century BC), Christopher Wren (1632–1723), Thomas Telford (1757–1834), and Isambard Kingdom Brunel (1806–1859).[7] In the 1950s, organizations started to apply project-management tools and techniques more systematically to complex engineering projects.[8] Henry Gantt (1861–1919), the father of planning and control techniques As a discipline, project management developed from several fields of application including civil construction, engineering, and heavy defense activity.[9] Two forefathers of project management are Henry Gantt, called the father of planning and control techniques,[10] who is famous for his use of the Gantt chart as a project management tool (alternatively Harmonogram first proposed by Karol Adamiecki);[11] and Henri Fayol for his creation of the five management functions that form the foundation of the body of knowledge associated with project and program management.[12] Both Gantt and Fayol were students of Frederick Winslow Taylor's theories of scientific management. His work is the forerunner to modern project management tools including work breakdown structure (WBS) and resource allocation. The 1950s marked the beginning of the modern project management era where core engineering fields came together to work as one. Project management became recognized as a distinct discipline arising from the management discipline with the engineering model.[13] 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. The critical path method (CPM) was developed as a joint venture between DuPont Corporation and Remington Rand Corporation for managing plant maintenance projects. The program evaluation and review technique (PERT), was developed by the U.S. Navy Special Projects Office in conjunction with the Lockheed Corporation and Booz Allen Hamilton as part of the Polaris missile submarine program.[14] PERT and CPM are very similar in their approach but still present some differences. CPM is used for projects that assume deterministic activity times; the times at which each activity will be carried out are known. PERT, on the other hand, allows for stochastic activity times; the times at which each activity will be carried out are uncertain or varied. Because of this core difference, CPM and PERT are used in different contexts. These mathematical techniques quickly spread into many private enterprises. PERT network chart for a seven-month project with five milestones At the same time, as project-scheduling models were being developed, 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 project control. AACE continued its pioneering work and in 2006, released the first integrated process for portfolio, program, and project management (total cost management framework). In 1969, the Project Management Institute (PMI) was formed in the USA.[15] PMI publishes the original version of A Guide to the Project Management Body of Knowledge (PMBOK Guide) in 1996 with William Duncan as its primary author, which describes project management practices that are common to "most projects, most of the time."[16] Project management methods can be applied to any project. It is often tailored to a specific type of project based on project size, nature, industry or sector. For example, the construction industry, which focuses on the delivery of things like buildings, roads, and bridges, has developed its own specialized form of project management that it refers to as construction project management and in which project managers can become trained and certified.[17] The information technology industry has also evolved to develop its own form of project management that is referred to as IT project management and which specializes in the delivery of technical assets and services that are required to pass through various lifecycle phases such as planning, design, development, testing, and deployment. Biotechnology project management focuses on the intricacies of biotechnology research and development.[18] Localization project management includes application of many standard project management practices to translation works even though many consider this type of management to be a very different discipline. For example, project managers have a key role in improving the translation even when they do not speak the language of the translation, because they know the study objectives well to make informed decisions.[19] Similarly, research study management can also apply a project manage approach.[20] There is public project management that covers all public works by the government, which can be carried out by the government agencies or contracted out to contractors. Another classification of project management is based on the hard (physical) or soft (non-physical) type. Common among all the project management's types is that they focus on three important goals: time, quality, and cost. Successful projects are completed on schedule, within budget, and according to previously agreed quality standards i.e. meeting the Iron Triangle or Triple Constraint in order for projects to be considered a success or failure.[21] For each type of project management, project managers develop and utilize repeatable templates that are specific to the industry they're dealing with. This allows project plans to become very thorough and highly repeatable, with the specific intent to increase quality, lower delivery costs, and lower time to deliver project results. A 2017 study suggested that the success of any project depends on how well four key aspects are aligned with the contextual dynamics affecting the project, these are referred to as the four P's:[22] Plan: The planning and forecasting activities. Process: The overall approach to all activities and project governance. People: Including dynamics of how they collaborate and communicate. Power: Lines of authority, decision-makers, organograms, policies for implementation and the like. There are a number of approaches to organizing and completing project activities, including phased, lean, iterative, and incremental. There are also several extensions to project planning, for example, based on outcomes (product-based) or activities (process-based). Regardless of the methodology employed, careful consideration must be given to the overall project objectives, timeline, and cost, as well as the roles and responsibilities of all participants and stakeholders.[23] Main article: Benefits realisation management Benefits realization management (BRM) enhances normal project management techniques through a focus on outcomes (benefits) of a project rather than products or outputs and then measuring the degree to which that is happening to keep a project on track. This can help to reduce the risk of a completed project being a failure by delivering agreed upon requirements (outputs) i.e. project success but failing to deliver the benefits (outcomes) of those requirements i.e. product success. Note that good requirements management will ensure these benefits are captured as requirements of the project and their achievement monitored throughout the project. In addition, BRM practices aim to ensure the strategic alignment between project outcomes and business strategies. The effectiveness of these practices is supported by recent research evidencing BRM practices influencing project success from a strategic perspective across different countries and industries. These wider effects are called the strategic impact.[24] An example of delivering a project to requirements might be agreeing to deliver a computer system that will process staff data and manage payroll, holiday, and staff personnel records in shorter times will reduced errors. Under BRM, the agreement might be to achieve a specified reduction in staff hours and errors required to process and maintain staff data after the system installation when compared without the system. Main article: Critical path method Critical path method (CPM) is an algorithm for determining the schedule for project activities. It is the traditional process used for predictive-based project planning. The CPM method evaluates the sequence of activities, the work effort required, the inter-dependencies, and the resulting float time per line sequence to determine the required project duration. Thus, by definition, the critical path is the pathway of tasks on the network diagram that has no extra time available (or very little extra time).[25] Main article: Critical chain project management Critical chain project management (CCPM) is an application of the theory of constraints (TOC) to planning and managing projects and is designed to deal with the uncertainties inherent in managing projects, while taking into consideration the limited availability of resources (physical, human skills, as well as management & support capacity) needed to execute projects. The goal is to increase the flow of projects in an organization (throughput). Applying the first three of the five focusing steps of TOC, the system constraint for all projects, as well as the resources, are identified. To exploit the constraint, tasks on the critical chain are given priority over all other activities. Main article: Earned value management Earned value management (EVM) extends project management with techniques to improve project monitoring.[26] It illustrates project progress towards completion in terms of work and value (cost). Earned Schedule is an extension to the theory and practice of EVM. See also: Iterative and incremental development In critical studies of project management, it has been noted that phased approaches are not well suited for projects which are large-scale and multi-company,[27] with undefined, ambiguous, or fast-changing requirements,[28] or those with high degrees of risk, dependency, and fast-changing technologies. 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 especially true as software development is often the realization of a new or novel product. These complexities are better handled with a more exploratory or iterative and incremental approach.[29] Several models of iterative and incremental project management have evolved, including agile project management, dynamic systems development method, extreme project management, and Innovation Engineering®.[30] Main article: Lean project management Lean project management uses the principles from lean manufacturing to focus on delivering value with less waste and reduced time. There are five phases to a project lifecycle; known as process groups. Each process group represents a series of inter-related processes to manage the work through a series of distinct steps to be completed. This type of project approach is often referred to as "traditional"[31] or "waterfall".[32] The five process groups are:Typical development phases of an engineering project Initiating Planning Executing Monitoring and Controlling Closing Some industries may use variations of these project stages and rename them to better suit the organization. For example, when working on a brick-and-mortar design and construction, projects will typically progress through stages like pre-planning, conceptual design, schematic design, design development, construction drawings (or contract documents), and construction administration. The phased approach works well for small, well-defined projects, but often results in challenge or failure on larger projects, or those that are more complex or have more ambiguities, issues, and risks[33] - see the parodying 'six phases of a big project'. Main article: Process-based management The incorporation of process-based management has been driven by the use of maturity models such as the OPM3 and the CMMI (capability maturity model integration; see Image:Capability Maturity Model.jpg Main article: Product production management Product production management is the application of operations management to the delivery of capital projects. The Product production management framework is based on a project's production system view, which is defined as a successful project as output-oriented rather than activity- or task-oriented.[35] The most common implementation of this approach is PRINCE2.[36] The project development stages[37] Traditionally (depending on what project management methodology is being used), project management includes a number of elements: four to five project management process groups, and a control system. Regardless of the methodology or terminology used, the same basic project management processes or stages of development will be used. Major process groups generally include:[38] Initiation Planning Production or execution Monitoring and controlling Closing In project environments with a significant exploratory element (e.g., research and development), these stages may be supplemented with decision points (go/no go decisions) at which the project's continuation is debated and decided. An example is the Phase–gate model. Project management relies on a wide variety of meetings to coordinate actions. For instance, there is the kick-off meeting, which broadly involves stakeholders at the project's initiation. Project meetings or project committees enable the project team to define and monitor action plans. Steering committees are used to transition between phases and resolve issues. Project portfolio and program reviews are conducted in organizations running parallel projects. Lessons learned meetings are held to consolidate learnings. All these meetings employ techniques found in meeting science, particularly to define the objective, participant list, and facilitation methods. Initiating process group processes[37] The initiating processes determine the nature and scope of the project.[39] If this stage is not performed well, it is unlikely that the project will be successful in meeting the business' 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 initiating stage should include a plan that encompasses the following areas. These areas can be recorded in a series of documents called Project Initiation documents. Project Initiation documents are a series of planned documents used to create an order for the duration of the project. These tend to include: project proposal (idea behind project, overall goal, duration) project scope (project direction and track) product breakdown structure (PBS) (a hierarchy of deliverables/outcomes and components thereof) work breakdown structure (WBS) (a hierarchy of the work to be done, down to daily tasks) responsibility assignment matrix (RACI - Responsible, Accountable, Consulted, Informed) (roles and responsibilities aligned to deliverables / outcomes) tentative project schedule (milestones, important dates, deadlines) analysis of business needs and requirements against measurable goals review of the current operations 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 schedules SWOT analysis: strengths, weaknesses, opportunities, and threats to the business After the initiation stage, the project is planned to an appropriate level of detail (see example of a flowchart).[37] The main purpose is to plan time, cost, and resources adequately to estimate the work needed and to effectively manage risk during project execution. As with the Initiation process group, a failure to adequately plan greatly reduces the project's chances of successfully accomplishing its goals. Project planning generally consists of[40] determining the project management methodology to follow (e.g. whether the plan will be defined wholly upfront, iteratively, or in rolling waves); developing the scope statement; selecting the planning team; identifying deliverables and creating the product and work breakdown structures; identifying the activities needed to complete those deliverables and networking the activities in their logical sequence; estimating the resource requirements for the activities; estimating time and cost for activities; developing the schedule; developing the budget; risk planning; developing quality assurance measures; gaining formal approval to begin work. Additional processes, such as planning for communications and for scope management, identifying roles and responsibilities, determining what to purchase for the project, and holding a kick-off meeting are also generally advisable. For new product development projects, conceptual design of the operation of the final product may be performed concurrent with the project planning activities and may help to inform the planning team when identifying deliverables and planning activities. Executing process group processes[37] While executing we must know what are the planned terms that need to be executed. The execution/implementation phase ensures that the project management plan's deliverables are executed accordingly. This phase involves proper allocation, coordination, and management of human resources and any other resources such as materials and budgets. The output of this phase is the project deliverables. Documenting everything within a project is key to being successful. To maintain budget, scope, effectiveness and pace a project must have physical documents pertaining to each specific task. With correct documentation, it is easy to see whether or not a project's requirement has been met. To go along with that, documentation provides information regarding what has already been completed for that project. Documentation throughout a project provides a paper trail for anyone who needs to go back and reference the work in the past. In most cases, documentation is the most successful way to monitor and control the specific phases of a project. With the correct documentation, a project's success can be tracked and observed as the project goes on. If performed correctly, documentation can be the backbone of a project's success Monitoring and controlling process group processes[37]Monitoring and controlling consist 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 include:[41] Measuring the ongoing project activities ('where we are'); Monitoring the project variables (cost, effort, scope, etc.) against the project management plan and the project performance baseline (where we should be); Identifying corrective actions to address issues and risks properly (How can we get on track again?); Influencing the factors that could circumvent integrated change control so only approved changes are implemented. Two main mechanisms support monitoring and controlling in projects. On the one hand, contracts offer a set of rules and incentives often supported by potential penalties and sanctions.[42] On the other hand, scholars in business and management have paid attention to the role of integrators (also called project barons) to achieve a project's objectives.[43][44] In turn, recent research in project management has questioned the type of interplay between contracts and integrators. Some have argued that these two monitoring mechanisms operate as substitutes[45] as one type of organization would decrease the advantages of using the other one. In multi-phase projects, the monitoring and control process also provides feedback between project phases, 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:[38] Continuing support of end-users Correction of errors Updates to the product over time Monitoring and controlling cycle In this stage, auditors should pay attention to how effectively and quickly were problems are resolved. Over the course of any construction project, the work scope may change. 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, "as built." The requirement for providing them is a norm in construction contracts. Construction document management is a highly important task undertaken with the aid of an online or desktop software system or maintained through physical documentation. The increasing legality pertaining to the construction industry's maintenance of correct documentation has caused an increase in the need for document management systems. When changes are introduced to the project, the viability of the project has to be re-assessed. It is important not to lose sight of the initial goals and targets of the projects. When the changes accumulate, the forecasted result may not justify the original proposed investment in the project. Successful project management identifies these components, and tracks and monitors progress, so as to stay within time and budget frames already outlined at the commencement of the project. Exact methods were suggested to identify the most informative monitoring points along the project life-cycle regarding its progress and expected duration.[46] Closing process group processes[37] Closing includes the formal acceptance of the project and the ending thereof. Administrative activities include the archiving of the files and documenting lessons learned. This phase consists of:[38] Contract closure: Complete and settle each contract (including the resolution of any open items) and close each contract applicable to the project or project phase. Project close: Finalize all activities across all of the process groups to formally close the project or a project phase Also included in this phase is the post implementation review. This is a vital phase of the project for the project team to learn from experiences and apply to future projects. Normally a post implementation review consists of looking at things that went well and analyzing things that went badly on the project to come up with lessons learned. Project control (also known as Cost Engineering) should be established as an independent function in project management. It implements verification and controlling functions during the processing of a project to reinforce the defined performance and formal goals.[47] The tasks of project control are also: the creation of infrastructure for the supply of the right information and its update the establishment of a way to communicate disparities in project parameters the development of project information technology based on an intranet or the determination of a project key performance indicator system (KPI) divergence analyses and generation of proposals for potential project regulations[48] the establishment of methods to accomplish an appropriate project structure, project workflow organization, project control, and governance creation of transparency among the project parameters[49] Fulfillment and implementation of these tasks can be achieved by applying specific methods and instruments of project control. The following methods of project control can be applied: investment analysis cost–benefit analysis value benefit analysis expert surveys simulation calculations risk-profile analysis surcharge calculations milestone trend analysis cost trend analysis target/actual comparison[50] Project control is that element of a project that keeps it on track, on time, and within budget.[41] 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. Projects may be audited or reviewed while the project is in progress. Formal audits are generally risk or compliance-based and management will direct the objectives of the audit. An examination may include a comparison of approved project management processes with how the project is actually being managed.[51] 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 and fixes. 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 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 Evaluation of quality of change There are important characteristics of a project: (i) It should always have specific start and end dates. (ii) They are performed and completed by a group of people. (iii) The output is the delivery of a unique product or service. (iv) They are temporary in nature. (v) It is progressively elaborated. – example: designing a new car or writing a book. Main article: Project complexity Project complexity and its nature play an important role in the area of project management. Despite having a number of debates on this subject matter, studies suggest a lack of definition and reasonable understanding of complexity in relation to the management of complex projects.[52][53] Project complexity is the property of a project which makes it difficult to understand, foresee, and keep under control its overall behavior, even when given reasonably complete information about the project system.[54] The identification of complex projects is specifically important to multi-project engineering environments.[55] As it is considered that project complexity and project performance are closely related, it is important to define and measure the complexity of the project for project management to be effective.[56] Complexity can be: Structural complexity (also known as detail complexity, or complicatedness), i.e. consisting of many varied interrelated parts.[57] It is typically expressed in terms of size, variety, and interdependence of project components, and described by technological and organizational factors. Dynamic complexity refers to phenomena, characteristics, and manifestations such as ambiguity, uncertainty, propagation, emergence, and chaos.[54] Based on the Cynefin framework,[58] complex projects can be classified as: Simple, complicated, complex, and really complex projects - based on the Cynefin framework Simple (or clear, obvious, known) projects, systems, or contexts. These are characterized by known knowns, stability, and clear cause-and-effect relationships. They can be solved with standard operating procedures and best practices. Complicated: characterized by known unknowns. A complicated system is the sum of its parts. In principle, it can be deconstructed into smaller simpler components. While difficult, complicated problems are theoretically solvable with additional resources, specialized expertise, analytical, reductionist, simplification, decomposition techniques, scenario planning, and following good practices.[59][60] Complex are characterized by unknown unknowns, and emergence. Patterns could be uncovered, but they are not obvious. A complex system can be described by Euclid's statement that the whole is more than the sum of its parts. Really complex projects, a.k.a. very complex, or chaotic: characterized by unknowns. No patterns are discernible in really complex projects. Causes and effects are unclear even in retrospect. Paraphrasing Aristotle, a really complex system is different from the sum of its parts.[61] By applying the discovery in measuring work complexity described in Requisite Organization and Stratified Systems Theory, Elliott Jaques classifies projects and project work (stages, tasks) into seven basic levels of project complexity based on such criteria as time-span of discretion and complexity of a project's output:[62][63] Level 1 Project – improve the direct output of an activity (quantity, quality, time) within a business process with a targeted completion time up to 3 months. Level 2 Project – develop and improve compliance to a business process with a targeted completion time from 3 months to 1 year. Level 3 Project - develop, change, and improve a business process with a targeted completion time from 1 to 2 years. Level 4 Project – develop, change, and improve a functional system with a targeted completion time of 2 to 5 years. Level 5 Project - develop, change, and improve a group of functional systems/business functions with a targeted completion time from 5 to 10 years. Level 6 Project – develop, change, and improve a whole single value chain of a company with a targeted completion time from 10 to 20 years. Level 7 Project - develop, change, and improve multiple value chains of a company with target completion time from 20 to 50 years.[64] Benefits from measuring Project Complexity is to improve project people feasibility by matching the level of a project's complexity with an effective targeted completion time, with the respective capability level of the project manager and of the project members.[65] The Positive, Appropriate and Negative Morcov[61] Similarly with the Law of requisite variety and The law of requisite complexity, project complexity is sometimes required in order for the project to reach its objectives, and sometimes it has beneficial outcomes. Based on the effects of complexity, Stevens Martcov[61] proposed its classification as Positive, Appropriate, or Negative.[66][61] Positive complexity is the complexity that adds value to the project, and whose contribution to project success outweighs the associated negative consequences. Appropriate (or requisite) complexity is the complexity that is needed for the project to reach its objectives, or whose contribution to project success balances the negative effects, or the cost of mitigation outweighs the negative manifestations. Negative complexity is the complexity that hinders project success. Main article: Project managerThis section needs additional citations for verification. Please help improve this article by adding citations to reliable sources in this section. Unsourced material may be challenged and removed. (October 2022) (Learn how and when to remove this message) A project manager is a professional in the field of project management. Project managers are in charge of the people in a project. People are the key to any successful project. Without the correct people in the right place and at the right time a project cannot be successful. Project managers can have the responsibility of the planning, execution, controlling, and closing of any project typically relating to the construction industry, engineering, architecture, computing, and telecommunications. Many other fields of production engineering, design engineering, and heavy industrial have project managers. A project manager needs to understand the order of execution of a project to schedule the project correctly as well as the time necessary to accomplish each individual task within the project. A project manager is the person accountable for accomplishing the stated project objectives on behalf of the client. Project Managers tend to have multiple years' experience in their field. A project manager is required to know the project in and out while supervising the workers along with the project. Typically in most construction, engineering, architecture, and industrial projects, a project manager has another manager working alongside of them who is typically responsible for the execution of task on a daily basis. This position in some cases is known as a superintendent. A superintendent and project manager work hand in hand in completing daily project tasks. Key project management responsibilities include creating clear and attainable project objectives, building the project requirements, and managing the triple constraint (now including more constraints and calling it competing constraints) for projects, which is cost, time, quality and scope for the first three but about three additional ones in current project management. A typical project is composed of a team of workers who work under the project manager to complete the assignment within the time and budget targets. A project manager normally reports directly to someone of higher stature on the completion and success of the project. 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. A complete project manager, a term first coined by Robert J. Graham in his simulation, has been expanded upon by Randall L. Englund and Alfonso Bucero. They describe a complete project manager as a person who embraces multiple disciplines, such as leadership, influence, negotiations, politics, change and conflict management, and humor. These are all "soft" people skills that enable project leaders to be more effective and achieve optimized, consistent results. A term is a tendency to confuse the project success with project management success. They are two different things. "Project success" has 2 perspectives: the perspective of the process, i.e. delivering efficient outputs; typically called project management performance or project efficiency. The perspective of the result, i.e. delivering beneficial outcomes; typically called project performance sometimes just project success.[67][68][69] [self-published source?] Project management success criteria are different from project success criteria. The project management is said to be successful if the given project is completed within the agreed upon time, met the agreed upon scope and within the agreed upon budget. Subsequent to the triple constraints, multiple constraints have been considered to ensure project success. However, the triple or multiple constraints indicate only the efficiency measures of the project, which are indeed the project management success criteria during the project lifecycle. The a priori criteria leave out the more important after-completion results of the project which comes under four levels i.e. the output (product) success, outcome (benefits) success and impact (strategic) success during the product lifecycle. These posterior success criteria indicate the effectiveness measures of the project product, service or result, after the project completion and handover. This overarching multilevel success framework of projects, programs and portfolios has been developed by Paul Bannerman in 2008.[70] In other words, a project is said to be successful, when it succeeds in achieving the expected business case which needs to be clearly identified and defined during the project inception and selection before starting the development phase. This multilevel success framework conforms to the theory of project as a transformation depicted as the input-process / activity-output-outcome-impact in order to generate whatever value intended. Emanuel Camilleri in 2011 classifies all the critical success and failure factors into groups and matches each of them with the multilevel success criteria in order to deliver business value.[71] An example of a performance indicator used in relation to project management is the "backlog of commissioned projects" or "project backlog".[72] Main article: Project risk management The United States Department of Defense states that "Cost, Schedule, Performance, and Risk" are the four elements through which Department of Defense acquisition professionals make trade-offs and track program status.[73] There are also international standards. Risk management applies proactive identification (see tools) of future problems and understanding of their consequences allowing predictive decisions about projects. ERM system plays a role in overall risk management.[74] Main articles: Work breakdown structure and Structure A work breakdown structure (WBS) is a tree structure that shows a subdivision of the activities required to achieve an objective - for example a portfolio, program, project, and contract. The WBS may be hardware-, product-, service-, or process-oriented (see an example in a NASA reporting structure (2001)).[75] Beside WBS for project scope management, there are organizational breakdown structure (chart), cost breakdown structure and risk breakdown structure. A WBS can be developed by starting with the end objective and successively subdividing it into manageable components in terms of size, duration, and responsibility (e.g., systems, subsystems, components, tasks, sub-tasks, and work packages), which include all steps necessary to achieve the objective.[33] 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.[75] The work breakdown structure can be displayed in two forms, as a table with subdivision of tasks or as an organizational chart whose lowest nodes are referred to as "work packages". It is an essential element in assessing the quality of a plan, and an initial element used during the planning of the project. For example, a WBS is used when the project is scheduled, so that the use of work packages can be recorded and tracked. Similarly to work breakdown structure (WBS), other decomposition techniques and tools are: organization breakdown structure (OBS), product breakdown structure (PBS), cost breakdown structure (CBS), risk breakdown structure (RBS), and resource breakdown structure (ResBS).[76][61] There are several project management standards, including: 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. ISO 21500:2012 – Guidance on project management. This is the first International Standard related to project management published by ISO. Other standards in the 21500 family include 21503:2017 Guidance on programme management; 21504:2015 Guidance on portfolio management; 21505:2017 Guidance on governance; 21506:2018 Vocabulary; 21508:2018 Earned value management in project and programme management; and 21511:2018 Work breakdown structures for project and programme management. ISO 21502:2020 Project, programme and portfolio management — Guidance on project management ISO 21504:2015 Project, programme and portfolio management - Guidance on portfolio management ISO 21505:2017 Project, programme and portfolio management — Guidance on governance ISO 31000:2009 - Risk management. ISO/IEC/IEEE 16326:2009 – Systems and Software Engineering—Life Cycle Processes—Project Management[77] Individual Competence Baseline (ICB) from the International Project Management Association (IPMA).[78] Capability Maturity Model (CMM) from the Software Engineering Institute. GAPPS, Global Alliance for Project Performance Standards – an open source standard describing COMPETENCIES for project and program managers. HERMES method, Swiss general project management method, selected for use in Luxembourg and international organizations. The logical framework approach (LFA), which is popular in international development organizations. PMBOK Guide from the Project Management Institute (PMI). PRINCE2 from AXELOS. PM2: The Project Management methodology developed by the [European Commission].[79] Procedures for Project Formulation and Management (PPFM) by the Indian Ministry of Defence [80] Team Software Process (TSP) from the Software Engineering Institute. Total Cost Management Framework, AACE International's Methodology for Integrated Portfolio, Program and Project Management. V-Model, an original systems development method. Main article: Program management Some projects, either identical or different, can be managed as program management. Programs are collections of projects that support a common objective and set of goals. While individual projects have clearly defined and specific scope and timeline, a program's objectives and duration are defined with a lower level of granularity. Besides programs and portfolios, additional structures that combine their different characteristics are: project networks, mega-projects, or mega-programs. A project network is a temporary project formed of several different distinct evolving phases, crossing organizational lines. Mega-projects and mega-programs are defined as exceptional in terms of size, cost, public and political attention, and competencies.[61] Main article: Project portfolio management An increasing number of organizations are using what is referred to as project portfolio management (PPM) as a means of selecting the right projects and then using project management techniques[81] as the means for delivering the outcomes in the form of benefits to the performing public, private or not-for-profit organization. Portfolios are collections of similar projects. Portfolio management supports efficiencies of scale, increasing success rates, and reducing project risks, by applying similar standardized techniques to all projects in the portfolio, by a group of project management professionals sharing common tools and knowledge. Organizations often create project management offices as an organizational structure to support project portfolio management in a structured way.[61] Thus, PPM is usually performed by a dedicated team of managers organized within an enterprise project management office (PMO), usually based within the organization, and headed by a PMO director or chief project officer. In cases where strategic initiatives of an organization form the bulk of the PPM, the head of the PPM is sometimes titled as the chief initiative officer. Main articles: Project management software and Project management information system Project management software is software used to help plan, organize, and manage resource pools, develop resource cost estimates and implement plans. Depending on the sophistication of the software, functionality may include estimation and planning, scheduling, cost control and budget management, resource allocation, collaboration software, communication, decision-making, workflow, risk, quality, documentation, and/or administration systems.[82][83] Virtual program management (VPM) is management of a project done by a virtual team, though it rarely may refer to a project implementing a virtual environment[84] It is noted that managing a virtual project is fundamentally different from managing traditional projects,[85] combining concerns of remote work and global collaboration (culture, time zones, language).[86] Agile construction Architectural engineering Construction management Cost engineering Facilitation (business) Industrial engineering Project Production Management Project management software Project workforce management Systems engineering Aide management is the application of the principles of Agile software development and lean manufacturing to project and program delivery. Game theory Earned value management Human factors Kanban (development) Kickoff meeting is the first meeting with the project team and with or without the client of the project. Operations research Outline of project management Postmortem documentation is a process used to identify the causes of a project failure, and how to prevent them in the future. Process architecture Program management Project accounting Project governance Project management software Project management triangle Return on time invested Small-scale project management Schedule (project management) Systems development life cycle Main articles:This is a list of project management terms. A glossary of project management terms. ^ Phillips, Joseph (2004). PMP Project Management Professional Study Guide. McGraw-Hill/Osborne. p. 354.

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must successfully address project requirements, stakeholder expectations, and business needs and goals. Adhering to the following 12 essential project management concepts can help assure your project's success. A project is larger in scope than a typical task or activity. Structure your project in a manageable, understandable way that is easy for the project management team and stakeholders to evaluate. Defining the goals and objectives of your project is essential to establishing its structure and gaining support from project management team members and stakeholders. Articulate the goals and specific objectives of the project clearly, and ensure these align with the company's overall objectives. Sponsor support is crucial to the success of a project. A project sponsor can provide enthusiastic assistance and helpful guidance for the project. Sponsors also can garner additional support and resources from multiple stakeholders and teams as necessary. Roles and responsibilities will vary depending on business requirements, stakeholder expectations, available people and resources, and other factors. Define these roles clearly to ensure effective collaboration and avoid duplication of efforts and unaddressed project needs. Foster a culture of accountability within your team. Implement ways to track and measure individual and collective responsibility. Adaptability is key throughout a project's life cycle. Goals, needs, expectations, available people, and resources are subject to change at any time throughout a project's life cycle. Every project management plan must include a robust strategy and clearly defined processes for managing project scope and dealing with changes. Risks can quickly threaten the project, if not the business itself. Project management plans must include comprehensive steps for identifying, assessing, and mitigating project risks. Regularly review and update the risk management plan as the project progresses. The project management team should monitor progress at every stage of every project. Establish key performance indicators (KPIs) to help measure progress toward established goals. Your project management plan must also include a system for regularly tracking, assessing, and reporting project progress. The goal of every project is to deliver value to stakeholders and to the business as a whole. Give the highest priority to tasks that contribute to the project's success. Include methods and tools that enable your team to continuously assess and adjust priorities based on stakeholder needs and project objectives. Effective performance management is key to project management success. Establish a performance management baseline to evaluate and track team and project performance. Use performance metrics to identify areas for improvement and recognize achievements. To close out your project successfully, complete all the necessary tasks defined in your project plan. Ensure that all deliverables meet quality standards. Obtain necessary stakeholder and management approvals. Reflect on the project's successes, and highlight the key factors that contribute to positive outcomes. It's equally important to document lessons learned to inform future projects and sustain continuous improvement. Effective collaboration is essential for unified adherence to project management principles. Collaboration, communication, and documentation are critical elements of every project management effort, from ideation to execution and assessment. Confluence brings everyone together in a connected workspace to move projects forward. Teams can create, edit, share, and collaborate on project plans seamlessly, keeping everyone on the same page. Confluence can improve project management team performance and lead to more efficient project execution. It can also deliver greater value to team members, stakeholders, and the business. Try Confluence The Agile project management methodology combines the sprints of Scrum with the continuous information sharing and feedback of Kanban. It focuses project management teams on continuous improvement and delivering value to stakeholders. It's flexibility and cross-functional team support make Agile highly effective for managing projects subject to change. All project management efforts face similar challenges, such as: Scope creep. As a project proceeds, needs, requirements, stakeholder desires, and external influences can also change. These changes can cause deviations from the original plan. They can also lead to budget overruns, delays, and disappointed stakeholders. A detailed plan with a well-defined project timeline and regular communication with stakeholders can help minimize or eliminate scope creep. Unrealistic deadlines. Overly ambitious deadlines can lead to missed milestones. Project managers must balance what stakeholders want and what is achievable with the available resources. Insufficient resources. Every project must deal with limited availability of money, time, and talent. Realistic, conservative budgets and accurate cost estimates can help, but teams should expect to face resource constraints beyond their plans and forecasts. Poor communication. Ineffective communication can lead to misunderstandings, unclear and unmet expectations, additional work, and missed deadlines. Consistent communication can help you avoid scope creep and manage stakeholder expectations. Change and risk management. Project management plans must include well-documented risk identification and mitigation processes and adaptation to sudden changes. This can help minimize project disruptions and delays. Monitoring, evaluating, and documenting progress. Consistent monitoring and evaluation can keep projects on track and identify challenges before they become problems. Documentation of monitoring efforts and evaluations can help keep team members and stakeholders informed and engaged. Here are some of the methodologies most widely used for project management. Kanban: Kanban focuses on the visualization of tasks and progress. It relies on a shared physical or digital whiteboard typically divided into columns, each labeled with a stage of the workflow —To Do, In Progress, and Completed, for example. Kanban's visual approach means everyone can see and follow the work as a project progresses. This keeps everyone informed and aligned with each other and the project objectives. Kanban can also help teams be more adaptable and flexible in the face of changing needs or priorities. Waterfall: Waterfall project management is more linear and sequential than other methods. Waterfall projects typically have well-defined requirements for planning, design, development, testing, and deployment. Waterfall projects demand strict adherence to plans and close alignment with declared requirements and objectives. Scrum: The Scrum methodology includes a highly structured framework. It defines specific team member roles and the length of each work cycle or sprint. Teams hold daily meetings to review progress and map upcoming sprints. This methodology is well-suited for complex projects and active stakeholder involvement.