

## BIOGRAPHICAL INFORMATION

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Project Manager  
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### Specific Responsibilities

Joined Osmose Utilities Services in 2002 when Osmose acquired Coherent Networks, Inc. Responsible for managing data collection and data migration projects for a number of electric utility companies, including cooperatives, municipals, and IOU's, as well as gas utilities.

### Past Experience

At Coherent Networks, responsible for project management, technical management, and sales consulting with a variety of utility customers. Earlier project management experience included a joint research and development project with faculty at Syracuse University in the area of natural language processing and information retrieval, sponsored by the Defense Advanced Projects Research Agency (DARPA).

### Educational Information

B.S. - Computer Science, Syracuse University, 1983  
M.S. - Computer Science, Syracuse University, 1990

### Professional Memberships

Project Management Institute  
Association for Computing Machinery (past member)

## **What is the PMBOK and What Can It Do For Me?**

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### **Abstract:**

As defined by the Project Management Institute, the Project Management Body of Knowledge (PMBOK) is the sum of knowledge within the profession of project management. Their “Guide to the PMBOK” purports to describe that subset of the PMBOK that is generally accepted, i.e. applies to most projects most of the time. This paper will provide an overview of the concepts elucidated in the PMBOK, as well as the key benefits of a well-defined project management approach, especially for the particular challenges of projects that generate and manage geospatial information. These benefits accrue not only to the project managers, but to their organizations, internal and external customers, and other stakeholders. Along the way it will describe the Project Management Professional certification (analogous to the Professional Engineer certification for engineering) and summarize the requirements for obtaining the PMP.

Some of the topics that will be covered include the differences between a project and an operation, and between a problem solver and a project manager; the role of the project management plan; the major elements of a project (scope, time, cost, quality, risk); the key roles on a project (customer, sponsor, project manager) and their inter-relationship; and the matrix of five process groups and nine knowledge areas that all project management processes can be mapped into.

### **INTRODUCTION TO THE PMBOK**

As defined by the Project Management Institute, the Project Management Body of Knowledge (PMBOK) is the sum of knowledge within the emerging profession of project management. This includes knowledge of proven, widely-applied traditional practices, as well as knowledge of innovative and advanced practices which may have limited applicability; it includes both published and unpublished material. This body of knowledge ultimately resides with the practitioners and theoreticians who study, apply and advance it; so in a sense anything that anyone knows about Project Management is incorporated in it. By definition this is an amorphous, ever-growing entity, which can not always be captured in a usable form. However, there are subsets of this body of knowledge which have been gathered into written documents for the purposes of standards setting, education, and creating a common language for talking about project management.

### **Background**

The Project Management Institute was founded in 1969, and is headquartered in Pennsylvania near Philadelphia. Their motto is “Building professionalism in project management”. The founders’ premise was that there were a number of management practices common to projects in a variety of application areas. Their first attempt at creating and documenting standards for project management began in 1981 and culminated in a Special Report in the Project

Management Journal published in 1983, which also included a code of ethics and guidelines for accreditation and certification. A revised and expanded document called “The Project Management Body of Knowledge” was published in 1987, which was superseded by the first “Guide to the PMBOK” in 1996. The most recent edition of the Guide was published in 2000.

PMI’s “Guide to the PMBOK” purports to describe that subset of the body of knowledge that is generally accepted, to provide guidance that is usable and repeatable. This means that it applies to most projects most of the time, and that there is widespread consensus regarding its value and usefulness. This does not mean it is a set of dictums intended to be applied uniformly to all projects; it is still up to the project manager to determine what is appropriate for any given project. The Guide also intends to provide a common lexicon for discussing project management, as there are a variety of terms in use in the profession.



**Figure 1: Relationship of project management to other management disciplines**

As illustrated in the above diagram, the PMBOK overlaps other management disciplines while encompassing much information that is unique to project management. “General management” incorporates planning, organizing, staffing, executing, and controlling the operations of an ongoing enterprise; the PMBOK overlaps this in several areas, including financial forecasting and planning techniques. “Application areas” are types of projects which have important components common to those projects, but which are not needed in all projects. These are typically defined in terms of functional departments, technical elements, or industry groups, and to be performed effectively require knowledge specific to a particular field, e.g software development. This overlaps with generally accepted project management knowledge and practice.

### Definitions

As defined in the PMBOK, project management is “the application of knowledge, skills, tools and techniques to project activities in order to meet the project requirements”. It usually involves competing demands for scope, time, cost, risk and quality, from a variety of

stakeholders with differing needs and expectations, with identified requirements. As noted, it is a relatively young profession.

Among the benefits of effective project management are the following:

- Ability to define and control project scope
- Improved communication among project participants
- Accurate projection of resource requirements
- Identification and communication of problem areas
- Improved assessment and mitigation of project risk events
- Clarification of and alignment with organizational goals

A key distinction should be drawn between a project and an operation. Both are work performed by staff within an organization that are constrained by limited resources and must be planned, executed and controlled. However, a project can be viewed as a temporary endeavor undertaken to create a unique product or service, while an operation is ongoing and repetitive. “Temporary” means that the project has definite beginning and ending points, while “unique” indicates the result is different in some distinguishing way from all other products or services, even within the same organization.

Another critical aspect of projects is that because the product of each project is unique, the characteristics that distinguish the result must be progressively elaborated. This means that in a step by step fashion, those characteristics must be thoroughly explored and developed; they will be defined broadly early in the project, and then are made more explicit and detailed as the project proceeds and the participants come to a better and more complete understanding of the expected results. This process of elaboration must be carefully coordinated with proper scope definition and control, since the scope should remain constant even as a better understanding of the project processes and outputs is achieved. Even though every project is unique, to be effective (and to grow) a project manager must identify and learn from the similarities between projects.

Other related terms include “program”, which can be defined as a group of projects managed in a coordinated way to obtain benefits not achievable when managing them individually, and which may take on characteristics of ongoing operations; and “subproject”, which is a logical component of a project, and which can be contracted to an external organization or another functional unit within the organization.

### Project Fundamentals

The fundamental components of a project can be viewed as 1) the process, 2) the team, and 3) the product, all of which come together to make up the project. Effective project managers are able to create and maintain synergy among these three components by keeping each one in balance with the others.

Another way of analyzing a project is to divide it into the core elements of scope, time, cost, quality, and risk. Scope is the answer to the question, “What are we delivering?”; Time – “How are we generating the deliverables, and how long will it take us to generate them?”; Cost – “Who is needed to complete the project, what other resources do we need, how much do we need of

each, and how much will they cost?"; Quality – "Against what standard are we measuring the deliverable, how good should it be, how good is the process being used, and how good are the staff and other resources?; and Risk – "How confident are we of the conditions surrounding the project, and that we can complete the project according to the plan?". As noted earlier, these elements tend to compete with one another, and must be balanced for a project to reach a successful conclusion for all the parties involved.

### Project Roles

To be successful, a project manager must go beyond simply solving problems. Some differences between a reactive problem solver and a pro-active project manager include:

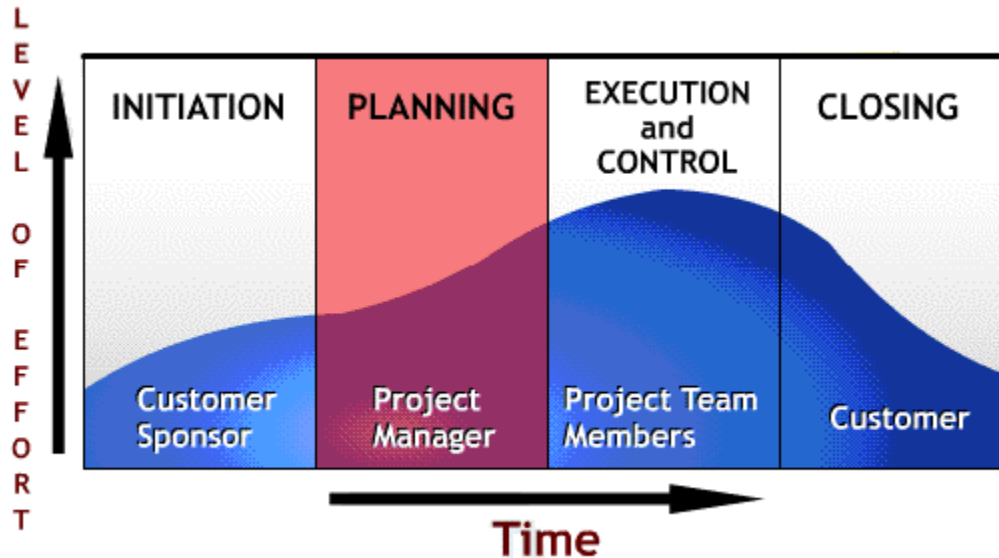
- | <b><u>Problem Solver</u></b>                            | <b><u>Project Manager</u></b>  |
|---|--------------------------------|
| - Seeks out optimal solutions                           | - Seeks pragmatic solutions    |
| - Strives for accuracy                                  | - Strives for workability      |
| - Deals with things                                     | - Deals with people            |
| - Focuses on processes                                  | - Focuses on outcomes          |
| - Works with "laws" that can't or should not be changed | - Works with situational rules |
| - Specializes to improve                                | - Generalizes to improve       |
| - Succeeds individually                                 | - Succeeds through others      |

This last distinction is the hallmark of a true manager.

The major roles on a project are the customer, the project manager, and the sponsor. Each will exert a range of influence on the project and its elements of scope, time and cost; this level of influence usually varies over time. For example, at the definition stage of a project, the impact of the customer and the sponsor is at its highest level, while the role of project manager increases during the planning and execution stages. The more unique the project's deliverables, or the more unknown the environment in which it will be performed, the more the project manager's role will tend to vary over the lifespan of the project. Other roles on a project include functional managers, team members, project participants, and "stakeholders", i.e. anyone with a stake in the success of the project such as shareholders, executive steering committee members, support staff, service representatives, etc.

### Phases and Processes

Organizations performing projects will typically divide each project into two or more project phases to facilitate control and manage uncertainty. A project phase can be defined as the period in which an aspect of a project is carried out, and is marked by the completion of one or more deliverables. A deliverable is a concrete, verifiable work product such as a design, a prototype, a dataset, etc. The entire set of project phases can be described as the project life cycle, which defines the start and endpoints of a project. The level of effort during the project varies over time, and there are different stakeholders involved at each of the phases. For example, as noted above the customer and sponsor are usually most involved at the startup of a project, the project manager takes the lead during the planning stage, and the efforts of the project team members are at their peak during the execution stage.



**Figure 2: Project lifecycle – level of effort vs. time**

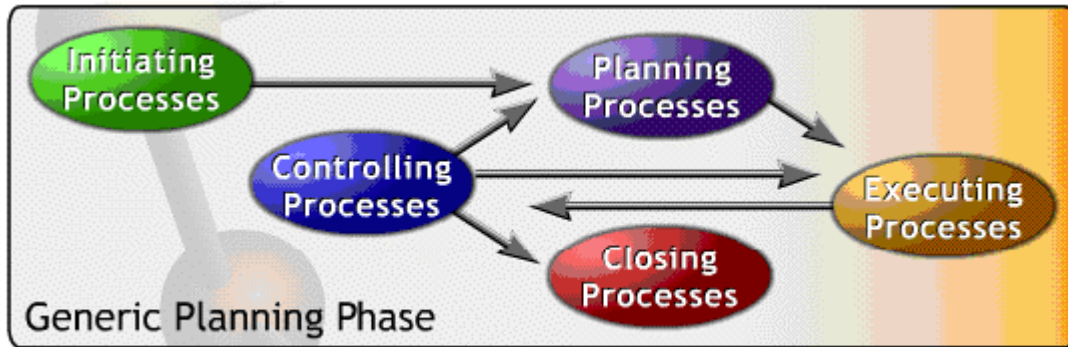
Projects are composed of processes, which are defined in the PMBOK as “a series of actions bringing about a result”. These processes are performed by people and generally fall into one of two categories:

- a) project management processes, which describe, organize and complete the work of the project;
- b) product-oriented processes, which specify and create the project’s product, and are usually defined by the project life cycle and vary by application area.

Project management processes can be divided into five groups of one or more processes each:

- 1) Initiating processes: authorizing the project or phase
- 2) Planning processes: defining and refining objectives and selecting the best of the various courses of action to attain the project objectives
- 3) Executing processes: coordinating people and other resources to carry out the plan
- 4) Controlling processes: ensuring that project objectives are met by monitoring and measuring progress regularly to identify variances from the plan, so that corrective action can be taken when needed
- 5) Closing processes: formalizing acceptance of the project or phase and bringing it to conclusion.

The process groups are linked by the results they produce – the output of one group usually becomes the input to another. The links are iterated among the planning, executing and controlling process groups, so that for example planning produces a written project plan early in the project that is executed against, and then provides updates to the plan as the project progresses. These process groups are not one-time events, but are overlapping activities that occur at varying levels of effort as illustrated in figure 2.



**Figure 3: Five process groups interacting in one phase**

Within each process group are one or more individual processes, which are also linked by their inputs and outputs. The PMBOK defines these as follows:

- 1) Initiating processes (1):
  - a) Initiation – authorizing the project or phase
- 2) Planning processes (21):
  - a) Core processes (11):
    - i) Scope planning – developing a written scope statement as the basis for future project decisions
    - ii) Scope definition – subdividing the major project deliverables into small components
    - iii) Activity definition – identifying the specific activities that must be performed to produce the various project deliverables
    - iv) Activity sequencing – identifying dependencies between activities
    - v) Activity duration estimating – estimating the number of time units that will be required to complete each activity
    - vi) Schedule development – analyzing activity sequences, activity durations, and resource requirements to create the project schedule
    - vii) Risk management planning – determining how to plan for managing risks
    - viii) Resource planning – deciding which resources (staff, equipment, etc) and the quantities of each that are needed
    - ix) Cost estimating – developing an approximation of the costs of the required resources
    - x) Cost budgeting – allocating the overall cost estimate across the project phases and activities
    - xi) Project plan development – summarizing the results of the other planning processes in a coherent document
  - b) Facilitating processes (10):
    - i) Quality planning – determining which quality standards are relevant and how to meet them
    - ii) Organizational planning – identifying and assigning project roles, responsibilities and reporting relationships
    - iii) Staff acquisition – obtaining and assigning the people needed for the project

- iv) Communications planning – identifying the information and communication needs of the stakeholders
  - v) Risk identification – determining which risks are likely to affect the project
  - vi) Qualitative risk analysis – performing a qualitative analysis of risks and conditions to prioritize their effects on the project
  - vii) Quantitative risk analysis – measuring the probability and impact of risks
  - viii) Risk response planning – developing procedures to enhance opportunities and reduce threats to the project’s objectives
  - ix) Procurement planning – deciding what to procure, how much to procure, and when
  - x) Solicitation planning – determining product requirements and potential sources
- 3) Executing processes (7):
- a) Project plan execution – carrying out the project plan by performing the project activities
  - b) Quality assurance – monitoring overall project performance on a regular basis to ensure that the project will satisfy the relevant quality standards
  - c) Team development – building individual and group skills and competencies to enhance project performance
  - d) Information distribution – providing required information to stakeholders in a timely fashion
  - e) Solicitation – obtaining quotations, proposals, etc.
  - f) Source selection – choosing from potential sellers
  - g) Contract administration – managing the relationship with the seller
- 4) Controlling processes (8):
- a) Integrated change control – coordinating changes across the entire project
  - b) Scope verification – formalizing acceptance of the project scope
  - c) Scope change control – controlling changes to the scope
  - d) Schedule control – controlling changes to the project schedule
  - e) Cost control – controlling changes to the project budget
  - f) Quality control – evaluating specific project results to verify that they comply with the relevant quality standards and identifying ways to eliminate the causes of performance that falls short
  - g) Performance reporting – collecting and distributing performance information, including status reporting, progress measurement, and forecasting
  - h) Risk monitoring and control – monitoring identified risks, identifying new risks, ensuring the execution of risk plans, and evaluating their effectiveness
- 5) Closing processes (2):
- a) Administrative closure – generating, collecting and distributing information to formalize phase or project completion, including lessons learned for use in future projects
  - b) Contract closeout – completion and settlement of the contract

Each of these processes can also be grouped into nine different knowledge areas, to form a matrix:

**Process Groups**

		INITIATING	PLANNING	EXECUTING	CONTROLLING	CLOSING
<b>Knowledge Areas</b>	INTEGRATION MANAGEMENT		Project Plan Development	Project Plan Execution	Integrated Change Control	
	SCOPE MANAGEMENT	Initiation	Scope Planning Scope Definition		Scope Verification Scope Change Control	
	TIME MANAGEMENT		Activity Definition Activity Sequencing Activity Duration Estimating Schedule Development		Schedule Control	
	COST MANAGEMENT		Resource Planning Cost Estimating Cost Budgeting		Cost Control	
	QUALITY MANAGEMENT		Quality Planning	Quality Assurance	Quality Control	
	HUMAN RESOURCE MANAGEMENT		Organizational Planning Staff Acquisition	Team Development		
	COMMUNICATIONS MANAGEMENT		Communications Planning	Information Distribution	Performance Reporting	Administrative Closure
	RISK MANAGEMENT		Risk Management Planning Risk Identification Qualitative Risk Analysis Quantitative Risk Analysis Risk Response Planning		Risk Monitoring and Control	
	PROCUREMENT MANAGEMENT		Procurement Planning Solicitation Planning	Solicitation Source Selection Contract Administration		Contract Closeout

**Figure 4: Process groups and knowledge areas**

### Geospatial Information Projects

A well-defined project management approach can be of great value not only to the project manager, but also to their organization, their internal and/or external customers, and other stakeholders. Organizations which sponsor or are otherwise involved in geospatial information projects include utilities, municipalities, and businesses who provide products and services to them and each other. Examples of these projects include implementing a new outage management system or work management system, data migration from one mapping system to another, development of new landbase information, field collection to enhance an existing GIS, and software development of a new geospatial information product. The size of these projects ranges from relatively small and self-contained to massive undertakings with a number of participating organizations over several years. Larger projects typically involve a variety of stakeholders including utilities, vendors, local governments, and regulatory bodies.

Perhaps all large projects have scope control issues, but one challenge of projects that generate and manage geospatial information is that of “scope creep”. The PMBOK-defined processes in the Project Scope Management knowledge area are therefore highly applicable; these processes include Initiation, Scope planning, Scope definition, Scope verification, and Scope Change Control. An example of an activity in the Scope verification process that can assist in the elimination of scope creep is the creation of a detailed statement of work soon after contract signing, but prior to the investment of extensive engineering resources. This document provides more detail than may have been included in the contract scope definition. Once created by the performing organization, the document is reviewed by the customer, who may provide feedback and request adjustments. When both sides are in agreement, the document is signed by representatives of the customer and supplier. This helps to set the correct expectations, can be

used by the development team to guide their efforts, and can be referred to later in the project if questions arise.

## PROJECT MANAGEMENT PROFESSIONAL CERTIFICATION

The Project Management Professional, or PMP, certification is offered by PMI as formal recognition for achieving a defined set of educational and experience milestones. It also mandates adherence to a code of professional conduct. The final requirement is to pass a multiple-choice examination designed to assess the candidate's project management knowledge, in particular of the information contained in the "Guide to the PMBOK". It is analogous to the (perhaps better-known) Professional Engineer (PE) certification for those in the engineering profession.

As part of the application process for becoming a PMP, and before PMI will certify a candidate for the PMP examination, they must provide documentation that they have met the full set of educational and experiential requirements in one of two categories:

**Category 1 Criteria:** at the time of application a candidate must have all of the following:

- 1) a BA/BS degree or the equivalent from a college or university;
- 2) 4500 hours of personal project management experience within the five process groups (Initiating, Planning, Executing, Controlling, Closing) in the past 6 years;
- 3) 36 non-overlapping months of personal project management experience in those 6 years;
- 4) 35 contact hours of project management-specific instruction, in the areas of project quality, scope, time, cost, human resources, communications, risk, procurement and/or integration management. These can take the form of courses, workshops, or training sessions from a variety of providers including colleges and universities, training companies and consultants, PMI component organizations, distance-learning companies, and employers.

**Category 2 Criteria** (for those without a bachelors degree):

- 1) high school diploma or equivalent;
- 2) 7500 hours of project management experience in the last 8 years;
- 3) 60 non-overlapping months of project management experience in those 8 years;
- 4) 35 contact hours of PM-specific instruction.

When applying for the PMP, the following forms are required:

- 1) a completed experience verification form showing that the minimum requirements for both hours and months as a project manager have been met;
- 2) a completed education form showing that the 35 contact hours of instruction have been obtained; and
- 3) the application form with payment (currently \$405 for PMI members, \$555 for non-members).

Once the application has been accepted and approved by PMI, the final requirement must be met: to pass a 4-hour, 200-question multiple-choice test with a score of 137 or better (roughly 70%). This test is based on the material found in the “Guide to the PMBOK”, and there are a number of resources available that offer assistance in preparing for the examination, including books, software, and test preparation courses. More information on PMI and the PMP certification is available at PMI’s web site, [www.pmi.org](http://www.pmi.org).

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