The Roadmap to Exceptional Project Management - Basic Introduction – Part 1

An Online Continuing Education Course for Engineers

Course Number: P-5007

Credit: 5 Hours / 5 PDH / 5 CPD

The Roadmap to Exceptional Project Management - Basic Introduction – Part 1

Maher Sidani, PE,

Chapter 1- Project Definition

We will start this course by examining the very first basic understanding needed, which is to define what a project is. As simple as it sounds, this will form the first building block to set the roadmap for managing a project.

According to the Project Management Institute (PMI), *a project is a temporary endeavor to create a unique product, service, or result*. Breaking it down further one more step, a project has three distinct characteristics:

First, a project is temporary: This is in contrast to an ongoing operation; a project has a distinct beginning and end.

In operations, which is part of every organization, there are ongoing tasks that are executed on a daily, weekly, or monthly basis. For example, accounting or marketing tasks that generate products and deliverables are continuously used by upper management or other line managers within the organization, such as budget reports, win/loss reports, etc. These reports are constantly generated to allow managers to spot company performance trends so they can chart forward-thinking strategies and implement tactical steps. These tasks and resulting deliverables are repetitive, and while their structure or format may change or be revised with time, they don't end as long as their need is justified.

Projects can occur at all levels of the organization and be of all sizes and lengths. Typically, projects become more complex and prone to higher risks the larger they are, which requires more extensive project management methods and tools. The end of a project is reached when the project's objectives have been achieved. Temporary does not necessarily mean short; many projects last for several years. In every case, however, the duration of a project is finite, and they are not ongoing efforts.
This defines a project's first essential element, the project schedule. Anytime you are tasked with executing a project … you must know and be aware of the duration to complete the project.
We all know that time is money. So, there will be costs associated with implementing a project, and to execute a project within a finite duration, you must know and agree on the budget needed to complete the project. While learning the project schedule alone does not simply translate into a project budget, as you still need to define the project product, deliverables, and resource needs, this helps determine the second essential element of a project, which is the project budget.

Second, a project is unique: It aims to create a product, service, or other specific result.
No two projects are the same; uniqueness is an essential characteristic of the project deliverables. At face value, many projects may look identical, even in the simplest form. However, they are not and will have some variations that make them different and unique. Consider, for example, a housing development that consists of building similar houses. Even for identical house configurations, layouts,

and looks, each house will sit on a different lot of land that will have various surveys, different foundation considerations, different driveways, requiring different connections to the sewer system and other utilities, which depends on the exact location, elevation, and proximity from the house.
When asked, project managers who have managed numerous projects, me included, will confirm this and will tell you that they have never managed two projects that are exactly alike. Aside from having the actual deliverables differ, many other project attributes will differ. Attributes that could be different are the client or customer, the end user, the schedule, your team executing the project, the budget agreed to, and available technology, to name a few.

Since we are talking about the end product or deliverable, we have defined the third essential element of a project, which is the project scope. Having a defined scope is very important as it sets the client requirements that will be used in determining whether the project's objectives have been achieved.
Finally, a project is progressively elaborated: Because it is temporary and unique, a project is progressively elaborated – or iteratively refined – until a solution reaches a sufficient level of definition or completeness.

Progressive elaboration means developing in steps and continuing in increments. Unlike the first two characteristics, this final characteristic does not address the project's specifics but rather the approach and methodology used for managing it. It accompanies the concepts of temporary and unique. While the scope of a project defines the objectives and deliverables to be achieved by the end of the project, the roadmap to get there only gets explicitly developed by the project team as the project progresses. For longer-duration projects, sometimes certain conditions change during the execution of the project, requiring that the project team adapt to the changing conditions through some progressive development as they better understand the impact of the changes.

Take a simple example to illustrate the point and assume you have a task to deliver a package from point A to point B during a certain timeframe. Even with the latest technology of having a GPS, it can only estimate how long it would take to complete the trip when you start, but it will make adjustments as you are driving. There is no way of telling when you start the journey whether an accident will occur along the way after you leave or a lot of people will hit the road (maybe there is an event that everyone is going to), which significantly adds congestion. The accident or the unanticipated congestion will add time to your trip; otherwise, you will have to adjust. This is why the GPS often suggests specific roadmap changes to minimize the delay. The point is that not everything is known when you start an endeavor, and there will be unique surprises along the way that you will have to deal with and manage.

Key Takeaways

- **Project Essence:** Projects are temporary, unique, and progressively elaborated endeavors. They have set timelines, offer distinct outcomes, and evolve through iterative refinement.
- **Navigating Uncertainties:** Projects embrace unpredictability. Like adjusting routes during a journey, project managers must adapt to unforeseen challenges, highlighting the need for flexible strategies.

Chapter 2 - Understanding Project Types

Projects come in various sizes, purposes, configurations, and complexity. Companies, agencies, and organizations use them to deliver products or services. Each entity identifies, executes (internally or externally), and delivers its projects differently depending on its size, organization, capabilities, and approach. Other countries probably have different mechanisms that reflect their statutes and policies. Even for public agencies within the same country, you would think that there is some consistency in their approach to delivering projects; they don't, and the approach may vary significantly. For example, in the United States, public projects in each state are procured and delivered differently to a certain extent. However, some characteristics can be used to identify and categorize projects to highlight the differences in their project management approach.

From a project management perspective, projects can be categorized into various types based on their characteristics, goals, formation, and industry. Given the wide-ranging possibilities and kinds of projects, the breakdown will be done at a broad level, then subdivided into further categories to capture the subtle differences in project characteristics that would likely impact the approach to managing them. Here are some common types of projects:

Broad Type Categories

Internal Projects: These types of projects are initiated within a company, driven chiefly by either the company's need to support its internal operations or for the internal development of products that, in most cases, are made for external use or distribution. The significant difference for internal projects is that the customer is most likely either a mid-level, an upper, or even executive-level manager that are responsible for timing and funding the project and looking for an internal project manager to execute the project, whether using internal resources or procuring outside suppliers, or a mix of both. In this case, project managers are assigned the project and do not have to compete in the open market. However, they still have to finalize and get approval for the project's scope, schedule, and budget. They are expected to follow the proper management protocols and standards for the successful delivery of the project. Examples of internal projects are numerous and wide-ranging, such as:

- To support the company's internal operations:

  IT/ Technology:
  Network Infrastructure Upgrade **-** Upgrading the company's network infrastructure to improve speed, reliability, and security.
  Data Analytics Dashboard - Developing a dashboard to provide real-time insights from company data for better decision-making.
  Finance:

Financial Reporting Enhancement - Upgrading financial reporting systems to provide more accurate and timely data for decision-making.
Budgeting and Forecasting Process - Revamp the budgeting process and implement improved forecasting techniques.

Infrastructure Upgrades:

Many large companies, such as pharmaceutical companies, hospitals, and power plants, have their engineering departments handling many needed upgrades. This does not mean they cannot supplement their capabilities by procuring services from external sources. The assigned internal project manager would deliver the upgrade, including the procurement process.
Plant Expansion: Expanding manufacturing facilities to accommodate increased production capacity or new product lines.
HVAC and Energy Systems Upgrade - Upgrading heating, ventilation, air conditioning (HVAC), and energy management systems for improved efficiency and comfort.
Equipment Modernization - Replacing or upgrading outdated machinery and equipment to enhance productivity and reduce downtime.

- Product development for external use or distribution:

Product Development:

New Product Design - Developing a new product from concept to prototype and final production, involving design, testing, and validation phases.
Product Enhancement - Upgrading an existing product by incorporating new features, improving performance, or addressing customer feedback.
R&D Initiatives - Research and experiment with new technologies, materials, or processes that could lead to innovative products or improvements.

External Projects: The primary purpose of exterior projects is to provide services for external customers. These types of projects differ from internal projects since the customers procure them by soliciting proposals in the open market from several competing companies. These companies will have to submit detailed proposals that provide their approach to how and what they will be delivering, the team that they will use, the schedule it will take them to deliver it, as well as their price for doing the work. Customers differ on how they select the winning company as some will look at price only, some will select based on the quality and reputation of the company, and some will select based on the time. In any case, the selection process is, in many cases, very arduous and competitive, through sometimes several rounds of lengthy negotiations. As such, another major difference between an internal and external project is that an external project requires an added skillset of client management and customer focus to have a successful project.

- **Advisory Projects:**
  Technology Consulting - Assisting clients in identifying and implementing technology solutions to address specific challenges or opportunities.
  Financial Advisory - Offering financial expertise to help clients with mergers and acquisitions,

financial planning, and investment strategies.

- **Software Development and IT Projects:**
  Custom Software Development - Building tailor-made software solutions to address specific business needs or streamline processes for their clients.
  Website Development - Design and develop websites to enhance clients' online presence and user experience.

- **Financial and Accounting Services:**
  External Auditing - Conducting independent audits of financial statements to ensure accuracy and compliance with accounting standards.

- **Engineering and Construction Projects:**
  Infrastructure Development - Designing and constructing major infrastructure projects such as roads, bridges, airports, and railways.
  Architectural Design Services - Providing architectural designs and plans for commercial and residential buildings.
  Environmental Remediation: - Cleaning contaminated sites and restoring environmental quality through engineering solutions.

Depending on the nature of the project, whether internal or external, their scope can consist of work related to a simple single-discipline or a complex multi-discipline/cross-functional project. For obvious reasons, single-discipline projects are easier to manage as, most likely, the project manager would be a team member of that discipline and has the proper experience in the execution needs and the team capabilities.

<u>Single-Discipline Projects:</u>

- **IT or Software Projects -** These encompass developing, implementing, and maintaining software applications, systems, and technologies. Examples include software development, website creation, or database management.
- **Geotechnical Investigations Projects –** These projects primarily involve subsurface investigations and inspections, laboratory testing, and the development of geotechnical and foundation reports used by other engineering consultants.

<u>Multi-Discipline Projects:</u>

On the other hand, multi-discipline projects involve a scope and work product that needs to be developed and executed by several team members from different disciplines and functions. Project organizations for multi-discipline projects vary in configuration depending on the size and complexity of the project. Some projects may require that the entire project team, which comes from different disciplines, report directly to the assigned project manager, which makes it a strong project organization

and thus preferred and used on large complex projects. On other projects, the team members will continue to report through their functional organization structure, and the assigned project manager will have access to their specialty expertise without a direct reporting line. This type of organization called a matrix organization, represents a somewhat weaker type of project organization as the project manager has to continuously work through the functional manager to secure the proper resources and their availability. Either way, the challenge for multi-discipline projects is that the project manager will have to manage a team from different disciplines with varied levels of expertise they may not have solid experience with.

- **Architectural Projects** – many specialties are typically involved in these projects. In most cases, the architect acts as the project manager and is primarily responsible for envisioning, coordinating, and managing the product development that involves other engineering disciplines, such as mechanical, electrical, plumbing, and structural, to design the various elements of the project.
- **Infrastructure Projects** – most heavy civil projects, such as a new roadway design, involve many specialties within the civil engineering field, from highway design to structural bridge and geotechnical engineering to environmental science for permitting.

You probably have noticed that some of the project examples provided may have been included in more than one project type category. That is because the lists and categories are not mutually exclusive, and each entity deals with its projects, even similar projects, differently. As mentioned, this is mostly driven by the entity's size, capability, and approach and has nothing to do with the project characteristics. So, the above examples should be used only to clarify and highlight the differences between different project types and not an all-inclusive list of projects, as the number of project types is much larger.

Special Type Category - Engineering, Architecture, and Related Projects

This section emphasizes and details a particular category related to engineering, architecture, and associated projects. Some of these projects could be internal projects, but they are primarily external projects that companies deliver in response to an external customer solicitation. One of the common characteristics of these projects that makes them a particular category is that they have a relatively longer and more complicated framework that involves several steps to take them from concept to a finally constructed product ready for use. Many of these projects could be very large-scale complex projects that are considered mega projects with costs in the billions of dollars and take years to deliver. Regardless of size, these projects are typically procured and delivered using one of the following mechanisms:

Design Projects

A design project is the first step in the traditional Design-Bid-Build project delivery mechanism in which the owner decides to first engage a consulting company to develop a design that culminates in a design bid package. The design bid package is then used to solicit bids from contractors, who would then be charged with building the design and delivering the final product in compliance with the design. In the

design-bid-build project delivery mechanism, each of the design, the bid, and the build are distinct and sequential stages, where each stage cannot be started before the completion of the prior stage. Additionally, the owner would be the customer for each of the designers and contractors, with separate contract agreements with each and without a direct contract between the designer and contractor.
A typical design project starts with a Concept Development stage to evaluate various options and ends with a selected concept, followed by a Preliminary Engineering stage that further develops the selected concept, and eventually advances through a Final Design stage that provides the complete detailed design for the bid package. It is worth noting that for larger projects, some public agencies decide to procure each stage separately and might end up with a different designer for each of the design stages.

Under this mechanism, the owner expects the design project manager to deliver the project according to an agreed-upon scope, schedule, and budget in conformance with their requirements and to a quality standard that ensures that the design is complete and error-free so that they can bid and build it without any issues. ***CAUTION:*** One of the things that is very important to highlight is that design project managers typically make a very big mistake by focusing solely on being on budget and schedule. They frequently are tempted to cut corners and compromise on the scope and quality of the project in order not to exceed the budget or schedule. Their thinking is that their job is done once they get the design bid package completed and delivered to the owner. This i rdinal mistake as the d n project manager's responsibility extends into the remaini eyond. Design flaws and inaccuracies will have to be r us, the design project manager a t it is of high quality to mi during construction

Design/Build

In recent years, Design/Build. This type of proj faster with one point of acc tly with the contractor as par rporate the contractor's capal design/build is achieved by pro of a contractor and a d ntracts with the designer as a d er.

During the procurem their concept solution alo on the team's qualifications, on predetermined selecti jects, such as one-step or two-step solicitatio are outside the scope of this discussion and will be discussed i dicated to design/build projects. ***CAUTION:*** Design/build projects are inherently riskier than the traditional design-bid-build due to their fast pace and the fact that the projects are designed and constructed incrementally in smaller packages. In contrast, the