PROJECT MANAGEMENT TOOLBOX

TOOLS AND TECHNIQUES FOR THE PRACTICING PROJECT MANAGER

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THIRD EDITION

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PREFACE

In the eight years since the second edition of the *Project Management Toolbox* was published, the practice of project management has changed significantly. Today, more than half of the projects use hybrid approaches to managing projects. Meaning that while predictive (waterfall) tools are still used, adaptive (Agile) tools and techniques are often integrated where applicable. The practice of separating the two ways of performing projects is waning and an attitude of "figure out the best way to deliver value" is taking over.

With that in mind, some of the tools that were predominantly used in the predictive projects of the past, such as a Time-Scaled Network Diagram or a Line of Balance Schedule, are not in the third edition. Several new tools have been introduced. The new tools can be used for predictive, adaptive, or hybrid projects, such as a Project Canvas, Project Roadmap, and Communication Matrix.

Some of the existing topics have been updated. The chapter on requirements has been refreshed. The intent of eliciting and managing requirements hasn't changed, but the tools used to do so have been updated. You will see a Requirements Management Plan and a Requirements Traceability Matrix rather than a Product Requirements Document and a Requirements Ambiguity Checklist.

There are also new chapters – Resource Planning, Advanced Risk Management, and Change Management. Some of these chapters have new content, and others reorganize content from the second edition.

The third edition of this book maintains the previous effective format of presenting a tool, describing how to develop it and then how to apply it, interspersed with examples and tips where applicable. Rather than having a separate section for the benefits of each tool, the benefits are indicated when introducing the tool.

It must be acknowledged that the world of project management is on the precipice of a huge change with the advent of artificial intelligence (AI). AI can be a tremendous asset when managing a project, but it cannot replace the fundamental understanding of project management and the knowledge of how to use tools to effectively manage projects. Therefore, while acknowledging the benefit of AI, this book does not describe how to use it in project management. After learning how to work with the tools in this Toolbox, you may choose to see how AI applies them, but first, you have to understand the fundamental tools, how to develop them and how to use them.

With thanks to the existing and future readers of this book. May it prove useful throughout your project management journey.

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Finally, a huge thank you to project, program, and portfolio professionals everywhere. Every one of you is an inspiration. Keep uplifting our world!

The PM Toolbox

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INTRODUCTION TO THE PM TOOLBOX

Project management tools support the practices, methods, and processes used to effectively manage a project. They enable the primary players on a project—the project manager, project team, executive leadership team, and governance body.

For purposes of this book, tools are considered to be processes, techniques, artifacts, software, or other job aids that assist in creating deliverables or project information. PM tools may be qualitative or quantitative in nature.

To illustrate, consider two examples, the Team Charter and a Monte Carlo Analysis. The Team Charter is an artifact that outlines how the team will work together on a project. A Monte Carlo analysis involves analyzing data that is generated from a software tool that uses an algorithm to quantify uncertainty around cost or schedule outcomes.

Note there is no mention of specific software tools here. While many PM tools discussed in this book exist in a software format, the focus is not on tool formats. Rather, the focus is on the use of tools to manage projects more effectively and efficiently.

A project management (PM) toolbox provides a set of tools that serves several purposes, such as:

1. Increasing the efficiency of the project players
2. Providing the right information to support problem solving
3. Providing relevant information for making decisions
4. Helping to establish and maintain alignment between business strategy, project strategy, and project outcomes.

The design of a PM Toolbox should align with the approach an organization takes for establishing project management methodologies and processes.

Project Management Toolbox: Tools and Techniques for the Practicing Project Manager, Third Edition. Cynthia Snyder Dionisio, and Russ J. Martinelli.

ALIGNING THE PM TOOLBOX

Organizations have a host of options when developing their methodologies and processes—they can be more standardized or more flexible. Generally, projects with a high degree of certainty do well with more standardization. Projects that face a high degree of uncertainty require more flexibility. The decision about how much to standardize project management methodologies and processes is driven by business strategy and by the types of projects needed to realize the business strategy.

The rationale behind standardization is to create a predictable process that prevents activities from differing substantially from project to project, and from project manager to project manager. Put simply, standardization saves project players the trouble of reinventing a new method and process for each individual project. As a result, the process is repeatable despite changes in customer expectations or management turnover.

The rationale behind flexibility is to give the project team the ability to explore, experiment, and iterate processes to reduce uncertainty. The players learn and adapt through multiple iterations in order to meet the needs of the project and the stakeholders.

When developing a PM toolbox, organizations should weigh the need for fixed and repeatable processes against the need for flexible and adaptable processes. This need may vary depending on the different departments or functions in an organization. For example, an engineering department may benefit from well-established policies, processes, and tools. In the same organization, the IT department may benefit from a more flexible and adaptable set of processes and tools. Both approaches are fine as long as they support the business strategy and are aligned with the project objectives.

Since the PM Toolbox is aligned with the PM methodology used, it is understandable that the level of standardization of the methodology impacts the standardization level of the PM Toolbox. For example, a methodology that is highly standardized will probably be supported by a highly standardized PM Toolbox.

CUSTOMIZING THE TOOLBOX

Developing a PM Toolbox is an evolutionary process. In a practical sense, PM toolboxes will look quite ad hoc at first. The tendency is to begin building the PM Toolbox with existing tools due to a project manager's familiarity with them. Thus, the early-stage PM Toolbox has more to do with familiarity of use than with standardization. As a firm begins to mature its project management practices, there is a greater understanding of the tools that are needed in the Toolbox.

Often, project managers assume that the PM Toolbox is of a one-size-fits-all nature. This is incorrect. The PM Toolbox reflects the project management methodology and types of projects the methodology serves.

Regardless of whether an organization's project management methods and processes are standardized, flexible, or semi-flexible, a PM Toolbox needs to be designed so that it aligns with both the PM methods and processes employed as well as the strategy of the project and the business strategies driving the need for the project. To accomplish this, a process for selecting and adapting the PM Toolbox is needed.

There are multiple options for customizing a PM Toolbox. Three of the most common are:

1. Customization by project size
2. Customization by project innovation
3. Customization by project type.

Each option has the purpose of showing which specific project management tools to select and adapt for the PM Toolbox. An in-depth knowledge of individual tools is a prerequisite to each of the options because you need to understand how each tool can support a project deliverable. This section describes the customization options and offers guidelines for selecting one of them for implementation.

Customization by Project Size

Some organizations use project size as the key variable when customizing a PM Toolbox. Their logic is that larger projects are more complex than smaller ones, or the size drives differences in project management methodology complexity. The reasoning here is that as the project size increases, so does the number of project management activities and resulting project deliverables associated with a project, and so does the number of interactions among them.

Since different project sizes require different processes and tools, we first need a way to classify projects by size and then customize their toolboxes. In Table 1.1 you can see examples of how different companies classify small, medium, and large projects.

Based on size, the companies determined the managerial complexity of the project classes and processes. The complexity influences the PM Toolbox make-up. A simplified example is shown in Table 1.2.

As Table 1.2 indicates, some of the tools in the toolboxes for projects of different size are the same, others are different. For example, all use the Lessons Learned (Chapter 17) because all projects need to learn from their performance. Since managerial complexity of the three project classes and their processes calls for different tools, some of the tools differ. For example, Earned Value Management (Chapter 15) is needed in large projects, but not medium or small projects.

Table 1.1: Examples of Project Classification by Size

	Project Size		
Project and Company Type	**Small**	**Medium**	**Large**
Product development projects in a $1Billion/year high-technology manufacturer	$1–2M	$2–5M	>$5M
Infrastructure technology projects in a $300M/ year food processing company	<$50k	$50–150k	>$150k
Software development projects in a $40M/year customer relationship management software company	300–400 person-hours	1000–3000 person-hours	>3000 person-hours

Table 1.2: Examples of PM Toolbox Customization by Project Size

Project Size	Origination	Planning	Development	Closure
Small	Project canvas	Scope statement	Summary status report	Project closure report
		WBS		
		Responsibility matrix		
		Milestone chart		
Medium	Project Charter	Stakeholder register Stakeholder analysis Communication matrix Scope statement	Summary status report	Project closure report
		WBS	Change management system	Post mortem review
		Responsibility matrix	Change log	
		Cost estimates	Critical path method	
		Critical path method	Cost baseline	
		Risk register Risk assessment Risk responses	Risk register	
Large	Project charter	Stakeholder register Stakeholder analysis Communication matrix Scope statement	Summary status report	Project closure report
	Complexity assessment	WBS		Post mortem review
		Responsibility matrix	Change management system	Project closure plan and checklist
		Cost estimates	Critical path method	
		Critical path method	Slip chart	
		Risk register Risk assessment Risk responses	Earned value management	
		Monte Carlo analysis	Risk register Monte Carlo analysis Risk dashboard	

When customizing the PM Toolbox by project size follow these steps:

- Identify a small number of project categories
- Define each category by the size parameter
- Match the project size with the proper toolbox.

Note that while customization by project size offers advantages of simplicity, it also carries a risk of being generic, disregarding other situational variables. To some, these other variables may be of vital importance, as will be pointed out in the next section on customization by project family.

Customization by Project Innovation

The amount of innovation influences the tools in the PM Toolbox. For example, companies in the high-technology industry face an environment of dynamic technology change. Because of this, their portfolios have many quick time-to-market projects driven by the desire of their customers to continuously buy the latest and greatest technological products and services. Conversely, facilities management projects don't often have to contend with innovation and technology risk.

Innovation projects have more uncertainty. Uncertainty generally means more complexity, which requires more flexibility in the project management processes and the supporting toolbox. For example, as innovation grows:

- The more scope and requirements evolve
- The more the schedule becomes fluid
- Cost Estimates follow the fluidity of the schedules and scope.

A simple example reflecting these trends in adapting the toolbox for three levels of innovation could be Derivative Projects, Incremental Projects, and Breakthrough Projects.

- Derivative projects are those that have little to no innovation. The organization has done them before, the scope and requirements are well known, and there is little expectation of change.
- Incremental projects have some degree of innovation, often improving components or parts of a project. The outputs are mostly known, though there may be a need to iterate on a few aspects of the deliverables.
- Breakthrough projects deal with unknown, or evolving technologies. There may be uncertainty associated with requirements, technology, and solutions. These types of projects require a flexible approach to deal with the uncertainty and complexity associated with creating new solutions to problems or opportunities.

Table 1.3 shows an example of customizing the toolbox based on the degree of innovation.

As the table shows, the PM Toolbox for derivative and incremental projects are similar. However, breakthrough projects typically use a more Agile or adaptive approach that allows for evolving and changing scope.

Customization by Project Type

While the previous two approaches to PM Toolbox customization rely on one dimension each—project complexity and project innovation—customization by the project type uses two dimensions.[1]

Table 1.3: Customizing the Toolbox by Project Innovation

Project Innovation	Origination	Planning	Development	Closure
Derivative projects	Project charter	Milestone chart	Summary status report	Project closure report
	Scoring models	Requirements specification		
		WBS		
Incremental projects	Project charter	Stakeholder analysis Scope statement	Summary status report	Project closure report
	Scoring models	WBS or PWBS	Change log	Change log
		Requirements specification	Critical path method	Lessons learned
		Cost estimates	Budget consumption chart	
		Critical path method	Risk register	
		Risk register Risks analysis Risk responses		
Breakthrough projects	Project roadmap	Stakeholder engagement plan	Backlog	Project closure report
	Complexity assessment	Requirements elicitation plan	Requirements traceability matrix	Post mortem review
		Backlog	Task board	Lessons learned
		Release planning	Release planning	
			Sprint retrospective meetings	

This model shows a grid with each dimension. Each dimension includes two levels: (1) innovation of the capability under development (low, high) and (2) project complexity (low, high). This helps to create a two-by-two matrix that features four types of projects—routine, administrative, technical, unique (see Figure 1.1).

A routine project is one having a low level of capability innovation (less than half of the technologies are new) and low complexity (few cross-project interdependencies). Due to the low levels of innovation and complexity, the project scope can normally be frozen before development begins or early in the development phase. Scope also remains fairly stable with few changes. With scope remaining stable, project scheduling, cost management, and performance management are also quite static.

Typically, routine projects are performed within a single organization or organizational function (for example, infrastructure technology). Examples include the following:

- Continuous improvement project in a department
- Upgrading an existing product
- Developing an updated model in a product line
- Expanding an established manufacturing line.

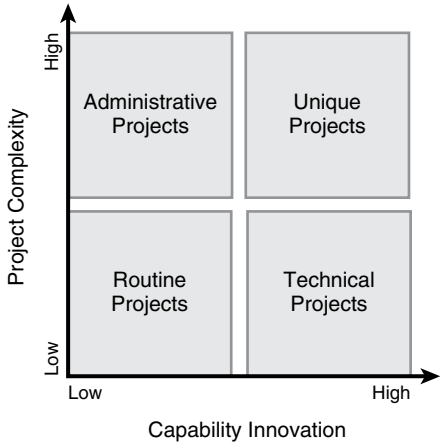

Figure 1.1: Four Project Types

Administrative projects are similar to routine projects in terms of innovation. Business goals and scope are normally well defined, stable, and detailed. The added complexity requires the coordination of multiple organizational functions and the mapping of the many functional interdependencies, but the lack of capability innovation allows for standard scheduling techniques. The same added complexity generally means larger project size, with higher financial exposure, justifying the need for detailed bottom-up cost estimates reconciled with financial targets contained in the project business case. Risk is primarily related to the increased number of interactions between the functions and project team; therefore, additional risk planning and analysis is required.

Some examples of administrative projects are as follows:

- Corporate-wide organizational restructuring
- Deploying a standard information system for a geographically dispersed organization
- Building a traditional manufacturing plant
- Upgrading an enterprise computer system.

Technical projects consist of more than 50% of new technologies or features at the time of project origination. This creates a higher degree of uncertainty that requires project flexibility. The goals, scope, and WBS are simple due to the low level of complexity, but they may take longer to fully define. The rolling wave or similar approach can be used, meaning that only the schedule for the following 60–90 days can be planned in detail, while the remainder of the program schedule is represented only by milestones. Similarly, cost estimates are fluid as well. A detailed cost estimate for the next 60–90 days can be developed, while cost estimates for the remainder of the project are at the summary or rough order of magnitude level. The increased technical

innovation results in increased technical risk and the need for a more rigorous risk management implementation and tools. Here are some examples:

- Reengineering a new product development process in an organization
- Developing a new software program
- Adding a line with the latest manufacturing technology to a semiconductor fabrication plant
- Developing a new model of a computer game.

For unique projects, business goals, detailed scope definition, and WBS development take time to evolve as a result of many new features and cross-project interdependencies. The evolving nature of scope leads to the need for fluid schedules. Project mapping and rolling wave scheduling processes can be used to contend with the fluidity. Similarly, cost estimates for milestones are more detailed in the near term and more summary level for the longer term. A high degree of project complexity exists due to multiple organizational functions required to execute unique projects, requiring integration tools. Combined capability innovation and project complexity push risks to the extreme, making it the single most challenging element to manage. In response, a rigorous risk management plan is needed, as well as a combination of tools such as a Monte Carlo Analysis and a Risk Dashboard (Chapter 11). Example technology projects include:

- Building a new light rail train system for a city
- Developing a new generation integrated circuit
- Developing a new software suite.

Now that we've defined the four project types, we can move on to the next step—describe how the two dimensions impact the construction of the PM Toolbox. Taken overall, the growing technical innovation in a project generates more uncertainty, which consequently requires more flexibility in the tools chosen. Figure 1.2 shows examples of several project management tools that are adapted to account for different processes driven by different project type.

A summary comparison of the tools for the four project types reveals that they use similar types of tools. For example, all use the WBS. Still, when the same type of tool is used, there are differences in their structure and how they are used. Consider, for instance, Gantt and Milestone Charts. Both are used in the routine and unique projects, but terms of use are significantly different. This is the situational approach—as the nature of the project management processes change, so does the PM Toolbox.

Which Customization Option to Choose?

The three options for customizing the PM Toolbox each has its advantages, disadvantages, and risks. Each option fits some situations better than others. Table 1.4 provides some insight on how to choose the option best suited for your needs. Customization by project size is a good option when an organization has projects of varying size and