# A Learning Framework for Project Management

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## Abstract

The contribution of this paper is a framework for understanding and practicing learning in a project environment. The framework includes the goals, processes, and tools for learning. The project management and learning processes are described using the plan-do-study-act (PDSA) cycle from quality management. The PDSA cycle is used to define the learning process that occurs within and between projects. Data from a survey of practicing project managers supports the learning framework by providing an assessment of project management practices. Four implications are provided for project managers to use in focusing the learning activities of a project team.

*Keywords*: lessons learned; organizational learning; plan-do-study-act

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Project organizations are faced with two important competitive forces: the shift to a knowledge-based society (Toffler, 1990) and the need to improve their knowledge faster than the competition (Stata, 1989). This paper focuses on understanding how project managers continuously build knowledge and improve project performance through learning. Given that a project organization survives in part on its technical knowledge and the development of this knowledge from successes and failures is a central piece of the technical profession (Kharbanda & Pinto, 1996; Petroski, 1992), project organizations must continuously build their knowledge from experience.

John Voeller, chief technology officer of Black & Veatch, defined the need for learning from experience when he stated "We sell experience. ... One of the most daunting difficulties for any professional services corporation is the ability to learn from experience" (Ricks, 1997). *Learning* is the process by which knowledge is created from experience and the path by which improvement takes place (Bohn, 1994; Fiol & Lyles, 1985). Peters and Homer (1996) emphasize the need for project managers to learn continuously. What is needed is a set of processes for supporting learning among project team members.

The concept of the learning organization has been offered to emphasize the need for creating an environment to support learning throughout the organization. A learning organization is "an organization continually expanding its capacity to create its future" (Senge, 1990). According to Garvin (1993) a learning organization is "an organization skilled at creating, acquiring, and transferring knowledge, and at modifying its behavior to reflect new knowledge and insights."

This paper attempts to answer the question, "How is learning integrated in the project management process to learn continuously from project experiences and increase capabilities for the future?" I'll answer this question by first defining the learning processes in a project management environment. Second, I'll analyze from a learning perspective survey results of practicing project manager goals and processes for learning in a project environment. This paper expands the current knowledge base by making explicit the connection of the concepts of the learning organization and organizational learning with project management practices and techniques and lessons learned. A project manager can use this framework and survey results to develop organizational learning practices. The framework provides the conceptual overview while the survey results offer specific guidelines.

## Learning Process in a Project Environment

The learning process is important because it is a means to help a project manager accomplish three goals: (1) to deliver a successful project, (2) to deliver a series of successful projects, and (3) to build capabilities. Based on

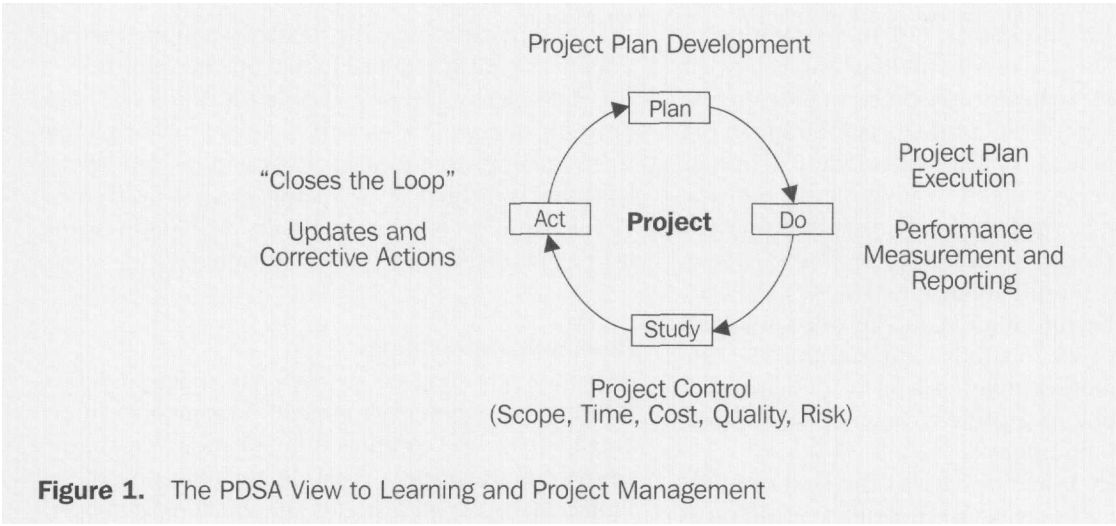


**Figure 1.** The PDSA View to Learning and Project Management

Drucker's (1993) and Nonaka and Takeuchi's (1995) definition of the knowledge-based organization, building the organization's knowledge and capability is one key to long-term survival of organizations. Without having the right capabilities, the organization cannot deliver a successful project and therefore a series of projects. Three core capabilities of a project environment are the project management, the product (e.g., engineering, design, or construction), and the learning processes. Project managers apply the project management process to the product process to ensure the product meets the needs of the customers within the requirements and constraints of the project scope.

For the project organization to learn, organizational members must create, share, and apply knowledge (Argyris & Schon, 1978; Huber, 1991). The organization's members create new knowledge by being engaged in a learning experience. Learning-by-doing occurs when a problem solver associates plans and actions with results to develop procedures to accomplish positive results and avoid negative results (Anzai, 1987). The plan-do-study-act (PDSA) cycle, an easily understood and widely used model from quality management (Juran, 1988), can be used to represent the learning process in a project environment.

- In the "plan" step, the project team determines the nature of the problem and constructs a plan. The plan is a set of expectations about the set of steps to take and the expected results.
- In the "do" step, the project team implements the plan. Implementation produces a set of results about the expected and unexpected actions taken and associated performance such as cost, schedule, or technical performance. These results are used to understand project status and to move the project forward.
- In the "study" step, the project team reflects on the associated plans and results to determine the good and bad instances. The output of the "study" step is a lesson learned.
- The "act" step is the closing of the loop to show the decision to continue with or abandon the process of improvement.

Throughout the learning process, support is increased for practices that meet expectations and decreased for less effective practices for a given activity.

The steps of the plan-study-do-act (PDSA) cycle parallel the project management process steps of the project management body of knowledge, "planning" is the same, "do" is "executing," and "studying" is "control." The "act" step is the use of the lessons learned on the next project during the planning phases. The use of "study" over "control" emphasizes the learning and improvement nature of the framework. The relationship between the PDSA cycle and the project management process is shown in Figure 1.

A lesson learned is a "catchall phrase describing what has been learned from experience" (Juran, 1988) and is a tool for learning. A lesson learned overcomes the barriers to organizational learning and knowledge sharing (Purser, Pasmore, & Tenkasi, 1992) by playing two roles. First, the process of developing a lesson learned provides an opportunity for the project team to


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take reflective time to gain a full understanding of project results. The process of building lessons learned via the PDSA cycle represents the process of identifying actions as bad or good and procedures for overcoming or achieving the actions. The lesson learned should describe the actions to take or avoid on similar projects. Second, a lesson learned is a mechanism to document the learning to share with others. For example, lessons learned support the planning function in the PDSA cycle by providing information and knowledge gained from one PDSA cycle to another either within the current project or another project. Using the PDSA view of a project, learning in a project occurs in two cycles: interproject and intraproject.

**Interproject Learning Cycle.** The goal of interproject learning is to deliver a series of successful projects by continuously building an organization's capability to execute the project management, product, and learning processes. Interproject knowledge learning is the combining and sharing of lessons learned across projects to develop new knowledge. Tools to support interproject learning include information technology tools and employee groups aimed at sharing knowledge across the organization (Fiksel & Hayes-Roth, 1985; Niwa, 1990; Smith, 1994; Shane & Schumacher, 1996; Sullivan & Yates, 1988; Williams & Kotnour, 1993). Sidell (1993) provides a detailed example of an online system for recognizing, documenting, validating, and making available lessons learned for an organization. Van Aken, Monetta, and Sink (1994) describe the use of affinity groups or peer groups to share what they have learned internal and external to the organization.

**Intraproject Learning Cycle.** Intraproject learning focuses on tasks within a single project and supports the delivery of a successful project by identifying problems and solving them during the project life cycle. Learning takes place when project team members discuss approaches for completing a task or overcoming problems. Project management control tools support intraproject learning by facilitating the plan-versus-actual comparison to determine project status and define corrective actions (Thamhain, 1996). The intraproject learning cycle occurs throughout a project and can be delineated by phase of the project, routine reporting cycle such as weekly or monthly status and review meetings, project deliverables, or major occurrences in the project.

An example of intraproject learning is the launch countdown process for NASA space shuttle vehicle launches (Kotnour, Orr, Spaulding, & Guidi, 1997). When a perturbation resulting from technical, weather, or management problems occurs the problem is reported. Real-time troubleshooting and repair plans are developed by a team to help solve the problem. Potential constraints are accurately assessed and coordinated to assure timely, safe, and efficient utilization of available support to meet the critical milestones and guarantee on-time launch capability. The problems and their resolutions are saved and studied for use on later launches.

As shown in Figure 2, the intra-learning cycle supports the interproject learning cycle by providing a routine, ongoing store of data, information, and knowledge that is integrated for interproject lessons learned. The intraproject learning produces a "living" lessons-learned journal for interproject learning.

## Research Methodology

To help in providing a more complete understanding of learning in a project environment, a lessons learned-oriented survey was completed by 43 project managers who were attending a local chapter meeting of the Project Management Institute. The structured and open-ended qualitative survey used the lessons-learned terminology because it is more familiar to project managers than organizational learning. The qualitative open-ended survey portion is shown in Table 1. The structured survey portion's questions and responses are shown in Table 2. The respondents had an average of 9.4 years experience as project managers. The research was conducted to determine (1) if project managers do have the three learning goals in mind when they are managing a project; (2) If and how project managers practice intraproject learning; (3) If and how project managers practice interproject learning; and (4) what role does a lesson learned plays in project learning.

**Results and Discussion.** The qualitative data from the open-ended survey portion were analyzed using content analysis (Weber, 1985). Content analysis is a systematic process for converting qualitative data into information. I first read all of the responses to a given question. Second, I developed a classification scheme of the responses from the initial reading. A classification scheme defines the primary meaning of a response. Third, I reread the responses and classified each comment or sentence into the classification scheme. Fourth, I made a grid of the responses and associated classification scheme. Fifth, I reread the responses and refined the classification of the responses.

The results from the survey along with the connection to the learning goals, processes, and tools that the results support are given next. Thirty-one respondents said they completed lessons learned while 12 said they did not.

Project managers appear to have the three learning goals in mind when they manage a project. In responding to an open-ended question on the aim of project management, project managers consistently focused on the classic definition of project success: cost, schedule, performance, and customer satisfaction. The project managers addressed the first goal of project management defined earlier: to deliver a successful project. In response to why they produced lessons learned, project managers defined two dri-

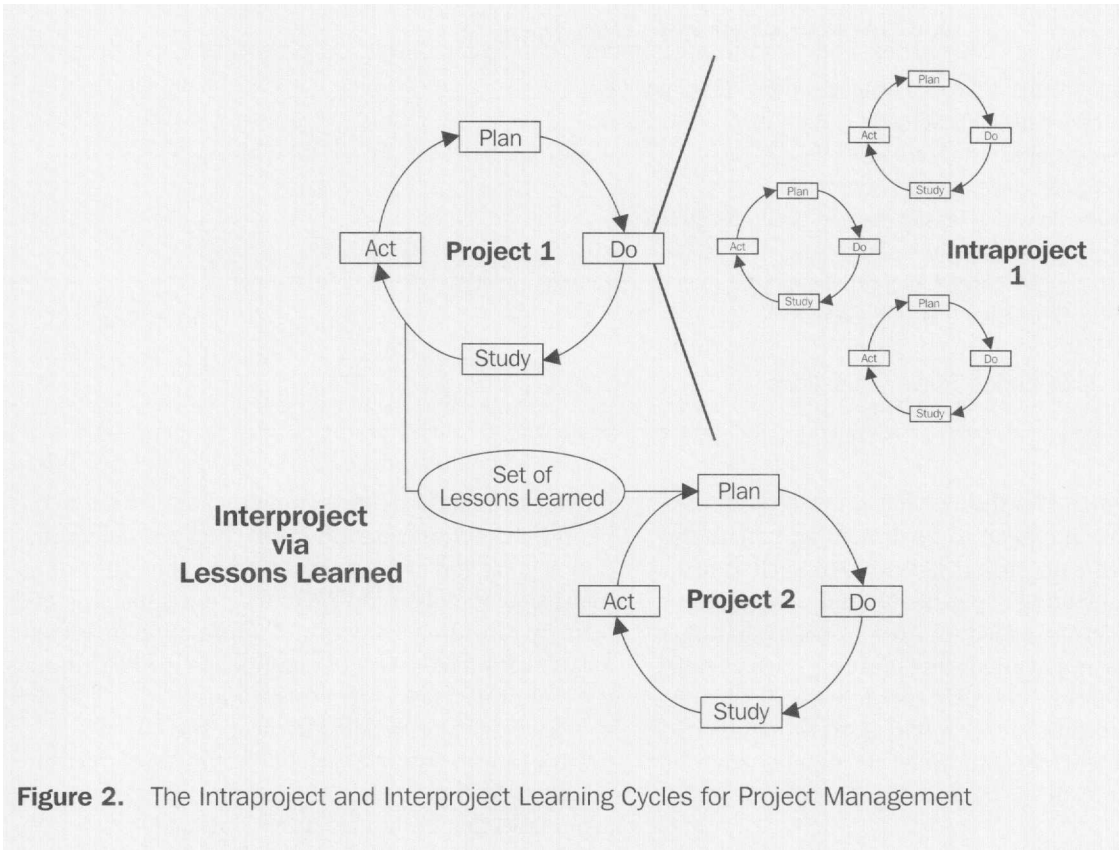


**Figure 2.** The Intraproject and Interproject Learning Cycles for Project Management

vers for completing lessons learned: to meet an organizational mandate to produce a lesson learned and to improve the efficiency/effectiveness of processes, communication, and future projects. The latter drivers relate to the goals of building capabilities and delivering a series of successful projects. It will become evident in the responses below that project managers also consider the other two goals of building capabilities and delivering a series of successful projects when managing projects.

The responses to "why do you produce lessons learned?" were related with the response to "what do you do with lessons learned?" and "how do you use a lesson learned?" These responses, when combined, defined a process of lessons-learned use. Project managers use lessons learned to provide an opportunity for the project team to analyze and learn from project events; that is, a lesson learned is a reflective mechanism for the project team. Developing lessons learned help a project manager to learn by measuring objectives set at the beginning of each project against the results.

The project learning focuses on determining gaps, what worked, and what didn't work. From this learning, project managers could develop action items in terms of what works. As shown in Table 2, responses to the structured question "What do you produce a lesson learned about?" define the type of tasks that project managers produce lessons learned for. The majority of project managers complete lessons learned for tasks that had major problems. By completing the lessons learned, project managers hoped to improve the next project performance by using the positive aspects on later projects; not repeating the mistakes of the past; guiding time and resource estimates; and increasing personal development.

The lesson learned supports interproject learning by sharing knowledge across projects. Project managers primarily completed lessons learned at the end of the project, based on both formal and informal reviews. As shown in Table 2, responses to "If you produce a lesson learned, when do you produce a lesson learned?" define the time when lessons learned are produced. The majority of the project managers complete lessons learned at the end of the project. In response to the open-ended question, "When do you produce a lesson learned?" project managers described the completion of lessons learned as at the end of the project such as before, during, or after closeout, and during the project. They completed lessons learned throughout the project after the completion of major milestones, deliverables or phases; when a problem or mistakes arises; or at every opportunity.

Project managers developed lessons learned through a review of task performance or their memory of project events. As shown in Table 2, responses to the structured question "How do you know what to produce a lesson learned about?" define the review methods project managers use to identify what to produce lessons learned about.

The completion of lessons learned supports both learning within and between projects. However, not all project managers regularly complete lessons learned because time is not available, lessons learned are not relevant due to project scopes varying; and there is no

1. When you manage a project, what is your aim(s) or goal(s)?
2. Do you produce lessons learned?
3. Why do produce lessons learned?
4. When do you produce a lesson learned?
5. What do you do with a lesson learned once it is produced?
6. How do you use a lesson learned?
7. How do you share lessons learned across your project team and organization?
8. Why don't you produce a lesson learned?

**Table 1.** Open-Ended Survey Questions

procedural demand for the lesson learned. Project managers identified the need to document and share the lessons learned with project stakeholders such as team members, engineering departments, and management. Project managers provided four responses to sharing a lesson learned: not at all; during meetings such as staff, closeout, bimonthly, biweekly lesson-learned meetings with other project managers, circulation documents, and management presentations; documents such as minutes; and electronic databases or E-mail.

## Managerial Implications of the Framework and Survey Results

The learning framework and survey results offer a set of implications for a project manager to use in focusing the learning activities of a project team.

*The opportunity for learning is an inherent part of the project management process.* The project management process parallels the learning process. The steps in the process provide the foundation for learning. In answering the aim of project management, project managers focused on traditional criteria. In a discussion with project managers, most of the project managers viewed producing lessons learned as a valuable and important exercise. However, they felt that they did not have time to complete a formal lesson-learned process. They viewed learning as a separate activity. However, every step in the project management process, if viewed from the learning perspective, can serve as the basis for producing and sharing knowledge for the project team.

*The project management planning and control tools provide the foundation for learning.* The roles of project management tools are not only to help the project execute as planned but also to support learning by providing a mechanism for planning, communicating expectations, and recognizing the deviations or successes of a project. The planning tools provide the original baseline from which actual results are compared. The planning tools facilitate learning-by-doing by providing the explicit definition of the goals and expectations or understanding of the project. The project management control tools provide the data and information for comparison to the planning data/information from which the determination of good and bad instances can be made. The project management tools are an aid to the project manager and team by providing the data and information to ask and answer continually a set of questions to guide learning:

- What project tasks met expectations?
- What project tasks failed to meet expectations?
- How can we improve each of our processes to ensure we get tasks that meet performance expectations and avoid tasks that do not meet expectations?
- Why does this situation of met/failed expectations exist?
- What caused this situation of met/failed expectations?
- What do we need to do to ensure we meet expectations on the next project?
- What do we need to do to ensure failed expectations do not occur on the next project?

Answering these questions helps the project team develop lessons learned on the procedures to keep doing and stop doing. Lessons learned offer the mechanism to document and share these learnings.

*The use of lessons learned can be conducted throughout a project life cycle, not just at the end of the project.* Using the intraproject learning cycle, lessons learned can be produced for each cycle in a project to carry on learnings to the next cycle and to the next project. The survey of project managers found the majority of project managers produced lessons learned at the end of the project cycle. A few produced them throughout the project. An obvious problem with producing lessons learned at the end of the project is that our biases influence what we ll create a lesson learned about. For example, we ll create a lesson learned about the most recent event or the event that caused the most trouble. However, earlier events could have been the necessary steps for success or many positive events may have occurred that other projects should follow.

*The learning process can break down at any stage of the intraproject or interproject learning PDSA cycle.* The model of intraproject and interproject learning offers insights into where the learning process can break down. Not using the project management process and tools in a systematic

| | Percentage of Project Managers |
|---|---|
| 9. What do you produce a lesson learned about? | |
| Tasks that failed to meet expectations or minor adjustments/problems | 40% |
| Tasks that met expectations | 36% |
| Tasks that had major problems | 62% |
| 10. If you produce a lesson learned, when do you produce a lesson learned? | |
| Throughout the project as the opportunity arises | 31% |
| Throughout the project at regular review meetings | 26% |
| At the end of the project | 69% |
| 11. How do you know what to produce a lesson learned about? | |
| Compare the actual results with the original or baseline plan for all tasks | 43% |
| The things they remembered | 45% |

**Table 2.** Structured Survey Questions and Responses

fashion can lead to breakdowns in the learning process. For example, old plans without updates to actual times are used because actual task times are not fed back into the loop or problem resolutions are not captured resulting in the organization not having previously invented solutions readily available. For example, one company had to call a retired person for the solution to a problem. If the company had been unable to find the retiree, then it would have been necessary to reinvent the solution.

The learning process can fail in the "plan" step by not developing an initial, realistic plan that provides a baseline to compare actual results to or not reviewing past plans and lessons learned to apply to the current project. In the "do" step, learning can break down due to the project team not following the plan or collecting data on the performance and changes to the plan. Learning can fail in the "study" step by not analyzing project performance with project control processes/tools, not completing lessons learned, or not completing lessons learned that focus on the three processes of project management, product, or learning. Finally, the learning can fail in the "act" step by not sharing with or incorporating lessons learned into the next project.

## Conclusions

The results of the survey provide support for the concepts presented in the framework. Project managers have the three learning goals in mind when they are managing a project. The open-ended portion of the survey supports the delineation of three goals of project management as related to a learning perspective: delivering a successful project, building capabilities, and delivering a series of successful projects. In questions related to why they produce a lesson learned, project managers discussed the aim of improving other projects by not repeating "the mistakes of the past" and building capabilities or to increase "personal development." Project managers practice intraproject learning. The concept of intraproject learning was supported when project managers described timing for developing lessons learned.

Project managers practice interproject learning by producing lessons learned and sharing them in their organization. The benefits of lessons learned support the theory of two roles for a lesson learned: to provide a mechanism to help project team members reflect on project performance; to support the knowledge dissemination to other projects.

The survey results show that project managers *do* conduct learning activities. However, lesson-learned use and formality varies as defined by the type of tasks lessons learned are produced about, the time when lessons learned are produced, and the method used to identify what to produce a lesson learned about. This variation may be caused by the project manager's level of attention given to each of the three learning goals. Additional quantitative studies need to be completed to determine the extent to which the learning processes lead to project management success.

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