

PM-1

Automotive Project Management Guide

1st Edition



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FOREWORD

This guide was produced through the efforts of the Automotive Industry Action Group's (AIAG) Project Management Project Team.

The purpose of this guide is to improve the automotive product development process. Specifically, it acts as a guide to integrate the Project Management Institute's (PMI) comprehensive Project Management Body of Knowledge (PMBOK) into the phases defined in the Chrysler, Ford, and General Motors Advanced Product Quality Planning and Control Plan (APQP). The intended user of this guide is the automotive industry as a whole; particularly, manufacturers and their supply chain for both parts and processes. This guide is intended to describe the implementation of project management and the processes for managing product development. It does not require a specific organizational structure or the title Project Manager to be effective.

Much work has been done relative to improving the performance of the automotive product development process. Current contributions including the likes of APQP, QS-9000, PPAP, etc., stand at the front of the line of many. Until now, project management concepts, processes, tools, techniques, and practices have been mentioned; but only as enablers. This guide compiles the PMBOK project management processes into a stand-alone and comprehensive document for use by the automotive industry.

Project management, while very mature in many diverse industries, is now finding new applications in the automotive industry. Significant among those applications is the product development process. Today, some industry visionaries see the automotive product development process as multiple *projects* to be managed and improved with the doctrine of classic project management techniques. Previously, automotive project management was defined as: tracking, scheduling, a job title, the Critical Path Method, the structure of an organization, usage of project management software or some other characterization. All of these are necessary, but none by itself is complete.

In all instances of the automotive product development process today, projects are being managed. To say otherwise is a mistake. This guide presents a comprehensive set of concepts and processes for the purpose of common understanding. Organizations which have successfully implemented project management began first by assessing where they were versus what needed to be done. Circumstances considered included implications resulting from new or revised policies and procedures, tools and equipment, roles and responsibilities, as well as organizational experience and skill.

This text provides guidance to enable the better understanding of needs and processes which are mutually beneficial. Product development teams may wish to use only a portion or all of the processes described in this guide. Specific interpretation, infrastructure and practice are left up to the individual organization within the industry. This guide defines project management and its underlying component processes and terminology, and then applies them to the context of an automotive product development process as described in the APQP. Specific methodologies like the Critical Path Method or any other computer assisted technology are excluded.

Implementing the project management processes found in this guide will improve performance in the automotive product development process. Furthermore, continuous, disciplined practice and rigorous integration will assure continued success.

The figures and concepts discussed in Sections 1.2, 1.3, 2.0 and various other areas of this document contain references directly from *A Guide to the Project Management Body of Knowledge (PMBOK)*, March 1996. These items will be identified throughout the document with a superscript (¹) which refers the reader to Appendix A - References. These items have been reprinted with permission of the Project Management Institute, 130 South State Road, Upper Darby, PA 19082, a worldwide organization of advancing the state-of-the-art in project management.

The figures and concepts discussed in section 3.0 are referenced directly from the Advanced Product Quality Planning and Control Plan (APQP). These figures will be identified throughout the document with a superscript (²) which refers the reader to Appendix A - References. These items are reprinted with permission from the Chrysler, Ford and General Motors Supplier Quality Requirements Task Force.

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1.0 INTRODUCTION

The purpose of this guide is to illustrate and communicate to automotive manufacturers and suppliers the terminology, processes, and techniques for successfully implementing Project Management. This document explains the benefits of project management: efficiently utilize resources, communicate, and exceed the needs of customers. The contents are intended as guidelines for quality implementation of any business process associated with automotive product design, development, validation, and manufacture.

The manner in which projects are executed directly impacts the competitiveness of the automotive manufacturer and/or supplier. The cumulative effects of how these projects are managed also affects the productivity, costs, and quality within the automotive supply chain.

1.1 BENEFITS OF PROJECT MANAGEMENT

This is an age where companies succeed by providing high levels of customer satisfaction, value, and service at a competitive price, utilizing technology and the skills of a highly trained work force. The key to sustaining the competitive advantage is an organization's ability to utilize future projections, while having the agility to adjust, act, and execute actions required to satisfy the customer's needs. Project management's tools and techniques, more than just a planning guide or milestone chart, facilitate organizations to pull (team) together, communicate, analyze, learn, and effectively execute the activities required by the customer.

More and more business articles are being written boasting of improved time to market, improved customer relationships, reduced cost and quality improvements all due to professional project management. Additional articles are written on the steps and duration required to fully implement project management in an organization.

This is evidenced by the many articles being written today, such as the following excerpts:

“Getting the Job from Ford” Automotive Production January 1996 - Ford’s Tom Helzerman, Manager, Assembly Technology, Advanced Manufacturing Technology Development, talking to the annual meeting of the Robotic Industries Association, provides an answer as it pertains to the companies that will be selected as vendors for capital equipment.

“There are three factors in assuring that as a supplier the customer is your number one goal,” Helzerman says. “These are project management, project start-up, and long term performance.”

“From the Viper Pit Making A Dream A Reality” PM Network June 1993, by Roy Sjoberg, Executive Engineer Viper Program, James Royer Manager, Viper Engine and Charles M. Rightler, Program Timing, Chrysler Corporation

“Reduced lead time, more than anything else, should drive teams to program management, because defining and monitoring the critical path will be paramount to going from three years to two years. Three years may appear to be an achievement now, but it will not seem so great tomorrow because global competition is certainly not standing still. Project management is a valuable tool to manage the path to shorter lead time.”

“Making Beautiful Music With Program Management” Wards Auto World August 1996 by Tim Keenan

“By most accounts, however, program management (PM) is more than a buzzword. It’s the way automotive components and systems will be developed from now on, picking up where simultaneous and robust engineering leave off.” “Program managers are like orchestra conductors,” says Brett Healy, Director of Sales and Marketing at Webasto Sunroofs Inc. “They aren’t necessarily experts on any of the instruments, but know how to make beautiful music by bringing people together at the right time.”

1.2 DEFINITION OF PROJECT MANAGEMENT¹

This guide defines project management as follows:

Project management is the application of knowledge, skills, tools, and techniques to the completion of work activities in order to meet or exceed stakeholder needs and expectations. Meeting or exceeding stakeholder needs and expectations invariably involves balancing competing demands among:

- Scope, time, cost and quality
- Stakeholders with differing needs and expectations
- Identified requirements (needs) and unidentified requirements (exceptions) (PMBOK Guide 1996)

A project is defined as having a distinct starting point and an ending point or finish. It is performed by people using tools, usually both limited. It is planned, executed, and controlled. Projects are often unique, such as corresponding to a distinct model year or product, and may involve the extensive use of new technologies or require coordination between a diverse pool of people who work together for the purpose of obtaining a common goal.

Early project management methods were developed by DuPont in 1957 and later built upon by NASA, the U. S. Department of Defense and the utility and computer industries. The process was

later embraced by the building design and construction industry as an effective means to get and stay competitive. After all, anyone can build a vehicle, it is the team who can build it better, faster and cheaper who will prosper in this globally competitive environment. The same holds true for systems, subsystems and components. *Better, faster, and cheaper!* Project management processes, tools and techniques allow organizations to control costs and proactively identify problems and solutions on paper before they become actual crises with limited options. Project management allows stake-holders to evaluate options and determine the best way of meeting customer needs.

Project management is a systematic approach to initiating, planning, executing, controlling and closing. It is valuable because it guides the project team to address the critical questions:

- Who are the stakeholders?
- What are their requirements?
- Who needs to be involved?
- What needs to happen?
- Does everyone understand their role?
- Who needs what from whom?

The project management approach is increasingly finding its way not only into the engineering community of automotive design and development, but also the buying community, the accounting and finance staff, customer service, human resources, administrative support, and of course manufacturing and assembly.

1.3 THE GROWTH OF PROJECT MANAGEMENT¹

As the benefits of professional project management become evident, there is an increased interest and awareness in the subject matter of project management (PM). For example, over thirty colleges and universities now have Master & Ph.D. programs on PM.

Figure 1. Keller Graduate School of Management Enrollment

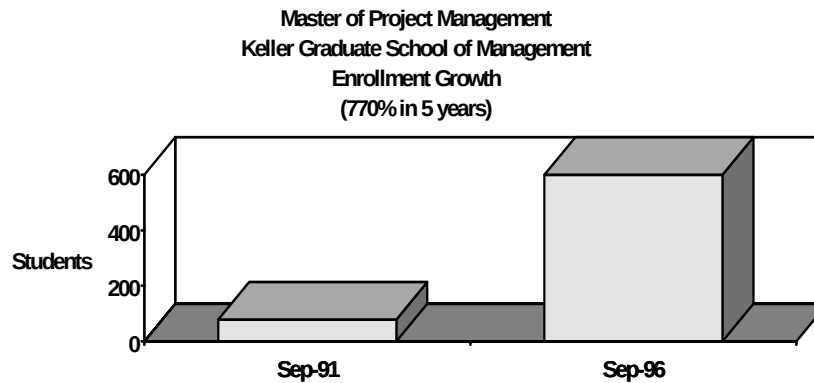
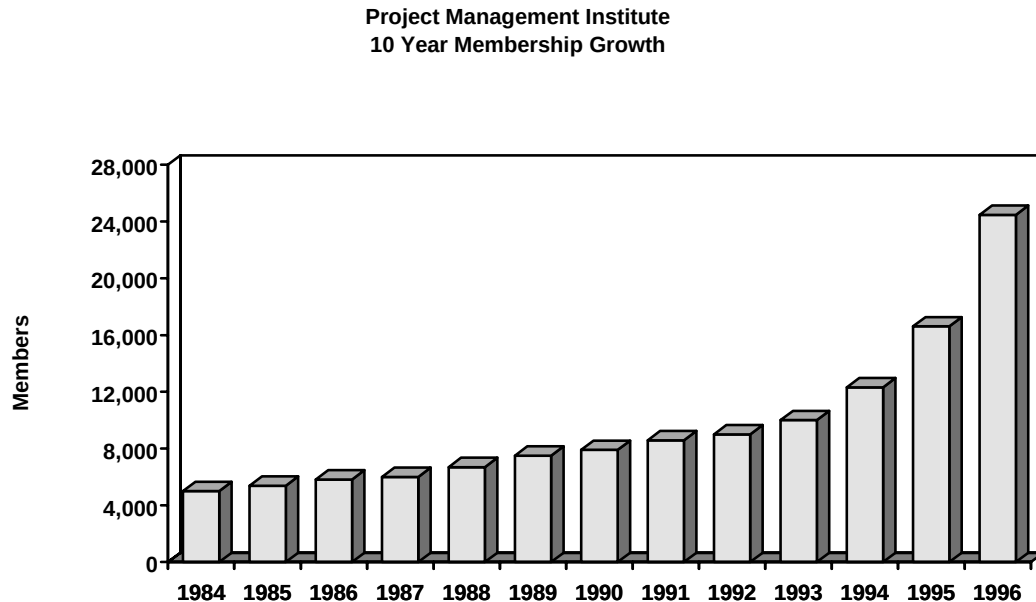


Figure 1 illustrates the growth in enrollment in the Master of Project Management (MPM) course at Keller Graduate School of Management.

The Project Management Institute (PMI) as well as other project management groups worldwide, such as IPMA in Europe, have experienced significant growth in the last several years. PMI also has Special Interest Groups (SIG's) focusing on PM within specific industries. In 1997 the automotive project management SIG will conduct its 4th annual symposium. The first three years were sponsored by Chrysler, Ford and General Motors respectively.

Figure 2. PMI Membership



- PMI established 1969
- 1984 initiated Project Management Professional (PMP) certification, in 1990 a total of 493 members were certified. Currently the number exceeds 5,300.
- 84 chapters in over 33 countries

The recognition of the importance of PM within the auto industry is also evident in the formation of a Project Management Team by the AIAG. The mission of the AIAG Project Management Project Team is *to improve the management of automotive projects, improve quality, reduce cost, and reduce development time*. The project management methods, tools, and processes will be integrated with the current automotive industry standards and guidelines.

1.4 APPLICATION OF PROJECT MANAGEMENT

This guide provides insight as to the application of project management within the Advanced Product Quality Planning (APQP) manual. As the Big Three agree that the APQP is a common template for achieving quality within the automotive design, development and manufacturing process; the automotive industry will further benefit to design, develop and utilize project templates for initiating, planning, executing, controlling, and closing, to meet the needs of customers and stakeholders.

Project management within the automotive industry, as with any industry, is a method to achieving customer satisfaction, *better, faster, and cheaper*. Project management facilitates the teaming and

provides the coordination tools required to design, develop, and deliver the entire automotive system. Some applications of project management processes include:

- CAD/CAM systems implementation
- tooling design
- prototype development
- vehicle system verification
- assembly equipment installation
- continuous improvement implementation

The approach utilized integrates the APQP² and *A Guide to the Project Management Body of Knowledge (PMBOK)*¹. The basic components matrix of APQP and its phases of product design/development/validation are integrated with project management processes to facilitate competitive advantages.

The future of the automotive industry demands a project management process.

To do it better, faster and cheaper: Plan the work; work the plan.

2.0 PROJECT MANAGEMENT¹

Project management as a distinct function in the automotive industry is relatively young, and while there is substantial commonality around what is done, there is also substantial variability in the understanding of its practice and usage of the terms. This section will identify and describe the processes and terms used in the management of projects. These definitions will be based on the Guide to the Project Management Body of Knowledge (PMBOK) as developed by the Project Management Institute (PMI). *The words, concepts and graphs used herein were excerpted, paraphrased or summarized directly from the PMBOK.*¹

PMBOK is an inclusive document that describes the sum of knowledge within the profession of project management. It contains proven processes that are accepted in the profession of project management without regard to industry. These practices are individually tailored to each individual project and industry by the project team which is responsible for determining what is appropriate for that project.

What is a project?

A project is a temporary endeavor undertaken to create a unique product or service. Project organizations exist to initiate, develop, execute, and finish projects. Projects differ from operations in that projects have a defined beginning and an end, whereas an operation will extend over an indefinite time period with significant repetition of tasks.

Programs, projects, and subprojects are all related. All three endeavors consume resources and have objectives to meet. A program is a group of projects managed in a coordinated fashion to obtain benefits not available by managing them individually. Some programs may include repetitive undertakings or ongoing operations. Projects are frequently subdivided into smaller and more manageable units called subprojects. Subprojects are often assigned to an internal function or an external supplier.

What is project management?

Project management is the application of knowledge, skills, tools, and techniques in order to meet or exceed stakeholder requirements and expectations for a project. Meeting or exceeding stakeholder requirements means balancing competing demands among scope, time, cost, quality, and other project objectives. These other project objectives may be defined or undefined, specific or general, and internal or external.

Project stakeholders are those individuals and organizations that are actively involved in the project or whose interests may be affected by it. Stakeholders may include individuals such as customers, sponsors, owners, buyers, suppliers, vendors, stockholders, government agencies, and others.

The project management framework provides a basic structure for understanding project management. It defines key terminology, puts project management into the larger context in which projects exist, describes a general view of how the various project management processes interact, and describes the integrative processes of initiation, planning, execution, controlling, and closing.

Project management processes, as defined in the PMBOK Guide, have been formalized into nine knowledge areas:

- Project Integration Management
- Project Scope Management
- Project Time Management
- Project Cost Management
- Project Quality Management
- Project Human Resource Management
- Project Communications Management
- Project Risk Management
- Project Procurement Management

The work of project management can overlap into other disciplines. Two clear overlapping areas are general management and technical management. All types of management require the general management processes of planning, staffing, controlling, and executing. Technical management requires specialized knowledge of engineering or scientific processes that may not be needed on all projects.

Context - Projects are performed in phases to provide better management control. The sum of all phases is known as the project life cycle with each phase defined by one or more deliverables. Deliverables are tangible manifestations of completed work. Ordinarily, phases are named by the primary work accomplished during that phase. Words like concept, development, execution, and finalization are commonly used in the project management profession. The automotive industry has developed its own terminology for the phases of a project, and these will be discussed in section 3.0 of this guideline.

Determining customer needs, conducting market surveys, and producing a business plan may be part of the product life cycle, but are not generally included in the project life cycle. Likewise, operations, product selling, maintenance, or warranty recalls are also not part of the project life cycle. These activities, however, may employ project management techniques to provide better management planning, execution, and control.

There can be as many organizational structures for project management as there are organizations. In organizations that undertake projects, project teams are usually organized in one of three broad categories:

- functional (aligned by technical discipline)
- projectized (each project is staffed with all of its own disciplines), or
- matrix (a dual reporting relationship for team members to both functional and project leadership)

Each category is differentiated by the project manager's role, authority, title, staff, and time commitment. Each category has both strengths and weaknesses. Often, the project team organization is determined by the various characteristics of the projects undertaken. Those characteristics include: uncertainty, technology, complexity, duration, size, importance, and time criticality.

Project managers must possess several skills that are key to the project's success. Successful project managers are those who have both management skills and demonstrate a positive spirit toward total quality management. Beyond good general management skill, a project manager must be a leader, communicator, negotiator, problem solver and influencer. The project team and its leader must also stay aware of any impacts to their project that might occur as a result of environmental, socioeconomic, governmental or other external influences.

Process - A process is a series of actions bringing about a result. Although project management processes, as described earlier, are broken down into the nine knowledge areas on a subject matter basis, they are divided into five process groups on a functional basis:

- Initiating
- Planning
- Executing
- Controlling
- Closing

Each process group is made up of several processes, with a total of 37 processes. These processes are further broken down by necessary inputs, tools and techniques, and outputs.

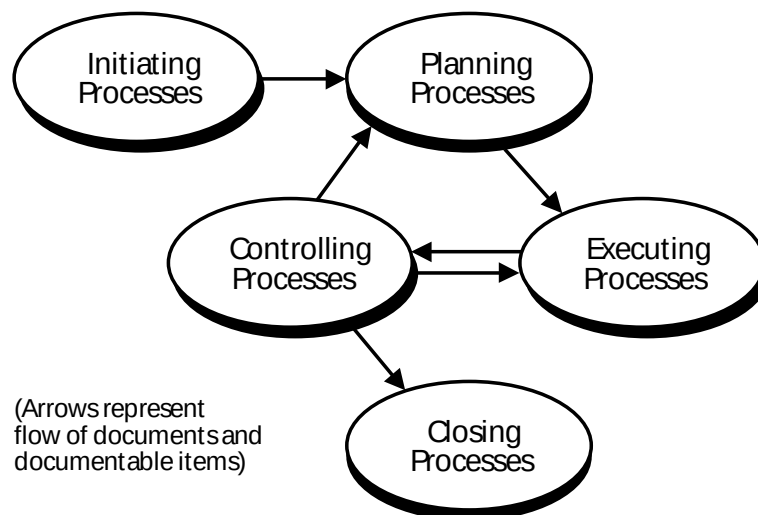
The addition of the process groups of *Initiating* and *Closing* differentiates projects from operations. Projects are temporary; they require a clear starting point and a desired future end point. *Initiating* a project requires a recognition that the project should be started and a commitment to do so. Initiation is the process group performed by management that is required to start a project. *Closing* a project formalizes the acceptance or turnover and brings the project to an orderly end. Closing a project requires verifying that all project requirements have been met. Closing all contracts and

turning off the money assures completion. In the automotive industry, it may be a subsequent follow-up questionnaire to measure customer satisfaction.

Planning, executing and controlling are iterative throughout a project in that a partial plan may be executed and controlled prior to completing the whole plan and the plan may be changed as the project is executed. The process groups of *Executing* and *Controlling* are tightly allied in order to identify and reduce uncontrolled variations to the plan. This includes forecasting the future based on today's performance and taking remedial action to prevent problems in the future. Change control is required to distinguish project performance from scope creep. Sometimes projects must be re-planned or in the worst case terminated because of a poor change control process.

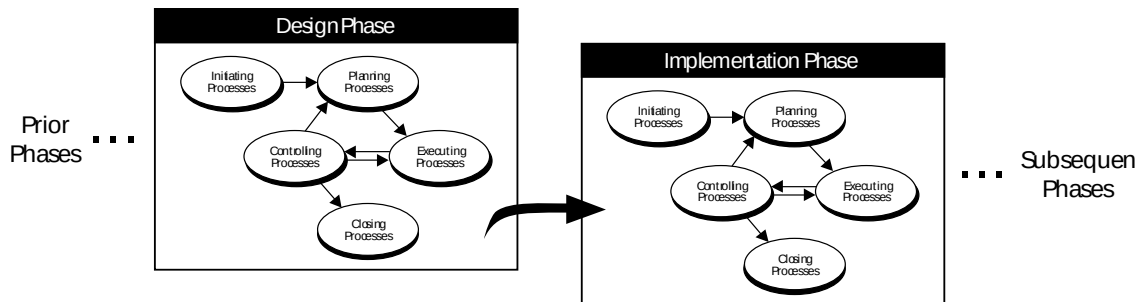
The process of project management is an integrative one - an action or lack of action in one area will usually affect other areas. Interactions can be obvious, such as an out of control execution due to the lack of a comprehensive plan. Conversely, interactions can be non-intuitive; a project is ahead of schedule but over budget. The integration between the process groups can be seen in Figure 3 (Figure 3-1 from PMBOK)¹.

Figure 3. Links Among Process Groups¹



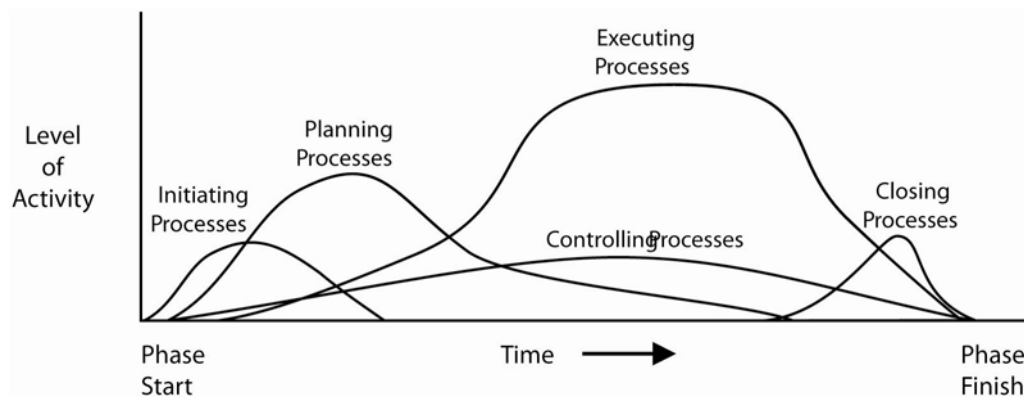
The iteration concept is important for managing a project and each major phase of a project life cycle. Each phase can and should be treated as a project in and of itself. The concept phase requires initiating, planning, executing, controlling, and closing; the design phase requires initiating, planning, executing, controlling and closing; and so on. Figure 4 on the following page displays this iterative cycle.

Figure 4. Interaction Between Phases¹



The process groups identified above are neither linear nor discrete. Instead they are overlapping and interdependent. Each produces an output that is used as input for another process. Within a phase, this overlapping of process groups can be seen in Figure 5 (Figure 3-2 from *PMBOK*).

Figure 5. Overlap of Process Groups in a Phase¹



Within each process group, the individual processes are classified as either "Core" or "Facilitating." Some processes have clear dependencies that require them to be performed in essentially the same order on most projects. For example, activities must be defined before they can be scheduled or costed. Interactions among the other processes are more dependent on the nature of the project. Although these facilitating processes are performed intermittently and as needed during the project,