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THE ROLE OF THE PROJECT MANAGEMENT OFFICE
IN ACHIEVING PROJECT SUCCESS

by

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Bachelor of Arts
East China Normal University, 1985

Master of Business Administration
The George Washington University, 1995

A Dissertation
Submitted to the Faculty of
the Graduate School of Business and Public Management of
The George Washington University
in Partial Fulfillment of the Requirement for the Degree
Doctor of Philosophy

Washington, D.C.
November 20, 2001

Dissertation Directed by:

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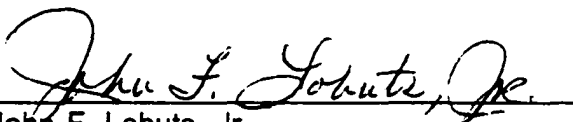
REPORT ON FINAL DOCTORAL DISSERTATION EXAMINATION

The undersigned Committee has examined Ms. Xiaoyi (Christine) Dai, a candidate for the Doctor of Philosophy degree, on her dissert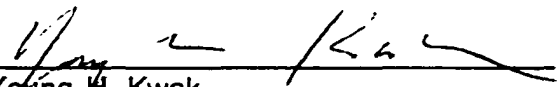ation entitled: "The Role of the Project Management Office in Achieving Project Success." The Committee has found the candidate's work to be acceptable and recommends to the Board of Trustees that she be granted the Doctor of Philosophy degree on January 30, 2002.

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November 20, 2001

The George Washington University

WASHINGTON DC

PH.D. PROGRAM

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Signatures of Committee:

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Presiding Member
Committee on Doctoral Studies

November 20, 2001

ABSTRACT

This study investigated whether a project management office (PMO) contributes significantly to project management (PM) effectiveness and, hence, to project success. The study also explored the degree of influence that the use of PMO functions and services has in addition to the influence of critical success factors (CSFs) identified by Pinto and modified for this study. Finally, the study explored the circumstances associated with the establishment and use of PMOs, as well as major environmental conditions in which PMOs operate.

Three surveys were conducted. One was a random survey (N = 234) used Project Management Institute year 2000 membership list as the population for sample choice. The other was a targeted survey utilized a group of organizations (N = 96) that were identified in advance as already having some version of a PMO; along with a group of project managers (N = 52) served by some of those PMOs. Web-based surveys were employed in all three samples.

Results supported that the PMO presence index has a positive linear influence on reported project success, as do most of the individual PMO functions and services – such as PM standards and methods, project historical archives, human resource/staffing assistance, PM training, and project administrative support. However, results lacked evidence to support the claim that the PMO presence index itself represents a new CSF. Finally, descriptive statistics and qualitative features were addressed, leading to practical guidelines for organizations already operating a PMO or moving to establish one.

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First, I wish to acknowledge Professor William G. Wells, Jr. for his guidance and support during my years of study at the George Washington University. He has been there in every critical moment when I needed help the most. He possesses rare wisdom and I was fortunate to work with him. Gratitude also goes to Professor John Lobuts and Professor Refik Soyer, who had confidence in me and supported me all the way through.

This dissertation took some extra effort in getting started and completed. Nonetheless, I was able to get extra benefit from several detours. I learned what it takes to maintain patience and perseverance, together with having wholehearted faith in people who were there to help. These experiences will have significant impacts on my future professional career.

I also wish to thank the valuable support of those who participated in this study as project management experts and survey respondents. Special thanks go to Thomas Block, Paul Dinsmore, Davidson Frame, David Griffith, Joan Knutson, Jeffrey Pinto, Michael Price, and John Sullivan.

Sincere appreciation is also extended to LeRoy Ward and ESI International, the Project Management Institute, and the Program on Project Management at the George Washington University for their support in this study.

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CHAPTER ONE

INTRODUCTION

Before reviewing the roles project management offices play in assisting organizations that conduct projects, note that there are two major general definitions for what is frequently called a *project office*. One is as an organizational entity established to manage a specific project or a related series of projects, usually headed by a project manager. This type can also be called a *program office* or a *project office*.[1]

Another type reflects a much broader mission, and is defined as an organizational entity established to assist project managers and teams throughout the organization in implementing project management principles, practices, methodologies, tools and techniques.[2] This latter type is more often now being referred to as a *project management office* or **PMO**, and, among other terms, can also be called a *center of excellence* or *center of expertise.** This latter type of office was the focus of this study. The term *project management* will hereafter be abbreviated as **PM**.

1.1 Background

Projects are an important instrument for change and development in organizations – private and public, domestic and international - as well as in society at large.[3] For example, there has been a major increase in the overall use and acceptability of PM and

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* The differentiating features are more important than the names given to these organizational units. No standard agreed-upon terminology has been established by the PMI (through the PMBOK) or any other authoritative body. The lack of such a standard set of terms can result in much confusion and is an issue that should be addressed by PMI.

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its related methodologies among pharmaceutical companies,[4] as well as in other industries such as computer and information technology.[5,6] Gareis[7] and Lundin[8] suggest that the broader application of projects for solutions to various problems requires a new orientation in PM and a new model for more effective operations in project-driven organizations.

The increasing use of PM arises from many recognized advantages of applying the project approach for better problem solving in scarce-resource and fast-changing environments. Jessen[9] suggests there are four advantages of using the project approach: (1) simplicity and efficiency in managing limited resources and reaching predefined goals in non-routine operations; (2) positive contributions to human motivation; (3) acquisition of a cross-disciplinary orientation, thus combining different professional views and knowledge in one operational, goal-directed concept; (4) recognition of the project approach as a professional discipline in its own right.

In listing these advantages of the project approach, Jessen also pinpoints one of the major problems concerning its use. Because of the one-time only nature of projects, the project approach often seems to derive little benefit from knowledge gained in previous projects due to a lack of effective transfer of knowledge from earlier failures or successes. This situation implies the need for organizations to respond with measures to enhance transferability of lessons learned from previous projects. This study attempted to gain a better understanding of one such measure.

A related theme is that more effective PM offers great potential for improving overall organizational performance by enhancing the prospects for project success and minimizing the likelihood of failure. This is, however, a very complex issue, as there are many dimensions for evaluating and measuring project success. Indeed, there are numerous conflicting views as to how best to define and achieve project success.

An abundance of examples of project failures exist across many domains, ranging from newer knowledge-based industries (for example, information technology,

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telecommunications, and pharmaceuticals) to more traditional ones (e.g., construction, national security, and international development). To gauge the degree of failure in one particular industry, a 1994 study conducted by the Standish Group[10] defined failure as any project that experienced cost or time overruns or deficiencies in content (features and functions). In a review of 8,380 information technology projects, it was determined that 31.1% were outright failures, 52.7% were "in recovery," and only 16.2% were accomplished successfully on time, within budget, and according to content requirement.

In addition to high failure rates, projects can also suffer from being "out of control." The KPMG Group[11] conducted two surveys in information systems development to determine the frequency of *runaway projects*: those that (1) produce unacceptable systems, (2) grossly exceed budget and/or time estimates and, (3) seem to take on lives of their own. The first survey was conducted in 1988 with 600 of the firm's largest clients, and the second in 1991 with 300 large firms. In the first, over 30% of KPMG's clients said they had at least one runaway project. In the latter, this percentage increased to 65%. Moreover, 50% of respondents regarded this as a normal phenomenon.

While it appears to be easier to develop consensus on measuring project failure, less progress has been made toward developing a corresponding measure of success. Pinto and Slevin[12] report an empirical study in support of their claim that there are ten critical success factors (CSFs), ranging from project mission to trouble-shooting, that serve as predictors of project success.

Might's and Fischer's research[13] aims at examining how organizational structure interrelates with PM success. They conclude that the choice and articulation of specific performance criteria should be given considerable care. They also reaffirm that some form of decentralized management structure (specifically, a matrix format) is positively related to PM success, as measured by overall criteria of project performance or by cost performance.

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1.2 The Need for This Study

Whatever the specific views on how to achieve success, there is a generally accepted view expressed in the various literatures: the prospects for successful project outcomes are generally enhanced by improving PM effectiveness. Effectiveness is defined as (1) timely and accurate accomplishment of pre-established requirements, and (2) a measure of the extent to which an item satisfies a set of specific organizational objectives.[14] According to some authorities, as will be noted below, the use of a Project Management Office (PMO) is one way for improving this effectiveness, particularly by enabling the effective transfer of knowledge from earlier successes/failures and by providing a range of support services both for projects and various management levels.

Although the use of some kind of project office or project management office has a long history dating back at least to the 1930s, the topic has emerged in recent times with renewed emphasis. Block and Frame[15] offer the idea of establishing and maintaining a "project office" (i.e., a PMO) for nurturing PM capabilities. Fleming and Koppelman[16] provide insights on the role of the "project office" (also a PMO) in assisting project teams. Also, PM practitioners and consultants of various backgrounds, such as Vandersluis,[17] Knutson,[18] and Dinsmore[19] call for the establishment of such offices.

In addition to the recognition by these authorities, there is a growing view arising from organizational studies of best practices in PM that suggests there is value in using some form of the PMO entity. For example, when Reflex Inc. faced the challenge of how to increase profitability and better control the costs of many projects that were simultaneously being conducted within the organization, it turned to the establishment and use of a PMO.[20] This strategic organizational move addressed four questions that executive management had confronted: (1) how to measure success; (2) how to deal with the problem of estimating activity durations for each new project; (3) how to dispel the

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notion that each project starts with a blank piece of paper; and, (4) how to create a repository of project histories.

Increasingly, organizations are establishing central information systems (IS) or information technology (IT) project management offices reporting directly to a chief information officer (CIO). For example, when Barbara Cooper arrived as the new CIO of Toyota Motor Sales U.S.A., Inc. in 1996, nobody could give her a list of ongoing IS projects or a list of "problem projects" because nobody knew about all of them.[21] To remedy this situation, she decided to create the organization's first ever PMO through which all IS project plans would be coordinated and tracked. Another senior executive, Randy Bauer, subsequently said, "We've adopted PM as our saving grace. We're taking the time now to learn what good practice is."[22] In short, it became accepted at Toyota that the use of a PMO had been a good decision.

Further, besides the authorities mentioned above, another key authority, Harvey Levine,[23] claims that a PMO is an essential organization function for project success. To make PM work there must be personal strengths and knowledge in the discipline of PM, structured in such a way as to be available to the project teams. He further asserts that while an organization's structure may be flexible and innovative, PM standards and practices must be in place. Levine[24] also claims that a PMO is intended to implement PM as a separate function (for example, a department) within the organization hierarchical structure. It is a repository for project experience, models and standards. Levine implies that the PMO is a way to provide the appropriate structure.

Block and Frame[25] suggest that as an organization directs more of its energy toward implementing projects, an *ad hoc* approach to PM leads to inefficiencies and can even be dangerous. They believe that, as more projects are undertaken, the establishment of a PMO can help an organization to develop a consistent approach to implementing projects, to integrate organization-spanning, cross-functional activities, and to nurture PM professionalism. Block[26] further claims that as a PMO matures to a full service provider

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of PM, organizations will enjoy the full benefits of this approach by implementing PM effectively throughout the entire organization.

However, and as a major stimulus for this study, it was not possible to find any systematic empirical research to complement and test this growing body of anecdotal evidence. The matter of whether a PMO contributes significantly to PM effectiveness and hence, to project success, has not been thoroughly researched. Thus, the purpose of this study is to enhance understanding and knowledge of these issues for students and researchers of PM, as well as for the practice of project management.

1.3 Objectives of Study

The specific goals of this study were: (1) to investigate the impact of a PMO on reported project success; (2) to construct a set of indices of functions and services representing the presence of PMO practices in organizations; and (3) to extend the previous research conducted by Pinto (1986) on the impact of critical success factors (CSFs) on reported project success, explicitly including whether the use of a PMO warrants inclusion of a CSF. An empirical inquiry was conducted to test specific hypotheses in each of these three areas.

1.3.1 Research Question and Hypotheses

The primary research question is: What impact does the presence of PMO functions and services have on reported project success? The hypotheses associated with this research question are the following:

First H_0: The PMO presence index has no linear influence on reported project success.

First H_a: The PMO presence index has a linear influence on reported project success.

The motivation for the first hypothesis was to investigate whether the use of PMO functions and services has a simple linear impact on reported project success.

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Second H_o: The PMO presence index has no 2nd order influence on reported project success.[1]

Second H_a: The PMO presence index has a 2nd order influence on reported project success.

The motivation for the second hypothesis is to explore whether the presence of PMO functions and services has a more complex impact on reported project success. It has been hypothesized that the relationship between the PMO presence index and reported project success was quadratic over the range of observations. Reported project success should increase as the score of PMO presence index grows greater; however, if a PMO presence index gets too strong, the reported project success may become retarded.

Third H_o: The PMO presence index has no influence on reported project success beyond the influence of CSFs alone.

Third H_a: The PMO presence index has an influence on reported project success beyond the influence of CSFs alone.

The motivation for the third hypotheses was to remedy the outcome in which a proportion of the variation in the criterion variable (reported project success) remains unexplained when previously reported CSFs alone are used as predictor variables.

Also. general information on PMO use was gathered as an ancillary benefit of this study in addressing the following issues:

1. Are there indications on growth in the establishment of PMOs?

2. What circumstances are associated with the establishment of PMOs?

3. What are the main environmental factors related to the establishment of PMOs?
   - What management level approved PMO establishment?
   - What are the stated management purposes for PMO establishment?
   - What policy statements have been issued about PMOs?
   - Where are PMOs placed in organizations?
   - At what amounts are PMOs being funded?
   - What services and functions are provided by PMOs?

---

[1] In other words, the estimated coefficient of the *square* of the predictor variable representing PMO use will display no statistical relationship in the multiple regression model.

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1.3.2 Procedures for the Study

The main research instruments were three self-administrated, web-based surveys. The first sample was drawn from the membership list of the Project Management Institute (PMI) and represents a cross-section of industries. The respondents were asked to form their responses based on a recently completed project on which they had participated. The second sample of survey recipients was selected from a group of organizations that were identified in advance as already having some version of a PMO. Two additional survey instruments were used. They were modifications of the PMI survey instrument – splitting one into two parts - with one component directed to the organizational contact for the PMO and the second component directed to a project manager served by the PMO.

Results of the first survey were analyzed using multivariate statistical analysis methods, including multiple regression analysis, to find estimates of relationships among a PMO presence index, CSFs, and Reported Project Success. Results from the second survey also underwent statistical analysis, and provided more detailed information regarding the ancillary benefits of PMOs.

The primary units of analysis were a project on the one hand, and a PMO on the other. The observation units, or units of data collection, were individual members from the PMI membership list, points of contact from identified target organizations with some form of a PMO, and project managers chosen by the PMO contacts.

1.3.3 Contributions of the Study

This study's primary contribution was aimed at testing claims, arising from the anecdotal evidence described above, that project success would be enhanced by the use of PMOs. In doing so, it indirectly tested the claim that PMOs also enhance PM effectiveness.

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Furthermore, it is hoped that the study will provide scholars and practitioners with additional insights into how PMOs help achieve project success. The study generated a list of possible PMO functions and services and identified those that were most highly correlated with project success. This information provides direct guidance and priorities on which features should be used to establish a most effective PMO.

The study results should become a useful addition to the PM literature since they reflect a formal statistical research effort. They point the way to more extensive research on the use of PMO in the future. Finally, an ancillary benefit is that the study extended previous research which claimed that the preconditions (CSFs) leading to project success can have different scores for different projects. It also shows whether and how certain organization-wide preconditions (PMO functions and services) can also have a significant effect.

1.3.4 Definition of Key Terms

For definition of key terms, please refer to the GLOSSARY on page 168.

1.4 Limitation of the Study

This research design was not longitudinal. Though survey respondents were asked to recall their most recent project, recall of details from the distant past may be low, somewhat reducing the reliability of reports for less-recent projects.

Secondly, since project participants rather than clients or end-users reported project outcomes, biases in the form of inflated success reports may have been present. Thus, since information collected on each project came from survey recipient's reporting, further outcome validation would be very difficult without far more resources than were available for this survey research.

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Thirdly, PMOs in early stages of use may not be fully representative of what will finally unfold in later years. It was judged that this risk would exist no matter when the survey were conducted, thus it was accepted as being unavoidable.

All these limitations underscore the necessity of more extensive future research.

1.5 Organization of the Dissertation

The organization of the remainder of the dissertation is as follows:

Chapter Two reviews the literature related to the research questions. It also provides key definitions and background information needed to understand project success, CSFs, previous research on the relationship of these two, and PMOs.

Chapter Three contains the research methodology and constructs for project success, PMO and CSF. Variables derived from the research questions are operationalized, and the measurement indicators for these research variables are identified.

Chapter Four presents results from the random PMI member survey - responses regarding characteristics of the PMO in their organizations.

Chapter Five presents results from the random PMI member survey – responses regarding project performance.

Chapter Six presents results from the targeted survey – responses from representatives who had indicated the presence of a PMO in their organizations in advance of undertaking the second survey.

Chapter Seven presents results from the targeted survey – responses regarding project performance given by selected project managers from organizations having PMOs.

Chapter Eight provides analysis of the influence of PMO (presence index) factor above and beyond the influence of CSFs.

Chapter Nine provides summaries, conclusions, and recommendations for further research.

CHAPTER ONE ENDNOTES

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CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This literature review summarizes the limited prior research on the impacts of project management offices (PMOs) and a somewhat more extensive coverage of critical success factors (CSFs) on project outcomes. This review revealed neither basic theoretical underpinning for the use of a PMO, nor any significant empirical study for the use of a PMO. Anecdotal reporting and general opinion pieces tend to predominate the limited literature on this organizational entity. As noted earlier, this finding on the near absence of formal research on this important topic was a major motivation for undertaking this study.

The absence of well-developed theoretical underpinnings or highly structured areas of associated literature for PMOs should not be surprising. PM is an evolving discipline that is quite eclectic in its components, drawing very broadly from a variety of fields including engineering, engineering management, general management, operations research, and the behavioral and social sciences. Therefore, this research study of the PMO must be approached with a general understanding of the fluid and evolving nature of the field of which it is a part.

This chapter is organized under several literature groupings. Presented first is a discussion of project success. Second, it examines the concept of CSFs and their use in the PM field. Third, the emerging trend of PMO establishment and associated features and functions is reviewed. Finally, a conceptual framework developed from the overall

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literature review is introduced. Details of this framework are presented in a subsequent chapter.

2.2 Project Success

The Project Management Institute (PMI) defines a *project* as "a temporary endeavor undertaken to create a unique product or service."[1] This study augments this definition with the qualification that a project is a unique, multitask job which must be started and completed between two planned dates, using a planned amount of resources, and achieves expected levels of performance. Organizations use projects as temporary organizational structures to accomplish agreed upon objectives.

Project management is the application of knowledge, skills, tools, and techniques to project activities in order to meet or exceed stakeholder needs and expectations from a project according to the PMI.[2] In addition, it is commonly stated that PM is the planning, organizing, directing and controlling of resources for a relatively short-term objective that has been established to complete specific goals and objectives. Moreover, PM utilizes the systems approach to management by having functional personnel (vertical hierarchy) assigned to a specific project (horizontal hierarchy),[3] an organizational form also referred to as a matrix.

Project success is often assessed using internal measures such as meeting schedule and budget requirements, and achieving performance objectives. These characteristics are seen as being relatively easy to measure and within the realm of the project organization.[4] Freeman and Beale[5] conclude that project sponsors are predominantly concerned with meeting the three targets of technical performance, cost, and duration.

However, in the last decade some studies on success reflect more about external effectiveness: a project's impact on and utility for its customers.[6,7,8,9] Among prominent researchers, Lewis[10] concludes that project deliverables, achieved results, and met project

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stakeholder expectations are three major influences when it comes to the judgment of project success; Pinto and Slevin[11] present a definition of project success drawn from both the PM dimension and the project's implementation (see Figure 2.1). They suggest that project success has two major components: those dealing with the project itself (time, cost, and performance), and those dealing with the client (use, satisfaction, and effectiveness). As measures of project and implementation success complement each other, they suggest that a synthesis of these two areas has the potential to present a more accurate, comprehensive, and useful model of project success than those that have been used to date in much of the PM field.
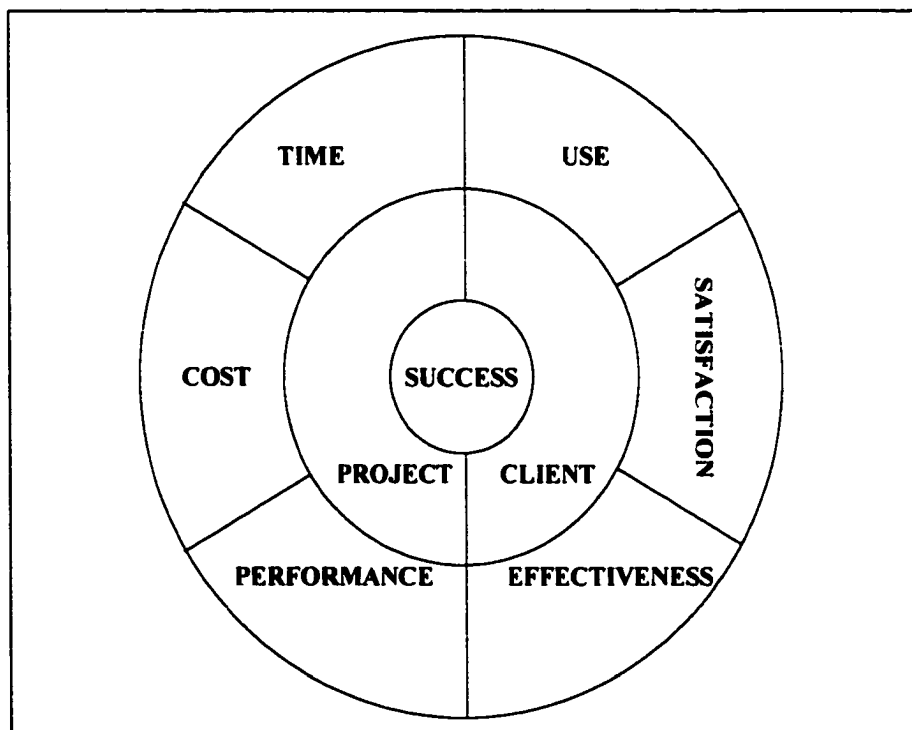
Figure 2.1 Model of Project Success
Source: Project Success: Definitions and Measurement Techniques by Pinto and Slevin,
Project Management Journal, v19n1, Feb.1988.

The study by Pinto and Slevin stresses that in developing an adequate assessment program, it is important to know when it is feasible to determine project success. They believe there are definite benefits involved in waiting until after the project has been transferred to the clients for whom it is intended before making a final assessment of project success. On the other hand, the waiting period should not be too long because the

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possibility exists of other organizational factors influencing the client's business which may make it difficult to determine the relative impact of a particular project on client operations.[12]

This more comprehensive measure for project success forces organizations to take a more holistic perspective, one that transcends the cost, time and scope boundaries of any individual project. Thus, the organization must focus on the impact of the entire portfolio of projects on its operational and strategic goals. As Shenhar[13] *et al.* point out, project definition, planning and success assessments should all become an integrated part of strategic planning and strategic management in organizations. Assessment measures should be set prior to project initiation, and be consistent with the strategic goals of the organization. Treating PM merely as a general set of tools or techniques is superficial. To better use PM, organizations need to cultivate an environment and organizational culture that are supportive and facilitative of projects.

Under this expanded perspective, learning from previous project experiences will provide insights and thereby increase the likelihood of individual project success. It has been suggested that the PMO can enhance this learning by providing a central organizational memory in which important lessons, techniques, and tools can be maintained for easy accessibility. On the other hand, the cost of establishing and maintaining a PMO might outweigh these benefits when considered from the overall organizational perspective.[14] This study explores what impact PMO features have on reported project success, when broadly defined.

2.3 Critical Success Factors

Critical success factors (CSFs) are defined as "the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization. They are the few key areas where things must go right for the business to flourish. If results in these areas are not adequate, the organization's efforts for the

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period will be less than desired. As such, these areas of activity should receive constant and careful attention from management."[15]

Empirical research on success factors for PM and implementation has been conducted for some years.[16,17] Kerzner[18] reported six CSFs for PM excellence:

1) Corporate understanding of PM
2) Executive commitment to PM
3) Organizational adaptability
4) Project manager selection criteria
5) Project manager leadership style
6) Commitment to planning and control

Pinto and Slevin[19] developed a ten-CSF model extending across the project life cycle and called it a *project implementation profile* (see Figure 2.2). In addition to these ten factors, all of which to some degree are within the control of the project team, four other factors labeled as external to the project implementation process were added in a subsequent study. These latter four factors are characteristics of the project team leader, power and politics, environmental events, and urgency. The authors concluded that the relative importance of each of the various factors is subject to dramatic changes at different phases in the project implementation process (see Figure 2.3).[20]

As an indicator of the progress in the development of research in PM, it is noteworthy that there are differences between the six CSFs reported by Kerzner and ten CSFs identified by Pinto and Slevin. Indeed, there are several other lists of CSFs reported in the literature (see Table 2.1) that have some common factors, but differ in important ways. However, some commonality emerges in that most of these lists include factors related to the project manager and the organization to which the project belongs. While none of them directly address the question of the impact of PMO on project success, a natural next-step beyond any of these studies would be to determine how organizations could systematically foster key success factors on an ongoing basis. Before taking this next step, however, note that others have seen the need to study the relationship among organizational factors and project outcomes. For example, Might and

18
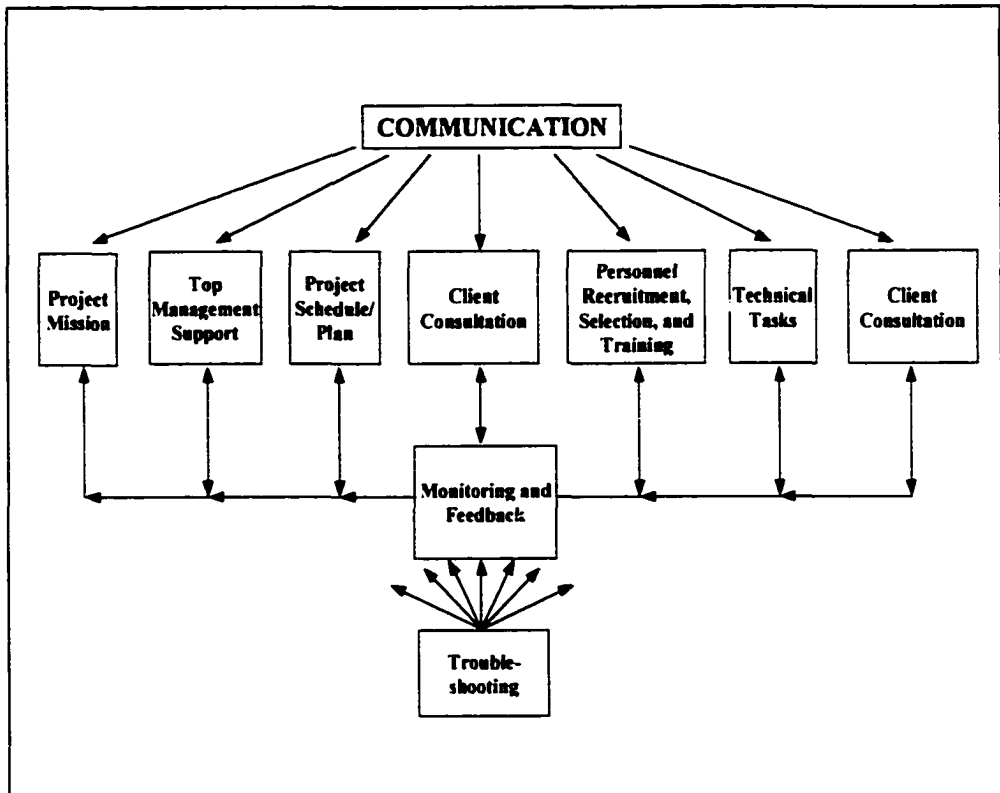
Figure 2.2 Ten Critical Success Factors of the Project Implementation Profile
Source: Critical Factors in Successful Project Implementation by Pinto and Slevin,
IEEE Transactions on Engineering Management, V34n1, Feb.1987.
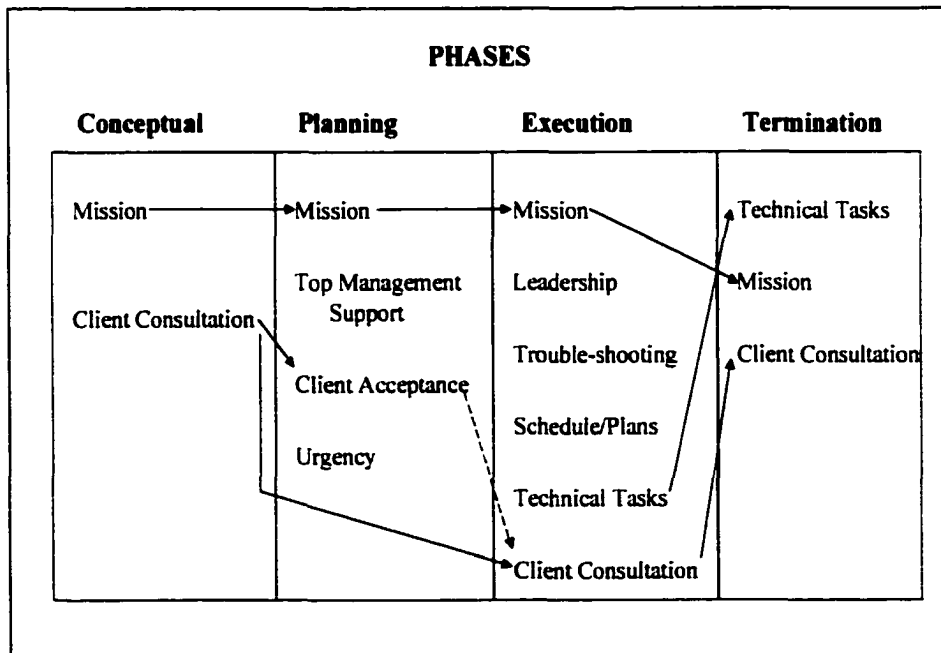
Figure 2.3 Critical Success Factors at Each Project Phase
Source: Critical Success Factors Across the Project Life Cycle by Pinto and Slevin,
Project Management Journal, v19n3, Jun.1988.

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Belassi and Tukel (1996)	Morris and Hough (1987)	Locke (1984)	Baker, Murphy and Fisher (1983)	Cleland and King (1983)	Martin (1976)	Sayles and Chandler (1971)
Top management support	Politics	Project authority from the top		Top management support	General management support	
	Project objectives	Make project commitments known	Clear goals	Project summary	Define goals	
Preliminary estimates			Accurate initial cost estimates	Project review	Require planning and review	
Client consultations			Minimum start-up difficulties	Market intelligence (who is the client)		
Availability of resources			Adequate project team capability	Logistic requirements	Allocate sufficient resource	
		Set up communications and procedures	Adequate funding to completion	Information and communication channels	Provide for control and information mechanism	Communication
Project managers performance	Implement problems	Appoint competent project manager	On-site project manager	Manpower and organization	Organize and delegate authority	Project manager's competence
Others (for dissimilar responses)	Schedule duration urgency	Set up control mechanisms (schedules, etc.)	Planning and control techniques	Project schedule		Scheduling
	Community involvement	Progress meetings	Task (vs. social orientation)	Acquisition		Monitoring and feedback
			Goal commitment of project team	Executive development and training	Select project team	Control systems and responsibilities
	Technical uncertainty innovation			Operational concept	Select project organizational philosophy	Continuing involvement in the project
	Financial contract legal problems			Financial support		
			Absence of bureaucracy	Facility support		

Table 2.1 Lists of Critical Success Factors Developed in the Literature
Source: Adapted from "A New Framework for Determining Critical Success/Failure Factors in Project" by Belassi and Tukel, *International Journal of Project Management*, v14n3, 1996.

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Fischer explored the relationship between the organizational structure and project performance. They observed three major types of structure stretching from functional design at the one extreme to a dedicated project structure at the other, with a matrix format somewhere in between. The results suggest that while neither of the structural extremes shows any notable degree of association with project performance, the intermediate forms do possess some positive relationship to project success.[21] Their study focused mainly on the organizational structure variable, but points to a broader array of inquiries at the organizational level of analysis. This PMO study represents one way to continue this type of research.

2.4 Pinto's Critical Success Factors Model

Since part of this research was designed to extend Pinto's model, relating CSFs to achieving project success, this model and its major findings are briefly described and summarized in this section.

2.4.1 Definition of Project Success

As was suggested in a previous section, project success is a complex concept and considerable variety exists in the way various analysts and researchers have approached it. Pinto defines project success using a multiple measure of cost, schedule, and performance metrics as shown in Table 2.2.

In addition to including the traditional success metrics (cost, schedule, performance), this definition extends beyond these "technical metrics" to include organizational validity and organizational effectiveness. This extension incorporates the client satisfaction dimension that has become a topic of considerable focus in determining project success.

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Cost	The necessity of bringing in a project on or near the budget allocated.
Schedule	The importance of bringing the project in on time or within the specified time frame
Performance, including: • Technical Validity • Organizational Validity • Organizational Effectiveness	Technical Validity is whether a project is technically sound, and meets minimum technical performance criteria. Organizational Validity is the acceptance of the project on the part of the project team members and the clients who ultimately receive the results of the project. Organizational Effectiveness is an improvement for organization either through more effective decision-making or performance on the part of clients.

Table 2.2 Defining Project Success

Source: Project Implementation: A Determination of Its Critical Success Factors, Moderators, and Their Relative Importance Across the Project Life Cycle, Dissertation by Pinto, Univ. of Pittsburgh, 1986.

The 13-item questionnaire shown in Table 2.3 was used to solicit success data. Each item was assessed on a 7-point Likert scale that ranged from Strongly Agree (7) to Strongly Disagree (1). A composite measure of project performance (degree of success) was obtained for each respondent by calculating the mean of the item scores as follows:

$$MEANSCORE_{SUCCESS} \equiv \frac{\sum_{j=1}^{n} ItemScore_j}{n}$$

where

$ItemScore_j$ = Success score as measured by item "j" in the questionnaire.

$\sum$ = Summation of scores across all Success items, and

n = The number of Success items on which a response was received (some may have been missing)

2.4.2 Definition of Critical Success Factors

As was documented in Section 2.3, Pinto posited ten CSFs for achieving project success in his research. These ten CSFs are listed and defined in Table 2.4. His study tested whether and to what extent they accounted for the variance in project success results.

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Item 1	This project has/will come in on schedule.	
Item 2	This project has/will come in on budget.	
Item 3	The project that has been developed works, (or if still being developed, looks as if it will work).	Technical Validity
Item 4	This project will be/is used by its intended clients.	Organizational Validity
Item 5	This project has/will directly benefit the intended users: either through increasing efficiency or employee effectiveness.	Organizational Effectiveness
Item 6	Given the problem for which it was developed, this project seems to do the best job of solving that problem, i.e., it was the best choice among the set of alternatives.	Technical Validity
Item 7	Important clients, directly affected by this project, will make use of it.	Organizational Validity
Item 8	I am/was satisfied with the process by which this project is being/was completed.	
Item 9	We are confident that non-technical startup problems will be minimal, because the project will be readily accepted by its intended users.	Organizational Validity
Item 10	Use of this project has/will directly lead to improved or more effective decision making or performance for the clients.	Organizational Effectiveness
Item 11	This project will have a positive impact on those who make use of it.	Organizational Effectiveness
Item 12	The results of this project represent a definite improvement in performance over the way clients used to perform these activities.	Organizational Effectiveness
Item 13	All things considered, this project was/will be a success.	

Table 2.3 Questionnaire Items for Project Success
Source: Project Implementation: A Determination of Its Critical Success Factors, Moderators, and Their Relative Importance Across the Project Life Cycle, Dissertation by Pinto, Univ. of Pittsburgh, 1986.

CSF	Definition
Project Mission	Initial clearly defined goals and general directions.
Top Management Support	Willingness of top management to provide the necessary resources and authority/power for project success.
Project Schedule/Plan	A detailed specification of the individual action steps for project implementation.
Client Consultation	Communication, consultation, and active listening to all impacted parties.
Personnel	Recruitment, selection, and training of the necessary personnel for the project team.
Technical Tasks	Availability of the required technology and expertise to accomplish the specific technical action steps.
Client Acceptance	The act of "selling" the final project to its ultimate intended users.
Monitoring and Feedback	Timely provision of comprehensive control information at each stage in the implementation process.
Communication	The provision of an appropriate network and necessary data to all key actors in the project implementation.
Trouble-shooting	Ability to handle unexpected crises and deviations from plan.

Table 2.4 Ten Critical Success Factors and Definitions
Source: Project Implementation: A Determination of Its Critical Success Factors, Moderators, and Their Relative Importance Across the Project Life Cycle, Dissertation by Pinto, Univ. of Pittsburgh, 1986.

To obtain data on assessments for each CSF factor, Pinto utilized a 5-item

questionnaire. Each item was assessed on a 7-point Likert scale that ranged from

Strongly Agree (7) to Strongly Disagree (1). A composite measure for each CSF was

obtained from each respondent by calculating the mean of the item scores. For example,

the calculation for "Project Mission," which is CSF_1, was performed as follows:

where

$$MEANSCORE_{CSF1} \equiv \frac{\sum_{j=1}^{n} ItemScore_j}{n}$$

$ItemScore_j$ = CSF1 factor score as measured by item questionnaire "j",

Σ = summation of item scores from all questions under CSF1, and

n = the number of items on which a response was received (maximum 5, some may have been missing).

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2.4.3 CSF Research Results

The essence of Pinto's analysis rested on determining whether there was a linear correlation between the CSFs and Project Performance (Success). The full multiple regression models identified seven CSFs that showed a statistically significant relationship with project success. Data were analyzed at three levels of significance: .01, .05, and .10. Tests with p-values (Significant t) greater than 0.10 resulted in conclusions of non-significant results. Details are in Table 2.5.

Variable	Beta*	t	Sig t	Decision
Project Mission	.41	9.17	p < .01	Selected
Top Management Support	.06	2.03	p < .05	Selected
Project Schedule/Plan	.08	2.64	p < .01	Selected
Client Consultation	.14	4.19	p < .01	Selected
Personnel	-.01	-0.33	N.S.	Not Selected
Technical Tasks	.21	4.82	p < .01	Selected
Client Acceptance	-.02	-0.53	N.S.	Not Selected
Monitoring and Feedback	-.03	-0.90	N.S.	Not Selected
Communication	-.11	-3.12	p < .01	Selected
Trouble-shooting	.10	2.78	p < .01	Selected

Table 2.5 Results of Multiple Regression Using the Full Model of 10 Independent Variables
Source: Project Implementation: A Determination of Its Critical Success Factors, Moderators, and Their Relative Importance Across the Project Life Cycle, Dissertation by Pinto, Univ. of Pittsburgh, 1986.

Based on a survey return sample size of 418, and an adjusted R^2 value of 0.633, Pinto's full model accounted for 64.4% of the total variance in the dependent variable – project success - which left 35.6% of the variance unexplained. One objective of this research is to determine whether and how Pinto's research findings may have changed over the past fourteen years.

2.5 The Project Management Office

As described in the beginning of this study, the PMO entity in this research is not the same as a project office or program office (see Table 2.6).

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* Beta represents the estimated coefficient of predictor variable.

	Full Name	Definition
	Project Office	Organizational entity established to complete a specific project or series of projects, usually headed by a project manager.
PO	Program Office	Organizational entity established to complete a number of projects that collectively satisfy a strategic or tactical organizational objective, usually headed by a program manager and staffed by professionals from various disciplines.
PMO	Project Management Office	Organizational entity established to assist project managers and teams throughout the organization in implementing PM principles, practices, methodologies, tools and techniques.

Table 2.6 Term Definition
Source: *Project Management Terms – A Working Glossary*, LeRoy Ward, ESI International, 2000.

A project office is an organizational grouping of individuals authorized to manage a specific project. The responsibilities include providing an information focal point for both in-house control and customer reporting; controlling time, cost, and performance to adhere to contractual requirements; ensuring that all required work is documented and distributed to all key personnel; and ensuring that all work performed is both authorized and funded by contractual documentation.[22] A project office is often used to serve only one single, large, complex project or program with a series of projects.

In contrast, a PMO does not directly manage any project. Instead, it is an internal consultative service focused on providing PM support to all or many of an organization's projects. Nonetheless, under the circumstance of few projects in an organization or some special conditions, a PMO may be called upon for more immediate involvement, or take the lead for a project.

In some literature, the PMO and PO terms are differentiated based on the content of what they do (functions and services), but in other cases, the terms are used interchangeably. This interchangeability is shown in Block and Frame's work and some others.[23, 24] The determining feature for a PMO is whether the entity extends beyond one project to deal with multiple projects, clients, contractors, partner organizations, etc.

A PMO is often staffed with full time personnel to provide some combination of managerial, administrative, training, consulting and technical services for projects and for

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the organization overall. One of its goals is to provide methods, procedures, systems, and policy in a consistent fashion. It is a focal point for PM implementation throughout an organization and is a supportive entity for the effective use of PM methodology.[25, 26, 27]

Some PMOs are placed organizationally so that the director reports to a senior level of management and is on a level comparable to various functional managers. Other PMOs are within divisions, as often seen in the area of information systems and information technology.[28]

PMOs are also called by different names, including project management center of excellence[29] and center of expertise.[30] Others appear under more disguised names, such as a PM cost center or profit center. Reasons for being called a cost center are because one sponsor is responsible for all costs related to the establishment and management of the PMO, and funding for all services and products is acquired through the office. In other cases, organizations carry out PMO-like functions or services without formally establishing a PMO. For example, an organization might have a human resource department that arranges PM training.[31]

2.5.1 PMO Functions and Services

PMO functions and services vary depending on its size and stated management purpose. In a general review of PMOs, Block and Frame[32] propose the following characteristics to help improve an organization's PM effectiveness:

- Project support which focuses mainly on offloading administrative burdens from project managers, such as reporting and software operations.

- Consulting and mentoring, whereby professional PM expertise, including proposal development and project planning, is to be shared as needed throughout the organization.

- Development and enforcement of standards and methods to leverage best practices and to ensure members of the organization all speaking the same PM language.

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- Training to enhance individual skills and to encourage certification of PM professionals.

- Assistance in staffing its projects with appropriate project managers.

- Playing a high-tech project support role by enabling virtual project offices.

This list is generally reinforced by other studies. Bates[33] and Knutson[34] emphasize having a central historical archive for all types of projects; providing a secretariat for the project review process and helping with interdepartmental reporting to top management. Levine,[35] Vandersluis,[36] and Wells[37] emphasize maintaining a standard set of PM products and services. Bates,[38] Rauh,[39] deGuzman,[40] and Wells[41] called for providing training and career development. Most of these studies stated the need to have specialized internal consultant(s) to provide coaching and mentoring services.

Fleming and Koppelman[42] suggest that PMOs can provide vital staff support to project managers and their teams. Bates further adds that PMOs should assume tasks such as providing project risk assessment, performing post-project evaluation services, and ultimately leading the organizational transition to an effective project environment.[43]

Various representative views on PMO functions and services are summarized in the Table 2.7. Anecdotal evidence that better PM is induced by PMO use is growing. The following benefits have been identified:[44]

- Predictable, repeatable use of tools and techniques.

- Growing staff professionalism in PM.

- Standardization and portability of tools and techniques.

- Facilitation of use of PM in becoming a core competency.

- Improvements in organizational design and performance.

- More productive and skillful project teams.

- Profitability improvements.

- External recognition for overall organizational performance.

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Wells (1999)	DeGuzman (1999)	Block and Frame (1998)	Bates (1998)	Knutson (1995)
Serving as a focal point for a transition to PM in a project-driven organization.			Leading the transition of the organization to an effective project environment.	Helping with multi-project and inter-departmental reporting to top management.
Supplying PM support to project teams.	Providing technical support (i.e., project management and program management, contract management, maintenance of PM systems and infrastructure).	Provide project support – offloading administrative burden.		Providing mentoring on PM techniques and software.
Providing PM consulting and mentoring.	Providing consultation (i.e., coaching and mentoring, standards-setting).	Consulting and mentoring.	Managing the organization's project environment (i.e., coaching and consulting service, providing instructor for training, providing career development guidance, developing PM policy).	An internal consultative focused on the discipline of PM. An internal consultative focused on the discipline of PM.
Developing and maintaining PM methodologies and standards.	Maintaining a standard set of PM products and services.	Develop and enforce PM standards and methods.	Serving projects in a support role (i.e., Responsibilities for project selection, developing and maintaining PM methodology, procedures, and system, Providing project staff).	Facilitating the continuous improvement process related to the project process.
Providing or arranging PM training.		PM training and certification.		
Providing organizations with a cadre of experienced managers.	Providing training and education –to supporting professional certification efforts.	Recommending project managers.		
Providing better capabilities for human resource planning.		Assuming role of virtual office.	Managing project information (i.e., maintaining project database, project historical archives, and providing secretariat for project review process.	Maintaining the central historical archives for projects.

Table 2.7 Views of PMO Functions and Services from the Literature

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2.5.2 Concerns Surrounding PMO Utilization

Among the unfavorable views on organizations adopting the use of PMO, there are two main accounts:[45] (1) the PMO is seen as an unnecessary expense that organizations can ill afford in an era of resource scarcity; (2) the PMO contributes another layer of bureaucracy that will slow down business. As these opinions raise concerns for organizations considering the use of a PMO, some advocates suggest that to ensure a smooth establishment and an effective use of PMOs, organizations should carefully consider the following key issues before embarking upon such an endeavor:[46]

- The management level of the PMO and to whom the director reports.
- The PMO relationship to a project review executive committee, if one exists.
- The general responsibilities, authority and functions of the PMO.

The role of PMOs in increasing project success cannot be taken lightly without further investigation of these issues.

2.6 Conceptual Framework

As suggested earlier, the PMO is supposed to be a source for providing useful, consistent, convenient assistance to project oriented organizations, project managers and teams. More PM services could nurture a strong PM environment which would help project teams and project managers perform better and, consequently, increase the rate of successful project outcomes.

So far, however, no generally-accepted research framework has emerged or been used by analysts considering the connection between project success and the use of a PMO. Still, enough important and related areas were identified to postulate a preliminary framework by integrating several strands of research on project success, critical success factors, and project management office. The primary theme of this study is to investigate what influence PMO services and functions have on project success rates. This research examines PMO services and functions in depth by creating a set of indices of PMO presence and exploring their potential to increase project success rate. It extended Pinto's

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(1986) model and examined what influence PMO seems to offer in addition to the CSF

attributes identified earlier. Details of this model are set forth in the next chapter.

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CHAPTER TWO ENDNOTES

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CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter provides details of the research methodology broadly outlined in Chapters One and Two. The primary research question is "<u>What impact does the presence of PMO functions and services have on reported project success?</u>"

After the overall research model is specified, a review of the main hypotheses is presented. Next, the constructs making up both dependent and independent variables are formulated. Data collection procedures are then described, including details on how the survey instruments were tested and refined. The main data analysis approaches follow.

3.2 Research Model and Hypothesis Tests

As noted above, the primary objective for this research was to explore the degree of influence that PMO services and functions exert upon reported project success. The study also explored the degree of influence that PMO presence index has *in addition to* the influence of CSFs identified by Pinto and modified for this study. Figure 3.1 shows how these two dimensions are combined into a unified model.

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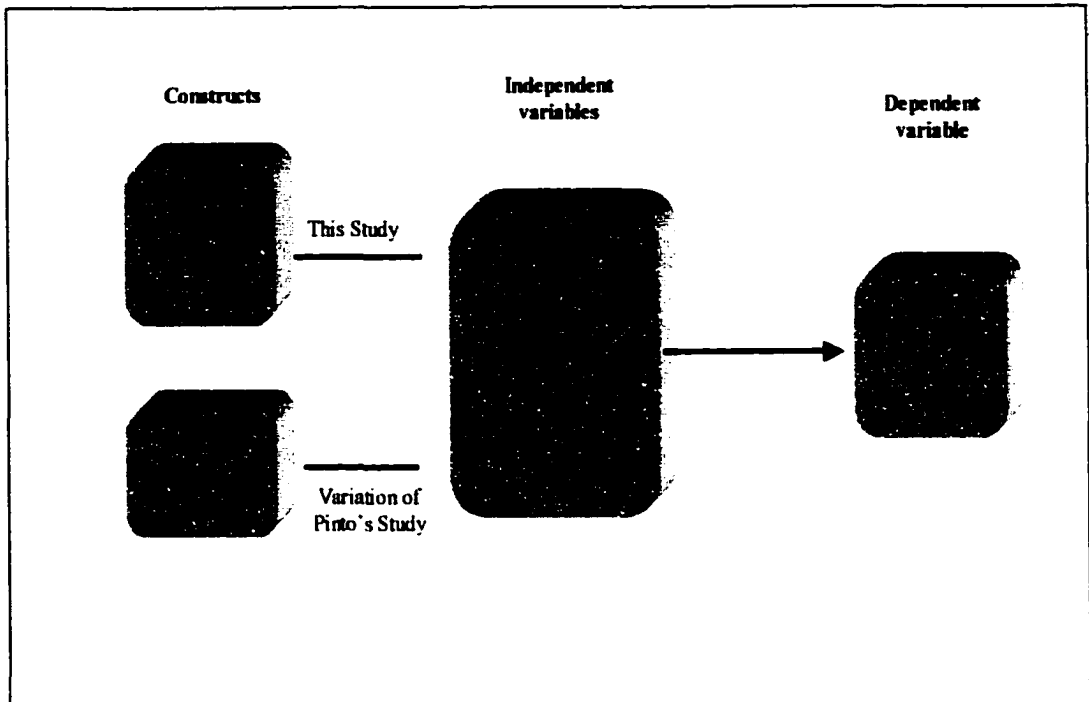
Figure 3.1 Research Model

The main research hypotheses, presented earlier, are restated below:

First H_0: The PMO presence index has no linear influence on reported project success.

First H_a: The PMO presence index has a linear influence on reported project success.

The motivation for the first hypotheses was to investigate the impact of a PMO on reported project success, under the assumption that the PMO services and functions provided either directly by a PMO or independent of a formal PMO.

Second H_0: The PMO presence index has no 2nd order influence on reported project success.

Second H_a: The PMO presence index has a 2nd order influence on reported project success.

The motivation for the second hypotheses was to explore whether the presence of PMO functions and services has a more complex impact on reported project success. It is hypothesized that the relationship between the PMO presence index and reported project success is quadratic over the range of observations. Reported project success should increase as the score of a PMO presence index grows

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greater; but if a PMO presence index gets too strong, the reported project success may become retarded.

Third H_o: The PMO presence index has no influence on reported project success beyond the influence of CSFs alone.

Third H_a: The PMO presence index has an influence on reported project success beyond the influence of CSFs alone.

The motivation for the third hypotheses is to remedy the outcome in which a proportion of the variation in the criterion variable (reported project success) remains unexplained when previously reported CSFs are the sole predictor variables.

The following formal statistical tests were performed:

- t-tests from a sequence of simple regression models,

- t-tests from a multiple regression model which includes all variables,

- a forward stepwise regression model built using the amount of additional variance explained as the inclusion criterion.

Regression assumptions for linearity, homoscedasticity, and normality were checked in establishing simple linear regression and multiple linear regression models.

3.2.1 PMO Presence and Project Success

In testing the hypothesis on whether the PMO presence index has an influence on reported project success, a simple linear regression was performed with the Reported Project Success score as the dependent variable and the PMO Presence Index as the independent variable.

In addition to this main test, simple linear regression models were used to test relationships between the six sub-component PMO categories (individual PMO services and functions) and reported project success score. Details regarding each of these six categories are provided in a later section.

$H_{a\text{-}PMO1}$: there is a linear relationship between PM standards and methods and reported project success.

$H_{a\text{-}PMO2}$: there is a linear relationship between project historical archives and reported project success.

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H_{a-PMO3}: there is a linear relationship between project administrative support and reported project success.

H_{a-PMO4}: there is a linear relationship between human resource/staffing assistance and reported project success.

H_{a-PMO5}: there is a linear relationship between PM consulting and mentoring and Reported project success.

H_{a-PMO6}: there is a linear relationship between PM training and reported project success.

A second-order polynomial regression model was used to test the second main hypothesis, whether the PMO presence index has a 2nd order influence on reported project success. In other words, it tested whether the estimated coefficient of the *square* of the predictor variable representing PMO presence index was statistically significant in the multiple regression model. The regression model is as follows:

$$Y_i = \beta_0 + \beta_1 x_i + \beta_{11} x_i^2 + \varepsilon$$

where

$$x_i = X_i - \text{X-bar}$$

is called a *second-order model with one independent variable* because the single independent variable appears to the first and second powers.[1] Note that the independent variable is expressed as a deviation around its mean X-bar, and that the *i*th observation deviation is denoted by x_i. Here,

β_0 = the mean response of Y when x = 0, i.e., when X = X-bar,

β_1 = the regression coefficient, often called the *linear effect coefficient*, and

β_{11} = the *quadratic effect component*.

3.2.2 PMO Presence and Project Success, Given the Presence of CSFs

In testing the third hypothesis, whether the PMO presence index has an influence on reported project success beyond the influence of CSFs alone, a full multiple regression model was used. It tested whether each independent variable had a statistically

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significant influence upon the dependent variable in the presence of the other independent variables. Also, a forward-selection stepwise regression analysis was performed on the full set of variables, including seven CSFs and PMO presence index, to test the relative strength of their relationship with reported project success. It selected independent variables for inclusion in the regression model one at a time and stopped when the adjusted R^2 value stopped rising. The full model is represented below:

$$Y = \beta_0 + \beta_1 X_{csf1} + \beta_2 X_{csf2} + \beta_3 X_{csf3} + \beta_4 X_{csf4} + \beta_5 X_{csf5} + \beta_6 X_{csf6} + \beta_7 X_{csf7} + \beta_8 X_{csf8} + \varepsilon$$

where,

β_0 = Intercept
β_1 = Linear effect of X_{csf1}- Project Mission
β_2 = Linear effect of X_{csf2}-Top Management Support
β_3 = Linear effect of X_{csf3}-Project Schedule/Plan
β_4 = Linear effect of X_{csf4}-Client Consultation
β_5 = Linear effect of X_{csf5}-Technical Tasks
β_6 = Linear effect of X_{csf6}-Communication
β_7 = Linear effect of X_{csf7}-Trouble Shooting
β_8 = Linear effect of X_{csf8}-PMO Presence Index

Because multiple regression was being performed, the magnitude of these linear effects were those which occurred only when all other variables were present in the model. The effect of each variable considered individually was derived from simple regression results.

Pearson correlation tests were conducted to assess the level of interrelationship among the PMO presence index factor and CSFs.

3.2.3 Additional Tests: CSFs and Project Success

Simple linear regression models were used to retest part of Pinto's earlier study, which found a significant relationship between the seven CSFs selected for this study and reported project success score.

1. $H_{a\text{-}CSF1}$: there is a positive linear relationship between project mission and reported project success.

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2. $H_{a\text{-}CSF2}$: there is a positive linear relationship between top management support and reported project success.

3. $H_{a\text{-}CSF3}$: there is a positive linear relationship between project schedule/plan and reported project success.

4. $H_{a\text{-}CSF4}$: there is a positive linear relationship between client consultation and reported project success.

5. $H_{a\text{-}CSF5}$: there is a positive linear relationship between technical tasks and reported project success.

6. $H_{a\text{-}CSF6}$: there is a positive linear relationship between communication and reported project success.

7. $H_{a\text{-}CSF7}$: there is a positive linear relationship between trouble-shooting and reported project success.

3.3 Variable Constructs

3.3.1 General Categories of PMO Presence

As defined earlier, a PMO is an organizational entity established to assist project managers and teams throughout the organization in implementing PM knowledge, principles, tools and techniques.

Although a standard set of PMO features, services and functions has yet to be agreed upon in theory or practice, the literature review led to the identification of the following categories:

> Developing and maintaining PM Standards and Methods

> Developing and maintaining Project Historical Archives

> Providing Project Administrative Support

> Providing Human Resources/Staffing Assistance

> Providing or arranging PM Training

> Providing PM Consulting and Mentoring

As is described in detail later, the PMO Presence Index construct will be developed from thirty survey items distributed evenly across these six categories. The categories themselves are outlined below.

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3.3.1.1 PM Standards and Methods

As the guardian of PM expertise within an organization, a PMO develops and maintains a set of standards and methods. These standard procedures are detailed enough for providing guidance but not excessively detailed so as to inhibit creativity. The following lists include representative areas in this category, and the PMO survey instrument contains detailed questions on them:

- Proposal procedures
- Project selection procedures
- Project planning & scheduling procedures
- Change management procedure
- Risk assessment procedures
- Documentation procedures

3.3.1.2 Project Historical Archives

As an important role of an organization's central library and database, archiving provides a systematic way to collect and store information on previous project knowledge such as lessons learned and templates. These can provide invaluable input for future projects. Representative areas are listed below:

- Records of prior project performance (for example, status/progress report)
- Copies of prior project plans
- Key issue and problem lists for prior projects
- Establishment of a historical project archival office
- Description of techniques and templates

3.3.1.3 Project Administrative Support

As project numbers and scale grow large, the associated administrative requirements expand quickly. Administrative work often is not reflected directly in

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project deliverables and thus can represent a distraction to the core project team. The following shows some representative work areas in this category:

- Project schedule maintenance
- Project timesheet maintenance
- Project workbook maintenance
- Project report production and distribution
- Providing a "war room" for reviews and meetings
- PM software assistance

3.3.1.4 Human Resource/Staffing Assistance

As more organizations carry out their activities through projects, the demand for project managers has grown. Selecting the right persons for these jobs is critical. The following list presents areas in which a PMO can help an organization meet its need for a steady supply of qualified project managers:

- Project manager skill set identification
- Project manager candidate personnel identification
- Project team member candidate personnel identification
- Input on project manager's performance evaluation
- Appropriate information on policies and procedures

3.3.1.5 PM Consulting and Mentoring

As organizations become more sophisticated in project management, the need for moving away from an *ad hoc* basis to a more systematic and planned PM approach expands. An organization with multiple projects often requires ready access to PM expertise to develop strategic insight. The following includes representative areas of consulting and mentoring:

- Confidential advice on sensitive issues and problems

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- Project start-up assistance

- Timely response to project needs/problems

- Group sharing sessions for project managers

- Assisting senior management

3.3.1.6 PM Training

As an organization devotes more resources and energy to conduct their business
on a project basis, the need for PM training grows. A PMO can take a leadership role in
working with a human resource department for identifying a training curriculum,
selecting outside training vendors, or developing and delivering some training courses
itself. The following lists representative areas of training support provided by a PMO:

- PM basics

- Advanced PM topics

- Assistance in preparation for career advancement

- PM software skills

- Design and development of training courses both for internal and external
  customers

3.3.2 Formation of the PMO Presence Index

The PMO presence index was formed from responses to survey questions in each
of these six categories. The particular survey questions are contained in Appendix D.
Aggregating the responses across all categories formed an overall composite PMO
Presence index, and a sub-index was formed for each of the six categories individually.
The overall hierarchy of the PMO Presence index is displayed in Figure 3.2.

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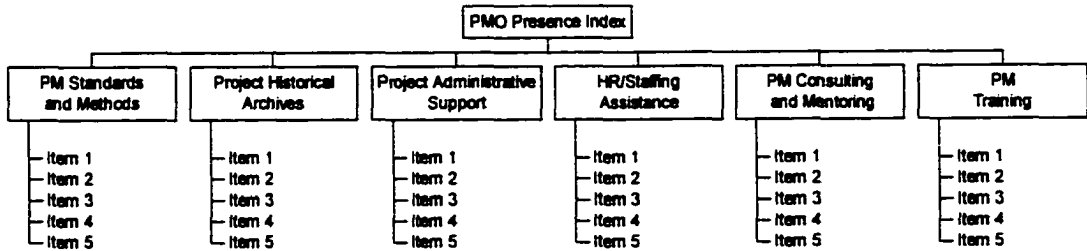
Figure 3.2 PMO Presence Index Hierarchy

Each question was phrased to require the respondent to indicate a level of agreement with the statement on a 7-point Likert scale ranging from Strongly Agree (7) to Strongly Disagree (1). Each sub-index was calculated as the mean of the associated item scores. For an individual category, for example, PM Standards and Methods, this mean was formed across a maximum of five responses as follows:

$$MEANSCORE_{STANDARDS/METHODS} \equiv \frac{\sum_{j=1}^{n} ItemScore_j}{n}$$

where

ItemScore$_j$ = Standards and Methods category score as measured by questionnaire item "j",

$\sum$ = Summation of item scores from all questions under Standards and Methods, and

n = The number of items on which a response was received (maximum 5).

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For the composite PMO Presence index, this mean will be formed from all available responses across all categories. In other words, the mean PMO Presence composite score "MEANSCORE$_{PMO}$" for any particular survey respondent will be:

$$MEANSCORE_{PMO} \equiv \frac{\sum_{j=1}^{n} ItemScore_{j}}{n}$$

where

ItemScore$_j$ = score as measured by questionnaire item "j",

Σ = summation of item scores from all questions, and

n = the number of items on which a response was received (maximum 30).

3.3.3 Reported Project Success Defined

As was suggested in the literature review, the concept of project success is complex, and there is considerable variety in the way various analysts and researchers have approached it. This study used multiple measures in an attempt to assess the various aspects of project outcomes. Reported project success included meeting schedule, budget, technical performance requirements, and achieving expected results. Terms of "meeting schedule requirement" and "meeting budget requirement" were both determined by the completion of the project vis-à-vis the project plan. "Meeting technical performance requirement" was determined by whether a project was technically sound, and met minimum technical performance criteria. "Achieving expected results" was measured by organizational validity and organizational effectiveness, where the organizational validity was the acceptance of the project on the part of the project team members and the clients who ultimately received the results of the project; and the organizational effectiveness was an improvement for the organization either through more effective decision making or performance on the part of clients. For dependent variable Reported Project Success, this study adapted Pinto's "Project Performance"

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questionnaire instrument to derive a value by calculating the mean of the questionnaire item scores.

3.3.4 Selected CSFs for PMO Study

Pinto identified ten CSFs, seven of which turned out to have significant influence on project success and three of which had no statistically significant influence. This study explored whether PMO services and functions influenced project success above and beyond these seven CSFs, which are: Project Mission, Top Management Support, Project Schedule/Plan, Client Consultation, Technical Tasks, Communication, and Trouble-Shooting. For these seven selected CSFs, this study reused part of Pinto's "Factor Contributions" questionnaire instrument to solicit data for each factor. Each factor score was derived by calculating the sample mean across its related items.

3.4 Development of Survey Instrument for PMO Presence Index

The PMO presence index covers six categories. It initially had ten question items for each category in the original instrument, but the size of the instrument became a concern. In order to make it more likely that recipients would finish the survey within a reasonable time frame, an analysis of the degree of importance of each item was performed by a group of selected experts to reduce category size to five. As described below, the consensus prioritization of category items also helped improve construct validity.

In the first step, identified PMO experts (see Appendix A - Identified Field Experts on PMO) were asked to rate which five (out of ten) questions were considered most important in representing each of the six categories. Based on mean ranks, the top five items in each category were retained to form the basis of the survey questionnaire.

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3.5 Data Gathering

This study used the Project Management Institute's (PMI) year 2000 membership list as the population for sample choice. PMI is a nonprofit professional association that has been in existence since 1969 and is dedicated to advancing the field of PM. Its members come from different fields and industries all over the world. It has a large membership pool which provides an opportunity for drawing a sample for a cross-sectional survey in a random fashion. Also, members of PMI are likely to have some knowledge of PM and are likely to participate in PM practices. One thousand members in North America were randomly selected from the pool of 35,880 members who have not chosen to exclude their names from mailing lists.

In addition, this research utilized a targeted group of organizations worldwide that were identified as having some version of a PMO. It was believed that using only a random survey would not necessarily ensure a reasonable response rate and obtain reasonably complete sets of data on PMO features and practices. A targeted survey helps in getting more reliable information than a random survey in which a researcher often has little control over getting various kind of information. More important, using both a randomly selected and a targeted group permits a comparison between the two along many dimensions. Such comparisons potentially offer a rich variety of insights and direction pointing that can lead to more comprehensive research in the future.

There were 96 PMO representatives who participated, along with 52 project managers who were invited by some of those 96 PMO representatives. Results from the project managers underwent statistical analysis; results from PMO representatives were used to generate the following general information on PMO use:

1. Are there indications on growth in the establishment of PMOs?

2. What circumstances are associated with the establishment of PMOs?

3. What are the main environmental factors related to the establishment of PMOs?

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- What management level approved PMO establishment?
- What are the stated management purposes for PMO establishment?
- What policy statements have been issued about PMOs?
- Where are PMOs placed in organizations?
- At what amount are PMOs being funded?
- What services and functions are provided by PMOs?

There were three survey instruments. One was the "Project Management Institute Members Questionnaire" for randomly selected PMI candidates. The second was the "Project Management Office (PMO) Manager/Representative Questionnaire" for targeted PMO managers/representatives. The third was the "Project Manger Questionnaire" for project managers identified by PMO managers/representatives. The survey instruments were created under a web address hosted at the George Washington University. Each participant was mailed a letter of invitation from the GWU Academy For Excellence In Project Management along with a personal key allowing access to the survey. A reminder letter was mailed one month later. Also, a note from the research committee chairman was included in both the first and second mailing to reinforce the academic purpose of the survey.

3.6 Data Conditioning

Confirmatory Factor Analysis was used to assess the *construct validity* for the six factors comprising the PMO presence index. The items making up each factor were tested to determine whether they were measuring a single category or multiple categories of PMO features. When only a single category emerged for any particular factor, the corresponding construct would be considered valid.

The study tested the *internal consistency*, or reliability of the variables using the coefficient alpha developed by Cronbach.[2] McIver and Carmines suggest[3] that the *Cronbach alpha* should be the preferred measure as an estimate of scale reliability. The formula for this measure is:

$$\alpha \cong \frac{N\overline{\rho}}{1+\overline{\rho}(N-1)}$$

where

α = is coefficient alpha based upon the inter-item correlation matrix,

ρ-bar = the mean inter-item correlation, and

N = the number of items.

Pearson correlation coefficients were developed to determine whether *collinearity* might be a problem. Collinearity occurs when any pair of predictor variables is highly correlated. If there are too many explanatory variables, some of them may not be needed. This technique helps identify any redundant explanatory variables in the regression.

Also, the *variance inflation factor* (VIF) was used to validate potential collinearity problems. The VIF is the reciprocal of the tolerance value, which is calculated as one minus the proportion of the variable's variance explained by the other predictors (VIF$_i$ = 1 / [1-R$_i^2$]). A VIF value above 10 indicates that correlation between independent variables require remediation.[4]

External validity is a measure of whether the results of the study could be generalized to broader settings, beyond those in which the survey was conducted. To achieve this requirement, the research enumerated the diverse background of questionnaire respondents. Also, for non-response bias, an independent samples t-test was performed between early and late respondents (those who didn't respond until after the second mailing). According to Oppenheim,[5] late respondents share the basic characteristic of non-respondents. This assumption is under the condition that the late respondents would be classified as non-respondents if the second mailing were not sent out.

H$_{a\text{-ST}}$: The mean ST value of the population from the first mailing differs from the second mailing.

H$_{a\text{-AR}}$: The mean AR value of the population from the first mailing differs from the mean AR value of the population from the second mailing.

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$H_{a\text{-}NAD}$: The mean NAD value of the population from the first mailing differs from the mean NAD value of the population from the second mailing.

$H_{a\text{-}NHR}$: The mean NHR value of the population from the first mailing differs from the mean NHR value of the population from the second mailing.

$H_{a\text{-}NTR}$: The mean NTR value of the population from the first mailing differs from the mean NTR value of the population from the second mailing.

$H_{a\text{-}CN}$: The mean CN value of the population from the first mailing differs from the mean CN value of the population from the second mailing.

3.7 Summary

The research methodology is summarized in the following Table 3.1:

Targeted Industries	Variables/ Factors	Data Gathering Method	Data Analysis Method	Contribution
Multiple industry	-Four categories of project success measures -Seven critical success factors -One index for PMO presence	Web-based survey questionnaire	-Descriptive statistics -Correlation analysis -Regression analysis	Better understanding the role of PMO in achieving success and influencing CSF to achieve a higher project outcome success rate

Table 3.1 Summary of Research Methodology

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CHAPTER THREE ENDNOTES

[1] John Neter, Michael H. Kutner, Christopher J. Nachtsheim and William Wasserman, *Applied Linear Regression Models*, Irwin, 1996

[2] Lee J. Cronbach, "Coefficient Alpha and the Internal Structure of Tests," *Psychometrika*, v16n3, page 297-334, Sept.1951.

[3] John P. McIver and Edward G. Carmines, *Unidimensional Scaling*, Sage Publications: Beverley Hills, CA., 1980.

[4] Joseph F. Hair and Rolph E. Anderson et.al., *Multivariate Data Analysis*, fourth edition, Prentice-Hall , Inc., 1995.

[5] A. N. Oppenheim, *Questionnaire Design and Attitude Measurement*, Basic Books: New York, page 34, 1966.

CHAPTER FOUR

INFORMATON FROM THE RANDOM SURVEY –
REGARDING THE PMO

4.1 Introduction

This chapter is divided into four sections, including this introduction. The second presents descriptive statistics and the third presents findings on the ancillary research questions regarding environmental conditions related to the establishment and implementation of PMOs. Finally, a summary section is provided.

Invitation letters were sent to a 1,000-candidate random sample of the PMI membership list inviting them to participate in the web-based survey. Over 120 responses had been received after one month. A reminder letter was sent to the remaining candidates, and an additional 114 responses were subsequently received (see Table 4.1). The total yield was 234 out of 1,000, or 23.4%.

	First Mailing	Second Mailing	Total
Mails returned due to:			
Respondent left organization	3	3	
Post office returns	4	7	
Subtotal	7	10	
Submitted survey responses	120	114	234

Table 4.1 Summary of Responses on the First and Second Mailings from the Random Sample

Of 234 responses, 113 responded that they had a PMO or an entity similar to a PMO in their organizations; 45 responded that they did not have a PMO in their organizations; 76 responded that they had not yet officially established a PMO, but there were people performing PMO functions and services as part of their job description (see Table 4.2). Therefore, 189 (or 81%) of the respondents reported either have a PMO or a similar entity providing PMO type of functions and services.

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#1	Nobody does any PMO functions or services, and there are no plans to develop such a capability in the organization.	27
#2	Nobody does any PMO functions or services; however, there are plans to develop such a capability in the organization.	18
#3	Some people perform PMO functions and services as part of their job description, but there is no such office or comparable entity in the organization yet.	40
#4	Some people perform PMO functions and services as a full-time job responsibility; but there is no such office or comparable entity in the organization yet.	36
#5	An entity that provides PMO functions and services is in place.	113
	Total	234

Table 4.2 PMO Distribution for the Random Sample

4.2 PMO Descriptive Statistics

This section includes a number of PMO dimensions and features from the PMI random survey. Information was collected from the "PMI Member Questionnaire," Part Two, as shown in Appendix D. While much PMO variety has been encountered in this random study, nevertheless it has been possible to sort out and describe them in terms of certain standard management parameters. Following are descriptive statistics for the 113 respondent organizations that have a PMO entity.

4.2.1 PMO Growth

Based on the random sample, Figure 4.1 on the next page shows, beginning in the mid-1990s, a distinct increase in the number of PMOs being established. While this result is solidly grounded in data from the random population, a broader extension of this trend to project-oriented organizations generally must await future research.
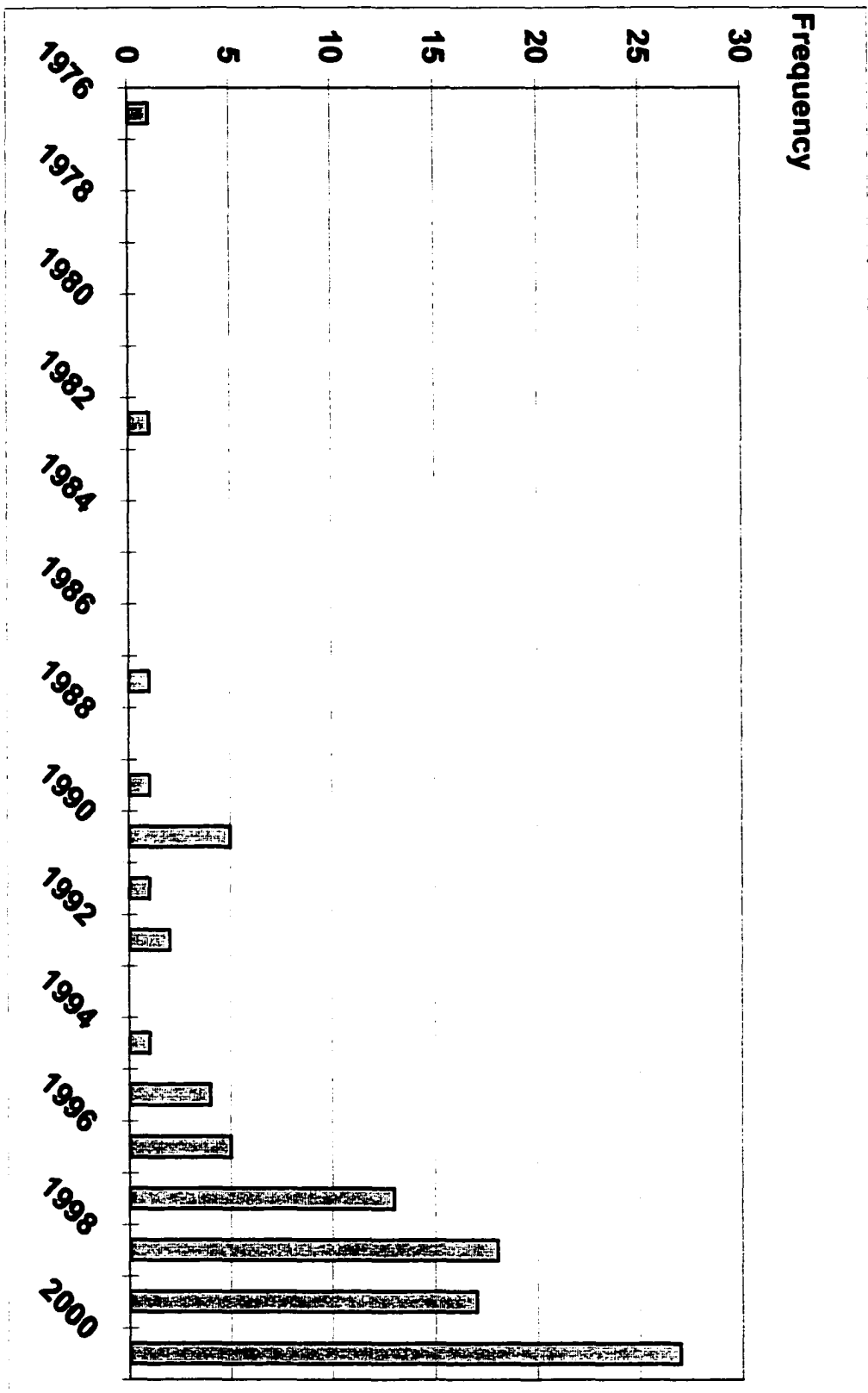
Figure 4.1 Histogram Showing Year in which PMOs Were Established from the Random Sample

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4.2.2 Management Level for PMO Establishment Approval

In keeping with a well-established critical success factor (CSF) involving top management support for improving the effectiveness of PM and project performance (see Table 2.4), Table 4.3 shows an overwhelming proportion of PMOs has been established under the approval of top/upper management. Further research will be required to determine more definitive profiles of PMOs in various organizations that may have an overall top-level PMO as well as lower-level related units in various divisions or groups.

PMO Approval Level	
Top/Upper Management	98
Middle/Departmental Management	7
Don't know	8
Total	113

Table 4.3 Summary of PMO Approval Level for the Random Sample

4.2.3 A Typology for PMOs

Drawing on data collected in the random study, one particular typology for PMOs was developed based on the type of staffing. Table 4.4 shows the distribution of Type I, II, III in the 113 respondent organizations. Those organizations using only full-time staffing (Type I) constitute 40%, while Type I plus some combination of part-time employees and contractors come to an additional 53%. Thus, it may be concluded that full-time staffing is used in 93% of the 113 respondents' organization.

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Type I: Some people perform PMO functions and services as a full-time job responsibility. **Type II:** Some people perform PMO functions and services as part of their job description. **Type III:** Some contractors are used to provide PMO functions and services.		
Type I Only		45
Type II Only		1
Type III Only		1
Type I and Type II		16
Type I and Type III		24
Type II and Type III		0
Type I and Type II and Type III		20
Don't know		6
	Total	113

Table 4.4 Summary of PMO Staffing Type for the Random Sample

4.2.4 PMO Reporting Level

In Table 4.5, it is shown that of the 113 PMO-related respondents, 71% of the PMOs report to top/upper management while 22% report to middle management or departmental management. Reporting to senior management predominates by a large margin.

PMO Reporting Level	
Top/Upper Management	80
Middle/Departmental Management	25
Don't know	8
Total	113

Table 4.5 Summary of PMO Reporting Level for the Random Sample

4.2.5 Titles for Head of A PMO

While Table 4.4 shows a relatively small number of staffing types, information in Table 4.6 demonstrates a great amount of diversity in titles of those who perform as a PMO head. However, about 20% suggest a direct PMO connection and another 55% involve either "manager" or "director."

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Title	Count
Director of PMO or Project Office	6
PMO Manager	5
Director of Project Management	4
Director, PM Center of Expertise	1
Director of Program Management	1
Director of Strategic Project Management	1
Director of Corporate Project Management	1
Project Manager	4
Project Executive	3
Project Principal	1
Senior Manager	5
Portfolio Manager	1
Project Control Officer	1
Project Management Supervisor	1
Project Management Center Manager	1
Program Manager	3
Manager	7
Center Manager	1
Manager Program Controls	1
Methodologies and Processes Manager	1
General Manager	2
Executive Program Manager	1
Executive Project Manager	1
Executive Director	1
Senior Director	1
Director	26
Vice President	15
Account Executive	1
Alliance Products Manager	1
Area Program Manager	1
Assistant Project Manager	1
Chief Engineer	1
Contractor	1
Corporate Manager	1
Director of IT or Director of IT Strategy	2
Director of Engineering	1
Information Systems Manager	1
Manager of Client and Program Services	1
Managing Partner	1
President	1
Principal	1
Don't know	2
Total	113

Table 4.6 Summary of Titles for the Head of A PMO Entity for the Random Sample

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4.2.6 PMO Funding

For the 56 organizations that reported on PMO funding, the data is presented in Figure 4.2. Among them, 33 (or 59%) estimated less than 2% of the overall organizations' total budget being devoted to a PMO. This is an area where there is no high level of confidence in the validity of the data, and is an area requiring further research.

4.3 Environmental Conditions Related to The Establishment and Implementation of PMOs

This section provides summary information on a variety of environmental conditions related to the establishment and implementation of PMOs. Addressed are the topics of motivation, mission statement, policy documents, and functions and services provided by PMOs.
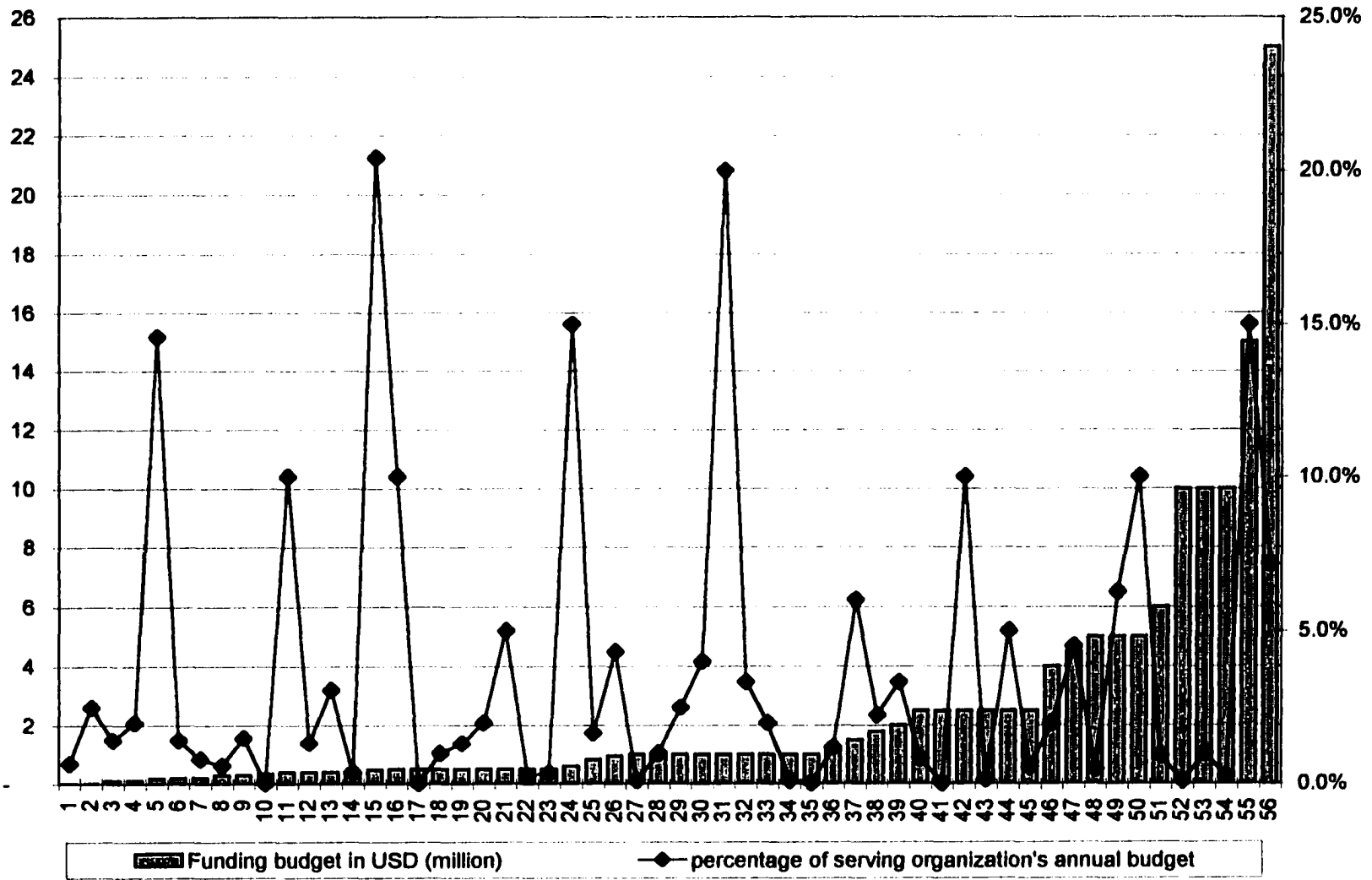
Figure 4.2 The PMO Funding and Funding as A Percentage of Its Organization's Annual Budget from Random Survey (One outlier removed: Funding budget = $150 million, percentage of serving organization's annual budget = 10%)

4.3.1 Motivation for Establishment of PMOs

Appendix E (Part I) contains detailed information provided by respondents on the motivation for establishing a PMO by their respective organizations. For a few organizations only a single motivating factor was stated, whereas the great majority described multiple motivations. Table 4.7 lists a number of the most frequently reported motivations. The Appendix also shows a significant number of IT/IS firms or departments have been prominent in the movement toward PMO establishment.

Improving all elements of project management – including performance outcomes, lessons learned, and support for project managers.	36
Achieving a common project management approach – including methodologies, standards and accountability.	25
Achieving more efficient use of human and other resources in a multiple project environment.	16
Improving quality and customer satisfaction.	13
Incorporating project management with strategic goals and developing competitive advantages.	10
Directed by an external client, CEO or other senior executive (e.g. CIO) due to positive attitude/experience with project management.	8
Change to a matrix organization and the complexity of a multiple project environment.	4

Table 4.7 Frequently Reported Motivations for PMO Establishment for the Random Sample

4.3.2 PMO Mission Statement

Of the 113 respondents, 52 (or 46%) reported having a PMO mission statement as shown in Table 4.8. Appendix F (Part I) contains information on the details of the various statements. Per agreement with the respondents, organization names have been removed.

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Yes, and provided mission detail.	30
Yes, but unable to provide mission detail.	22
No, do not have mission statement.	53
Don't know, or did not answer the question.	8
Total	113

Table 4.8 Summary of Responses on Question "Does Your PMO Have A Mission Statement?" for the Random Sample

Representative PMO mission statements (or excerpts from them) are listed below:

- To provide PM best practices across the enterprise (experts, processes, tools).

- A competency center designed to create, consolidate and leverage best practices. It functions as a hub for managing information about projects, but not for managing the projects themselves.

- From the corporate level, it is responsible for the development and standardization of "project-related" methodologies, tools, processes and services.

- To provide leadership to insure timely completion of projects within budget constraints.

- To support successful delivery of organizational (project) endeavors.

- To help reduce the number of troubled or failed projects.

- To help bring about standardization of PM methodologies.

- To help provide early detection of potential problems.

- To provides a centralized method for balancing the enterprise-wide portfolios of projects by employing best practices and state-of-the-art approaches to project and quality management.

- Using PMI methodologies to constantly improve and advance PM results and efficiencies for projects and clients.

- To support the delivery organizations in providing world-class project management processes and training to ensure successful outcomes and exceed customer expectations.

- To bring about consistency in project management functions and to improve knowledge sharing.

- To support the organization's strategic direction by improving project management.

- To provide support to the organization and project teams through project manager selection and training – as well as for methods, tools, and other services.

It should be noted that, in general, the respondents of the random survey did not seem to have the same degree of access to various documents (such as mission statements) as did the targeted respondents who are PMO representatives or managers. The latter results are discussed in Chapter Six.

Even a brief review of the above list and Appendix F reveals a wide range of purposes as expressed in the various mission statements. Some focus more broadly on high-level organizational goals while others tend to concentrate more specifically on improving PM skills within the organization.

4.3.3 PMO Policy Documents

A point of inquiry in the survey dealt with what organizational policy documents had been issued on the establishment and use of their PMO. Appendix G (Part I) provides the detailed responses and Table 4.9 shows that 64 (or 57%) of the respondents

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reported having such documents. Another 26 respondents (or 23%) reported not knowing about such documents or did not answer the question.

Yes	64
No	13
Don't know; or did not answer the question	26
Total	113

Table 4.9 Summary of Responses on Question "Does Your PMO Have Policy Document(s)?" for the Random Sample

The following is a list of representative policy documents and areas identified by the respondents:

- PMO charter

- Project management policy/strategy

- Project management methodology guidelines

- Various standard operating procedures (SOPs)

- Business justification document

- Policies on key areas (e.g. training, project tracking, planning, configuration management, quality assurance, risk management)

- Project metrics and standards

- PMO website or corporate website

- Reporting mechanisms

- IT governance policy

- Best practices database

4.4 Summary

An extensive survey process led to the receipt of 234 responses out of a sample population of 1000 – for a response rate of 23.4%. Of these 234 responses, 113 indicated the presence of a PMO or an entity similar to a PMO. Major research findings discussed in this chapter may be summarized as follows:

- Beginning in the mid-1990s, there was a distinct increase in the number of PMOs being established.

- An overwhelming proportion of the PMOs was approved by top/upper management.

- Full-time staffing is used by 93% of the 113 respondents having a PMO or a comparable entity.

- PMOs reporting to senior management predominate over those reporting to a lower level by a ratio of over three to one.

- There is great diversity in the titles of PMO heads, although about 20% suggest a PMO connection and another 55% involve either "manager" or "director."

- The most frequently reported policy documents were a PMO charter and PM guidelines.

As summary points, it seems reasonable to conclude that PMOs can be seen as supportive and facilitative entities rather than as another level of directive management. Nevertheless, it also is very evident that top management interest and involvement are present in significant ways.

Finally, it must be noted that the responses from the randomly selected PMI members are less rich in content than those received from the targeted organizations. This may be observed in Appendices E, F, and G; these documents contain information taken directly from the survey responses.

CHAPTER FIVE

RESULTS FROM THE RANDOM SURVEY –
REGARDING PROJECT PERFORMANCE

5.1 Introduction

This chapter presents the random survey results on project performance and functions and services in five sections. After this introduction, the first section provides summary information about the projects on which survey respondents reported. The second section presents data conditioning procedures, including factor analysis, a Cronbach alpha test, and independent samples t-tests. The third section presents the linear regression models, and inferences drawn on specific hypothesis tests. Information was collected from the "PMI Member Questionnaire" Part One, Three, and Four (see Appendix D). Finally, a summary section of key points and findings of this chapter is presented.

5.2 Background Information on Respondents and Reported Projects

To identify the end product of the project on which respondents reported, seven pre-coded responses were provided, along with an "Other" category inviting a brief description of the major project deliverable. The results are listed in Table 5.1.

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Type	Absolute Frequency	Relative Frequency
Physical Facility	32	13.68%
Hardware, Equipment, or Appliance Development	36	15.38%
Food, Drug, or Soft Goods Development	5	2.14%
New or Improved Process or Software Development	123	52.56%
Service or Test	21	8.94%
Study or Report	8	3.42%
Department Reorganization or Moving to a New Facility	9	3.85%
Other	0	0%
Total	**234**	**100%**

Table 5.1 Frequency Distribution on End Product for the Random Sample

To identify what role the respondent played in the project on which they were reported, five pre-coded responses were provided, along with an "Other" category inviting a brief description. The results are listed in Table 5.2.

To indicate the industry in which the project was performed, seven pre-coded responses were provided, along with an "Other" category inviting a brief description. The results are listed in Table 5.3.

Type	Absolute Frequency	Relative Frequency
Project Manager	169	72.22%
Support Manager on Project Team	23	11.54%
Manager of Project Managers	5	2.14%
Project Function Manager	4	2.14%
Project Team Member (Technical)	9	3.85%
Project Team Member (Administrative)	8	3.42%
Member of Business Unit Affected by the Project	5	2.14%
Other (subtotal)	**11**	**4.69%**
Internal Consultant	6	2.56%
Consultant	2	0.85%
Project Sponsor	2	0.85%
Museum Curator	1	0.43%
Grand Total	**234**	**100%**

Table 5.2 Frequency Distribution on Position of Respondent for the Random Sample

Type	Absolute Frequency	Relative Frequency
Manufacturing	29	12.39%
Construction	11	4.7%
Engineering	11	4.7%
Business Management	11	4.7%
Software Development	26	11.11%
Telecommunications	31	13.25%
Computers/Data Processing/Information Technology	35	14.96%
Other (subtotal)	**80**	**34.18**
Transportation	7	2.99%
Retail	3	1.28%
Health Care	4	1.71%
Entertainment	2	0.85%
Energy	5	2.14%
Aerospace	3	1.28%
Financial/Insurance	25	10.68%
Pharmaceutical	4	1.71%
Government	13	5.56%
Education	3	1.28%
Utility	7	2.99%
Miscellaneous	4	1.71%
Grand Total	**234**	**100%**

Table 5.3 Frequency Distribution on Industry for the Random Sample

Project size was reported by selecting one of 5 bins, ranging from projects of less than $100,000 to those exceeding $50 million. Results are summarized in Table 5.4.

Size (in U.S. $)	Absolute Frequency	Relative Frequency
Less than $100,000	32	13.68%
Greater $100,000 to $1 million	71	30.34%
Greater $1 million to $10 million	76	32.48%
Greater $10 million to $50 million	32	13.68%
Greater than $50 million	23	9.83%
Total	234	100%

Table 5.4 Frequency Distribution on Project Size for the Random Sample

Several quantitative values were also gathered, including both project information and demographics about the individual survey respondents. Descriptive statistics for these items are presented in Table 5.5.

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Variable	Mean	Median	Mode	Min	Max	S.D.
Project Duration (month)	15.74	10	7	½	184	19.42
Ongoing Team Size (person)	27	10	10	1	1000	88.02
Peak Team Size (person)	71	15	15	1	5000	352.47
Years of Full-Time Work Experience	20.27	20	20	0.5	45	8.41
Years Spent Working on Projects	12.23	10	10	0.16	33	7.36

Table 5.5 Descriptive Statistics for Quantitative Questions for the Random Sample

5.3 Validity and Reliability of the PMO Constructs

Before examining the results shown in Table 5.6 and Table 5.7, it may be helpful to provide a reminder of the abbreviations used in the tables and text.

- ❖ ST – Representing PM Standards and Methods

- ❖ AR – Representing Project Historical Archives

- ❖ AD – Representing Project Administrative Support

- ❖ HR – Representing Human Resources/Staffing Assistance

- ❖ TR – Representing PM Training

- ❖ CN – Representing PM Consulting and Mentoring

Further, at this point, it may be useful to refer to Appendix D, showing the questionnaire for PMI members, Parts One, Three, and Four.

A factor analysis using the varimax rotation method was performed on the items comprising each of the six PMO independent variables. The initial principal component analysis used the *latent root criterion*, in which any factor with an *eigenvalue* greater than one was considered significant, and the remainder were ignored. The first ten principal components are listed in Table 5.6, with six satisfying the latent root criterion that have an eigenvalue greater than one. They are FACTOR1 with an eigenvalue of 13.64, FACTOR2 with an eigenvalue of 2.13, FACTOR3 with an eigenvalue of 1.71, FACTOR4 with an eigenvalue of 1.53, FACTOR5 with an eigenvalue of 1.15, and FACTOR6 with an eigenvalue of 1.12.

```
Initial Factor Method: Principal Components
Eigenvalues of the Correlation Matrix:  Total = 30 Average = 1

                                   Factor
                  1        2        3        4        5
Eigenvalue    13.6410   2.1257   1.7076   1.5330   1.1499
Difference    11.5153   0.4181   0.1746   0.3831   0.0268
Proportion     0.4547   0.0709   0.0569   0.0511   0.0383
Cumulative     0.4547   0.5256   0.5825   0.6336   0.6719

                  6        7        8        9       10
Eigenvalue     1.1231   0.9130   0.7732   0.7097   0.5981
Difference     0.2101   0.1398   0.0635   0.1116   0.0677
Proportion     0.0374   0.0304   0.0258   0.0237   0.0199
Cumulative     0.7093   0.7398   0.7656   0.7892   0.8091
```

Table 5.6 Eigenvalues of the Correlation Matrix in Principal Component Analysis

More specifically, the results confirmed the six PMO functions and services, matching three of the functions and services directly. Full results are presented in Table 5.7, with the items – questionnaire items – comprising each factor highlighted in bold print: PM Standards and Methods (FACTOR3), Project Historical Archives (FACTOR1) and PM Consulting and Mentoring (FACTOR5). However, the first item under PM Training (TR1 –refer to item number one under 3E Training in the survey questionnaire for PMI members in Appendix D) was loaded with the Human Resources and Staffing Assistance (FACTOR2). The final two items under Project Administrative Support (AD4 and AD5) were loaded with PM Training (FACTOR4). The remaining three items under Project Administrative Support (AD1, AD2, and AD3) formed FACTOR6.

The test suggests that AD4 and AD5 have stronger ties with the PM Training variable than with the Project Administrative Support variable. It is conceivable that project management software standardization (AD4) and availability (AD5) have a stronger affinity with the activities of software training and one-on-one coaching; thus, these two question items better belong to the PM Training construct.

The test also suggests that TR1 relates more consistently with the Human Resource/Staffing Assistance construct than with the PM Training construct. The point is

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conceded that the item "Project team members received assistance in identifying and documenting their existing skill sets" should have been grouped with the Human Resource/Staffing Assistance in the survey instruments.

			Rotated Factor Pattern			
ITEMS	**FACTOR1**	**FACTOR2**	**FACTOR3**	**FACTOR4**	**FACTOR5**	**FACTOR6**
ST1	0.17781	0.55624	**0.59954**	-0.08131	-0.03411	-0.02019
ST2	0.28754	0.15378	**0.75121**	0.27107	0.01827	0.08613
ST3	0.33162	0.10638	**0.60388**	0.24751	0.20773	0.13800
ST4	0.09132	0.08367	**0.81840**	0.18220	0.12164	0.25623
ST5	0.23363	0.13868	**0.69294**	0.04150	0.31121	0.16508
AR1	**0.65940**	0.18668	0.44767	0.12803	0.11801	0.12057
AR2	**0.76747**	0.16179	0.31559	0.08204	0.24449	0.09930
AR3	**0.81741**	0.17288	0.21058	0.08076	0.19905	0.12858
AR4	**0.76482**	0.16455	0.25388	0.18532	0.26536	0.16310
AR5	**0.77323**	0.10498	0.07326	0.21943	0.12453	0.26092
AD1	0.25293	0.16952	0.30055	0.14940	0.08363	**0.75050**
AD2	0.13935	0.21871	0.31030	0.17089	0.21922	**0.76437**
AD3	0.30256	0.33680	0.04402	-0.01622	0.20869	**0.59793**
AD4	0.05900	0.09493	0.20945	**0.72189**	0.12250	0.31035
AD5	-0.05401	0.07095	0.19393	**0.76365**	0.23001	-0.01274
HR1	0.05704	**0.64061**	0.31097	0.17603	0.28572	0.17092
HR2	0.17132	**0.64685**	0.31111	0.21541	0.36085	0.13214
HR3	0.25064	**0.63443**	0.25185	0.12649	0.34983	0.30640
HR4	0.23471	**0.69953**	0.08060	0.26458	0.13060	0.17885
HR5	0.07164	**0.62091**	-0.05270	0.25685	0.11607	0.44731
TR1	0.36714	**0.50147**	0.10585	0.39681	0.25416	0.19096
TR2	0.40841	0.36405	-0.04229	**0.55695**	0.21844	0.13594
TR3	0.42741	0.21198	0.04756	**0.62525**	0.14762	0.14129
TR4	0.30811	0.34091	0.17239	**0.59834**	0.10492	-0.07431
TR5	0.19883	0.20481	0.16505	**0.50348**	0.48284	0.12976
CN1	0.33140	0.16200	0.35493	0.40425	**0.52211**	0.20887
CN2	0.19068	0.21411	0.14068	0.37734	**0.60195**	0.32960
CN3	0.34672	0.35139	0.14801	0.38060	**0.48629**	0.02343
CN4	0.16276	0.19892	0.09653	0.15511	**0.79749**	0.14638
CN5	0.29168	0.20568	0.13519	0.16452	**0.72583**	0.08861

Table 5.7 Factor Analysis for PMO Independent Variables

As a result, the original set of variables, ST, AR, AD, HR TR and CN, were replaced by ST, AR, NAD, NHR, NAD, and CN, where the "N" before variable AD, HR, and TR stands for "new." The revised set – ST, AR, NAD, NHR, NTR, and NCN - was used for subsequent analyses.

❖ ST – Representing PM Standards and Methods

❖ AR – Representing Project Historical Archives

❖ NAD – Representing Project Administrative Support

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❖ **NHR** – Representing Human Resources/Staffing Assistance

❖ **NTR** – Representing PM Training

❖ **CN** – Representing PM Consulting and Mentoring

Also, from here after, the dependent variable Reported Project Success will be represented by DV.

❖ **DV** – Representing Reported Project Success

The technique used to measure the reliability of the PMO constructs in the questionnaire was the *Cronbach alpha* test. It shows whether each questionnaire item making up a factor is behaving in a homogeneous fashion with the mean factor score (and thus with the other items). Various minimal alpha values have been recommended, from 0.35 by Van de Ven and Ferry,[1] to 0.50 by Nunnally,[2] to 0.70 by Hair et al.[3] Table 5.8 shows the alpha values for all six PMO variables, as well as the Pearson Correlation coefficient between each item and the 5-item mean. All alpha values substantially exceed each of the minimum thresholds listed above. The factor analysis helped move items to more appropriate variable constructs.

Descriptive statistics for all six independent variables and the dependent variable are provided in Table 5.9. Note that the standard deviation for each variable indicates sufficient spread to enable a regression analysis to be performed.

Variable	N	Mean	S. D.	Min	Max
ST	232	5.03	1.47	1.00	7.00
AR	228	3.60	1.75	1.00	7.00
NAD	228	4.18	1.84	1.00	7.00
NHR	232	4.19	1.66	1.00	7.00
NTR	234	4.55	1.51	1.00	7.00
CN	232	5.66	1.63	1.00	7.00
DV	234	5.66	1.14	1.07	7.00

Table 5.9 Descriptive Statistics for PMO Independent and Dependent Variables for the Random Sample

Research Variable	Item	Item-Mean correlation	Alpha
ST (PM Standards and Methods)	ST1	0.742	0.8499
	ST2	0.829	
	ST3	0.796	
	ST4	0.798	
	ST5	0.815	
AR (Project Historical Archives)	AR1	0.836	0.9159
	AR2	0.884	
	AR3	0.904	
	AR4	0.891	
	AR5	0.814	
NAD-new construct (Project Administrative Support)	AD1	0.871	0.8115
	AD2	0.890	
	AD3	0.811	
NHR-new construct (Human Resource/ Staffing Assistance)	HR1	0.812	0.8982
	HR2	0.816	
	HR3	0.855	
	HR4	0.799	
	HR5	0.778	
	TR1	0.798	
NTR-new construct (PM Training)	AD4	0.750	0.8579
	AD5	0.824	
	TR2	0.786	
	TR3	0.759	
	TR4	0.736	
	TR5	0.710	
CN (PM Consulting and Mentoring)	CN1	0.853	0.8865
	CN2	0.836	
	CN3	0.838	
	CN4	0.833	
	CN5	0.800	

Table 5.8 Cronbach Alpha Values for the Independent Variables

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Independent samples using two tailed t-tests for equal variance were performed. It was intended to determine whether there was any bias in questionnaire responses between those who responded to the first mailing and those who did not (but waited until the second mailing). This measure helps to ensure the *external validity* of the research effort. Descriptive statistics for the first and second mailings are presented in Table 5.10.

Variable		N	Mean	S. D.
ST	First Mailing	113	5.06	1.50
	Second Mailing	119	4.99	1.42
AR	First Mailing	111	3.69	1.64
	Second Mailing	117	3.52	1.84
NAD	First Mailing	111	4.11	1.89
	Second Mailing	117	4.25	1.80
NHR	First Mailing	113	4.23	1.57
	Second Mailing	119	4.16	1.76
NTR	First Mailing	114	4.52	1.51
	Second Mailing	120	4.59	1.52
CN	First Mailing	112	4.45	1.59
	Second Mailing	120	4.38	1.68

Table 5.10 Descriptive Statistics for the First and Second Mailings on PMO Function and Service Variables for the Random Sample

The test indicates that the mean value of independent variable ST from the first mailing was same in the population as the second mailing, with a 95% confidence level. The same conclusion also obtained for the variables AR, NAD, NHR, NTR, and CN. It suggests that in the population there is no bias in questionnaire responses between those who responded and those who did not. Table 5.11 presents a summary of t-test results on PMO function and service variables, including results of F tests for constant variance. Table 5.12 presents the interpretation of hypothesis testing between the first and second mailing.

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Independent Variable	Research Hypothesis H_a	Test Value	p-Value	Accept H_a?
ST	$\sigma^2_{first} \neq \sigma^2_{second}$	F'-value: 1.07	0.732	No
	$\mu_{first} \neq \mu_{second}$	t-value: 0.34	0.7337	No
AR	$\sigma^2_{first} \neq \sigma^2_{second}$	F'-value: 1.25	0.2375	No
	$\mu_{first} \neq \mu_{second}$	t-value:0.73	0.4671	No
NAD	$\sigma^2_{first} \neq \sigma^2_{second}$	F'-value: 1.11	0.5886	No
	$\mu_{first} \neq \mu_{second}$	t-value: -0.58	0.5599	No
NHR	$\sigma^2_{first} \neq \sigma^2_{second}$	F'-value: 1.25	0.2307	No
	$\mu_{first} \neq \mu_{second}$	t-value:0.29	0.7700	No
NTR	$\sigma^2_{first} \neq \sigma^2_{second}$	F'-value: 1.01	0.9655	No
	$\mu_{first} \neq \mu_{second}$	t-value:-0.36	0.7219	No
CN	$\sigma^2_{first} \neq \sigma^2_{second}$	F'-value: 1.13	0.5287	No
	$\mu_{first} \neq \mu_{second}$	t-value:0.34	0.7333	No

Table 5.11 Summary of Test Results between the First and Second Mailings on PMO Function and Service Variables for the Random Sample

Independent Variable	Research Hypothesis (H_a)	Implication:
ST	The mean ST value in the population from the first mailing differs from the second mailing.	Not Supported
AR	The mean AR value in the population from the first mailing differs from the second mailing.	Not Supported
NAD	The mean NAD value in the population from the first mailing differs from the second mailing.	Not Supported
NHR	The mean NHR value in the population from the first mailing differs from the second mailing.	Not Supported
NTR	The mean NTR value in the population from the first mailing differs from the second mailing.	Not Supported
CN	The mean CN value in the population from the first mailing differs from the second mailing.	Not Supported

Table 5.12 Test Interpretations of Hypothesis Testing between the First and Second Mailings on PMO Service and Function Variables for the Random Sample

The Pearson correlation coefficients were formed to investigate the possibility of a high degree of correlation among the new variables identified by the factor analysis. Results are presented in Table 5.13. All pair-wise correlation values except one falls below 0.75, with the remaining value being less than 0.7. These are all well below the

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threshold value of 0.9,[4] indicating that collinearity would not be a problem for the subsequent regression model. Note that the data in columns ST through DV are bivariate correlations. Values in the last column are R^2 values when the variable in the left margin is regressed on the remaining independent variables.

Pearson Correlation Coefficients /
Prob > |R| under Ho: Rho = 0 /
Number of Observations

	ST	AR	NAD	NHR	NTR	CN	DV	R^2
ST	1.0000							.4589
	0.0							
	232							
AR	0.5418	1.0000						.4591
	0.0001	0.0						
	226	228						
NAD	0.5271	0.5247	1.0000					.4757
	0.0001	0.0001	0.0					
	226	223	228					
NHR	0.5995	0.5701	0.6258	1.0000				.6465
	0.0001	0.0001	0.0001	0.0				
	230	226	227	232				
NTR	0.5294	0.4932	0.5091	0.6448	1.0000			.5290
	0.0001	0.0001	0.0001	0.0001	0.0			
	232	228	228	232	234			
CN	0.5506	0.6160	0.5651	0.7300	0.6731	1.0000		.6672
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0		
	231	226	226	231	232	232		
DV	0.3526	0.1437	0.1673	0.1866	0.2107	0.1845	1.0000	
	0.0001	0.0301	0.0114	0.0043	0.0012	0.0048	0.0	
	232	228	228	232	234	232	234	

Table 5.13 Pearson Correlation Coefficient on PMO Function and Service Variables for the Random Sample

However, a lack of high pair-wise correlation values does not ensure a lack of collinearity – it also may be due to the combined effect of three or more independent variables. To determine the existence of collinearity, a variance inflation factor (VIF) test was performed, with results in Table 5.14.

The VIF value for the multiple regression model was 1.1578, (1 / [1 − R^2] = 1 / [1 − 0.1363]). This value was well below the threshold VIF value of 10, which would indicate that collinearity was unduly influencing the least squares estimates.[5] However, a low VIF value does not guarantee a lack of collinearity in the model either. In fact, the model's VIF value was smaller than each variable's individual VIF value (shown in the

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last column of Table 5.14), which indicates that the dependent variable related less to the independent variables than they did to themselves. In addition, when each independent variable was regressed on the remaining independent variables, the obtained R^2 values (see Table 5.13) were larger than the regression $R^2 = 0.1363$ (see Table 5.14). Thus, indicating the existence of a collinearity problem.

```
Dependent Variable: Reported Project Success
Root MSE   1.07887     R-square   0.1363

                                  Variance
Variable  DF     Tolerance      Inflation
INTERCEPT  1         .          0.00000000
ST         1     0.54109630     1.84809988
AR         1     0.54087052     1.84887135
NAD        1     0.52430601     1.90728313
NHR        1     0.35347649     2.82904249
NTR        1     0.47102362     2.12303579
CN         1     0.33275324     3.00522992
```

Table 5.14 Variance Inflation Factors

There are several ways to deal with this collinearity problem. After evaluating several options (see Table 5.15), it was concluded that the six independent variables should all serve as a single index – the PMO Presence Index – which turned out to confirm the research hypothesis that the PMO phenomenon could be considered a new *critical success factor*. Detailed results on this issue are discussed in Chapter Eight.

So the search for a valid multiple regression model utilizing the independent variables ST, AR, NAD, NHR, NTR, and CN was still carried out. Results are presented in the following section.

	Remedy Measure	Decision to Apply?	Major Reason
1	Increase sample size	No	Survey has been completed.
2	Increase the amount of the information	No	No previous similar research has been conducted for this topic in the past.
3	Generate and use principal component scores to identify the correct set of independent variables	No	(1) The six chosen variables were already confirmed by factor analysis. (2) Difficult to explain the underlying reasons for "new" variables in further exploration.
4	Ridge Regression	No	Reduces the variance of the resulting estimates at the expense of being biased.
5	Delete independent variable(s) from equation that is causing trouble	Yes	Insufficient evidence that each variable represents an indicator of a distinct theoretical concept.
6	Combine two or more independent variables into one variable	Yes	Insufficient support that each variable is not merely another indicator of the same concept.

Table 5.15 Options for Collinearity Remediation

5.4 Regression Modeling Estimates for PMO Functions and Services

This section describes the inferences to be drawn between the dependent variable Reported Project Success and the six independent variables representing PMO functions and services. ST, AR, NAD, NHR, NTR and CN. The alternate hypotheses are listed below:

1. H_{a-PMO1}: There is a linear relationship between PM standards and methods and reported project success.

2. H_{a-PMO2}: There is a linear relationship between project historical archives and reported project success.

3. H_{a-PMO3}: There is a linear relationship between project administrative support and reported project success.

4. H_{a-PMO4}: There is a linear relationship between human resource/staffing assistance and reported project success.

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5. $H_{a\text{-}PMO5}$: There is a linear relationship between PM training and reported project success.

6. $H_{a\text{-}PMO6}$: There is a linear relationship between PM consulting and mentoring and reported project success.

t-tests were performed for each simple linear regression slope coefficient, with results shown in Table 5.16. For regression with variables ST, NHR, and CN respectively, the models underwent a weighted least squares (WLS) transformation to satisfy the regression assumptions. For regression with the variable CN, the dependent variable (DV) underwent a reciprocal transformation to satisfy the regression assumptions. See Appendix H for further details. Interpretations of these tests are presented in Table 5.17, assuming a 95% confidence level.

Independent Variable	Transformation	β_0	β_1	t Value	p-value	R^2
ST	Model - WLS	4.514	0.227	4.44	0.0001	0.0789
AR	No	5.317	0.095	2.18	0.0301	0.0207
NAD	No	5.216	0.105	2.55	0.0114	0.0280
NHR	Model - WLS	4.989	0.157	3.60	0.0004	0.0533
NTR	No	4.935	0.159	3.28	0.0012	0.0444
CN	DV - Reciprocal	0.245	-0.011	-2.81	0.0053	0.0333

Table 5.16 Coefficient Hypothesis Test on PMO Function and Service Variables for the Random Sample

Independent Variable	Expected Result	Implication
ST	Linear (positive) relationship with Reported Project Success.	Supported
AR		Supported
NAD		Supported
NHR		Supported
NTR		Supported
CN		Supported

Table 5.17 Interpretation of Coefficient Hypothesis Test on PMO Function and Service Variables for the Random Sample

Thus, six simple regression models were generated from the random survey:

1. **Reported Project Success = 4.541 + 0.227*ST**

The expected result was confirmed. For a one-unit increase in the independent variable ST, there would be a 0.227 increase in the dependent variable Reported Project

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Success. 7.89% of variation on dependent variable is explained by the independent variable ST.

2. Reported Project Success = 5.317 + 0.095*AR

The expected result was confirmed. For a one-unit increase in the independent variable AR, there would be a 0.095 increase in the dependent variable Reported Project Success. 2% of variation on dependent variable is explained by the independent variable AR.

3. Reported Project Success = 5.216 + 0.105*NAD

The expected result was confirmed. For a one-unit increase in the independent variable NAD, there would be a 0.105 increase in the dependent variable Reported Project Success. 2.8% of variation on dependent variable is explained by the independent variable NAD.

4. Reported Project Success = 4.989 + 0.157*NHR

The expected result was confirmed. For a one-unit increase in the independent variable NHR, there would be a 0.157 increase in the dependent variable Reported Project Success. 5.33% of variation on dependent variable is explained by the independent variable NHR.

5. Reported Project Success = 4.935 + 0.159*NTR

The expected result was confirmed. For a one-unit increase in the independent variable NTR, there would be a 0.0159 increase in the dependent variable Reported Project Success. 4.44% of variation on dependent variable is explained by the independent variable NTR.

6. Reported Project Success (reciprocal) = 0.245 - 0.011*CN

The expected result was confirmed after appropriate transformation. For a one-unit increase in the independent variable CN, there would be a 0.011 *decrease* in the reciprocal dependent variable Reported Project Success. 3.33% of variation on dependent variable is explained by the independent variable CN.

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In attempting to construct multiple linear regression models from the random survey data, the Pearson correlation coefficients reveals that there are low to moderate positive relationships between dependent and independent variables (see Table 5.13). Furthermore, all attempted multiple regression models are in violation of two or more of the assumptions of linearity, homoscedasticity, and normality of the residuals. Thus, no multiple regression models are obtained from the random data.

5.5 Additional Information on Having A PMO, Having No-PMO, and Having Something In-Between A PMO and No-PMO

This section examines whether there is a high score for reported project success in organizations that have established PMO entities, in comparison to organizations that have not done so. Thus, the research hypothesis is:

> H_a: The mean scores of reported project success differ between organizations having a PMO, having no PMO, and having something in-between.

It also examines whether the use of PMO functions and services differ significantly among organizations having PMOs, having no PMO or having someone working on PMO functions and services where no formal entity had been established yet. It was intended to determine whether the establishment of a PMO entity contributes to the use of PM standards and methods, PM historical archives, PM administrative support, PM human resources/staffing assistance, PM training, and PM mentoring and consultancy. Thus, the research hypothesis is:

> H_a: The mean scores for each of the PMO functions and services variables (ST, AR, NAD, NHR, NTR and CN) differ between organizations having a PMO, having no PMO, and having something in-between.

ANOVA tests were used on variable mean scores for ST, AR, NAD, NHR, NAD, CN, and DV (Reported Project Success). Results are shown in Table 5.18.

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Variable	Research Hypothesis H_a	F Test Value	p-Value	Accept H_a?
ST		6.30	0.0022	Yes
AR		9.28	0.0001	Yes
NAD		2.76	0.0653	No
NHR	H_a: Not $[\mu_{pmo} = \mu_{no} = \mu_{in\text{-}between}]$	3.34	0.0371	Yes
NTR		7.46	0.0007	Yes
CN		5.57	0.0043	Yes
DV		0.60	0.5519	No

Table 5.18 ANOVA Test for PMOs, No-PMOs, and In-Betweens for the Random Sample

Also, Sheffe's *a-posteriori* test was conducted to further investigate variable status. Results for Sheffe's grouping are presented in Table 5.19. When the populations share identical codes (such as three *A*s), the means among three groups are not statistically different; but when they have different codes (such as *A, B, AB*), the means of the three groups are statistically different.

More specifically, for NAD, NHR, and DV variables, it is concluded that among populations of PMOs and No-PMOs, there is no statistical evidence at a 95% confidence level to conclude that the mean scores differ is true. Likewise, among populations of PMOs and In-Betweens, there is no statistical evidence at a 95% confidence level to conclude that the mean scores differ is true. Lastly, among populations of No-PMOs and In-Betweens, there is no statistical evidence at a 95% confidence level to conclude that the mean scores differ is true.

For ST, AR, and CN variables, it is concluded that among populations of PMOs and No-PMOs, there is statistical evidence at a 95% confidence level to conclude that the mean scores differ is true. Likewise, among populations of PMOs and In-Betweens, there is statistical evidence at a 95% confidence level to conclude that the mean scores differ is true. Lastly, among populations of No-PMOs and In-Betweens, there is statistical evidence at a 95% confidence level to conclude that the mean scores differ is true.

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Variable	Population	N	Mean	S.D.	Scheffe Codes [*] ($\alpha = 0.05$)
ST	PMO	111	5.32	1.56	A
	No PMO	45	4.43	1.43	B
	In Between	76	4.95	1.26	AB
AR	PMO	110	4.06	1.77	A
	No PMO	44	2.83	1.68	B
	In Between	74	3.37	1.56	AB
NAD	PMO	110	4.47	1.82	A
	No PMO	44	3.85	2.09	A
	In Between	74	3.94	1.68	A
NHR	PMO	112	4.47	1.77	A
	No PMO	45	3.78	1.48	A
	In Between	75	4.04	1.55	A
NTR	PMO	113	4.93	1.44	A
	No PMO	45	4.05	1.55	B
	In Between	76	4.29	1.48	B
CN	PMO	112	4.75	1.59	A
	No PMO	45	3.85	1.69	B
	In Between	75	4.26	1.58	AB
DV	PMO	113	5.66	1.22	A
	No PMO	45	5.51	1.29	A
	In Between	76	5.75	0.92	A

Table 5.19 Scheffe's *Posteriori Test* **for PMOs, No-PMOs and In-Betweens for the Random Sample.**

For the NTR variable, it is concluded that among populations of PMOs and No-PMOs, there is statistical evidence at a 95% confidence level to conclude that the mean scores differ is true. Likewise, among populations of PMOs and In-Betweens, there is statistical evidence at a 95% confidence level to conclude that the mean scores differ is true. Lastly, among populations of No-PMOs and In-Betweens, there is no statistical evidence at a 95% confidence level to conclude that the mean scores differ is true.

Finally, Table 5.20 presents the summary results.

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[*] When populations share identical codes (such as three *A*s), the means among the three groups are not statistically different; but when they have different codes (such as *A*, *B*, *AB*), the means are statistically different.

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Variable	Expected Results	Implication:
ST		Not Supported
AR		Not Supported
NAD	The mean values are equal	Supported
NHR		Supported
NTR		Not Supported
CN		Not Supported
DV		Supported

Table 5.20 Summary of Test Results for PMOs, No-PMOs, and In-Betweens for the Random Sample

5.6 Summary

In testing the validity of the PMO functions and services variable constructs, the factor analysis confirmed three original constructs (ST, AR, and CN), as well as helped move certain items to form more appropriate new constructs (NAD, NHR, and NTR). Consequently, the reliability tests for the PMO functions and services variables show each of them display a homogeneous pattern.

In testing the external validity of the research, t-tests on PMO functions and services variables show that the mean values for ST, AR, NAD, NHR, NTR, and CN from the first and second mailing (those who waited the second mailing before responding) are the same. It suggests that in the population there is no bias in questionnaire responses between those who responded and those who did not. However, looking at the industry background of the survey respondents (see Table 5.3), particular industries, such as Computers/Data Processing/Information Technology, Telecommunications, and Software Development, are among areas being the highest in representation.

The VIF test indicates the existence of collinearity in six PMO functions and services variables. After deliberation, no actions were taken for modification, because it confirms the research hypothesis that these six PMO functions and services variables

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could be the indicator of the PMO phenomenon (which will be tested in Chapter Eight) as to whether the PMO Presence Index is one of the CSFs in achieving project success.

The background information on reported projects reveals that the end products of 123 projects were new or improved process of software development, and accounted for 53% of the total; this result was followed by 36 end products of hardware, equipment or appliance which accounted for 15%. This shows that PM has been applied quickly in the computer and information technology areas (See Table 5.1). 32% of the projects have a size of between $1 million to $10 million, while less than 10% of the projects have a size of over $50 million and another 14% of the projects have a size of less than $100,000 (see Table 5.4). 72% of the survey respondents played a role of project manager in a recently completed project (See Table 5.2). The survey respondents had an average of 20 years full time work experience and an average of 12 years working on projects.

For developing simple linear regression models, six simple linear regression models were obtained from the random sample. Among PMO functions and services variables, PM Standards and Methods (ST) explains 7.89% of variation on Reported Project Success, followed by Human Resources/Staffing Assistance (NHR) of 5.33%, PM Training (NTR) of 4.44%, PM Consulting and Mentoring (CN) of 3.33%, Project Administrative Support (NAD) of 2.8%, and finally Project Historical Archives (AR) shown as little as 2%. (see Table 5.16).

No multiple linear regression model was able to be generated from the random sample data.

Comparative results for six PMO functions and services variables between responses from organizations that have a PMO and responses from organizations that have No-PMOs indicate that organizations that have a PMO have done much more in promoting PM Standards and Methods (ST), PM Historical Archival (AR), PM Training (NTR), and PM Consulting and Mentoring (CN), while organizations without a PMO

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have done much less in providing such services and functions to project managers and project teams.

Finally, comparative results for Reported Project Success (DV) show no statistical evidence that project success score is higher in organizations that have a PMO than those that do not have one. This was a somewhat surprising result that differs from indication form the literature review.

CHAPTER FIVE ENDNOTES

[1] A. H. Van de Ven and D. L. Ferry *Measuring and Assessing Organizations*, Wiley and Sons, New York, 1980.

[2] J. C. Nunnally *Psychometric Theory* McGraw-Hill, New York, 1978.

[3] J. F. Hair, Jr., R. E. Anderson, R. L. Tatham and W. C. Black *Multivariate Data Analysis*, Fourth Edition, Prentice Hall, Englewood Cliffs, New Jersey, 1995.

[4] *ibid.* p. 127.

[5] John Neter, Michael H. Kutner, Christopher J. Nachtsheim, William Wasserman, "Applied Linear Regression Models," Third Edition, 1996, IRWIN, Page 387.

CHAPTER SIX

INFORMATION FROM THE TARGETED SURVEY -
REGARDING THE PMO

6.1 Introduction

The chapter is divided into four sections, including this introduction. The second section presents descriptive statistics, and the third presents findings on the ancillary research questions regarding the environmental factors surrounding the establishment of PMOs. Information was collected from the "PMO Representatives/Managers Questionnaire." Respondents' organizations were identified as having a PMO or a similar entity. Finally, a summary section is provided.

Invitation letters were sent to 240 potential survey participants selected from the Official Attendee List of the PMI Annual Symposium 2000 in Houston. The target recipients identified themselves as being a member of a PMO or a similar entity.

Another 230 e-mails were sent to contacts among the researcher's own network in the PM field. Those candidates were identified as being either a member of a PMO (most were PMO representatives or mangers) or performing some PMO related work on a regular basis. Also, an invitation message was posted with several PM-related forums such as the PMI Washington DC Chapter newsletter.

These efforts resulted in 157 respondents expressing an interest in participation in the study. A follow up message was sent explaining the survey procedures and asking them to provide the name of a project manager to co-participate. The selection criterion for the co-participant was somebody who had a recently completed a project for the

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organization in which the PMO was located. Ultimately, 52 pairs of respondents agreed to participate in the study jointly, and an additional 44 PMO representatives participated without identifying a counterpart project manager, thus, making a total of 96 respondents associated with a PMO. Responses from the 52 project managers are discussed in Chapter Seven.

6.2 PMO Descriptive Statistics

This section includes information on a number of PMO dimensions and features. While much PMO variety has been encountered in this targeted study, nevertheless it has been possible to sort out and describe them in terms of certain standard management parameters.

6.2.1 PMO Growth

Based on the targeted sample, Figure 6.1 on the next page shows, beginning in the mid-1990s, a distinct increase in the number of PMOs being established. While this result is solidly grounded in data from the targeted population, a broader extension of this trend to project-oriented organizations generally must await future research.

6.2.2 Management Level for PMO Establishment Approval

In keeping with a well-established critical success factor (CSF) involving top management support for improving the effectiveness of PM and project performance (see Table 2.4), the data in Table 6.1 shows an overwhelming proportion of PMOs have been established under the approval of top/upper management. Further research will be required to determine more definitive profiles of PMOs in various organizations that may have an overall top-level PMO as well as lower-level units in various divisions or groups.

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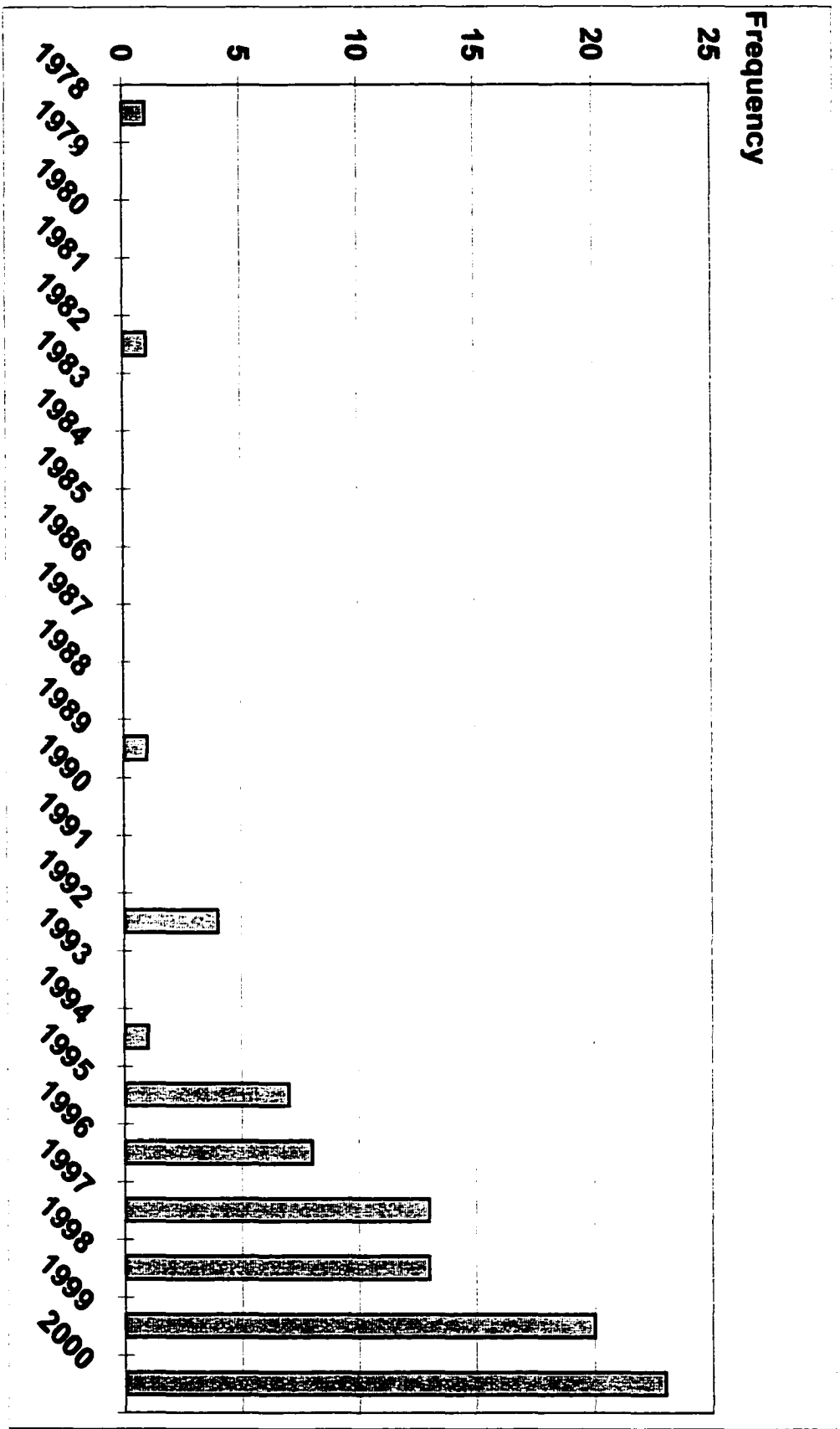
Figure 6.1 Histogram Showing Year in which PMOs Were Established for the Targeted Sample

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PMO Approval Level	
Top/Upper Management	80
Middle/Departmental Management	16
Total	96

Table 6.1 Summary of PMO Approval Level for the Targeted Sample

6.2.3 A Typology for PMOs

Drawing on data collected in the targeted study, one particular typology for PMOs was developed based on the type of staffing as was previously discussed in Chapter Four. Table 6.2 shows the distribution of Type I, II, III in the 96 respondent organizations. Those organizations using only full-time staffing (Type I) constitute 45%, while Type I plus some combination of part-time employees or contractors come to an additional 49%. Thus, it may be concluded that full-time staffing is used in 94% of the 96 respondents – almost the rate reported in the PMI member random survey in Chapter Four.

Type I: Some people perform PMO functions and services as a full-time job responsibility. **Type II:** Some people perform PMO functions and services as part of their job description. **Type III:** Some contractors are used to provide PMO functions and services.	
Type I Only	43
Type II Only	4
Type III Only	1
Type I and Type II	16
Type I and Type III	9
Type II and Type III	1
Type I and type II and Type III	22
Total	96

Table 6.2 Summary of PMO Staffing Type for the Targeted Sample

6.2.4 PMO Reporting Level

In Table 6.3, it is shown that of the 96 respondents, 61% of the PMOs report to top/upper management while 39% report to middle management or departmental management. Reporting to senior management predominates by a large margin, as was the case in the random survey discussed in Chapter Four.

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PMO Reporting Level	
Top/Upper Management	59
Middle/Departmental Management	37
Total	96

Table 6.3 Summary of PMO Reporting Level for the Targeted Sample

6.2.5 Titles for Head of A PMO

While Table 6.2 shows a relatively small number of staffing types, information in Table 6.4 demonstrates a great amount of diversity in titles of those who perform as a PMO head. However, about 25% suggest a direct PMO connection and another 50% involve either "manager" or "director." The PMO connection percentage is essentially the same as reported in Chapter Four (20%), and, the title "manager" or "director" shown here is about the same as the rate reported in Chapter Four (55%).

6.2.6 PMO Funding

For the 69 respondents that reported on PMO funding, the data is presented in Figure 6.2. Among them, 43 (or 62%) estimated less than 2% of the overall organizations' total budget being devoted to a PMO. This is an area where there is no high level of confidence in the validity of the data, and is an area requiring further research. The data shown here – in terms of percent – is essentially identical to the results shown in Chapter Four.

6.3 Environmental Conditions Related to the Establishment and Implementation of PMOs

This section provides summary information on a variety of environmental conditions related to the establishment and implementation of PMOs. Addressed are the topics of motivation, mission statement, policy documents, and functions and services provided by PMOs.

Title	Count
Project Office Manager	9
PMO Administrator	2
PMO Director	4
PMO Manager	2
Director, (Office of) Project Management	4
Manager, PM Center of Competency	1
Manager of Project Administration	1
Chief, Project Management Division	1
Project Management Bureau Head	1
Project Management Analyst	1
Project Management Consultant	1
Certified Executive Project Manager	1
Head of Global PM Excellence	1
VP, Product Development & Program Management Excellence	1
IT Project Office Manager	1
Manager	14
Senior Manager	2
Project Manager	3
Program Manager	3
Group Program Manager	1
Director	12
Senior Director	1
Assistant Director	1
Managing Director	1
Senior Director, Program Management	1
Senior Director, Project & Portfolio Manager	1
Delivery & Knowledge Management Director	1
Vice President	5
CIO (Chief Information Officer)	1
COO (Chief Operation Officer)	1
Director of Service Delivery	1
Manager, Supply Chain Management	1
Business Process Consultant	1
Assistant Vice President	2
Senior Information Systems Manager	1
President	1
Division Chief (Manager)	2
District Manager	1
Lead Analyst	1
Office Chief	1
Superintendent	1
Supervisor	1
Unit Manager (lowest, 5 levels from CEO)	1
Other (Self Directed Team, MAT Chief)	2
Total	96

Table 6.4 Summary of Titles for the Head of A PMO Entity for the Targeted Sample

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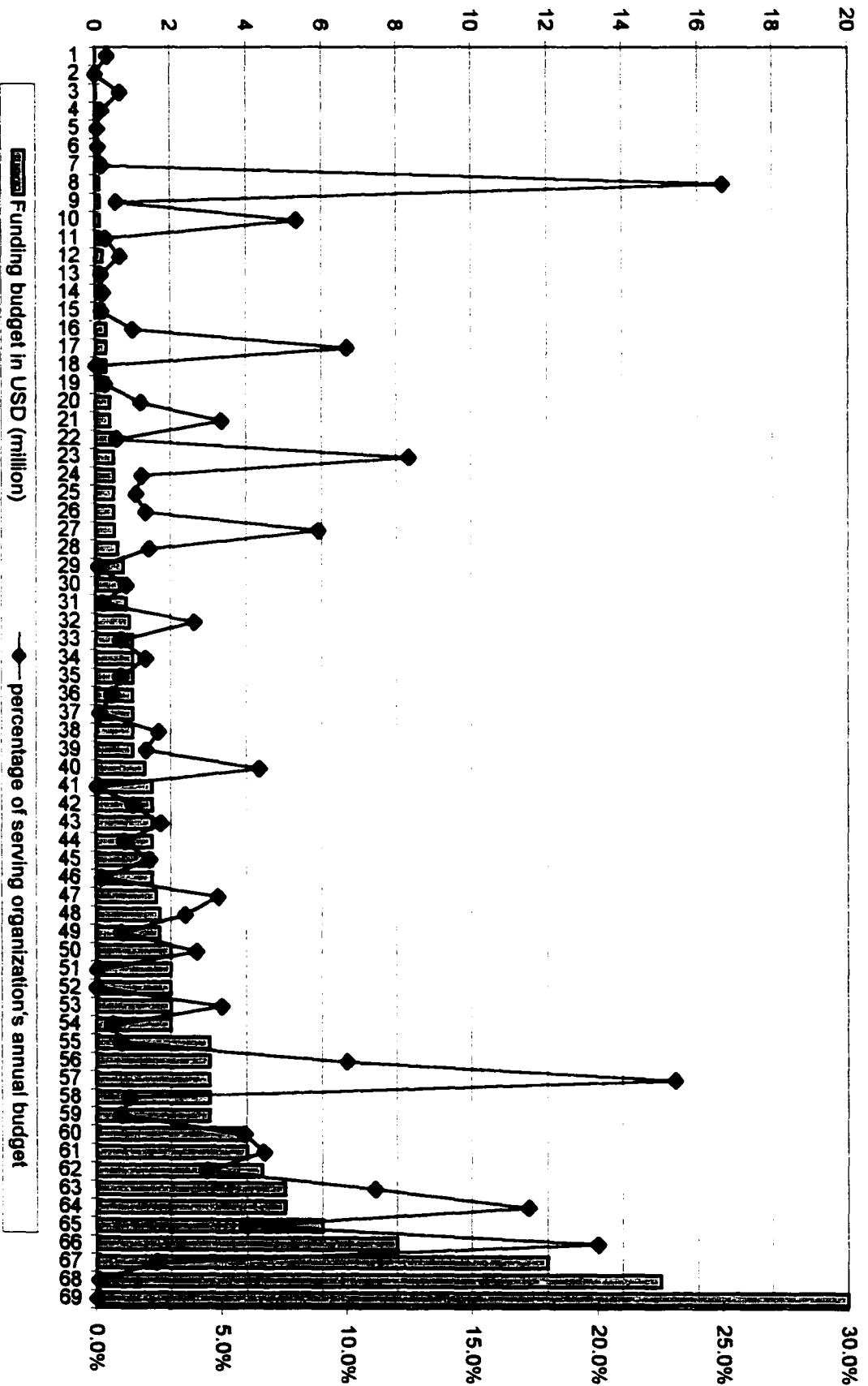
Figure 6.2 PMO Funding and Funding as a Percentage of Its Organization's Annual Budget for Targeted Sample

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6.3.1 Motivation for Establishment of PMOs

Appendix E (Part II) contains detailed information provided by respondents on the motivation for establishing a PMO by their respective organizations. For a few organizations only a single motivating factor was stated, whereas the great majority described multiple motivations. Table 6.5 lists a number of the most frequently reported motivations. The Appendix also shows a significant number of IT/IS firms or departments have been prominent in the movement toward PMO establishment. Comparison of the information in Table 6.5 with that in Table 4.7 in Chapter Four demonstrates a very close correspondence. Only two additional motivations were reported in Chapter Four.

Improving all elements of project management – including performance outcomes, lessons learned, and support for project managers – to reducing number of "troubled projects."	59
Achieving a common project management approach – including methodologies, standards and accountability.	25
Achieving more efficient use of human and other resources in a multiple project environment.	13
Ensuring more consistent project management training, competence, and performance.	10 (newly added)
Improving quality and customer satisfaction.	10
Incorporating project management with strategic goals and developing competitive advantages.	8
Directed by an external client, CEO or other senior executive (e.g. CIO) due to positive attitude/experience with project management.	0 (don't have)
Change to a matrix organization and the complexity of a multiple project environment.	0 (don't have)

Table 6.5 Frequently Reported Motivations for PMO Establishment for the Targeted Sample

6.3.2 PMO Mission Statement

Of the 96 respondents, 69 (or 72%) reported having a PMO mission statement as shown in Table 6.6. Appendix F (Part II) contains the information on the details of the various statements. Per agreement with the respondents, organization names have been

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removed. A significantly higher rate of the existence of PMO mission statements was reported by the targeted respondents versus the random respondents (72% over 46%). The precise reason for this disparity is unknown, but it may well be attributed to the random respondents not being as closely associated with the PMOs. Still, there are closely associated themes that are shown both in the following excerpts and those shown in Section 4.3.2 of Chapter Four.

Yes, and provided mission detail.	69
Yes, but unable to provide mission detail.	2
No, do not have mission statement.	25
Total	96

Table 6.6 Summary of Responses on Question "Does Your PMO Have A Mission Statement?" for the Targeted Sample

Representative PMO mission statements (or excerpts from them) are listed below:

- Development/implementation of an automated, effective project management system using Microsoft Project as the core application supported by training, checklists, templates, and reporting managed by a set of standard business practices.

- Our mission is to advocate and support the implementation of best-in-class project management practices, processes, and principle across the company.

- That our company becomes a project based business that applies and integrates project management into all core business processes and systems.

- To better organize and control the scope of projects and to provide a long-term vision of transferring project management knowledge throughout the organization so that PM becomes endemic to the culture.

- Build a project management culture through mentoring, training, assessment and in a system implementation of project management principles and practices; way that inspires and encourages project participants and

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stakeholders so that the company achieves improved business results while enhancing the skills of its people.

- To guide the organization in improving project management capability and maturity by maintaining internal and external dialogue to seek out best practices and opportunities for improvement. To support a consistent and repeatable practice of project management through centralized information, research and guidance. To create an association of people throughout the organization who are skilled in the art and science of project management for the purposes of networking and mutual support.

- To structure and promote an environment in which processes, methods and tools for systems development, change management and project management are optimally employed and continuously improved to the business in achieving strategic goals.

- To create an integrated delivery process so reliable, effective and responsive that our customers identify us as giving them a competitive advantage.

- To continuously improve project management skills and processes through effective coaching and introduction of best practices.

- To standardize project management disciplines organization-wide. To provide guidance to project managers which will result in successful project implementations that are: on time within budget meet performance measures.

- To support the project managers, in an effort to achieve the objectives of improved project management, project delivery and communication. To define items such as the project life cycle, implement an automated project management tool, establish a project management training and certification program, and introduce principles of repeatability and process improvement.

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- To continuously strive to improve the success of projects involving information technology and to seek out opportunities to enhance the project management capabilities of the IT department and the organization.

- To improve IT's effectiveness in portfolio, program and project management.

Even a brief review of the above list and Appendix F reveals a wide range of purposes as expressed in the various mission statements. Some focus more broadly on high-level organizational goals while others tend to concentrate more specifically on improving PM skills within the organization.

6.3.3 PMO Policy Documents

A point of inquiry in the survey dealt with what organizational policy documents had been issued on the establishment and use of their PMO. Appendix G (Part II) provides the detailed responses and Table 6.7 shows that 75 (or 78%) of the respondents reported having such documents. Another 3 organizations (or 3%) reported being in the process of preparing a variety of policy documents. If the two responses are combined, a positive response rises to 81%. This number is significantly higher than the 57% shown in Table 4.9 of Chapter Four.

Yes	75
No	18
In the process of making them	3
Total	96

Table 6.7 Summary of Responses on Question "Does Your PMO Have Policy Document(s)?" for the Targeted Sample

The following is a list of representative policy documents and areas identified by the respondents and it corresponds very closely to a comparable list in Section 4.3.3 in Chapter Four:

- PMO charter

- Project management policy/strategy

- Project management methodology guidelines

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- Capital project cost reduction initiatives

- Various standard operating procedures (SOPs)

- Business justification document

- Quality assurance policy, risk management implementation

- Policies on key areas (e.g. training, project tracking, planning, configuration management)

- Project metrics and standards

- PMO website

- Reporting mechanisms

6.3.4 PMO Functions and Services

In this section respondents reported what kind of functions and services their PMOs perform. More than one function and service can be reported. Except for human resource and staffing assistance, all of the main functions and services are used significantly, with achieving PM standards and methods being carried out in all 96 PMO entities. The category "Other" in Table 6.8 are those added by respondents.

6.4 Summary

An extensive search process led to the identification of 96 PMO entities willing to participate in this study. Major research findings discussed in this chapter may be summarized as follows:

- Beginning in the mid-1990s, there was a distinct increase in the number of PMOs being established.

- An overwhelming proportion of PMOs was approved by top/upper management.

- Full-time staffing is used by 94% of the PMOs.

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- PMOs reporting to senior management predominate over these reporting to a lower level by a ratio of three to two.

- There is great diversity in the titles of PMO heads, although about 25% suggest a PMO connection and another 50% involve either "manager" or "director."

- The most frequently reported policy documents were a PMO charter and PM guidelines.

- All 96 of the respondents reported a major function and service of their PMO was to bring about "PM Standards and Methods." The next most frequently reported was "PM Consulting and Mentoring."

PM Standards and Methods	96
Project Historical Archives	62
Project Administrative Support	68
Human Resource and Staffing Assistance	27
PM Training	68
PM Consulting and Mentoring	76
Other	
Maintaining Communication Web Site	1
Portfolio Management	3
Configuration Management	1
Managing Projects	3
Monitoring and Audit	4
Project Review	2
Quality Management (Assurance)	2
Sales Support	1
Financial Tracking and Execution	1
Capital Project Financial Governance	1
Budgeting	1
PM Certification Program	3
Enterprise Project Management System	1
Facilitation, Organization Development, Strategy	1
Project Planner	1
Assessment Review	1
Organization Change Agency	1

Table 6.8 Summary of PMO Functions and Services for the Targeted Sample

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As summary points, it seems reasonable to conclude that PMOs come across as supportive and facilitative entities rather than as another level of directive management. Nevertheless, it also is evident that top management interest and involvement are present in significant ways.

Finally, a comparison of the major findings in this chapter is essentially similar to those in Chapter Four – except for the last point (PMO functions and services) that was not addressed in Chapter Four. In retrospect, it probably would have been better to have the question included on this subject; however, at the time there was an attempt to keep the PMI survey as simple as possible in order to increase chances for getting a response.

CHAPTER SEVEN

RESULTS FROM THE TARGETED SURVEY –
PROJECT PERFORMANCE AND PMO FUNCTIONS AND SERVICES

7.1 Introduction

This chapter presents results from project managers in the targeted PMO survey on the relationships between project performance and PMO functions and services. It is divided into four sections following this introduction. The first presents information on respondent project managers and projects. The second presents the simple linear regression models, and describes the inferences drawn from specific hypothesis tests. The third section presents the selection process for the multiple regression models, and describes the inferences drawn from them. Information was collected from the "Project Manager Questionnaire," see Appendix D. Finally, a chapter summary is presented.

7.2 Background Information on Respondents and Reported Projects

The first questionnaire item in the project manager survey asked respondents to identify the end product of the project on which they were reporting. Seven pre-coded responses were provided, along with an "Other" category inviting a brief description of the major project deliverable. The results are listed in Table 7.1, and it illustrates the growing importance of PM in the "soft" side of project purposes in comparison with physical products.

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Type	Absolute Frequency	Relative Frequency
Physical Facility	5	9.62%
Hardware, Equipment, or Appliance Development	7	13.46%
Food, Drug, or Soft Goods Development	1	1.92%
New or Improved Process or Software Development	32	61.54%
Service or Test	5	9.62%
Department Reorganization or Moving to A New Facility	2	3.85%
Other	0	0%
Total	52	100%

Table 7.1 Frequency Distribution for End Product for the Targeted Sample

The second questionnaire item in the project manager survey asked what role the respondent played in the project on which they were reporting. Five pre-coded responses were provided, along with an "Other" category inviting a brief description. The results are listed in Table 7.2. Overwhelmingly the respondents were project managers.

Type	Absolute Frequency	Relative Frequency
Project Manager	48	92.31%
Support Manager on Project Team	1	1.92%
Manager of Project Managers	1	1.92%
Project Function Manager	1	1.92%
Project Team Member (Administrative)	1	1.92%
Other	0	0%
Total	52	100%

Table 7.2 Frequency Distribution for Position of Respondent for the Targeted Sample

Respondents were also asked to indicate the industry in which the project was performed. Seven pre-coded responses were provided, along with an "Other" category inviting a brief description. The results are listed in Table 7.3. These data suggest that PMOs may be appearing most frequently in the newer business and technology areas in contrast to the older, mature industries.

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Type	Absolute Frequency	Relative Frequency
Manufacturing	5	9.62%
Construction	4	7.69%
Engineering	0	0%
Business Management	3	5.77%
Software Development	6	11.54%
Telecommunications	8	15.38%
Computers/Data Processing/Information Technology	10	19.23%
Other (subtotal)	**16**	**30.77%**
Transportation	5	9.62%
Retail	1	1.92%
Health Care	2	3.85%
Financial/Insurance	6	11.54%
Pharmaceutical	1	1.92%
Utility	1	1.92%
Grand Total	**52**	**100%**

Table 7.3 Frequency Distribution on Industry for the Targeted Sample

Project size was reported by selecting one of 5 bins, ranging from projects of less than $100,000 to those exceeding $50 million. Results are summarized in Table 7.4

Size (in U.S. $)	Absolute Frequency	Relative Frequency
USD less than $100,000	7	13.46%
USD greater $100,000 to $1 million	23	44.23%
USD greater $1 million to $10 million	13	25%
USD greater $10 million to $50 million	7	13.46%
USD greater than $50 million	2	3.85%
Total	52	100%

Table 7.4 Frequency Distribution on Project Size for the Targeted Sample

Several quantitative values were also gathered, including both project information and demographics about the individual survey respondent. Descriptive statistics for these items are presented in Table 7.5. These data underscore the fact that the respondents generally are quite experienced in the world of work – and especially so in PM.

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Variable	Mean	Median	Mode	Min	Max	S.D.
Project Duration (month)	13.48	8	8	2.5	90	15.66
Ongoing Team Size (person)	18	10	8	1	100	22.23
Peak Team Size (person)	41	20	8	3	400	70.23
Years of Full-Time Work Experience	18.91	18.5	20	2.5	37	7.54
Years Spent Working on Projects	11.96	12	15	1	29	6.63

Table 7.5 Descriptive Statistics for Quantitative Questions for the Targeted Sample

Descriptive statistics for all six PMO variables are provided in Table 7.6. Note that none of the variables exhibits a particularly narrow spread, meaning that sufficient variance exists to allow inferential statistical analyses to be conducted.

Variable	N	Mean	S. D.	Min	Max
ST (PM Standards and Methods)	52	5.37	1.39	1.60	7.00
AR (Project Historical Archives)	52	3.31	1.81	1.00	7.00
NAD (Project Administrative Support)	51	4.33	1.87	1.00	7.00
NHR (Human Resource/Staffing Assistance)	51	4.19	1.76	1.00	7.00
NTR (PM Training)	52	5.08	1.32	2.00	7.00
CN (PM Consulting and Mentoring)	52	5.05	1.45	1.20	7.00
DV (Reported Project Success)	52	6.06	0.63	4.69	7.00

Table 7.6 Descriptive Statistics for PMO Independent and Dependent Variables for the Targeted Sample

7.3 Regression Model Estimates for PMO Functions and Services

This section describes the inferences to be drawn between the dependent variable Reported Project Success and the six independent variables representing PMO functions and services, ST, AR, NAD, NHR, NTR and CN.

$H_{a\text{-PMO1}}$: There is a linear relationship between PM standards and methods and reported project success.

$H_{a\text{-PMO2}}$: There is a linear relationship between project historical archives and reported project success.

$H_{a\text{-PMO3}}$: There is a linear relationship between project administrative support and reported project success.

$H_{a\text{-PMO4}}$: There is a linear relationship between human resource/staffing assistance and reported project success.

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$H_{a\text{-}PMO5}$: There is a linear relationship between PM training and reported project success.

$H_{a\text{-}PMO6}$: There is a linear relationship between PM consulting and mentoring and reported project success.

A t-test was performed for each simple linear regression slope coefficient, with results shown in Table 7.7.

Independent Variable	Dependent Variable	β_0	β_1	t value	p value	R^2
ST		4.943	0.208	3.68	0.0006	0.2135
AR	Reported	5.573	0.147	3.32	0.0017	0.1810
NAD	Project	5.73	0.08	1.73	0.0904	0.0574
NHR	Success	5.526	0.133	2.90	0.0055	0.1467
NTR		5.193	0.171	2.73	0.0087	0.1299
CN		5.58	0.096	1.61	0.1134	0.0494

Table 7.7 Coefficient Hypothesis Test on PMO Function and Service Variables for the Targeted Sample

Interpretations of these tests are presented in Table 7.8, with a 95% confidence level for variables ST, AR, NHR, and NTR, and a 90% confidence level for variable NAD. Note that even the result for variable CN that is reported as not being supported has a relatively small p-value (0.1134).

Independent Variable	Expected Result	Implication
ST		Supported
AR		Supported
NAD	Positive linear relationship with	Supported
NHR	Reported Project Success.	Supported
NTR		Supported
CN		Not Supported

Table 7.8 Interpretation of Coefficient Hypothesis Test on PMO Function and Service Variables for the Targeted Sample

Thus, as shown by Table 7.8, it was possible to develop five valid simple regression models.

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Reported Project Success = 4.943 + 0.208*ST

The expected result was confirmed. For a one-unit increase in the independent variable ST (PM Standards and Method), there would be a 0.208 increase in the dependent variable Reported Project Success. 21.35% of variation on the dependent variable is explained by the independent variable ST.

Reported Project Success = 5.573 + 0.147*AR

The expected result was confirmed. For a one-unit increase in the independent variable AR (Project Historical Archives), there would be a 0.147 increase in the dependent variable Reported Project Success. 18.1% of variation on the dependent variable is explained by the independent variable AR.

Reported Project Success = 5.73 + 0.08*NAD

The expected result was confirmed. For a one-unit increase in the independent variable NAD (PM Administrative Support), there would be a 0.08 increase in the dependent variable Reported Project Success. 5.74% of variation on the dependent variable is explained by the independent variable NAD.

Reported Project Success = 5.526 + 0.133*NHR

The expected result was confirmed. For a one-unit increase in the independent variable NHR (Human Resource/Staffing Assistance), there would be a 0.133 increase in the dependent variable Reported Project Success. 14.67% of variation on the dependent variable is explained by the independent variable NHR.

Reported Project Success = 5.193 + 0.171*NTR

The expected result was confirmed. For a one-unit increase in the independent variable NTR (PM Training), there would be a 0.171 increase in the dependent variable Reported Project Success. 12.99% of variation on the dependent variable is explained by the independent variable NTR.

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7.4 Multiple Regression Model Estimates for PMO Functions and Services

An array of multiple linear regression models was explored utilizing the same dependent variable and independent variables as were used in the simple regression models above. The null hypothesis asserts that there is no *additional* predictive value over and above that contributed by the other independent variable(s) that already are in the regression model. Thus the research hypothesis asserts that this is *additional* predictive value over and above that contributed by the other independent variable(s) that already are in the regression model.

To explore the strength of the linear relationships among these variables (the stronger the correlation, the better an independent variable predicts the dependent variable), Pearson correlation coefficients were generated and are shown in Table 7.9.

Pearson Correlation Coefficients /
Prob > |R| under Ho: Rho = 0 /
Number of Observations

	ST	AR	NAD	NHR	NTR	CN	DV
ST	1.00000						
	0.0						
	52						
AR	0.54556	1.00000					
	0.0001	0.0					
	52	52					
NAD	0.53021	0.38162	1.00000				
	0.0001	0.0057	0.0				
	51	51	51				
NHR	0.46778	0.41800	0.53982	1.00000			
	0.0005	0.0023	0.0001	0.0			
	51	51	50	51			
NTR	0.48949	0.53528	0.33846	0.42706	1.00000		
	0.0002	0.0001	0.0151	0.0018	0.0		
	52	52	51	51	52		
CN	0.55684	0.55374	0.49085	0.53780	0.44106	1.00000	
	0.0001	0.0001	0.0003	0.0001	0.0011	0.0	
	52	52	51	51	52	52	
DV	0.46211	0.42539	0.23959	0.38307	0.36039	0.22218	1.00000
	0.0006	0.0017	0.0904	0.0055	0.0087	0.1134	0.0
	52	52	51	51	52	52	52

Table 7.9 Pearson Correlation Coefficients on PMO Function and Service Variables for the Targeted Sample

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An "all-possible-regressions procedure" was used to analyze multiple regression candidates and select the most appropriate model (see Table 7.10). Having six independent variables from which to choose, 64 possible combinations were available for analysis. Higher ranking models were identified based on the following criteria:

1) Coefficient of multiple determination R_p^2 – seeking subsets for which R_p^2 value is high,

2) Error Sum of squares SSE_p – seeking subsets for which SSE_p value is small,

3) Mean square of error MSE_p – seeking to find subsets for which MSE_p value is at the minimum or so close to the minimum that adding more variables would not be worthwhile,

4) Total mean squared error C_p – seeking subsets with C_p values that were small and near their model parameter numbers (p),

5) Prediction sum of squares $PRESS_p$ – seeking models with small $PRESS_p$ values.

To ensure that the overall error rate across all significance tests was reasonable, a threshold significance level of $\alpha = 0.1$ was refer to as a guideline for model selection. Thus, according to the above five criteria the following three models were chosen for further consideration (Table 7.11, Table 7.12, Table 7.13):

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X variables	p	df	SSE_P	R_P^2	MSE_P	C_P	$PRESS_P$
ST	2	50	15.6479	0.2138	0.313	2	16.8524
AR	2	50	16.301	0.181	0.326	2	17.5248
NAD	2	50	18.2555	0.0572	0.3726	2	20.4556
NHR	2	50	15.8716	0.1464	0.3239	2	17.219
NTR	2	50	17.3245	0.1296	0.3465	2	18.5251
CN	2	50	18.9199	0.0495	0.3784	2	20.4844
ST, AR	3	49	14.7978	0.2566	0.302	3	16.716
ST, NAD	3	49	14.7854	0.2364	0.308	1.0293	16.8464
ST, NHR	3	49	14.1245	0.2404	0.2943	3	16.1679
ST, NTR	3	49	15.181	0.2373	0.3098	3	17.1478
ST, CN	3	49	15.6124	0.2156	0.3186	1.1115	17.6628
AR, NAD	3	49	15.9836	0.1745	0.333	1.4758	18.3856
AR, NHR	3	49	14.5865	0.2155	0.3039	3	16.6455
AR,NTR	3	49	15.8134	0.2055	0.3227	3	17.8255
AR,CN	3	49	16.296	0.1813	0.3326	1.015	18.1681
NAD, NHR	3	49	15.4211	0.1442	0.3281	1.0161	17.7162
NAD, NTR	3	49	16.392	0.1534	0.3415	1.8163	18.9143
NAD,CN	3	49	18.0103	0.0698	0.3752	1.6534	20.8349
NHR,NTR	3	49	14.1779	0.2375	0.2954	3	15.8119
NHR,CN	3	49	15.8576	0.1472	0.3304	1.0423	18.3226
NTR,CN	3	49	17.2249	0.1346	0.3515	1.2831	19.0033
ST, AR, NAD	4	48	14.2821	0.2624	0.3039	2.099	16.9473
ST, AR,NHR	4	48	13.725	0.2619	0.292	4	16.5218
ST, AR, NTR	4	48	14.6604	0.2635	0.3054	2.4498	17.4884
ST, AR, CN	4	48	14.4879	0.2721	0.3018	3.0267	17.0585
AR, NAD, NHR	4	48	14.3033	0.2062	0.3109	2.202	17.6006
AR, NAD, NTR	4	48	15.4628	0.2014	0.329	2.2265	18.877
AR, NAD, CN	4	48	15.9387	0.1768	0.3301	0.5995	18.9572
NAD, NHR, ST	4	48	13.028	0.277	0.2832	3.3523	15.7082
NAD, NHR, NTR	4	48	13.422	0.2551	0.2918	2.5264	15.8765
NAD, NHR, CN	4	48	15.4068	0.1449	0.3349	0.0585	19.1954
NHR, NTR, ST	4	48	13.4351	0.2745	0.2859	3.3291	15.9689
NHR, NTR, AR	4	48	13.8759	0.2537	0.2952	3.023	16.3751
NHR, NTR, CN	4	48	14.1032	0.2415	0.3	2.2487	16.4913
NTR, CN, ST	4	48	15.0531	0.2437	0.3136	2.4078	17.6716
NTR, CN AR	4	48	15.765	0.208	0.3284	2.1466	18.3861
NTR, CN NAD	4	48	16.391	0.1535	0.3487	0.8022	19.4948
ST, NAD, NTR	4	48	14.297	0.2616	0.3042	2.0948	17.2225

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ST, NAD, CN	4	48	14.694	0.2411	0.3126	0.322	17.623
ST, NHR, CN	4	48	13.9019	0.2523	0.2958	2.7525	16.749
AR, NHR, CN	4	48	14.406	0.2252	0.3065	2.5887	17.2497
ST, AR, NAD, NHR	5	47	12.844	0.2872	0.2854	2.9866	16.2507
ST AR, NAD, NTR	5	47	14.0642	0.2736	0.3057	1.8109	17.8571
ST, AR, NAD, CN	5	47	13.968	0.2786	0.3067	1.1336	17.222
AR, NAD, NHR, NTR	5	47	13.274	0.2633	0.295	2.0214	16.7702
AR, NAD, NHR, CN	5	47	14.18	0.213	0.3151	1.5906	18.3391
NAD, NHR, NTR, ST	5	47	12.18	0.3241	0.2707	3.8062	15.2415
NAD, NHR, NTR, CN	5	47	13.3672	0.2581	0.2971	1.7019	16.64
NHR, NTR, CN, ST	5	47	13.076	0.2968	0.2843	3.6	16.2429
NHR, NTR, CN, AR	5	47	13.6248	0.2672	0.2962	2.8672	16.8329
NTR, CN, ST, AR	5	47	14.2955	0.2818	0.3042	2.6513	17.6867
NTR, CN, AR, NAD	5	47	15.356	0.2067	0.3338	1.5429	19.3143
ST, AR, NHR, NTR	5	47	13.329	0.2831	0.29	2.6765	16.8211
ST, AR, NHR, CN	5	47	13.2173	0.2892	0.2873	5	16.6215
ST, NAD, NHR, CN	5	47	12.8173	0.2887	0.2848	3.0846	16.2548
ST, NAD, NTR, CN	5	47	14.082	0.2727	0.3061	1.7978	17.6012
ST, AR, NAD, NHR, NTR	6	46	12.1778	0.3242	0.2768	2.7497	16.0889
AR, NAD, NHR, NTR, CN	6	46	13.1204	0.2718	0.2982	1.527	17.297
NAD, NHR, NTR, CN, ST	6	46	11.8319	0.3433	0.2689	4.1161	15.3506
NHR, NTR, CN, ST, AR	6	46	12.8041	0.3114	0.2845	3.5527	16.8513
NTR, CN ST, AR, NAD	6	46	13.6866	0.2932	0.3042	2.057	17.9125
CN, ST, AR, NAD NHR	6	46	12.4559	0.3087	0.2831	3.374	16.3543
ST, AR, NAD, NHR, NTR, CN	7	45	11.786	0.3459	0.2741	3.205	16.0522

Table 7.10 Results of Analyzing Multiple Regression Variable Combinations for the Targeted Sample

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Model #1 Reported Project Success = 4.986 + 0.148*ST + 0.085*AR

F Value	Prob>F	R-square	Adj R-sq		
8.455	0.0007	0.2566	0.2262		
			T for H0:	Pr > |T|	Std Error of
Parameter	Estimate		Parameter=0		Estimate
INTERCEPT	4.9864316		16.16	0.0001	0.308567
ST	0.147581		2.23	0.0303	0.066149
AR	0.0853084		1.68	0.0997	0.050845

Table 7.11 Regression Model with Independent Variables ST and AR

Model #2 Reported Project Success = 4.944 + 0.152*ST + 0.077*NHR

F Value	Prob>F	R-square	Adj R-sq		
7.5945	0.0014	0.2403	0.2087		
			T for H0:	Pr > |T|	Std Error of
Parameter	Estimate		Parameter=0		Estimate
INTERCEPT	4.9437292		15.90	0.0001	0.311008
ST	0.1519643		2.44	0.0186	0.062366
NHR	0.0765421		1.55	0.1282	0.049441

Table 7.12 Regression Model with Independent Variables ST and NHR

Model #3 Reported Project Success = 4.728 + 0.169*ST + 0.083*NTR

F Value	Prob>F	R-square	Adj R-sq		
7.6231	0.0013	0.2373	0.2062		
			T for H0:	Pr > |T|	Std Error of
Parameter	Estimate		Parameter=0		Estimate
INTERCEPT	4.7284997		13.23	0.0001	0.357446
ST	0.169405		2.63	0.0114	0.064405
NTR	0.0832755		1.23	0.2254	0.067833

Table 7.13 Regression Model with Independent Variables ST and NTR

The final choice among the top three multiple regression model candidates was

Reported Project Success = 4.986 + 0.148*ST + 0.085*AR. See Table 7.14. Since the

p-value for model's global F value was 0.0007, the model was concluded at a 99%

confidence level that it has predictive value in the equation as a whole (see Table 7.11).

Furthermore, since the p-value for variable AR was 0.0997, the model indicated that with

90% confident level that the independent variable AR has additional predictive power

contributing to the dependent variable Reported Project Success given that the

independent variable ST is already in the model is true. Specifically, for a one-unit

change in the independent variable AR, holding the other independent variable ST

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constant, there would be a 0.085 contribution to the dependent variable Reported Project Success. The model has an Adjusted R^2 of 0.2262 – which means 22.62% variation in the dependent variable Reported Project Success has been explained by the model, and the remaining 77.38% variation has been left unexplained. The other two models were no selected because variable NHR has an insignificant p-value of 0.1282 (> 0.1) and variable NTR has an insignificant p-value of 0.2254 (> 0.1) in their models.

Variable	Expected Result	Implication
ST + AR	There is additional predictive power contributed to the dependent variable in the presence of the independent variable ST already in the model.	Supported

Table 7.14 Interpretation of Coefficient Hypothesis Test for Independent Variable ST and AR

7.5 Summary

The background information on reported projects reveals that end products of 32 projects' end products were new or improved process for software development, and accounted for 62%; this number was followed by 7 projects' end products of hardware, equipment or appliance which accounted for 13%. It shows that PM has been moved quickly into the computer and information technology areas (see Table 7.1). Still, respondents are representative of many industries, with 19% of them in the area of computer/data processing/information technology (see Table 7.3).

This research revealed that 44% of the projects have a size between $100,000 to $1 million, while less than 4% of the projects have a size of over $50 million and another 13% of the projects have a size of less than $100,000 (see Table 7.4). 92% of the survey respondents played a role of project manager in a recently completed project event (See Table 7.2). The survey respondents had an average of 19 years full time work experience and an average of 12 years working on projects.

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For developing simple linear regression models, five models were obtained. Among them, with a 95% confidence level, PM Standards and Methods (ST) explains 21.35% of variation on project success, followed by Project Historical Archives (AR) explaining 18.1%, Human Resources/Staffing Assistance (NHR) explaining 14.67%, and PM Training (NTR) explaining 12.99%. With a 90% confidence level, Project Administrative Support (NAD) explains 5.74% of variation on project success.

It is interesting to see that results (Table 7.15) both from the random and targeted survey data conclude that PM Standards and Methods (ST) explains the most variation in project success compared with other PMO functions and services. This result is fully compatible with and supportive of the PMO motivations and the various mission statements (shown in Section 4.3 and Section 6.3). The Fortune 500 Benchmarking Forum on PM reports a comparable finding.[1] The next most important variables are Human Resource/Staff Assistance (NHR) and then PM Training (NTR).

Project Historical Archives (AR) displays a high R^2 from the targeted sample; yet, a relative low R^2 from the random sample. It seems that PMOs in the targeted sample have given a lot more emphases on keeping and learning lessons from previous projects, and also have obtained project managers appreciation in helping them managing projects. It confirms Jessen's views (see page 2) and the Fortune 500 Benchmarking Forum's that learning from earlier project success/failure provides invaluable knowledge. Also, it is rather surprising to see that from the targeted sample, PM Consulting and Mentoring (CN) has no statistically significant support for the claim of having a relationship with Reported Project Success, even though the concept of CN was reported favorably in the open ended questions (see Chapter Six).

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Independent Variable	Sig. t (Random)	R^2 (Random)	Sig. t (Targeted)	R^2 (Targeted)
ST	$p < .01$	0.0789	$p < .01$	0.2135
AR	$p < .05$	0.0207	$p < .01$	0.1810
NAD	$p < .05$	0.0280	$p < .1$	0.0574
NHR	$p < .01$	0.0533	$p < .01$	0.1467
NTR	$p < .01$	0.0444	$p < .01$	0.1299
CN	$p < .01$	0.0333	N. Sig	0.0494

Table 7.15 Comparison of Simple Regression on PMO Functions and Services between the Random and the Targeted Samples

Variable AR (Project Historical Archives) is the best candidate as the last predictor add on to the regression model when variable ST (Project Standards and Methods) is already in the model. Thus, one multiple linear regression model (Reported Project Success = 4.986 + 0.148*ST + 0.085*AR) is generated from the targeted sample data and is determined as the most fitting one. It shows that, with a 90% confidence level, the independent variable AR (Project Historical Archives) has additional predictive power for contributing to the dependent variable Reported Project Success given that the independent variable ST was already in the model is true. The model explains 22.62% of variation in project success. It would seem these findings offer substantial practical advice to organizations using or contemplating the use of a PMO.

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CHAPTER SEVEN ENDNOTES

[1] Frank Toney and Ray Powers, *Best Practices of Project Management Groups in Large Functional Organizations – Results of the Fortune 500 Project Management Benchmarking Study*, Project Management Institute, 1997.

CHAPTER EIGHT

RESULTS OF CRITICAL SUCCESS FACTORS ANALYSIS

8.1 Introduction

This chapter is divided into five sections. The second section presents descriptive statistics and results of validity checks for responses to the first and second mailings from the random survey. The third section presents results from the random survey, including the linear regression models that are explored, and inferences to be drawn regarding specific hypothesis tests. Information was collected from the "PMI Member Questionnaire" Part One, Three, and Four (see Appendix D). The fourth section presents comparable results of the same items from the targeted survey. This information was collected from the "Project Manager Questionnaire" (see Appendix D). The final section presents a summary of key findings from this chapter.

8.2 Descriptive Statistics and Validity Checks for Random Survey

Before examining the results shown in Table 8.1 and Table 8.2, it could be helpful to provide a reminder of the abbreviations used in the tables and text.

- ❖ MI – Representing Project Mission
- ❖ MG – Representing Top Management Support
- ❖ CL – Representing Client Consultation
- ❖ TT – Representing Technical Tasks
- ❖ SP – Representing Project Schedule/Plan
- ❖ CM – Representing Communication

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❖ TS – Representing Trouble Shooting

❖ PMO Index – Representing PMO Presence Index

Descriptive statistics for the seven CSF independent variables are provided in Table 8.1. To remind, these variables were chosen based on the previous research Pinto and Slevin as described in Chapters Two and Three. In addition, the PMO Presence Index was added as a CSF for this study.

Variable	N	Mean	S. D.	Min.	Max.
MI	234	6.116	1.135	1	7
MG	233	5.107	.643	1	7
CL	228	6.001	.256	1	7
TT	234	5.739	1.152	1	7
SP	232	5.212	1.363	1	7
CM	234	5.570	1.233	1	7
TS	234	5.835	1.147	1	7
PMO Index	234	4.337	1.318	1	7

Table 8.1 Descriptive Statistics on CSF Variables for the Random Sample

An independent-samples two-tailed t-test for equal variance was performed. It was intended to determine whether a bias existed between those who responded to the first mailing and those who did not (but waited until the second mailing). This measure helps to ensure the *external validity* of the research. Descriptive statistics for both the first and second mailings are presented in Table 8.2 for the CSF variables.

The independent-samples t-test indicated that the mean value of the independent variable MI from the first mailing was statistically identical to the value from the second mailing, with a 95% confidence level. The same conclusions also were obtained for the variables MG, CL, SP, CM and PMO Index. It suggests that in the population there is no bias in questionnaire responses between those who responded and those who did not. However, for variables TT and TS, the independent two samples t-test indicated that the mean value from the first mailing was not the same as that from the second mailing, with a 95% confidence level. It suggests that in the population there is a bias in questionnaire responses between those who responded and those who did not. Table 8.3 presents the

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interpretation of hypothesis tests between the first and second mailings at a 95%

confidence level. Table 8.4 presents a summary of t-test results on the CSF variables,

including F tests conducted to determine whether the variances in the two samples were

equal.

Independent Variable	Mailing	N	Mean	S. D.
MI	First Mailing	120	5.9817	1.3609
	Second Mailing	114	6.2575	0.8184
MG	First Mailing	120	4.9677	1.7579
	Second Mailing	113	5.2539	1.5042
CL	First Mailing	116	5.9676	1.342
	Second Mailing	112	6.0357	1.165
TT	First Mailing	120	5.5845	1.2839
	Second Mailing	114	5.9018	0.974
SP	First Mailing	120	5.0923	1.4146
	Second Mailing	112	5.3406	1.2991
CM	First Mailing	120	5.4221	1.36
	Second Mailing	114	5.7252	1.0681
TS	First Mailing	120	5.6775	1.3018
	Second Mailing	114	6.0001	0.9338
PMO Index	First Mailing	120	4.3228	1.3918
	Second Mailing	114	4.3522	1.2412

Table 8.2 Descriptive Statistics for the First and Second Mailings on CSF Variables for the Random Sample

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Independent Variable	Research Hypothesis (H$_a$)	Implication:
MI	The mean ST value of the population from the first mailing differs from the second mailing.	Not Supported
MG	The mean AR value of the population from the first mailing differs from the second mailing.	Not Supported
CL	The mean NAD value of the population from the first mailing differs from the second mailing.	Not Supported
TT	The mean NHR value of the population from the first mailing differs from the second mailing.	Supported
SP	The mean NTR value of the population from the first mailing differs from the second mailing.	Not Supported
CM	The mean CN value of the population from the first mailing differs from the second mailing.	Not Supported
TS	The mean CN value of the population from the first mailing differs from the second mailing.	Supported
PMO Index	The mean PMO Index value of the population from the first mailing differs from the second mailing.	Not Supported

Table 8.3 Interpretation of Hypothesis Testing between the First and Second Mailings on CSF Variables for the Random Sample

Independent Variable	H$_a$	Test Value	p-Value	Accept H$_a$?
MI	$\sigma^2_{first} \neq \sigma^2_{second}$	F'-value: 2.77	0.0000	Yes
	$\mu_{first} \neq \mu_{second}$	t-value: -1.8893	0.0603	No
MG	$\sigma^2_{first} \neq \sigma^2_{second}$	F'-value: 1.37	0.0963	No
	$\mu_{first} \neq \mu_{second}$	t-value: -1.3312	0.1844	No
CL	$\sigma^2_{first} \neq \sigma^2_{second}$	F'-value: 1.33	0.1349	No
	$\mu_{first} \neq \mu_{second}$	t-value: -0.4082	0.6835	No
TT	$\sigma^2_{first} \neq \sigma^2_{second}$	F'-value: 1.74	0.0033	Yes
	$\mu_{first} \neq \mu_{second}$	t-value: -2.1355	0.0338	Yes
SP	$\sigma^2_{first} \neq \sigma^2_{second}$	F'-value: 1.19	0.3643	No
	$\mu_{first} \neq \mu_{second}$	t-value: -1.3894	0.1660	No
CM	$\sigma^2_{first} \neq \sigma^2_{second}$	F'-value: 1.62	0.01	Yes
	$\mu_{first} \neq \mu_{second}$	t-value: -1.9011	0.0586	No
TS	$\sigma^2_{first} \neq \sigma^2_{second}$	F'-value: 1.94	0.0004	Yes
	$\mu_{first} \neq \mu_{second}$	t-value: -2.1868	0.0298	Yes
PMO Index	$\sigma^2_{first} \neq \sigma^2_{second}$	F'-value: 1.26	0.2201	No
	$\mu_{first} \neq \mu_{second}$	t-value: 0.17	0.8625	No

Table 8.4 Summary of Test Results between the First and Second Mailings on CSF Variables for the Random Sample

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8.3 Regression Modeling for the Random Survey

This section presents results from the random survey, including the linear regression models that are explored, and then describe as the inferences to be drawn regarding specific hypothesis testing.

8.3.1 Regression Model Estimates for CSFs

This section describes the inferences to be drawn between the dependent variable Reported Project Success and the eight random sample independent variables representing CSFs: MI, MG, CL, TT, SP, CM, TS, and PMO Index.

$H_{a\text{-}CSF1}$: There is a positive linear relationship between project mission (MI) and reported project success.

$H_{a\text{-}CSF2}$: There is a positive linear relationship between top management support (MG) and reported project success.

$H_{a\text{-}CSF3}$: There is a positive linear relationship between client consultation (CL) and reported project success.

$H_{a\text{-}CSF4}$: There is a positive linear relationship between technical tasks (TT) and reported project success.

$H_{a\text{-}CSF5}$: There is a positive linear relationship between project schedule/plan (SP) and reported project success.

$H_{a\text{-}CSF6}$: There is a positive linear relationship between communication (CM) and reported project success.

$H_{a\text{-}CSF7}$: There is a positive linear relationship between trouble-shooting (TS) and reported project success.

$H_{a\text{-}CSF8}$: There is a positive linear relationship between PMO presence index (PMO Index) and reported project success.

A t-test was performed for each simple linear regression slope coefficient, with results shown in Table 8.5. For regressions with variables MI, MG, CL, TT, SP, CM, and TS respectively, the models underwent weighted least squares (WLS) transformation to satisfy the regression assumptions. For regression with variable PMO Index, dependent

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variable (DV) underwent an exponential transformation to satisfy the regression assumptions. See Appendix H for details. Interpretations of these tests are presented in Table 8.6, assuming a 95% confidence level.

Independent Variable	Transformation	β_0	β_1	t Value	p-value	R^2
MI	Model - WLS	1.719	0.644	9.636	0.0001	0.2858
MG	Model - WLS	4.274	0.273	5.276	0.0001	0.1075
CL	Model - WLS	2.699	0.595	6.612	0.0001	0.1621
TT	Model - WLS	2.419	0.567	9.409	0.0001	0.2762
SP	Model - WLS	3.714	0.375	6.153	0.0001	0.1414
CM	Model - WLS	3.503	0.39	5.93	0.0001	0.1316
TS	Model - WLS	2.562	0.533	8.123	0.0001	0.2214
PMO Index	DV - Exponential	216.2	47.852	3.41	0.0008	0.0476

Table 8.5 Coefficient Hypothesis Test on CSF Variables for the Random Survey

Independent Variable	Expected Results	Implication:
MI		Supported
MG		Supported
CL		Supported
TT	Positive linear relationship with Reported Project Success	Supported
SP	.	Supported
CM		Supported
TS		Supported
PMO Index		Supported

Table 8.6 Interpretation of Coefficient Hypothesis Test on CSF Variables for the Random Sample

Thus, based on the above analysis, it was possible to generate eight simple regression models generated from the random survey:

1. **Reported Project Success = 1.719 + 0.644*MI**

The expected result was confirmed. For a one-unit increase in the independent variable MI (Project Mission), there would be a 0.644 increase in the dependent variable Reported Project Success. 28.58% of variation on dependent variable is explained by the independent variable MI.

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2. Reported Project Success = 4.274 + 0.273*MG

The expected result was confirmed. For a one-unit increase in the independent variable MG (Top Management Support), there would be a 0.273 increase in the dependent variable Reported Project Success. 10.75% of variation on dependent variable is explained by the independent variable MG.

3. Reported Project Success = 2.699 + 0.595*CL

The expected result was confirmed. For a one-unit increase in the independent variable CL (Client Consultation), there would be a 0.595 increase in the dependent variable Reported Project Success. 16.21% of variation on dependent variable is explained by the independent variable CL.

4. Reported Project Success = 2.419 + 0.567*TT

The expected result was confirmed. For a one-unit increase in the independent variable TT (Technical Tasks), there would be a 0.567 increase in the dependent variable Reported Project Success. 27.62% of variation on dependent variable is explained by the independent variable TT.

5. Reported Project Success = 3.714 + 0.375*SP

The expected result was confirmed. For a one-unit increase in the independent variable SP (Project Schedule/Plan), there would be a 0.375 increase in the dependent variable Reported Project Success. 14.14% of variation on dependent variable is explained by the independent variable SP.

6. Reported Project Success = 3.503 + 0.39*CM

The expected result was confirmed. For a one-unit increase in the independent variable CM (Communication), there would be a 0.39 increase in the dependent variable Reported Project Success. 13.16% of variation on dependent variable is explained by the independent variable CM.

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7. Reported Project Success = 2.562 + 0.533*TS

The expected result was confirmed. For a one-unit increase in the independent variable TS (Trouble-Shooting), there would be a 0.533 increase in the dependent variable Reported Project Success. 22.14% of variation on dependent variable is explained by the independent variable TS.

8. Reported Project Success (exponential) = 216.2 + 47.852*PMO Index

The expected result was confirmed. For a one-unit increase in the independent variable PMO Index (PMO Presence Index), there would be a 47.852 increase in the dependent variable Reported Project Success in exponential term. 4.76% of variation on dependent variable is explained by the independent variable PMO Index.

8.3.2 Second-order Regression Model for PMO

In exploring whether PMO presence has a more complex impact on reported project success, a second-order regression model for the PMO Index (PMO Presence Index) variable was performed. It was hypothesized that the relationship between the PMO Index and Reported Project Success is quadratic over the range of observations. The model went through weighted least square (WLS) transformation to satisfy regression assumption (Table 8.7).

Second H_a: The PMO presence index has a 2nd order influence on reported project success.

Independent Variable	Transforma-tion	H_a	t Value	p-Value	Accept H_a?	Global F	p-Value	R^2
						6.5169	0.0018	0.0692
PMO Index	Model - WLS	$\beta_1 \neq 0$	3.83	0.0002	Yes			
(PMO Index – PMO Index-bar)^2		$\beta_{11} \neq 0$	-0.54	0.5905	No			

Table 8.7 Coefficient Hypothesis Test of Quadratic on PMO Index for the Random Sample

Since the p-value (0.5905) from the t-test result (-0.54) of the second order for the PMO Index variable is greater than the conventional alpha value 0.05, the research

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hypothesis that the PMO presence index has a 2nd order influence on reported project success is not true (Table 8.7). Thus, there is no second order regression model developed for the PMO factor from the random data.

8.3.3 Multiple Regression Modeling Estimates for CSFs

It was hypothesized that the PMO factor would contribute predictive value to project success, in addition to the original seven selected critical success factors taken from Pinto's research. However, in evaluating the correlations in the random sample, one of the six PMO functions and services, ST (PM Standards and Methods), showed a stronger correlation (0.35255) with Reported Project Success than the overall PMO Presence Index (0.26087). The Pearson correlation coefficients are listed in Table 8.8. Thus, the variable ST was selected to replace PMO as the additional CSF for multiple regression model construction.

8.3.3.1 Forward Stepwise Regression Model

The third research hypotheses is as follows:

Third H_a: The PMO presence index has an influence on reported project success beyond the influence of CSFs alone.

A forward stepwise regression approach was employed to search for the best-fitting regression model. Result shown in Table 8.9.

The model "Reported Project Success = 0.573 + 0.264*MI + 0.235*CL + 0.231*TT + 0.183*TS + 0.069*SP – 0.123*CM" has an adjusted R^2 of 0.5458 – which meant 54.58% of variation in the dependent variable Reported Project Success was explained by this model; the remaining 45.42% of the variation was left unexplained. For the variable coefficients, it was shown that:

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Pearson Correlation Coefficients / Prob > |R| under Ho: Rho = 0 / Number of Observations

	ST	PMO Index	MI	MG	CL	TS	SP	CM	TT	DV
ST	1.00000 0.0 232									
PMO Index	0.76526 0.0001 232	1.00000 0.0 234								
MI	0.32823 0.0001 232	0.37518 0.0001 234	1.00000 0.0 234							
MG	0.34088 0.0001 231	0.48315 0.0001 233	0.57585 0.0001 233	1.00000 0.0 233						
CL	0.34429 0.0001 226	0.33118 0.0001 228	0.53091 0.0001 228	0.34182 0.0001 227	1.00000 0.0 228					
TS	0.45439 0.0001 232	0.45155 0.0001 234	0.71152 0.0001 234	0.57753 0.0001 233	0.54244 0.0001 228	1.00000 0.0 234				
SP	0.47328 0.0001 230	0.55484 0.0001 232	0.52118 0.0001 232	0.51245 0.0001 231	0.44102 0.0001 226	0.64704 0.0001 232	1.00000 0.0 232			
CM	0.48753 0.0001 232	0.52642 0.0001 234	0.63918 0.0001 234	0.47266 0.0001 233	0.57315 0.0001 228	0.76675 0.0001 234	0.69276 0.0001 232	1.00000 0.0 234		
TT	0.40327 0.0001 232	0.42307 0.0001 234	0.75362 0.0001 234	0.52304 0.0001 233	0.53331 0.0001 228	0.74286 0.0001 234	0.58466 0.0001 232	0.68590 0.0001 234	1.00000 0.0 234	
DV	0.35255 0.0001 232	0.26087 0.0001 234	0.68081 0.0001 234	0.44321 0.0001 233	0.56070 0.0001 228	0.64584 0.0001 234	0.50139 0.0001 232	0.54382 0.0001 234	0.67973 0.0001 234	1.00000 0.0 234

Table 8.8 Pearson Correlation Coefficient for CSF Variables for the Random Sample

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Reported Project Success =

0.573 + 0.264*MI + 0.235*CL + 0.231*TT + 0.183*TS + 0.069*SP − 0.123*CM

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	6	157.36950	26.22825	46.062	0.0001
Error	219	124.70099	0.56941		
C Total	225	282.07049			

Root MSE	0.75459	R-square	0.5579	
Dep Mean	5.66836	Adj R-sq	0.5458	
C.V.	13.31237			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	0.572991	0.31350102	1.828	0.0690
MI	1	0.263632	0.07386438	3.569	0.0004
CL	1	0.234893	0.05414610	4.338	0.0001
TS	1	0.182503	0.08086092	2.257	0.0250
SP	1	0.069088	0.05289021	1.306	0.1928
CM	1	-0.122572	0.07248325	-1.691	0.0923
TT	1	0.230532	0.07642178	3.017	0.0029

Table 8.9 Coefficient Hypothesis Test of Multiple Regression on CSFs for the Random Sample

(1) At a 99% confidence level, with one unit of increase in variable MI, holding the other variables CL, TT, TS, SP, and CM in the model constant, there would be a 0.264 increase in the dependent variable Reported Project Success.

(2) At a 99% confidence level, the independent variable CL provides additional predictive power to the dependent variable Reported Project Success. With one unit of increase in variable CL, and holding the variables MI, TS, SP, TT, and CM all constant, there would be a 0.235 increase in the dependent variable.

(3) At a 99% confidence level, the independent variable TT provides additional predictive power to the dependent variable Reported Project Success. With one unit of increase in variable TT, and holding the variables MI, CL, SP, TS, and CM all constant, there would be a 0.231 increase in the dependent variable.

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(4) At a 95% confidence level, the independent variable TS provides additional predictive power to the dependent variable Reported Project Success. With one unit of increase in variable TS, and holding the variables MI, CL, TT, SP, and CM all constant, there would be a 0.183 increase in the dependent variable.

(5) At an 80% confidence level, the independent variable SP provides additional predictive power to the dependent variable Reported Project Success. With one unit of increase in variable SP, and holding the variables MI, CL, TT, TS, and CM all constant, there would be a 0.069 increase in the dependent variable.

(6) At a close to 90% confidence level, the independent variable CM provides additional predictive power to the dependent variable Reported Project Success. With one unit of increase in variable CM, and holding all other independent variables constant, there would be a 0.123 decrease in the dependent variable.

The multiple regression model based on the random survey data indicated that ST (PM Standards and Methods) was not an additional CSF. Thus, in answering the third research hypothesis, it is concluded that ST has no influence on reported project success, beyond the influence of the CSF variables MI, CL, TT, TS, SP, and CM alone.

8.4 Regression Modeling for the Targeted Survey

This section presents results from the targeted survey, including the linear regression models that are explored, and then describe as the inferences to be drawn regarding specific hypothesis testing.

8.4.1 Regression Modeling Estimates for CSFs

This section describes the inferences to be drawn between the dependent variable Reported Project Success and the eight targeted sample independent variables representing CSFs: MI, MG, CL, TT, SP, CM, TS, and PMO Index.

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$H_{a\text{-}CSF1}$: There is a positive linear relationship between project mission (MI) and reported project success.

$H_{a\text{-}CSF2}$: There is a positive linear relationship between top management support (MG) and reported project success.

$H_{a\text{-}CSF3}$: There is a positive linear relationship between client consultation (CL) and reported project success.

$H_{a\text{-}CSF4}$: There is a positive linear relationship between technical tasks (TT) and reported project success.

$H_{a\text{-}CSF5}$: There is a positive linear relationship between project schedule/plan (SP) and reported project success.

$H_{a\text{-}CSF6}$: There is a positive linear relationship between communication (CM) and reported project success.

$H_{a\text{-}CSF7}$: There is a positive linear relationship between trouble-shooting (TS) and reported project success.

$H_{a\text{-}CSF8}$: There is a positive linear relationship between PMO presence index and reported project success.

A t-test was performed for each simple linear regression slope coefficient, with results shown in Table 8.10. For regression with variables TT and PMO Index respectively, the models underwent a weighted least squares (WLS) transformation to satisfy the regression assumptions. For regression with variable SP, the independent variable SP underwent an exponential transformation to satisfy the regression assumptions. See Appendix H for details. Interpretations of these tests are presented in Table 8.11. assuming a 95% confidence level.

Independent Variable	Transformation	β_0	β_1	t Value	p-Value	R^2
MI	No	3.041	0.471	4.92	0.0001	0.3262
MG	No	5.043	0.177	2.78	0.0076	0.1339
CL	No	4.952	0.185	2.45	0.0176	0.1075
TT	Model - WLS	4.027	0.34	3.43	0.0012	0.1963
SP	IV - Exponential	5.8	0.00056	2.50	0.0158	0.1110
CM	No	4.767	0.22	2.90	0.0055	0.1442
TS	No	3.841	0.361	3.75	0.0005	0.2192
PMO Index	Model - WLS	4.764	0.286	4.78	0.0001	0.3132

Table 8.10 Coefficient Hypothesis Test on CSF Variables for the Targeted Survey

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Independent Variable	Expected Results	Implication:
MI		Supported
MG		Supported
CL		Supported
TT	Positive linear relationship with Reported Project Success	Supported
SP		Supported
CM		Supported
TS		Supported
PMO Index		Supported

Table 8.11 Interpretation of Coefficient Hypothesis Test on CSF Variables for the Targeted Sample

Thus eight simple regression models were generated from the targeted survey:

1. **Reported Project Success = 3.041 + 0.471*MI**

The expected result was confirmed. For a one-unit increase in the independent variable MI (Project Mission), there would be a 0.471 increase in the dependent variable Reported Project Success. 32.62% of variation on dependent variable is explained by the independent variable MI.

2. **Reported Project Success = 5.043 + 0.177*MG**

The expected result was confirmed. For a one-unit increase in the independent variable MG (Top Management Support), there would be a 0.177 increase in the dependent variable Reported Project Success. 13.39% of variation on dependent variable is explained by the independent variable MG.

3. **Reported Project Success = 4.952 + 0.185*CL**

The expected result was confirmed. For a one-unit increase in the independent variable CL (Client Consultation), there would be a 0.185 increase in the dependent variable Reported Project Success. 10.75% of variation on dependent variable is explained by the independent variable CL.

4. **Reported Project Success = 4.027 + 0.34*TT**

The expected result was confirmed. For a one-unit increase in the independent variable TT (Technical Tasks), there would be a 0.34 increase in the dependent variable

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Reported Project Success. 19.63% of variation on dependent variable is explained by the independent variable TT.

5. Reported Project Success = 5.8 + 0.0005601*e^{SP}

The expected result was confirmed. For a one-unit increase in the independent variable SP (Project Schedule/Plan) in exponential term, there would be a 0.0005601 increase in the dependent variable Reported Project Success. 11.1% of variation on dependent variable is explained by the independent variable SP.

6. Reported Project Success = 4.767 + 0.22*CM

The expected result was confirmed. For a one-unit increase in the independent variable CM (Communication), there would be a 0.22 increase in the dependent variable Reported Project Success. 14.42% of variation on dependent variable is explained by the independent variable CM.

7. Reported Project Success = 3.841 + 0.361*TS

The expected result was confirmed. For a one-unit increase in the independent variable TS (Trouble-Shooting), there would be a 0.361 increase in the dependent variable Reported Project Success. 21.92% of variation on dependent variable is explained by the independent variable TS.

8. Reported Project Success = 4.764 + 0.286*PMO Index

The expected result was confirmed. For a one-unit increase in the independent variable PMO Index (PMO Presence Index), there would be a 0.286 increase in the dependent variable Reported Project Success in exponential term. 31.32% of variation on dependent variable is explained by the independent variable PMO Index.

8.4.2 Second-order Regression Modeling for PMO Presence Index

In exploring whether PMO presence has a more complex impact on reported project success, a second-order regression model for the PMO Index (PMO Presence Index) variable was performed. It tested whether the relationship between PMO Index

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and Reported Project Success is quadratic over the range of observations. The model

went through weighted least square (WLS) transformation to satisfy regression

assumption (Table 8.12).

Second H_a: The PMO presence index has a 2nd order influence on reported project success.

Independent Variable	Transformation	H_a	t Value	p-Value	Accept H_a?	Global F	p-value	R^2
						13.062	0.0001	0.3477
PMO Index	Model - WLS	$\beta_1 \neq 0$	5.11	0.0001	Yes			
(PMO Index – PMO Index-bar)^2		$\beta_{11} \neq 0$	1.61	0.1138	No			

Table 8.12 Coefficient Hypothesis Test of Quadratic on PMO Index for the Targeted Sample

Since the p-value (0.1138) from the t-test result (1.61) of the second order for the

PMO Index variable is greater than the conventional alpha value 0.05, the research

hypothesis that the PMO presence index has a 2nd order influence on reported project

success is not true (Table 8.12). Thus, there is no second order regression model

developed for the PMO Index factor from the targeted data.

8.4.3 Multiple Regression Modeling Estimates for CSFs

It was hypothesized that the PMO factor would contribute predictive value to

project success, in addition to the original seven selected CSFs. In evaluating the

correlations in the targeted sample, PMO Presence Index showed the strongest correlation

with Reported Project Success (0.46286). The Pearson correlation coefficients are listed

in Table 8.13. Thus, the variable PMO Index was selected as the additional CSF for

multiple regression model construction in contrast to the result shown earlier from the

random survey results that the variable ST was selected to replace variable PMO Index.

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Pearson Correlation Coefficients / Prob > |R| under Ho: Rho = 0 / N = 52

	ST	PMO Index	MI	MG	CL	TS	SP	CM	TT	DV
ST	1.00000 0.0									
PMO Index	0.77901 0.0001	1.00000 0.0								
MI	0.45256 0.0008	0.39327 0.0039	1.00000 0.0							
MG	0.46760 0.0005	0.44113 0.0011	0.40855 0.00261	1.00000 0.0						
CL	0.31679 0.0221	0.25948 0.0632	0.28200 0.0428	0.29104 0.0363	1.00000 0.0					
TS	0.26457 0.0580	0.25177 0.0718	0.46512 0.0005	0.54019 0.0001	0.25924 0.0635	1.00000 0.0				
SP	0.52826 0.0001	0.41376 0.0023	0.20075 0.1536	0.39482 0.0038	0.29533 0.0335	0.40359 0.0030	1.00000 0.0			
CM	0.60893 0.0001	0.46892 0.0005	0.31887 0.0212	0.57642 0.0001	0.45530 0.0007	0.46395 0.0005	0.63364 0.0001	1.00000 0.0		
TT	0.42616 0.0016	0.48312 0.0003	0.24410 0.0812	0.53980 0.0001	0.08252 0.5608	0.47701 0.0003	0.37297 0.0065	0.54453 0.0001	1.00000 0.0	
DV	0.46211 0.0006	0.46286 0.0006	0.57146 0.0001	0.36624 0.0076	0.32809 0.0176	0.46816 0.0005	0.29892 0.0313	0.37943 0.0055	0.44099 0.0011	1.00000 0.0

Table 8.13 Pearson Correlation Coefficient for CSF Variables for the Targeted Sample

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8.4.3.1 Forward Stepwise Regression Model:

The third research hypothesis is as follows:

Third H_a: The PMO presence index has an influence on reported project success beyond the influence of CSFs alone.

A forward stepwise regression approach was employed to search for the best-fitting regression model. Results shown in Table 8.14.

Reported Project Success = 1.692 + 0.366*MI + 0.238*TT + 0.099*CL

```
                      Analysis of Variance

                    Sum of         Mean
    Source     DF   Squares       Square    F Value    Prob>F

    Model       3    9.01419     3.00473    13.194     0.0001
    Error      48   10.93155     0.22774
    C Total    51   19.94574


     Root MSE        0.47722    R-square     0.4519
     Dep Mean        6.06173    Adj R-sq     0.4177
     C.V.            7.87270


                    Parameter Estimates

                    Parameter    Standard    T for H0:
    Variable   DF   Estimate     Error       Parameter=0    Prob > |T|

    INTERCEP   1    1.684915     0.70061255    2.405        0.0201
    MI         1    0.366764     0.09455413    3.879        0.0003
    CL         1    0.099543     0.06277302    1.586        0.1194
    TT         1    0.238679     0.08270474    2.886        0.0058
```

Table 8.14 Coefficient Hypothesis Test of Multiple Regression on CSFs for the Targeted Sample

The model "Reported Project Success = 1.692 + 0.366*MI + 0.238*TT + 0.099*CL" has an adjusted R^2 of 0.4177 – which meant 41.77% of variation in the dependent variable Reported Project Success has been explained by this model; the remaining 58.23% of the variation was left unexplained. For the variable coefficients, it was shown that:

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(1) At a 99% confidence level, with one unit of increase in variable MI, holding the other variables TT and CL in the model constant, there would be a 0.366 increase in the dependent variable Reported Project Success.

(2) At a 99% confidence level, the independent variable TT provides additional predictive power to the dependent variable Reported Project Success. With one unit of increase in variable TT, and holding the variables MI and CL both constant, there would be a 0.238 increase in the dependent variable.

(3) At a close to 90% confidence level, the independent variable CL provides additional predictive power to the dependent variable Reported Project Success. With one unit of increase in variable CL, and holding the variables MI and TT both constant, there would be a 0.099 increase in the dependent variable.

The multiple regression model from the targeted survey data indicated that the PMO Presence Index variable was not an additional CSF. Thus, in answering the third research hypothesis, it is concluded that the PMO presence index has no influence on reported project success, beyond the influence of the CSF variables MI, TT, and CL alone.

8.5. Summary

This section presents a summary of the key findings from this chapter.

8.5.1 For the Random Sample

In testing the external validity of the research, t-tests on CSF variables show that the mean values for MI, MG, CL, SP, CM, and PMO Index from the first and second mailing (those who waited until the second mailing before responding) are the same which implies that in the general population there is no bias in questionnaire responses between those who responded and those who did not. However, the mean values for TT

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and TS are not the same which implies that in the population there may well be a bias in questionnaire responses between those who responded and those who did not (Table 8.3).

In developing a simple linear regression model, eight models were obtained for the CSF variables (Table 8.5). Among them, with a 95% confidence level, independent variable MI (Project Mission) explains 28.58% of variation on Reported Project Success, followed by TT (Technical Tasks) explaining 27.62% of variation on Reported Project Success, TS (Trouble Shorting) explaining 22.14% of variation on Reported Project Success, CL (Client Consultation) explaining 16.21% of variation on Reported Project Success, SP (Project Schedule/Plan) explaining 14.14% of variation on Reported Project Success, CM (Communication) explaining 13.16% of variation on Reported Project Success, MG (Top Management Support) explaining 10.75% of variation on Reported Project Success, and PMO Index (PMO Presence Index) explaining 4.76% of variation on reported project success (see Table 8.5).

Test result shows that the PMO presence index does not have a quadratic relationship with the reported project success (Table 8.7). There is no statistical evidence that a large PMO presence index would cultivate a bureaucratic environment which would constrain project managers' capability in achieving a high project success rate.

One multiple linear regression model (Reported Project Success = 0.573 + 0.264*MI + 0.235*CL + 0.231*TT + 0.183*TS + 0.069*SP − 0.123*CM) was generated from the random sample data (Table 8.9). There is a value for variables CL, TT, TS, SP, and CM to be the last add-in variable. About 54.58% of variation on the dependent variable (Reported Project Success) is explained by the independent variables of MI, CL, TT, TS, SP, and CM combined. In construction of the multiple regression model, PMO Index (PMO Presence Index) was replaced by variable ST (PM Standards and Methods) since ST had a stronger correlation coefficient with Reported Project Success than the PMO. However, ST does not qualify an additional CSF factor for the multiple regression model.

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8.5.2 For the Targeted Sample

In developing a simple linear regression model, eight models were obtained for the CSF variables (Table 8.10). Among them, with a 95% confidence level, Project Mission (MI) explains 32.62% of variation on project success, followed by PMO Presence Index (PMO Index) explaining 31.32% of variation on project success, Trouble Shooting (TS) explaining 21.92% of variation on project success, Technical Tasks (TT) explaining 19.63% of variation on project success, Communication (CM) explaining 14.42% of variation on project success, Top Management Support (MG) explaining 13.39% of variation on project success, Project Schedule/Plan (SP) in exponential term explaining 11.1% of variation on project success, and Client Consultation explains 10.75% of variation on project success.

Notice that the random and targeted survey data do not reach a similar conclusion in terms of β_1 coefficient and R^2 from the simple regression model. Specifically, the PMO Presence Index has a small R^2 (0.0476) from the random sample data, and has a much larger R^2 (0.3132) from the targeted sample data (see Table 8.15). One of the reasons could be that those project managers from the targeted group were selected by their PMO representatives/managers – who were more aware of the PMO presence and actually obtained much help from their PMOs which helped make contributions towards project success. On the other hand, it seems that PMO presence generally does not exert a strong influence on project managers and project teams, and does not have a significant contribution towards project success as yet.

Also, the second-order regression model test results show that the PMO presence index does not have a quadratic relationship with the reported project success both from the random sample data and the targeted sample data. There is no statistical evidence at a 95% confidence level that a large PMO presence index would cultivate a bureaucratic environment which would constrain project managers capability in achieving a high project success rate (see Table 8.7 and Table 8.12).

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Independent Variable	β_1 Coefficient (Random)	R^2 (Random)	β_1 Coefficient (Targeted)	R^2 (Targeted)
MI	0.644	0.2858	0.417	0.3262
MG	0.273	0.1075	0.177	0.1339
CL	0.595	0.1621	0.185	0.1075
TT	0.567	0.2762	0.34	0.1963
SP	0.375	0.1414	0.00056 (IV Exponential)	0.111
CM	0.39	0.1316	0.22	0.1442
TS	0.533	0.2214	0.361	0.2192
PMO Index	47.852 (DV Exponential)	0.0476	0.286	0.3132

Table 8.15 Comparison of Simple Regression on CSFs between the Random and the Targeted Samples

One multiple linear regression model (Reported Project Success = 1.692 + 0.366*MI + 0.238*TT + 0.099*CL) was generated from the targeted sample data. There is a value for variables TT, and CL to be the last predictors add on to the regression model. About 41.77% of variation on the dependent variable (Reported Project Success) is explained by the independent variables of MI, TT, and CL. PMO Index does not qualify as an additional CSF factor for the multiple regression model.

Notice that the regression technique does not generate a similar multiple regression model from the targeted sample data and from the random sample data. The model from the targeted sample has three independent variables (MI, TT and CL), while the model from the random sample has six independent variables (MI, CL, TT, TS, SP, and CM). Variables MI, TT and CL are included in both of the models. Also, for the random model the variable SP (Project Schedule/Plan) displays a weak link to project success. It gets into the multiple regression model with a small slope coefficient of 0.069 and a relatively large p-value of 0.1928.

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CHAPTER NINE

SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

9.1 Introduction

The purpose of this chapter is to provide an overall integrated summary and analysis that addresses the primary research question of this study (and associated hypotheses listed in Chapter One): <u>What impact does the presence of PMO functions and services have on reported project success</u>? A set of statistical techniques was applied in addressing this question.

Additionally, data on PMO establishment and use were gathered as ancillary benefits provided by this study. These data may be connected loosely to the notion of secondary research questions and they were addressed primarily in a qualitative manner supplemented with selected quantitative tools.

1. Is there a discernable trend in the establishment of PMOs?

2. What circumstances are associated with the establishment of PMOs (e.g., motivations)?

3. What are the main environmental factors related to the establishment of PMOs?
   - What management level approved PMO establishment?
   - What are the stated management purposes (e.g. mission statement) for PMO establishment?
   - What policy documents (e.g. charter) have been issued about PMOs?
   - Where are PMOs placed in organizations?
   - At what amounts are PMOs being funded?
   - What services and functions are provided by PMOs?

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Further, since this research drew upon Pinto and Slevin's (1986) work on critical success factors (CSFs) related to project success (as discussed in Chapters Two and Three), this chapter will address the degree to which this study may be used to update their findings. Finally, in performing the integration and analysis for this chapter, the following sources of data were used:

1. Literature review: Chapter Two.

2. The survey results obtained through sending a letter to 1000 randomly selected Project Management Institute (PMI) members. The letter invited their participation in a questionnaire through a George Washington University website. The total response rate was 23.4%. The findings and analysis are presented in Chapters Four and Five.

3. The survey results obtained through a combination of e-mail and some letters to (a) 240 individuals attending the 2000 PMI annual meeting in Houston who identified themselves as being associated with a PMO or similar entity; and (b) another 230 individuals who were contacted based on information from a variety of contacts. Thus, a total of 470 potential PMO-related candidates were contacted and eventually 96 individuals actually participated in the survey, for a response rate of 20.4%. For this sample, two website questionnaires were used: one was for PMO managers/representatives in the 96 participating organizations, the other was for 52 project managers who were invited by a subset of the managers/representatives from the same organization. The results and analysis are presented in Chapters Six and Seven.

These sources comprise both qualitative and quantitative data and lead to the use of a research methodology noted in Chapter Three (Methodology) called "triangulation," defined as "the combination of methodologies in the study of the same phenomenon," helping to ensure the validity and reliability of the results.[1]

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Following this introduction is a major section addressing important research findings from both the random and targeted surveys that concern PMO establishment (Chapters Four and Six respectively). Another section summarizes major research findings, from both the random and targeted surveys, concerning project performance (Chapters Five and Seven respectively). Next is a section on research results on CSFs including a comparison with the findings of Pinto and Slevin's earlier work mentioned above (Chapter Eight).

Finally, a concluding section addresses overall findings, conclusions and recommendations for future research, along with certain limitations and problems encountered in this study.

9.2 Summary, Findings and Analysis of Environmental Conditions Related to the Establishment and Use of PMOs

The information in this section may be considered as a broad profile of PMOs along a number of dimensions. The data on which the descriptions are based involve a combination of qualitative and quantitative items – with the latter consisting of percentages or sample frequency counts.

9.2.1 Background

The researcher's motivation for undertaking this study arose while exploring an earlier candidate topic for a dissertation: project failure and success. Increasingly, references were made by various PM authorities (see Chapters One and Two) to suggestions that one remedy for high project failure rates was for organizations to establish and use some kind of entity called a "project office" or "project management office (PMO)." Also, besides these references, it became apparent that a growing view – arising from various studies of best practices in PM – suggested that there is value in using some form of a PMO-type entity to improve project outcomes.

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Ultimately, the researcher decided to undertake the present study that combined "project success and failure" with the establishment and use of PMOs. Almost immediately, at least two major problems emerged:

The first problem is the lack of agreed-upon terms and definitions for what is called a project management office. For example, even authorities in the PM field often use the terms "project office," "project management office," and others such as a "systems program office (SPO)" synonymously. The differentiation presented in this study is that a "project office" is for managing one project and a "project/program management office" exists to provide supporting and facilitating services to multiple projects, and manages no projects directly. Such confusion of terms could possibly present an obstacle to reliable and valid data collection. In practice, it is believed that this potential problem was minimized by providing explanations in the letters or e-mails, and survey questionnaires.

The second major problem arose from a determination that no major empirical research study had ever been conducted on the primary research question or any aspect of PMOs. Existing information seemed to be based primarily on anecdotes, personal experiences, consulting experiences, and analyses based on very limited research efforts. Therefore, there were few guidelines available for assistance in designing a credible, focused research project.

However, the research effort by Pinto and Slevin, mentioned earlier, provided a general approach to examining project success through what they (and others) called critical success factors (CSFs). Permission was obtained to use their research – and a variation of their questionnaire – as a starting point for this study. After developing and discarding several conceptual models, the model shown in Figure 9.1 was developed to provide an overall framework for the research study, including providing a basis for the survey instruments.

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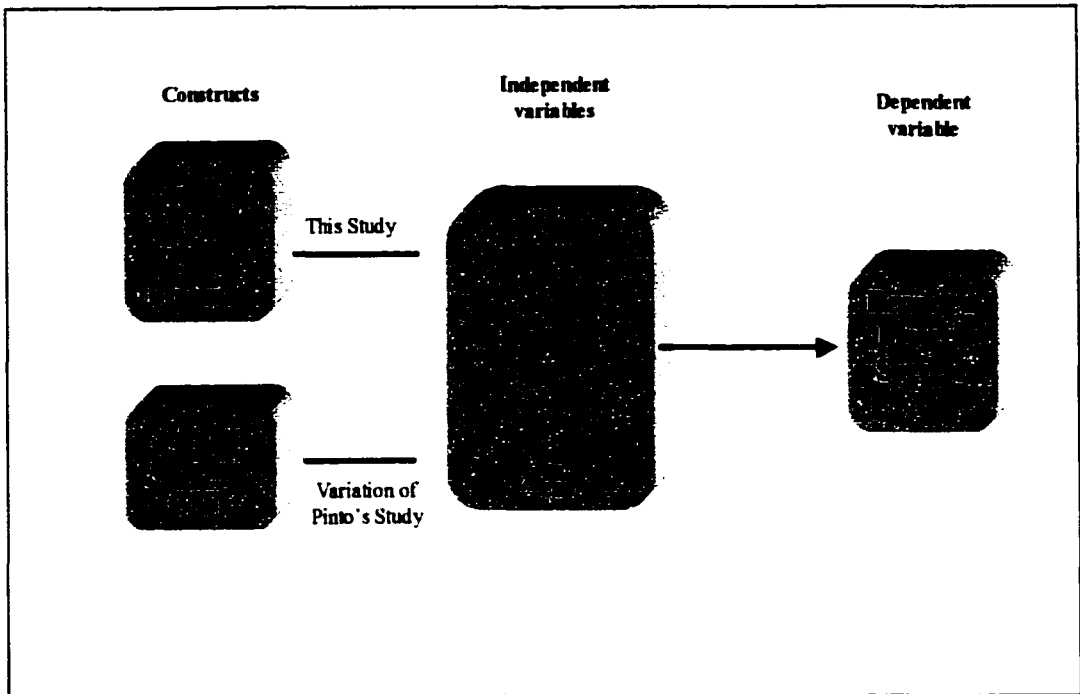
Figure 9.1 Research Model

9.2.2 A Trend in Establishment and Use of PMOs

A distinct trend involving increasing numbers of PMOs being established emerged in the mid-1990s. This trend is demonstrated by the frequency diagrams shown in Figure 4.1 (random survey) and Figure 6.1 (targeted survey). Indeed, the patterns obtained from the two surveys are remarkably similar. Such a growth pattern indicates that PMOs will continue to increase in number at least for the next several years.

9.2.3 Management Level for PMO Establishment Approval

As indicated in the literature review (Chapter Two), a frequently stated CSF for improving the effectiveness of PM and project performance is top management interest, support, and involvement. Related to this point is the fact that in both the random survey and targeted survey, an overwhelming proportion of PMO establishments was approved at a top/upper management level. As shown by Table 4.3 (random survey) and Table 6.1 (targeted survey), approval by top/upper management are 87 and 83% respectively.

These high levels are consistent with a conclusion that top/upper management is at least somewhat involved and interested in their respective organizations' approach to PM and particularly to a PMO.

9.2.4 Frequency of Full-time Staffing for An Organization's PMO

While insufficient data were collected to provide reasonably accurate numbers on actual sizes or average staffing levels, it is possible to state unequivocally that very high percentages for full-time staffing were reported in both the random and targeted surveys.

Table 4.4 (random survey) shows full-time staffing for 93% of the PMOs. A similarly 94% is shown in Table 6.2 (targeted survey). It may be concluded that full-time staffing of a PMO is the preferred model. Further research will be required to acquire accurate information on ranges and averages of staffing in various organizations. It is likely that such numbers will be situational and dependent upon the nature and variety of the roles assigned to a PMO and its position within an organization.

9.2.5 PMOs Reporting to Senior Management

A finding that is compatible with the above noted high percentages of PMOs established by top/upper management is that PMOs report to senior management by a large margin over those that do not. Table 4.5 (random survey) shows this margin to be a factor of three to one. The comparable margin for the targeted survey is about three to two as shown in Table 6.3. The patterns from the two surveys are similar.

9.2.6 Titles for Head of the PMO

Data from both the random and targeted surveys show a great deal of diversity in titles for those who are in charge of PMOs. Still, roughly a quarter of the titles from both surveys suggest some direct connection to a PMO. The largest category, however, involves "manager" or "director," as shown in Table 4.6 (random) and Table 6.4 (targeted).

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9.2.7 PMO Funding

The least confidence in all of the data collected about PMOs deals with their funding. More research will be required in this area, as is the case with staffing. With this caveat, the data shown in Figure 4.2 (random) and Figure 6.2 (targeted) suggest a close similarity in results. The proportion of an organization's budget devoted to a PMO was estimated at less than 2% for 59 and 62% of PMOs in the random and targeted surveys respectively.

9.2.8 Environmental Conditions Related to the Establishment and Implementation of PMOs

Several factors are considered together in the following section because of their close inter-relationships: motivation for PMO establishment, PMO mission statements, and PMO policy documents.

Motivation: Appendix E contains information from both the random and targeted surveys on motivating factors. For a few organizations. Appendix E shows a single motivation, whereas the great majority of respondents reported multiple motivations. By far the most frequently reported factors from both the random and targeted surveys were:

- Improving all elements of PM – including performance outcomes, lessons learned, support for project managers and reducing the number of "troubled projects."

- Achieving a common PM approach – including methodologies, standards, and accountability.

Mission Statement: Appendix F contains the details of various organizational PMO mission statements. A significantly higher rate of mission statement existence was reported by the targeted respondents compared to the randomly selected respondents (72% compared with 46%). While there were many variations in the wording of the mission statements, several themes appear prominently as shown in Section 4.3.2 (random) and Section 6.3.2 (targeted), including:

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- Advocate and support the implementation of best-in-class PM practices, processes, and principles across the organization.

- Structure and promote an environment in which processes, methods, and tools for system development, change management and PM are optimally employed and continuously improved in the business for achieving strategic goals.

- Standardize PM skills and disciplines organization-wide, while creating an integrated delivery process so reliable, effective and responsive that our customers identify us as giving them a competitive advantage.

PMO Policy Documents: Appendix G provides detailed responses for this topic. Of the random respondents, 57% reported having such documents; comparably, the targeted respondents reported a rate of 78%. A review of the Appendix G shows that the most frequently reported policy documents in both the random (Chapter Four) and the targeted (Chapter Six) surveys were a PMO charter and PM guidelines. Several other representative policy documents were related to:

- PM policy/strategy

- Various standard operating procedures

- Business justification documents

- Project metrics and standards

9.2.9 Major Functions and Services of PMOs

Later in this chapter the topic of functions and services provided by PMOs will be discussed statistically. However, as a general set of findings based on Chapter Six (Section 6.3.4 and Table 6.8), it may be stated:

- All 96 PMO respondents from the targeted sample reported a major function as performing "PM standards and methods."

- The next most frequently reported item was "consulting and mentoring."

- While not at the higher levels of the above two functions, these were mentioned frequently: providing administrative support, providing and arranging PM training, and maintaining historical archives.

A summary point in this area is that PMOs seem to come across as supportive and facilitative units rather than as another level of directive management. This is consistent with the definition of a PMO adopted in this study.

9.3 Relationships Between Project Success and PMO Functions and Services

This section is based on the results from Chapter Five (random survey) and Chapter Seven (targeted survey). Together, these results may be used to address the primary research question: <u>What impact does the presence of PMO functions and services have on reported project success</u>. Another dimension to addressing this question is on CSFs that is based on the research reported in Chapter Eight.

9.3.1 Background Information on Respondents and Reported Projects

A significant result from both the random survey and the targeted survey was as follows: while only 26% of the random respondents and about 31% of the targeted respondents reported their organizations as being part of the *software development, data processing, or computers/IT industry*, about 53 and 62%, random and targeted respectively, of the *reported projects* were associated with these areas. Although further research will be necessary on this topic, several tentative conclusions may be reached:

- In the world of projects and PM, the growing importance of "soft" projects in comparison with physical products is evident.
- As more of the output becomes increasingly complex and sophisticated, software, hardware, and process development become ever more intermingled.

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- Taken together, the results may well be seen as another manifestation of the "information revolution" that now pervades most of the human experience.

The respondents from both the random and the targeted samples presented very similar work patterns. Across many industry and governmental areas, they had, on average, 20 years of work experience with about 12 years in PM. For the random group, 72% had served as project manager and the proportion for the targeted group was 92%. It seems that the respondents were, on the whole, experienced, knowledgeable professionals.

While no effort was made in this study to determine any difference in reported results according to project size, it can be noted that 63% and 69% of reported projects, random and targeted respectively, fell into two categories: $100,000 - $1 million and $1 million - $10 million. More fine-grained analysis was postponed to a future time.

9.3.2 Linear Regression Models

It is in the domain of linear regression models – both simple and multiple – that significant differences emerged between the random and targeted survey results. Without doubt, this general area will require substantial future research to better understand the forces and factors behind the research results. Indeed, it may be necessary to consider a different research protocol involving additional methodologies, such as detailed case studies.

As a helpful reminder of the abbreviations used for the six categories of PMO functions and services in this study, the following list is provided:

- ❖ ST - representing PM Standards and Methods
- ❖ AR - representing Project Historical Archives
- ❖ NAD - representing Project Administrative Support
- ❖ NHR - representing Human Resources/Staffing Assistance
- ❖ NTR - representing PM Training

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❖ CN - representing PM Consulting and Mentoring

9.3.2.1 Simple Regression Modeling

A comparative summary of simple linear regression for PMO functions and services between the random and the targeted samples is presented in Table 9.1.

In both sets of models, ST (PM Standards and Methods) explains the most variation in project success (compared with other PMO functions and services). This result is fully compatible with and supportive of the PMO motivation and mission statement data noted above and in Section 4.3 (random survey) as well as the comparable data shown in Section 6.3 (targeted survey). Moreover, the Fortune 500 Benchmarking Forum on PM[2] (1997) has reported a similar finding on the importance of a standard methodology.

The next most important variable for the random sample is NHR (Human Resource/Staffing Assistance), while the second most important variable for the targeted group was AR (Project Historical Archives). The third most important variable in the random sample was NTR (PM Training), while the third most important variable for the targeted group was NHR.

It would seem that the respondents in the targeted group (both from the PMOs and projects) have placed much more emphasis on maintaining and using "lessons learned from previous projects" than did respondents in the random group. This positive view of the targeted group is compatible with that of Jessen (Chapter One, page 2) and the Fortune 500 Benchmarking Forum in which learning from earlier project success and failure is seen as providing invaluable knowledge.

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$$Y = \beta_0 + \beta_1 X_1 + \varepsilon_1$$

Entries are parameter estimates (t-statistics)

Variable	Estimates	Random (n = 234)	Targeted (n = 52)
ST	β_0 Intercept	4.541 (15.19)**	4.943 (15.77)**
	β_1 Slope Coefficient	0.227 (4.44)**	0.208 (3.68)**
	R-square	0.0789	0.2135
AR	β_0 Intercept	5.317 (30.62)**	5.573 (33.39)**
	β_1 Slope Coefficient	0.095 (2.18)**	0.147 (3.32)**
	R-square	0.0207	0.1810
NAD	β_0 Intercept	5.216 (27.76)**	5.73 (26.29)**
	β_1 Slope Coefficient	0.105 (2.55)**	0.08 (1.73)*
	R-square	0.0280	0.0574
NHR	β_0 Intercept	4.989 (22.02)**	5.526 (26.55)**
	β_1 Slope Coefficient	0.157 (3.60)**	0.133 (2.90)**
	R-square	0.0533	0.1467
NTR	β_0 Intercept	4.935 (21.24)**	5.193 (15.81)**
	β_1 Slope Coefficient	0.159 (3.28)**	0.171 (2.73)**
	R-square	0.0444	0.1299
CN	β_0 Intercept	0.245 (DV Reciprocal) (12.87)**	5.58 (17.93)**
	β_1 Slope Coefficient	-0.011 (-2.813)**	0.096 (1.61)
	R-square	0.0333	0.0494

Table 9.1 Summary of Simple Regression for PMO Functions and Services between the Random and the Targeted Samples

β_j = regression parameters, j = (0,1); ε = error term.
**(*) p <.05 (<.10) [2-tailed test for variables with hypothesized directions.]
R-square = variation in dependent variable explained by independent variable(s). Usually presented in percent form; e.g., results from the random survey indicate that 7.89% of variation in Reported Project Success is explained by PM Standards and Methods.

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A rather surprising finding from the targeted sample was that CN (PM Consulting and Mentoring) had no statistically significant support for the claim of having a relationship with project success – notwithstanding that this service was mentioned positively in the qualitative presentations in Chapter Six. This is an anomaly that seems to require further investigation in the future. Perhaps consulting and mentoring are often provided to projects that are already at risk for other reasons, diluting their efficacy. The same would apply to the lowest weight in the random sample being given to AR (Project Historical Archives), especially given the high value assigned to this function by the Fortune 500 Benchmarking Forum on PM and by the targeted group.

9.3.2.2 Multiple Regression Modeling

After the simple regression models were developed, an effort was made to construct multiple regression models, first from the random sample, and next, from the targeted survey. Attempts to develop a multiple regression model from the random sample failed due to violation of two or more regression assumptions of linearity, homoscedasticity, and normality of the residuals.

In turning to the targeted sample, it was determined that one model was the most fitting (see Chapter Seven Section 7.4). t-statistics are in parentheses.[*]

> DV (Reported Project Success) = $4.986 + 0.148ST + 0.085AR$
> $\quad\quad\quad\quad\quad\quad\quad\quad\quad$ (4.986)** (0.148)** (0.085)*
>
> $R^2 = 0.2566$ Adj. $R^2 = 0.2262$ F Value 8.455

This shows that, at a 90% confidence level, the variable AR (Project Historical Archives) has additional predictive power for the DV (Reported Project Success) given that ST (PM Standards and Methods) is already in the model. This result supports the importance of future exploration of the AR anomaly noted in the previous section.

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[*] **(*) $p < .05$ (<.10)

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The above cited multiple regression model explained 22.62% of the variation in DV. It would seem that these findings offer preliminary but substantial practical advice to organizations using or contemplating the use of a PMO. Before all else, establish goals for (1) achieving standard methodologies organization-wide through the PMO, and (2) putting into place a capability for maintaining a project historical archive.

9.3.3 Comparison of Reported Project Success in Organizations that Have Established PMO Entities with Those That Do Not

The analysis in this section is another step, but not the final one, in addressing the primary research question of this study: <u>what impact does the presence of PMO functions and services have on reported project success?</u> The data for the analysis arises from the random sample and is discussed in Section 5.5.

The organization modes compared are (1) those having a PMO, (2) those having no PMO, and (3) those having something in-between. For advocates of PMOs, the findings must be rather unsettling – and surprising – given the uniformly positive tone about PMOs seen in the literature review (Chapter Two). In essence, the random sample results do not show that reported project success is higher in organizations that have PMOs in comparison with those that do not.

A second area of hypothesis testing addressed whether the use of PMO functions and services differs significantly among organizations having a PMO, having no PMO, or having someone working on PMO functions and services where no formal entity has yet been established. Given the above finding on reported project success, another surprise emerged that should tend to make PMO advocates more pleased. Close examination of the comparative results for all six PMO functions and services for the three types of organizations showed that: organizations that have a PMO have done much more in promoting PM Standards and Methods (ST), PM Historical Archives (AR), PM Training (NTR) and PM Consulting and Mentoring (CN). Further, organizations without a PMO

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have generally done less in providing the range of possible functions and services (associated with the six variables of this study) for project managers and project teams.

9.3.4 Analysis of CSFs Associated with Reported Project Success in Organizations

9.3.4.1 Overview

The topic of this section deals with a set of eight of the CSFs that have been hypothesized as being associated with project success. Seven were selected from a set of ten independent variables identified in earlier research performed by Pinto and Slevin as discussed in Chapters Two and Three. The eighth variable was added as part of the research design of the present study and is directly related to the primary research question. The added CSF is the PMO Index (PMO Presence Index) – which, to remind, folds the six PMO functions and services independent variables, ST, AR, NAD, NHR, NTR, and CN, into a single variable.

The following list contains the eight CSFs tested in the research, and are shown both by name and abbreviation:

- ❖ MI – representing Project Mission
- ❖ MG – representing Top Management Support
- ❖ CL – representing Client Consultation
- ❖ TT – representing Technical Tasks
- ❖ SP – representing Project Schedule/Plan
- ❖ CM – representing Communication
- ❖ TS – representing Trouble Shooting
- ❖ PMO Index – representing PMO Presence Index

The original Pinto and Slevin questionnaire was adapted, with permission, in order to conduct this study. In essence, an effort was undertaken to determine if the PMO

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Index (PMO Presence Index) would qualify as a CSF – as well taking another look at what variables were judged to be the strongest.

9.3.4.2 Simple Regression Models

A comparative summary of simple linear regression for CSFs between the random and the targeted samples is presented in Table 9.2.

From the random sample data, and the development of the eight regression models, it is clear that the top four variables in explaining variation in DV (Reported Project Success), in order of their importance, are: MI (Project Mission), TT (Technical Tasks), TS (Trouble Shooting), and CL (Client Consulting). There is some similarity in the top four variables from the targeted sample, with MI being the first. PMO Index (PMO Presence Index) second, TS third, and TT fourth. Of more than passing interest for this research, the PMO Index was considered far more important by the targeted group than by the random group and its importance was seen as quite close to the leading variable, MI. Indeed, the PMO Index factor was least importance by a wide margin in the random group. One possible reason for the rather substantial difference could be as follows: project manager respondents from the target group are more likely to be more aware of and work more closely with their respective PMOs than the respondents from the random survey group. It is also possible that some bias might exist among project managers who were chosen by PMO representatives although it is the researcher's understanding that the web site entries were made confidentially. On the other hand, for the random group, it may be that the PMO is still a recent concept, and respondents might not be familiar with it.

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$$Y = \beta_0 + \beta_1 X_1 + \varepsilon_1$$
Entries are parameter estimates (t-statistics)

Variable	Estimates	Random (n = 234)	Targeted (n = 52)
MI	β_0 Intercept	1.719 (3.971)**	3.041 (4.92)**
	β_1 Slope Coefficient	0.645 (9.636)**	0.471 (4.92)**
	R-square	0.2858	0.3262
MG	β_0 Intercept	4.274 (13.62)**	5.043 (13.42)**
	β_1 Slope Coefficient	0.273 (5.276)**	0.177 (2.78)**
	R-square	0.1075	0.1339
CL	β_0 Intercept	2.699 (5.501)**	4.952 (10.77)**
	β_1 Slope Coefficient	0.495 (6.612)**	0.185 (2.45)*
	R-square	0.1621	0.1075
TT	β_0 Intercept	2.419 (6.475)**	4.027 (6.60)**
	β_1 Slope Coefficient	0.567 (9.409)**	0.34 (3.43)**
	R-square	0.2762	0.1906
SP	β_0 Intercept	3.714 (9.973)**	5.8 (43.55)**
	β_1 Slope Coefficient	0.375 (6.153)**	0.00056 (IV Exponential) (2.50)*
	R-square	0.1414	0.111
CM	β_0 Intercept	3.503 (8.521)**	4.767 (10.51)**
	β_1 Slope Coefficient	0.39 (5.93)**	0.22 (2.90)**
	R-square	0.1316	0.1442
TS	β_0 Intercept	2.562 (6.227)**	3.841 (6.42)**
	β_1 Slope Coefficient	0.533 (8.123)**	0.361 (3.75)**
	R-square	0.2214	0.2192
PMO Index	β_0 Intercept	216.2 (DV Exponential) (3.40)**	4.764 (15.40)**
	β_1 Slope Coefficient	47.852 (3.41)**	0.286 (4.78)**
	R-square	0.0476	0.3132

Table 9.2 Summary of Simple Regression for CSFs between the Random and the Targeted Samples

β_j = regression parameters, j = (0,1); ε = error term.
**(*) p <.05 (<.10) [1-tailed test for variables with hypothesized directions.]
R-square = variation in dependent variable explained by independent variable(s). Usually presented in percent form; e.g., results from the random survey indicate that 28.58% of variation in reported project success is explained by PM standards and methods.

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Above and beyond this key difference, however, there is a striking similarity between the two sets of findings in that both ranked Project Mission (MI: clarity and understanding of the project mission) as the most important CSF in influencing project performance outcomes. Moreover, Trouble Shooting (TS: ability to diagnose problems and solve them effectively) and Technical Tasks (TT: competence of technical staff and appropriate choices of technologies) were selected by both survey groups as being in the top three CSFs.

Such factors should be of great practical concern to organizations in prioritizing their effort related to the use of a PMO and how best such an entity can assist projects. Still, a major question of concern is whether a PMO is essential in addressing the above highly reported CSFs and the others ranked less highly in the set of eight that were examined in this research. This issue has not yet been brought to closure in the current analysis.

9.3.4.3 Multiple Regression Models

Concerning the CSF analysis, the next topic concerns the multiple regression models that were developed as shown in Chapter Eight. The two best models, one each from the random and targeted survey, are as follows (t-statistics are in parentheses[*]):

From the Random Survey:

$$DV = 0.573 + 0.264MI + 0.235CL + 0.231TT + 0.183TS + 0.069SP - 0.123CM$$
$$(1.828)^* \quad (3.569)^{**} \quad (4.338)^{**} \quad (3.017)^{**} \quad (2.257)^{**} \quad (1.306) \quad (-1.691)^*$$
$$R^2 = 0.5579 \quad Adj. R^2 = 0.5458 \quad F \text{ Value } 46.062$$

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[*] **(*) $p < .05$ (<.10)
Adj.R^2 = smaller than R^2; adjustment made reflecting number of independent variables and sample size

From the Targeted Survey:

$$DV = 1.692 + 0.366MI + 0.099CL + 0.238TT$$
$$(2.405)** \quad (3.879)** \quad (1.586) \quad (2.886)**$$

$$R^2 = 0.4519 \quad Adj. \ R^2 = 0.4177 \quad F \ Value \ 13.194$$

For the model from the random survey, it is seen that there was value for variable CL (Client Consultation), TT (Technical Tasks), TS (Trouble Shooting), SP (Project Schedule/Plan), and CM (Communication) to be the last added variable. In combination with MI, about 55% of variation on DV (Reported Project Success) is explained by these five independent variables. Please note that in constructing the model, the PMO Index (PMO Presence Index) variable was replaced by ST (PM Standards and Methods) because ST had a stronger correlation with DV then did the PMO Presence Index. However, ST still did not qualify as an additional CSF for the model. This finding adds to the "cloud hanging over" the PMO role in achieving better project performance.

In turning to the multiple regression model developed from the targeted survey data, it is seen that there was value for predictor variables TT and CL to be the last added in. About 42% of the variation in DV is explained by the three variables MI, TT, and CL.

Comparison of the two multiple regression models leads to a somewhat disquieting finding, and one that calls for additional research. While the independent variables MI, TT, and CL appeared in both models, the model from the random survey data had three additional variables: TS, SP, and CM. More research is needed here to test whether these three variables should be included or excluded from the multiple regression modeling in a random survey.

Finally from this section on CSFs, the most important finding is that the PMO Index (PMO Presence Index) did not appear in either multiple regression model. This was notwithstanding the fact that in the simple regression models for the targeted survey group, the Index was second only to MI (Project Mission) in importance.

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9.3.5 Overall Analysis of the Research Results as Related to the Primary Research Question and Related Matters

This section summarizes what the preceding analysis permits in the form of conclusions about the primary research question: <u>What impact does the presence of PMO functions and services have on reported project success?</u> Additionally, as noted in the introduction to this chapter, various data related loosely to the notion of secondary research questions on PMO establishment are addressed. As was mentioned in the earlier reference to "triangulation," these final conclusions are based on a combination of qualitative and quantitative data.

9.3.5.1 Conclusions Based on Qualitative and Descriptive Data

A starting point in these last steps towards reaching conclusions on the primary research question is to review key data in Section 9.2 from both the random and targeted surveys. First, there is the clear role of top/upper management in the establishment of PMOs and required reporting channels. Second, there is clear articulation of top level policy in the form of PMO mission statements and the various policy documents associated with PMOs.

In considering these points, it might be argued that it is not unreasonable to conclude that these top/upper managers believe there is the potential for significant improvement in the ways that their projects are launched and managed thereby leading to more successful project outcomes. Therefore, they demonstrate their commitment to support of PM by approving the establishment of the PMOs and having them report directly to them for the most part.

Alternatively, it might be argued that management was initiating or approving recommendations for PMO use that were poorly conceived and executed. It may well be that some PMOs were established or are being operated in such ways, but to suggest that all or most fall into this category nearly begs for the suspension of judgment. Moreover, the rapid rate of increase in the numbers of PMOs that have been placed into operation

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since the mid-1990s (as shown by both the random and target surveys) suggests some positive "word-of-mouth" may be occurring. Of course, this rate of increase also is likely being influenced by recommendations from consultants and academics, and this is one way that many organizational changes occur over time.

Further, from the literature review and reports of the Fortune 500 Benchmarking Forum on PM, a not inconsequential finding is that a number of the functions and services provided by PMOs have increasingly been characterized as a "best practice" in PM. Finally, in Section 9.3.3 it was shown that even for the random survey group (which did not connect the PMO entity directly to increased project success), the "best practice" functions and services were much more likely to be present in organizations that had PMOs than in those that did not.

All in all, the data forming the basis for the conclusions stated in this section do not build a totally unchallengeable case in support of a favorable impact of PMO functions and services (especially as provided by a PMO entity) on project success. However, it does not seem unreasonable to conclude that the circumstantial case is rather strong in support of PMO use. This commentary will be revisited subsequently.

9.3.5.2 Conclusions Based on the Regression Models Involving the Six Independent Variables of PMO Functions and Services from Random and Targeted Surveys

As noted in Sections 9.3.2.1 and 9.3.2.2 above, while there are some surprising findings and anomalies arising from the research data obtained from both the random and the targeted survey groups, it is possible to reach a relatively important conclusion about PMO functions and services.

In both sets of simple regression models that were developed, it is possible to link ST (PM Standards and Methods) most strongly and positively with DV (Reported Project Success). As stated earlier, this result is fully compatible with and supportive of the PMO motivation and mission statement data noted above in Section 4.3 (random survey)

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and Section 6.3 (targeted survey). Moreover, the Fortune 500 Benchmarking Forum on PM has reported a similar finding on the high importance of using a standard set of PM methodologies organization-wide.

Following ST, in the approximate rank order of importance of the six variables associated with DV (Reported Project Success), the simple regression models show NHR (Human Resources and Staffing), AR (Project Historical Archives), and NTR (PM Training) to be among the top four (between the two sets of models). One of the surprises from the models was the targeted simple regression model on CN (PM Consulting and Mentoring) showed this variable the least important to DV. This regression finding was surprising given the reasonably positive mentions of this function and service in the qualitative findings.

A similar surprise came from the random survey in that the lowest importance was assigned to AR (Project Historical Archives) whereas this variable was rated number two and very highly by the targeted survey group. Further, this function has been ranked very high as a "best practice" by the Fortune 500 Benchmarking Forum on Project Management.

This surprise was further reinforced by the multiple regression model that was developed from the targeted survey data; no valid multiple regression model could be formulated from the random survey group's data. As shown in Section 9.3.2.2, the targeted model includes the variables ST (PM Standards and Methods) and AR (PM Historical Archives), where AR is qualified as a best addition.

Based on close study of the various regression models, it seems possible to reach a major conclusion that some of the independent variables often associated with PMO functions and services have a positive relationship with improving project performance. It seems especially so for at least four of the six variables: ST, AR, NHR, and NTR. The practical implications of this conclusion for organizations to improve the performance of their projects appear to be rather significant. Still, more research will be required to sort

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out the various differences and anomalies appearing in the analysis of the data from the two survey groups.

9.3.5.3 Conclusions Based on A Comparison of Reported Project Success in Organizations That Have Established PMOs with Those That Do Not.

The data for this analysis is taken only from the random survey group as this part of the overall survey plan did not include the targeted group (since all of them had PMOs). A major finding was that the DV (Reported Project Success) was not higher in organizations that have a PMO in comparison with those that do not. This was not a supportive finding for PMOs leading to better project success. Given the positive tone in the literature about PMO use, this finding must be surprising and perhaps somewhat unsettling to PMO advocates.

However, the random group was not finished without providing another finding that also could be termed a surprise. The data showed that organizations having PMOs have done far more in promoting certain types of functions and services (ST, AR, NTR, CN) that have been associated both with PMOs and with improved project success. As will be seen, these apparently contradictory findings from the random survey group may offer a way to explain the lack of clear support for a positive response in the primary research question.

9.3.5.4 Conclusions Based on Analysis of the CSFs

A review of the data and analysis in Section 9.3.4 above brings into this final analysis the remaining topic: critical success factors. As a reminder, this component of the research design was based on the earlier CSF research of Pinto and Slevin. To the seven (out of ten) CSFs taken from the noted research because they showed statistically significant relationship with project success, the PMO Index (PMO Presence Index) was added as an eighth factor. All eight were then tested in terms of their association with DV (Reported Project Success).

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In focusing on the central data sets and their associated simple regression models, the following findings emerged:

- From the random group, the top four variables in order of their importance are: MI (Project Mission), TT (Technical Tasks), TS (Trouble Shooting), and CL (Client Consultation).

- There was overlap between MI, TT, and TS as these variables also were in the top three of the targeted group. However, the targeted group-valued the PMO Index as a close second to MI.

- The random group placed the PMO Index in last place by a large margin.

In turning to the multiple regression models, it can be noted that:

- Two different models emerged from the random and the targeted groups. Three of Pinto and Sleven's original factors, MI, TT, and CL, appeared in both of the random and the targeted model. While another three, SP (Project Schedule/Plan), CM (Communication), and TS (Trouble Shooting) appeared in the random model, not the targeted model.

- The PMO Presence Index did not make it into either the random or the targeted multiple regression model.

Overall, these findings do not support a direct additional predictive contribution of the PMO Index to Reported Project Success – in the presence of the stronger CSFs. The simple regression model did, however, show that the PMO Presence Index indeed has predictive power for the variation in Reported Project Success.

9.4 Overall Summary, Analysis and Conclusions

The main objective for this research was to explore the degree of influence that PMO functions and services have on reported project success. The study also explored the degree of influence that the use of PMO functions and services have in addition to the

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influence of CSFs identified by Pinto and modified for this study (reviewing Figure 9.1 on page 142).

Three sets of hypotheses were postulated in addressing the primary research question: <u>What impact does the presence of PMO functions and services have on reported project success.</u>

The first research hypothesis, that the PMO presence index has a linear influence on reported project success, could be largely accepted. The simple regression models, in varying degree from both the random and targeted survey groups showed a positive linear impact.

The second research hypothesis, that the PMO presence index has 2nd order influence on reported project success could not be accepted. The practical implication is that a strong PMO presence does not appear to introduce bureaucratic impediments to reported project success.

The third research hypothesis, that the PMO presence index has influence on reported project success beyond the influence of previously identified CSFs alone could not be accepted.

There is an apparent paradox in the above findings and conclusions. On the one hand, individual PMO functions and services are mostly found to be positively associated with project performance both from the random and the targeted group; however, on the other hand, when these PMO functions and services are bundled and considered as a factor in the context of the PMO presence index, this factor is not seen as a CSF.

While it is possible to speculate on the underlying reasons for this apparent (or perhaps real) contradiction, the prudent observation to make is that research findings do not always come in neat packages, each clearly and cleanly defined. Certainly, further research will be required and it is likely that a different research approach may be required; for example, it may be necessary to conduct a large number of detailed case

studies in organizations where a PMO has been in place long enough to have accumulated a significant data base.

If one were to speculate on the above findings, it might be possible to suggest that the PMO as an organizational entity may well have no direct influence and only impacts project performance by the functions and services it provides. Therefore, in this scenario, the PMO has only an indirect role, not a direct one. It was the PMO in the direct role that was examined in connection with the third set of hypotheses.

Of course, another speculation could be that the research design and questionnaire were unclear to an extent that led to some confusion on the part of various respondents. Still, the contradiction is present and ought to be considered anew in future research.

In contrast to the somewhat uncertain ground underlying certain parts of the three sets of hypotheses in addressing the primary research question, the general descriptive and qualitative area were fully addressed. The various data should provide important practical guideline for organization already operating a PMO or moving to establish one. Specific advice, examples, and findings show that:

- Top/upper management has largely been involved in establishing PMOs and in having reporting channels reflect their continuing interest.

- Notwithstanding the not entirely clear picture on the currently perceived impact of PMOs in reported project success arising from the statistical analyses, stated management purposes for establishing PMOs are clear-cut. These boil down to seeking better performance in the management of their projects and in the achievement of more successful outcomes. The mission statements listed in Appendix F present such a theme with regularity.

- A variety of PMO policy documents are described or identified by type, such as the PMO charter that is commonly mentioned.

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- A basic set of functions and services provided by PMOs was identified from the literature review. These were for the most part ratified by the research findings:
  - ➢ Developing and maintaining PM standards and methods
  - ➢ Developing and maintaining project historical archives
  - ➢ Providing project administrative support
  - ➢ Providing human resource/staffing assistance
  - ➢ Providing PM consulting and mentoring
  - ➢ Providing or arranging PM training

In concluding, it may be suggested that, while the statistical analysis leaves one with some sense of "unfinished business," this first ever large-scale research study of PMOs does present:

- A considerable set of guidelines, as well as practical advice and information for organizations interested in the establishment and use of PMOs.
- The CSFs identified by Pinto and Slevin nearly 15 years ago have held up reasonably well but the topic could benefit from a large scale updating.
- Guidelines and suggestions for future research.

9.5 Suggestions and Recommendations Arising from this Research

While the results from this research were not fully conclusive in terms of the stated research questions, nevertheless it seems reasonable to conclude that they point to a number of practical applications for immediate use and to several areas where additional research could be productive.

9.5.1 Suggestions for Practical Applications

Among the specific ways in which the research might be practically applied in management are:

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- Identifying specific guidelines for establishing a PMO capability in ways most likely to lead to success in improving PM within an organization. Examples including top management support, having the PMO report to upper management levels, allocating some full-time staffing, and avoiding the appearance and reality of a PMO being seen by project teams as a "management watchdog" rather than as a supportive and facilitating unit.

- Providing guidelines for selecting and prioritizing those PMO functions and services that are most likely to influence project outcomes positively.

- Providing specific guidelines and examples of various policy documents such as PMO mission statements, charters, and operating procedures.

- Demonstrating how a PMO can be a positive force for organization-wide use of "best practices" in PM, in accordance with a major purpose of the Fortune 500 Benchmarking Forum on PM.

- Demonstrating how a PMO can be a vehicle for bringing PM and projects into the strategic planning and operations of an organization.

9.5.2 Recommendations for Future Research

Among the areas that emerged during the course of the research and the subsequent analysis calling for additional research are the following:

- A number of anomalies emerged in the findings when comparing the different populations. The most important such anomaly was with respect to the value of a PMO in contributing to project success as seen by the different populations.

- Another example of such an anomaly was the different evaluations to such PMO services as "mentoring" and "consulting" by respondents from the population of service providers – PMO representatives/managers, and from

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the service receiver population – project managers. These and other

anomalies identified in the research need to be investigated in future research.

- There were some indications that the PMO is being adopted more rapidly in

   some of the newer technological areas (e.g. IT) than in the older, more mature

   industries. This phenomenon requires further inquiry to determine its validity

   and implications, if the finding is not simply an artifact of the research design

   and size of the survey population.

- The most important finding, related to the first anomaly noted above, was that

   the PMO Presence Index as a distinct factor did not warrant incorporation in

   the group of CSFs that were adapted from Pinto and Slevin's research in mid-

   80s. Yet, the types of services and functions provided by PMOs appeared in

   valid simple regression models dealing with the independent variable, "Project

   Success."

- As an overall recommendation, it may be necessary to design a research

   protocol that is based on the examination of PMOs after they have been in

   operation for some considerable period of time in organizations. Moreover,

   the research protocol of detailed case studies might be considered in addition

   to larger, broader survey approaches.

CHAPTER NINE ENDNOTES

[1] Todd D. Jick, "Mixing Qualitative and Quantitative Methods: Triangulation in Action." *Qualitative Methodology*, John Van Maanen, ed, 1983.

[2] Frank Toney and Ray Powers, *Best Practices of Project Management Group in Large Functional Organizations: Results of the Fortune 500 Project Management Benchmarking Study*, PMI, 1997, page 84.

GLOSSARY

Critical Success Factors (CSFs):

The limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization.

Effectiveness:

(1) The timely and accurate accomplishment of pre-established requirements. (2) A measure of the extent of which an item satisfies a set of specific organizational objectives.

Project:

A unique, multitask job which has to be started and completed between two certain dates, for a certain amount of resources, within expected levels of performance.

Project Lifecycle Phases:

A series of discrete but logically related steps that any organization proceeds through when executing a project. Generally it includes project conceptualization, planning, execution, and putting project's technical performance deliverables into operation.

Project Management (PM):

The application of knowledge, skills, tools and techniques to project activities in order to meet or exceed stakeholder needs and expectations from a project.

Project Management Office (PMO):

Organizational entity established to assist project managers and teams throughout the organization in implementing PM principles, practices, methodologies, tools and techniques. Also it is called a center of excellence or center of expertise.

Project Office:

Organizational entity established to complete a specific project or series of projects, usually headed by a project manager.

Program Office:

Organizational entity established to complete a number of projects that collectively satisfy a strategic or tactical organizational objective(s), usually headed by a program manager and staffed by professionals from various disciplines.

Project Success:

Measures for a project outcome determined by meeting schedule, budget, technical performance requirements, and achieving expected results.

Runaway Projects:

Projects that (1) produce unacceptable systems, (2) grossly exceed budget and/or time estimates and, (3) seem to take on lives of their own.

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APPENDICES

APPENDIX A

IDENTIFIED FIELD EXPERTS ON PMO

The PMO survey questionnaire draft was sent to the following listed experts for reduction and comments. They were identified through literature review.

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<u>Thomas R. Block,</u>	co-author of *The Project Office*, Crisp Publications, Inc., 1998.
<u>Davidson Frame,</u>	co-author of *The Project Office*, Crisp Publications, Inc., 1998; PMI executive board member at-large.
<u>David Griffith,</u>	co-sponsor for specific interest group (SIG) of "Academy of Program Management Office" at Project Management Institute (PMI).
<u>Joan Knutson,</u>	author of "Reengineering a Non-Centralized Project Structure into a Centralized Project Structure," *PM Network*, Feb. 1995. President and founder of a PM consulting and training firm.
<u>Paul C. Dinsmore,</u>	author of *Winning in Business with Enterprise Project Management*, New York : AMACOM, 1999. "Project Office: Does One Size Fit All?" *PM Network*, April 2000, v14n4. President of Management Consultants International Group.
<u>Jeffry K. Pinto,</u>	author of the dissertation "Project Implementation: A Determination of Its Critical success Factor, Moderators and Their relative Importance Across the Project Life Cycle."
<u>John Sullivan,</u>	author of "The Hidden Roles of the Project Support Office," *PM Network*, v14n2, Feb. 2000, page 17. Head of a project support office (PSO).
<u>LeRoy Ward,</u>	author of *Project Management Terms – A Working Glossary*, ESI International, 2000.
<u>William G. Wells Jr.,</u>	editor of *Project Management Journal* from 1997-2000.

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APPENDIX B

PMO QUESTIONNAIRE DRAFT FOR REVISE BY EXPERTS

It was the original questionnaire sent to the identified experts for question item reduction and comments.

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Please think of a completed project in which you **had recently been** (it means a most recently finished project) involved. Example would be:

> Opening a new facility
> A new product introduction
> A departmental reorganization
> Staffing a new department
> Moving to a new building
> Designing a new product
> Acquiring a LAN
> Developing a new application software

Background Data

Which of the following best describes the end product and your individual role in the project about which you are responding?

End Product	Your Individual Role
____Physical facility	____Project manager
____Hardware, equipment, or appliance	____Support manager on project team
____Food, drug, or soft goods	____Project team member (technical)
____New or improved process or software	____Project team member (administrative)
____Service or test	____Member of business unit affected
____Study	by the project
____Departmental reorganization or	____Other _____
move to a new facility	_____
____Other _____	please specify
_____	
please specify	

Briefly describe your selected project, giving its title and specific goals:

_____

_____

_____

_____

_____

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PART I. PROJECT PERFORMANCE

The following fourteen questions relate to your evaluation of the ultimate performance of the completed project in which you **had recently been** involved. Please circle the number showing the extent to which you agree or disagree with the following statements as they relate to the actual outcome of the project.

	Strongly Disagree			Neutral			Strongly Agree	
1. This project was completed on schedule 1	2	3	4	5	6	7	N/A
2. This project was completed within budget 1	2	3	4	5	6	7	N/A
3. The end product/service that was developed works 1	2	3	4	5	6	7	N/A
4. The end product/service is used by its intended clients 1	2	3	4	5	6	7	N/A
5. The end product/service has directly benefit the intended users through increased efficiency 1	2	3	4	5	6	7	N/A
6. The end product/service has directly benefit the intended users through increased employee effectiveness 1	2	3	4	5	6	7	N/A
7. Given the problem for which the end product/service was developed, this project seems to do the best job of solving that problem, i.e., it was the best choice among the set of alternatives ...1	2	3	4	5	6	7	N/A
8. I was satisfied with the process by which this project was being completed 1	2	3	4	5	6	7	N/A
9. We were confident that non-technical startup problems would be minimal, because the project was readily accepted by its intended users 1	2	3	4	5	6	7	N/A
10. Use of this end product/service led directly to improved performance for the clients 1	2	3	4	5	6	7	N/A
11. Use of this end product/service led directly to improved decision making for the clients 1	2	3	4	5	6	7	N/A
12. The end product/service had a positive impact on those who made use of it 1	2	3	4	5	6	7	N/A
13. The results of this project did represent a definite improvement in performance over the way clients used to perform these activities 1	2	3	4	5	6	7	N/A
14. All things considered, this project was a success 1	2	3	4	5	6	7	N/A

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PART II. CONTRIBUTIONS OF PROJECT MANAGEMENT OFFICE

The second part of this questionnaire attempts to measure the relative contribution of a project management office to the project's final performance outcome.

For this study, a **project management office** (PMO) is defined as an organizational entity established to **assist** project managers and teams throughout the organization in implementing project management principles, practices, methodologies, tools and techniques. PMO functions and services mainly include the following A to F areas or some kind of combinations of these areas.

A: Project Management Standards and Methods	Strongly Disagree	Neutral		Strongly Agree		Block

1. Assistance was provided in developing project proposal (assigning a proposal manager, selecting a proposal writing team, establishing a proposal development schedule, securing management approval for the bid, etc.) .... 1 2 3 4 5 6 7 N/A   Remove? Yes No

2. Rather than relying on subjective factors, objective project selection procedures were established. (cost-benefit analysis, etc.) .... 1 2 3 4 5 6 7 N/A   Remove? Yes No

3. Guidelines for how many levels or what type of breakdown (product vs. task orientation) should be used in the Work Breakdown Structure were available .... 1 2 3 4 5 6 7 N/A   Remove? Yes No

4. Methods for change requests (how to be initiated, routed, approved, etc.) were available .... 1 2 3 4 5 6 7 N/A   Remove? Yes No

5. A standard format for project scheduling techniques (PERT and CPM networks, GANTT and milestone charts, etc.) was used .... 1 2 3 4 5 6 7 N/A   Remove? Yes No

6. Risk assessment procedures (risk identification, impact analysis, response development, etc.) were established .... 1 2 3 4 5 6 7 N/A   Remove? Yes No

7. Documentation standards (progress/status reports and time sheets, etc.) were used .... 1 2 3 4 5 6 7 N/A   Remove? Yes No

8. Quality policies/measures were used .... 1 2 3 4 5 6 7 N/A   Remove? Yes No

9. A project management handbook was used .... 1 2 3 4 5 6 7 N/A   Remove? Yes No

10. Project termination processes/techniques were used .... 1 2 3 4 5 6 7 N/A   Remove? Yes No

Are there any other important statements that you think should be included in this list? If yes, please list them below:

_____

_____ 1   2   3   4   5   6   7

_____

_____ 1   2   3   4   5   6   7

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B: <u>Project Historical Archives</u>

	Strongly Disagree		Neutral			Strongly Agree			Block

1. Histories from prior projects were readily available 1   2   3   4   5   6   7 N/A   Remove? Yes No

2. Changes to project plans from prior projects were readily
   available 1   2   3   4   5   6   7 N/A   Remove? Yes No

3. Risk management documents from prior projects were
   readily available..1   2   3   4   5   6   7 N/A   Remove? Yes No

4. Progress/status reports from prior projects were readily available...1   2   3   4   5   6   7 N/A   Remove? Yes No

5. Key issue lists from prior projects were readily available 1   2   3   4   5   6   7 N/A   Remove? Yes No

6. Estimates vs. corresponding variance analyses from prior
   projects were readily available...1   2   3   4   5   6   7 N/A   Remove? Yes No

7. Project plans from prior projects were readily available 1   2   3   4   5   6   7 N/A   Remove? Yes No

8. Information on successful/unsuccessful projects was readily
   available 1   2   3   4   5   6   7 N/A   Remove? Yes No

9. Quality management documents from prior projects were
   readily available..1   2   3   4   5   6   7 N/A   Remove? Yes No

10. A historical project archives office was available............................1   2   3   4   5   6   7 N/A   Remove? Yes No

Are there any other important statements that you think should be included in this list? If yes, please list them below:

_____

_____ 1   2   3   4   5   6   7

_____

_____ 1   2   3   4   5   6   7

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C: <u>Assuming Project Administrative Tasks</u>

	Strongly Disagree		Neutral		Strongly Agree			**Block**

1. A computerized scheduling system providing information on who should be doing what and when was maintained on the project team's behalf..................................... 1 2 3 4 5 6 7 N/A   Remove? Yes No

2. Administrative staff worked closely with team members to update the schedule as needed .... 1 2 3 4 5 6 7 N/A   Remove? Yes No

3. Administrative staff met regularly with project team members to inquire what task commitments had been made during the reporting period .... 1 2 3 4 5 6 7 N/A   Remove? Yes No

4. Administrative staff met regularly with project team members to put together timesheet reports itemizing the tasks that were undertaken during the reporting period .... 1 2 3 4 5 6 7 N/A   Remove? Yes No

5. Administrative staff met regularly with project team members to ensure that a project workbook was kept up-to-date .... 1 2 3 4 5 6 7 N/A   Remove? Yes No

6. Assistance was provided to help document project results in a standard form as the project was carried out.................................... 1 2 3 4 5 6 7 N/A   Remove? Yes No

7. Assistance was provided to help distribute reports to those with a need to know.. 1 2 3 4 5 6 7 N/A   Remove? Yes No

8. A project "war room" was made available where participants could leave working documents and conduct meetings.................... 1 2 3 4 5 6 7 N/A   Remove? Yes No

9. The organization standardized project management software .... 1 2 3 4 5 6 7 N/A   Remove? Yes No

10. The organization helped implement project management software to the extent that it was readily available for use .... 1 2 3 4 5 6 7 N/A   Remove? Yes No

Are there any other important statements that you think should be included in this list? If yes, please list them below:

_____

_____ 1   2   3   4   5   6   7

_____

_____ 1   2   3   4   5   6   7

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D: Human Resource/Staffing Assistance

		Strongly Disagree		Neutral			Strongly Agree			Block

1. Assistance was received in identifying the proper person to manage the project ....1 2 3 4 5 6 7 N/A   Remove? Yes No

2. The project manager received assistance in identifying the proper skill requirements for the project ....1 2 3 4 5 6 7 N/A   Remove? Yes No

3. The project manager received assistance in identifying the proper people to staff the project ....1 2 3 4 5 6 7 N/A   Remove? Yes No

4. The project manager received assistance in identifying skill gaps between what was needed on the project and what skills were available from existing staff...............................1 2 3 4 5 6 7 N/A   Remove? Yes No

5. The project manager possessing balanced traits (adequate technical, interpersonal, administrative skills, etc.) was provided for the project ....1 2 3 4 5 6 7 N/A   Remove? Yes No

6. The project manager received assistance in gathering data for conducting performance evaluations of project team members ....1 2 3 4 5 6 7 N/A   Remove? Yes No

7. The human resource function received assistance in gathering data for conducting the project manager's performance evaluation ....1 2 3 4 5 6 7 N/A   Remove? Yes No

8. Guidelines were received with regard to awards or other types of recognition..1 2 3 4 5 6 7 N/A   Remove? Yes No

9. The human resource function received assistance on appropriate changes in human resource policies/procedures (e.g.: appraisals, promotions, overtime)...1 2 3 4 5 6 7 N/A   Remove? Yes No

10. Assistance was received to conduct recruiting outside the organization...1 2 3 4 5 6 7 N/A   Remove? Yes No

Are there any other important statements that you think should be included in this list? If yes, please list them below:

_____

_____1   2   3   4   5   6   7

_____

_____1   2   3   4   5   6   7

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E: <u>Training</u>

		Strongly Disagree	Neutral	Strongly Agree	**Block**

1. Project team members received assistance in identifying and documenting their existing skill sets ....1 2 3 4 5 6 7 N/A   Remove? Yes No

2. Project team members received introductory training on what project management does and how it fits into an organization ....1 2 3 4 5 6 7 N/A   Remove? Yes No

3. Project team members received training on advanced project management techniques (cost and schedule estimation, earned value management, etc.)................................1 2 3 4 5 6 7 N/A   Remove? Yes No

4. Project team members received adequate training on relevant project management software packages ....1 2 3 4 5 6 7 N/A   Remove? Yes No

5. Project team members received support in being able to prepare to take a professional certification exam (PMI's Project Management Professional exam, etc.).............................1 2 3 4 5 6 7 N/A   Remove? Yes No

6. Project team members received assistance in determining strategic training needs for future projects ....1 2 3 4 5 6 7 N/A   Remove? Yes No

7. Project team members received support in being able to attend training courses to fill strategic training needs ....1 2 3 4 5 6 7 N/A   Remove? Yes No

8. The human resource training function received support in designing/implementing an overall training program for project management.......................................1 2 3 4 5 6 7 N/A   Remove? Yes No

9. Appropriate one-on-one training was provided ....1 2 3 4 5 6 7 N/A   Remove? Yes No

10. Support was provided for the design/development of organization-specific training materials...........................1 2 3 4 5 6 7 N/A   Remove? Yes No

Are there any other important statements that you think should be included in this list? If yes, please list them below:

_____

_____1   2   3   4   5   6   7

_____

_____1   2   3   4   5   6   7

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F: <u>Consulting and Mentoring</u>

		Strongly Disagree		Neutral			Strongly Agree			**Block**

1. The organization provided assistance in developing a plan..............1   2   3   4   5   6   7 N/A   Remove? Yes No

2. The organization provided assistance to ensure that relevant
project management methodologies were employed.......................1   2   3   4   5   6   7 N/A   Remove? Yes No

3. The organization encouraged project startup practices
(developing a charter, scope statement, conducting a kickoff
meeting, etc.)..1   2   3   4   5   6   7 N/A   Remove? Yes No

4. The organization provided solutions to enable the team to
resolve unexpected problems in a timely fashion 1   2   3   4   5   6   7 N/A   Remove? Yes No

5. The organization identified sources of information to enable
the team to resolve unexpected problems in a timely fashion..........1   2   3   4   5   6   7 N/A   Remove? Yes No

6. The organization provided assistance in assessing the risks
associated with the project plan.......................................1   2   3   4   5   6   7 N/A   Remove? Yes No

7. The organization provided assistance in identifying the business
implications of alternative courses of risk response actions.............1   2   3   4   5   6   7 N/A   Remove? Yes No

8. The project manager received mentoring on those measures
that should be taken to successfully manage a project 1   2   3   4   5   6   7 N/A   Remove? Yes No

9. The organization's senior management received suggestions on
those measures that should be taken to ensure successful projects ..1   2   3   4   5   6   7 N/A   Remove? Yes No

10. Confidential advice on sensitive problems/issues was provided
to project team members..1   2   3   4   5   6   7 N/A   Remove? Yes No

11. Group sharing sessions were convened for project managers..........1   2   3   4   5   6   7 N/A   Remove? Yes No

Are there any other important statements that you think should be included in this list? If yes, please list them below:

_____

_____1   2   3   4   5   6   7

_____

_____1   2   3   4   5   6   7

PART III. GENERAL INFORMANCE ON PMO USE

Please answer the following questions with respect to your organization's **current** environment. Note that a PMO may also be called a project office, a project management center of excellence or center of expertise, etc. Indicating your response to the statement of **"My organization has some kind of a formal project management office (PMO)."**

[ ] No PLEASE PROCEED TO THE TOP OF PAGE ELEVEN

[ ] Yes _____

A) [ ] Some people have PMO functions as part of their normal duties

[ ] Some people have PMO functions as full-time job responsibility

[ ] PMO is a formal entity on the organization chart

B) The number of PMO staff:

Part time: _____

Full time: _____

C) To what management level does the PMO report?

[ ] Top/senior organization management

[ ] Middle management

[ ] Department management

D) What is the title (level) of the person in charge of the PMO?

_____

E) What is its approximate annual funding level for the PMO?

_____

F) What is the annual budget of the organization the PMO is designed to serve?

_____

G) When was the PMO officially established?

Year _____ Month _____

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H) What management level approved its establishment?

[ ] Top/senior organization management

[ ] Middle management

[ ] Department management

I) What was the primary cause motivating the establishment of PMO?

_____

_____

J) Was a charter for the PMO prepared?   .

[ ] No

[ ] Yes

K) What policy document(s) have been issued concerning the PMO?

_____

_____

L) Does the PMO have a mission statement?

[ ] No

[ ] Yes _____
                   |
                   ↓

What is its essence?

_____

_____

THANK YOU. YOU HAVE REACHED THE END OF THE SURVEY.

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APPENDIX C

COVER LETTERS FOR POTENTIAL SURVEY PARTICIPANTS

1) For random survey: the first and second mailings to members from PMI membership list.

2) For targeted survey: mails to PMO leads and to PMO contacts whose organizations were identified in advance for having some version of a PMO.

1-A) Letters to PMI Survey Recipients - First Mailing

185

To: Name
   Address Line One
   Address Line Two
   Address Line Three

December 5, 2000

Survey web address: www.survey.gwu.edu
Your key number: 62-91782592

Dear Mr. xxx,

My name is Christine Dai. I am a doctoral candidate in the Program on Project Management at The George Washington University. Currently I am working on my dissertation, which investigates the role of the project management office (PMO) in achieving project success. **I would like to invite you to participate in a research survey on this subject.** You were part of a sample identified from the membership list of Project Management Institute.

In the last few years, a growing view has emerged from organizational studies suggesting that there is value in using some form of a PMO entity in project management. Indeed, a growing number of project management experts of various backgrounds have called for the establishment of such an office. Unfortunately, aside from anecdotal evidence, little is known about whether a PMO contributes significantly to project management effectiveness and hence, to project success. The state of the research for this matter is quite sparse. With limited information, project organizations, project managers, and other interested parties have a difficult time recognizing, and responding to, concerns raised for this issue.

My PMO study uses a web-based survey to obtain information on the relative presence of PMO functions and services to a project's performance. **This survey is intended to draw on your knowledge of a recently completed project in your organization.** The anticipated time needed to complete a questionnaire is about 10-15 minutes. All data will be gathered via anonymous survey, used in aggregate form, and assured of confidentiality. To access the web survey you need a key number, which is printed on the upper right corner of this letter.

Study results will be made available to any survey recipients who request them. Thank you very much for your time, and contribution to the PMO study.

Sincerely yours,

Christine Dai

cdai@gwu.edu
(202)994-6109

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November 28, 2000

To Whom It May Concern:

In order to gain a better understanding of the extent to which the project

management office (PMO) contributes to project management effectiveness and hence, to

project success, Ms. Christine Dai at The George Washington University is undertaking a

research project in partial fulfillment of her doctoral degree. The research effort calls for

conducting a web-based survey of project management professional of various

backgrounds.

Thank you very much for your consideration, and participation.

Sincerely,

Parviz Rad, Ph.D., P.E., C.C.E., P.M.P.
Associate professor
Chairman of Dissertation Committee
Director of Program on Project Management

prad@gwu.edu

1-B) Letters to PMI Survey Recipients - Second Mailing

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To: Name
  Address Line One
  Address Line Two
  Address Line Three

January 5, 2001

Survey web address: www.survey.gwu.edu or
www.gwu.edu/~survey
Your key number: 62-94152720

Dear Mr.xxx,

One month ago an invitation letter was sent to you seeking your opinion on the extent to which (and the reasons why) a project management office (PMO) contributes to project management effectiveness and hence, to project success. As of today I have not yet received your completed questionnaire on the web.

I am writing to you again because of the significance each questionnaire has to the usefulness of this survey. You were selected to participate in this study because you were part of a sample identified from the membership list of Project Management Institute. In order that the results will be representative, it is important that each questionnaire be completed and submitted. **I hope that you will be able to complete the survey by January 31;** however, the survey may be available on the web for several days beyond this deadline.

The survey is intended to draw on your knowledge of a recently completed project in your organization. Whether the organization that conducted the reported project has a PMO will not affect the quality of your participation. The anticipated time to complete the survey is about 10-15 minutes. To access the web survey you need a key number, which is printed on the upper right corner of this letter (also, your key number will be checked off the mailing list when your response has been submitted).

All responses are gathered via anonymous survey, used in aggregate form, and assured of confidentiality. Study results will be made available to survey recipients who request them.

Your contribution to the success of this research project would be appreciated.

Sincerely yours,

Christine Dai
Doctoral Candidate
Program on Project Management

cdai@gwu.edu
(202)994-6109

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November 28, 2000

To Whom It May Concern:

In order to gain a better understanding of the extent to which the project management office (PMO) contributes to project management effectiveness and hence, to project success, Ms. Christine Dai at The George Washington University is undertaking a research project in partial fulfillment of her doctoral degree. The research effort calls for conducting a web-based survey of project management professional of various backgrounds.

Thank you very much for your consideration, and participation.

Sincerely,

Parviz Rad, Ph.D., P.E., C.C.E., P.M.P.
Associate professor
Chairman of Dissertation Committee
Director of Program on Project Management

prad@gwu.edu

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2-A) Message to Targeted PMO Survey Contacts

- Via Electronic Mail

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Subject: The Targeted PMO Survey

Dear Mr. XXX,

My name is Christine Dai. I am a doctoral candidate in the Program on Project Management at The George Washington University. Currently I am working on my dissertation, which investigates the role of the project management office in achieving project success.

You are referred to me by Mr. YYY. He suggests that for the targeted PMO study, you might be able to provide me several organizations that have some version of a project management office. The study uses a web-based survey to obtain information with respect to organizations' current state of use of PMO functions and services. The anticipated time to complete a questionnaire is about 10-15 minutes. To proceed with this investigation, the first step is to identify organizations that have some version of a formal PMO, and a contact person who is part of the PMO.

Could you please forward me the organization names, points of contact, and addresses? Any leads that you can provide would be helpful. Thank you very much for your consideration. I am looking forward to hearing from you.

Sincerely yours,

Christine Dai
Program on Project Management
Department Management Science School of Business and Public Management
The George Washington University Washington, DC 20052

P.S.

(1) For this study, any known organization that maintains a PMO or similar entity will be considered for participation. All data will be gathered via anonymous surveys, used only aggregately, and assured of confidentiality. Study results will be made available to any survey recipients who request them.

(2) For this survey, a PMO is defined as an organization entity established to assist project managers and teams throughout the organization in implementing project management principles, practices, methodologies, tools and techniques. PMO functions and services mainly include providing project management standards and methods, providing project historical archives, providing project administrative support, providing human resource and staffing assistance, providing or arranging training, providing consulting and mentoring, or some kind of combination of these areas.

(3) A PMO may also be called a project office, project support office, program management office, project management center of excellence, or comparable capability under some other names not mentioned above.

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Subject: PMO Survey

Dear Mr. ZZZ,

My name is Christine Dai. I am a doctoral candidate in the Program on Project Management at The George Washington University. Currently I am working on my dissertation, which investigates the role of the project management office in achieving project success. I would like to find out from you whether your organization might wish to participate?

The study uses a web-based survey to obtain information with respect to organizations' current state of use of PMO functions and services. The anticipated time to complete a questionnaire is about 10-15 minutes. To proceed with this investigation, the first step is to identify organizations that have some version of a formal PMO, and a contact person who is part of the PMO. I obtained your e-mail address from Mr. XXX.

Thank you very much for your consideration. I am looking forward to hearing from you.

Sincerely yours,
Christine Dai
Program on Project Management
Department of Management Science
School of Business and Public Management
The George Washington University Washington,
DC 20052

P.S

(1) For this survey, a PMO is defined as an organization entity established to assist project managers and teams throughout the organization in implementing project management principles, practices, methodologies, tools and techniques. PMO functions and services mainly include providing project management standards and methods, providing project historical archives, providing project administrative support, providing human resource and staffing assistance, providing or arranging training, providing consulting and mentoring, or some kind of combination of these areas.

(2) A PMO may also be called a project office, project support office, program management office, project management center of excellence, or comparable capability under some other names not mentioned above.

(3) Any known organization that maintains a PMO or similar entity will be considered for participation. All data will be gathered via anonymous surveys, used in an aggregate form, and assured of confidentiality. Study results will be made available to any survey recipients who request them.

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Subject: PMO Survey and Survey Procedure

Dear Mr. ZZZ,

Thank you very much for your reply. I appreciate your support. Let me explain more about the targeted PMO survey procedure.

There are two parts of the survey for the targeted PMO study. One is for PMO managers/representatives; the other is for project managers. The anticipated time to complete a questionnaire is about 10-15 minutes. The PMO managers/representatives' survey asks for general PMO information. The project managers' survey requires a project manager to use a recently completed project as a reference to provide information on the use of PMO functions and services. The project managers' questionnaire provides information on the use and effect of a PMO to the project's outcome. I will ask PMO manager/representative to provide me the name of a project manager to join him/her (co-participate) in the PMO survey. The main selection criterion for the project manager is one who has recently completed a project for the PMO manager/representative's organization. There should be no concern over that completed project performance - whether it was a success, less successful or not successful – it won't affect the quality of your participation.

Once I get the project manager's name and corresponding e-mail address, I will send a pair of key numbers. One is to the PMO manager/representative; the other is to the project manager. These two numbers will enable access to the web-site for the paired recipients to complete the PMO survey.

If there is no recently completed project in your organization from the establishment of the PMO to the current time, you have a choice to participate in the survey without requiring a project manager as a co-participant. It means that you only need to complete the PMO managers/representatives' survey. Please let me know if you have questions.

I am looking forward to hearing from you.

Sincerely yours,
Christine Dai

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2-B) Message to Targeted PMO Survey Contacts

- Via Postal Mailing

Subject: PMO Survey

To: Mr. AAA
    Address line1
    Address line2
    Address line3
    Address line4

September 28, 2000

Dear Mr. AAA,

My name is Christine Dai. I am a doctoral candidate in the Program on Project Management at The George Washington University. Currently I am working on my dissertation, which investigates the role of the project management office[1] (PMO) in achieving project success.

I did not have a chance to meet you at the PMI 2000 seminar in Houston. However, I obtained your mailing address from Official Attendee List. I assume that since we are both members of PMI, we might be able to share some common interest regarding the PMO subject.

The study uses a web-based survey to obtain information with respect to organizations' current state of use of PMO functions and services. The anticipated time to complete a questionnaire is about 10-15 minutes. To proceed with this investigation, the first step is to identify organizations that have some version of a formal PMO, and a contact person who is part of the PMO.

I would like to find out whether your organization might wish to participate my PMO survey. Any known organization that maintains a PMO or similar entity will be considered for participation. All data will be gathered via anonymous surveys, used only aggregately, and assured of confidentiality. Study results will be made available to any survey recipients who request them.

Thank you very much for your consideration. I am looking forward to hearing from you.

Sincerely yours,

Christine Dai
cdai@gwu.edu
(703)288-3068

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[1] For this survey, a PMO is defined as an organization entity established to assist project managers and teams throughout the organization in implementing project management principles, practices, methodologies, tools and techniques.

PMO functions and services mainly include providing project management standards and methods, providing project historical archives, providing project administrative support, providing human resource and staffing assistance, providing or arranging training, providing consulting and mentoring, or some kind of combination of these areas.

A PMO may also be called a project office, project support office, program management office, project management center of excellence, or comparable capability under some other name not mentioned above.

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Subject: PMO Survey and Survey Procedure

To: Mr. AAA
      Address line1
      Address line2
      Address line3
      Address line4

October 19, 2000

Dear Mr. AAA,

Thank you very much for your reply. I appreciate your support. I would like to explain more about the procedure for the targeted project management office (PMO) survey.

There are two parts of the survey for the targeted PMO study. One is for PMO managers/representatives; the other is for project managers. The anticipated time to complete a questionnaire is about 10-15 minutes.

The PMO managers/representatives' survey asks for general PMO information.

The project managers' survey requires a project manager to use a recently completed project as a reference to provide information on the use of PMO functions and services. The project managers' questionnaire provides information on the use and effect of a PMO to the project's outcome.

I will ask each PMO manager/representative to provide me the name of a project manager to join him/her (co-participate) in the PMO survey. The main selection criterion for the project manager is one who has recently completed a project for the PMO manager/representative's organization. There should be no concern over that completed project performance - whether it was a success, less successful or not successful won't affect the quality of your participation.

Once I get the project manager's name and corresponding address, I will send a pair of key numbers. One to the PMO manager/representative; the other to the project manager. These two numbers will enable access to the web-site for the paired recipients to complete the PMO survey.

If there is no recently completed project in your organization from the establishment of the PMO to the current time, you have a choice to participate in the survey without requiring a project manager as a co-participant. It means that you would only need to complete the PMO managers/representatives' survey.

Please let me know if you have questions. I am looking forward to hearing from you.

Sincerely yours,

Christine Dai
cdai@gwu.edu
(703)288-3068

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APPENDIX D

PMO QUESTIONNAIRES USED FOR RANDOM AND TARGETED SURVEY

Three final survey instruments that were used to collect data from a random
sample and a targeted sample.

- The "PMI Member Questionnaire" was used in the randomly survey.

- The "Project Management Office (PMO) Managers/Represents
  Questionnaire" was directed to PMO contacts whose organizations were
  identified in advance for having some version of a PMO.

- The "Project Managers Questionnaire" was directed to project managers
  served by those identified PMOs.

Project Management Institute Members Questionnaire

by Christine Dai
Doctoral Candidate
Management Science Department
The George Washington University

Thank you for participating in this survey. Your participation is crucial to the success of this research. Please **follow the instructions carefully** and **answer every question**. All responses will remain anonymous. Please do not reveal your name or your organization's name in any of these responses.

When you are finished entering your answers, click the "Submit" button at the bottom of the survey. Once you have clicked the "Submit" button, your survey is finished, and you cannot go back and change any answers. Also, do not exit until you have received the message indicating that your survey has been successfully submitted.

Background Information

Please think of **a completed project** in which you have **recently** been involved. An example would be:

> Opening a new facility
> A new product introduction
> A departmental reorganization
> Staffing a new department
> Moving to a new building
> Designing a new product
> Acquiring a LAN
> Developing a new application software

---

1. Which of the following best describes the end product in the project about which you are responding?

   ◦ Physical facility

   ◦ Hardware, equipment, or appliance

   ◦ Food, drug, or soft goods

   ◦ New or improved process or software

   ◦ Service or test

   ◦ Study/Report

   ◦ Departmental reorganization or moving to a new facility

   ◦ Other [ ]

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2. Which of the following best describes your individual role in the project about which you are responding?

     ○ Project manager

     ○ Support manager on project team

     ○ Project team member (technical)

     ○ Project team member (administrative)

     ○ Member of business unit affected by the project

     ○ Other

3. Briefly describe your selected project, giving its title and specific goals:

2000 chars. max.

4. Project start date (*MMYYYY*):

5. Project close-out date (*MMYYYY*):

6. Project was primarily to serve the needs of:

     ○ internal customer

     ○ external customer

     ○ both

     ○ unknown

7. Size of the project (in US dollars):

     ○ USD < $100,000

     ○ $100,000 < USD > $1 million

     ○ $1 million < USD > $10 million

     ○ $10 million < USD > $50 million

200

C USD > $50 million

8.   Approximate team size of the project (ongoing team):

9.   Approximate team size of the project (peak team size):

10.   Industry in which completed project was performed:
- C Manufacturing
- C Construction
- C Engineering
- C Business Management
- C Software Development
- C Telecommunications
- C Computers/Data Processing/Information Technology
- C Other

11.   Years of your full-time work experience:

12.   Total time (in years) spent working on projects:

Part One: Project Performance

The following questions relate to your evaluation of the ultimate performance of **the completed project** in which you have **recently** been involved. Please indicate the number showing the extent to which you agree or disagree with the following statements as they relate to outcome of the completed project.

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree
(N/A) - Not Applicable

---

1.   This project was completed on schedule.

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2. This project was completed within budget.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ N/A
Strongly   Neutral   Strongly
Disagree   Agree

3. The end product/service that was developed works.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ N/A
Strongly   Neutral   Strongly
Disagree   Agree

4. The end product/service is used by its intended client/users.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ N/A
Strongly   Neutral   Strongly
Disagree   Agree

5. The end product/service has directly benefited the intended client/users through increased efficiency.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ N/A
Strongly   Neutral   Strongly
Disagree   Agree

6. The end product/service has directly benefited the intended client/users through increased employee effectiveness.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ N/A
Strongly   Neutral   Strongly
Disagree   Agree

7. Given the problem for which the end product/service was developed, this project seems to do the best job of solving that problem, i.e., it was the best choice among the set of alternatives.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ N/A
Strongly   Neutral   Strongly
Disagree   Agree

8. I was satisfied with the process by which this project was carried out.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ N/A
Strongly   Neutral   Strongly
Disagree   Agree

9. We were confident that non-technical operational startup problems would be minimal, because the project was readily accepted by its intended client/users.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ N/A
Strongly   Neutral   Strongly
Disagree   Agree

10. Use of this end product/service led directly to improved performance for the client/users.

202

$\stackrel{\curvearrowright}{}$ 1 $\stackrel{\curvearrowright}{}$ 2 $\stackrel{\curvearrowright}{}$ 3 $\stackrel{\curvearrowright}{}$ 4 $\stackrel{\curvearrowright}{}$ 5 $\stackrel{\curvearrowright}{}$ 6 $\stackrel{\curvearrowright}{}$ 7 $\stackrel{\curvearrowright}{}$ N/A

Strongly   Neutral   Strongly
Disagree   Agree

11. Use of this end product/service led directly to improved decision making for the client/users.

$\stackrel{\curvearrowright}{}$ 1 $\stackrel{\curvearrowright}{}$ 2 $\stackrel{\curvearrowright}{}$ 3 $\stackrel{\curvearrowright}{}$ 4 $\stackrel{\curvearrowright}{}$ 5 $\stackrel{\curvearrowright}{}$ 6 $\stackrel{\curvearrowright}{}$ 7 $\stackrel{\curvearrowright}{}$ N/A

Strongly   Neutral   Strongly
Disagree   Agree

12. The end product/service had a positive impact on those who made use of it.

$\stackrel{\curvearrowright}{}$ 1 $\stackrel{\curvearrowright}{}$ 2 $\stackrel{\curvearrowright}{}$ 3 $\stackrel{\curvearrowright}{}$ 4 $\stackrel{\curvearrowright}{}$ 5 $\stackrel{\curvearrowright}{}$ 6 $\stackrel{\curvearrowright}{}$ 7 $\stackrel{\curvearrowright}{}$ N/A

Strongly   Neutral   Strongly
Disagree   Agree

13. The results of this project offered a definite improvement in performance over the way client/users used to perform these activities.

$\stackrel{\curvearrowright}{}$ 1 $\stackrel{\curvearrowright}{}$ 2 $\stackrel{\curvearrowright}{}$ 3 $\stackrel{\curvearrowright}{}$ 4 $\stackrel{\curvearrowright}{}$ 5 $\stackrel{\curvearrowright}{}$ 6 $\stackrel{\curvearrowright}{}$ 7 $\stackrel{\curvearrowright}{}$ N/A

Strongly   Neutral   Strongly
Disagree   Agree

14. All things considered, this project was a success.

$\stackrel{\curvearrowright}{}$ 1 $\stackrel{\curvearrowright}{}$ 2 $\stackrel{\curvearrowright}{}$ 3 $\stackrel{\curvearrowright}{}$ 4 $\stackrel{\curvearrowright}{}$ 5 $\stackrel{\curvearrowright}{}$ 6 $\stackrel{\curvearrowright}{}$ 7 $\stackrel{\curvearrowright}{}$ N/A

Strongly   Neutral   Strongly
Disagree   Agree

Part Two: General Information on Project Management Office

The second part of this questionnaire attempts to obtain information with respect to your organization's current project management environment. One of the indicators is having project management office (PMO) functions and services. PMO functions and services mainly include providing project management standards and methods, providing project historical archives, providing project administrative support, providing human resource and staffing assistance, providing training, and providing consulting and mentoring.

For this survey, a PMO is defined as an organizational entity established to assist project managers and teams throughout the organization in implementing project management principles, practices, methodologies, tools and techniques.

Note that a PMO may also be called a project office, project support office, program management office, project management center of excellence, or comparable capability under some other names not mentioned above.

---

1. Indicate the best description of the overall level of PMO functions and services in the organization that conducted the reported project.

    $\curvearrowright$
      #1, Nobody does any PMO functions or service, and there are no plans to develop such a capability in the organization.

    $\curvearrowright$
      #2, Nobody does any PMO funcations or services; however, there are plans to develop such a capability in the organization.

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    ⌒ #3, Some people perform PMO functions and services as part of their job description, but there is no such office or comparable entity in the organization yet.

    ⌒ #4, Some people perform PMO functions and services as a full-time job responsibility; but there is no such office or comparable entity in the organization yet.

    ⌒ #5, An entity that provides PMO functions and services is in place.

2.   If you checked box #3, #4, #5 in Question 1 above, please proceed to answer the questions below. Otherwise please proceed to "Part Three: Environmental Factors."

     What is the number of part time staff (internal members of the organization) performing PMO functions and services? Type N/A if it is "not applicable" for your case.

3.   What is the number of full time staff (internal members of the organization) performing PMO functions and services? Type N/A if it is "not applicable" for your case.

4.   What is the number of part time staff (outside contractors) performing PMO functions and services? Type N/A if it is "not applicable" for your case.

5.   What is the number of full time staff (outside contractors) performing PMO functions and services? Type N/A if it is "not applicable" for your case.

6.   If you checked box #5 in Question 1 above, please proceed to answer the questions below. Otherwise please proceed to "Part Three: Environmental Factors."

     To what management level does the PMO report?

     ⌒ Top/upper management

     ⌒ Middle/departmental management

7.   What is the title (level) of the person in charge of the PMO?

8.   What is the approximate annual funding level (in US dollars) for the PMO?

9.   What is the annual budget (in US dollars) of the organization the PMO is designed to serve?

10.   When was the PMO officially established(MMYYYY)?

11.   What management level approved its establishment?

     ⌒ Top/upper management

     ⌒ Middle/departmental management

12.   What was the primary cause motivating the establishment of the PMO?

204

[text box]

2000 chars. max.

13. Does the PMO have a mission statement?

○ Yes.

○ No.

14. If your answer to the previous question is "Yes," please provide the mission statement.

[text box]

2000 chars. max

15. What policy document(s) have been issued concerning the PMO (e.g., a charter)?

[text box]

2000 chars. max.

Part Three: Environmental Factors

The third part of this questionnaire attempts to measure the relative presence of project management office (PMO) functions and services in the environment in which the reported project was performed.

3A: Project Management Standards and Methods

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree

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---

1. Assistance was provided in developing project proposal (assigning a proposal manager, selecting a proposal writing team, establishing a proposal development schedule, securing management approval for the bid, etc.).

    1   2   3   4   5   6   7   N/A

Strongly Disagree   Neutral   Strongly Agree

2. Methods for change requests (how to be initiated, routed, approved, etc.) were available.

    1   2   3   4   5   6   7   N/A

Strongly Disagree   Neutral   Strongly Agree

3. Risk assessment procedures (risk identification, impact analysis, response development, etc.) were established.

    1   2   3   4   5   6   7   N/A

Strongly Disagree   Neutral   Strongly Agree

4. Documentation standards (progress/status reports and time sheets, etc.) were used.

    1   2   3   4   5   6   7   N/A

5. Project closeout processes/techniques were used.

    1   2   3   4   5   6   7   N/A

Strongly Disagree   Neutral   Strongly Agree

3B: Project Historical Archives

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree
(N/A) - Not Applicable

---

1. Information on changes to project plans from prior projects were readily available.

    1   2   3   4   5   6   7   N/A

Strongly Disagree   Neutral   Strongly Agree

2. Risk management documents from prior projects were readily available.

    1   2   3   4   5   6   7   N/A

Strongly Disagree   Neutral   Strongly Agree

3. Variance analyses (plan vs. actual) from prior projects were readily available.

    1   2   3   4   5   6   7   N/A

4. Information on successful/unsuccessful projects was readily available.

    1   2   3   4   5   6   7   N/A

Strongly   Neutral   Strongly
Disagree   Agree

5. A database of lessons learned was available.

    1   2   3   4   5   6   7   N/A

Strongly   Neutral   Strongly
Disagree   Agree

3C: Project Administrative Support

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree
(N/A) - Not Applicable

---

1. Administrative staff met regularly with project team members to ensure that a project binder/website was kept up-to-date.

    1   2   3   4   5   6   7   N/A

Strongly   Neutral
Disagree

2. Assistance was provided to help document project results in standard formats as the project was carried out.

    1   2   3   4   5   6   7   N/A

Strongly   Neutral   Strongly
Disagree   Agree

3. A project "war room" was made available where participants could store working documents and conduct meetings.

    1   2   3   4   5   6   7   N/A

Strongly   Neutral   Strongly
Disagree   Agree

4. Project management software was standardized in the organization.

    1   2   3   4   5   6   7   N/A

Strongly   Neutral   Strongly
Disagree   Agree

5. Project management software was made available for use.

    1   2   3   4   5   6   7   N/A

Strongly   Neutral   Strongly
Disagree   Agree

3D: Human Resource / Staffing Assistance

207

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree
(N/A) - Not Applicable

---

1. Assistance was received in identifying the proper person to manage the project.

    1   2   3   4   5   6   7   N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

2. The project manager received assistance in identifying the proper skill requirements for the project.

    1   2   3   4   5   6   7   N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

3. The project manager received assistance in gathering data for conducting performance evaluations of project team members.

    1   2   3   4   5   6   7   N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

4. Guidelines were received with regard to granting awards or other types of recognition.

    1   2   3   4   5   6   7   N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

5. Assistance was received to conduct recruiting for project staff outside the organization.

    1   2   3   4   5   6   7   N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

3E: Training

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree
(N/A) - Not Applicable

---

1. Project team members received assistance in identifying and documenting their existing skill sets.

    1   2   3   4   5   6   7   N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

2. Project team members received introductory training on what project management does and how it fits into an organization.

    1   2   3   4   5   6   7   N/A
    Strongly   Neutral   Strongly

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3. Project team members received adequate training on relevant project management software packages.

$\bigcirc$ 1 $\bigcirc$ 2 $\bigcirc$ 3 $\bigcirc$ 4 $\bigcirc$ 5 $\bigcirc$ 6 $\bigcirc$ 7 $\bigcirc$ N/A
Strongly   Neutral   Strongly
Disagree   Agree

4. Project team members received financial or management support to attend training courses to fill strategic training needs.

$\bigcirc$ 1 $\bigcirc$ 2 $\bigcirc$ 3 $\bigcirc$ 4 $\bigcirc$ 5 $\bigcirc$ 6 $\bigcirc$ 7 $\bigcirc$ N/A
Strongly   Neutral   Strongly
Disagree   Agree

5. Appropriate one-on-one training/coaching was provided.

$\bigcirc$ 1 $\bigcirc$ 2 $\bigcirc$ 3 $\bigcirc$ 4 $\bigcirc$ 5 $\bigcirc$ 6 $\bigcirc$ 7 $\bigcirc$ N/A
Strongly   Neutral   Strongly
Disagree   Agree

3F: Consulting and Mentoring

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree
(N/A) - Not Applicable

---

1. Assistance to ensure the utilization of relevant project management methodologies was provided.

$\bigcirc$ 1 $\bigcirc$ 2 $\bigcirc$ 3 $\bigcirc$ 4 $\bigcirc$ 5 $\bigcirc$ 6 $\bigcirc$ 7 $\bigcirc$ N/A
Strongly   Neutral
Disagree

2. Assistance in choosing solutions to enable the team to resolve unexpected problems in a timely fashion was provided.

$\bigcirc$ 1 $\bigcirc$ 2 $\bigcirc$ 3 $\bigcirc$ 4 $\bigcirc$ 5 $\bigcirc$ 6 $\bigcirc$ 7 $\bigcirc$ N/A
Strongly   Neutral   Strongly
Disagree   Agree

3. The project manager received mentoring on the unique measures that must sometimes be taken to manage a project successfully.

$\bigcirc$ 1 $\bigcirc$ 2 $\bigcirc$ 3 $\bigcirc$ 4 $\bigcirc$ 5 $\bigcirc$ 6 $\bigcirc$ 7 $\bigcirc$ N/A
Strongly   Neutral   Strongly
Disagree   Agree

4. Upper management received suggestions on the unique measures that must sometimes be taken to ensure successful projects.

$\bigcirc$ 1 $\bigcirc$ 2 $\bigcirc$ 3 $\bigcirc$ 4 $\bigcirc$ 5 $\bigcirc$ 6 $\bigcirc$ 7 $\bigcirc$ N/A
Strongly   Neutral   Strongly
Disagree   Agree

209

5. Group sharing sessions were convened in person or electronically for project managers.

        ⌒   ⌒   ⌒   ⌒   ⌒   ⌒   ⌒   ⌒
        1   2   3   4   5   6   7   N/A
       Strongly   Neutral   Strongly
       Disagree   Agree

Part Four: Other Factors

The fourth part of this questionnaire attempts to measure the relative contribution of some factors that are not typically considered project management office (PMO) functions and services but, based on previous research, have been found to affect a project's performance. Please indicate the number showing the extent to which you agree or disagree with the following statements as they relate to activities occurring in the project about which you are reporting.

4A: Project Mission

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree
(N/A) - Not Applicable

---

1. The goals of the project were in line with the general goals of the organization.

        ⌒   ⌒   ⌒   ⌒   ⌒   ⌒   ⌒   ⌒
        1   2   3   4   5   6   7   N/A
       Strongly   Neutral   Strongly
       Disagree   Agree

2. The basic goals of the project were made clear to the project team.

        ⌒   ⌒   ⌒   ⌒   ⌒   ⌒   ⌒   ⌒
        1   2   3   4   5   6   7   N/A
       Strongly   Neutral   Strongly
       Disagree   Agree

3. The results of the project benefited the parent organization.

        ⌒   ⌒   ⌒   ⌒   ⌒   ⌒   ⌒   ⌒
        1   2   3   4   5   6   7   N/A
       Strongly   Neutral   Strongly
       Disagree   Agree

4. I was enthusiastic about the chances for success of the project.

        ⌒   ⌒   ⌒   ⌒   ⌒   ⌒   ⌒   ⌒
        1   2   3   4   5   6   7   N/A
       Strongly   Neutral   Strongly
       Disagree   Agree

5. I was aware of and could identify the beneficial consequences to the organization of the success of that project.

        ⌒   ⌒   ⌒   ⌒   ⌒   ⌒   ⌒   ⌒
        1   2   3   4   5   6   7   N/A
       Strongly   Neutral   Strongly
       Disagree   Agree

4B: Top Management Support

(1) - Strongly Disagree
(4) - Neutral

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(7) - Strongly Agree
(N/A) - Not Applicable

---

1. Upper management was responsive to our requests for additional resources, if the need arose.

    ⊂ 1   ⊂ 2   ⊂ 3   ⊂ 4   ⊂ 5   ⊂ 6   ⊂ 7   ⊂ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

2. Upper management shared responsibility with the project team for ensuring the project's success.

    ⊂ 1   ⊂ 2   ⊂ 3   ⊂ 4   ⊂ 5   ⊂ 6   ⊂ 7   ⊂ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

3. I agreed with upper management on the degree of the project manager's authority and responsibility for the project.

    ⊂ 1   ⊂ 2   ⊂ 3   ⊂ 4   ⊂ 5   ⊂ 6   ⊂ 7   ⊂ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

4. Upper management supported the project team in a crisis.

    ⊂ 1   ⊂ 2   ⊂ 3   ⊂ 4   ⊂ 5   ⊂ 6   ⊂ 7   ⊂ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

5. Upper management granted us the necessary authority and supported our decisions concerning the project.

    ⊂ 1   ⊂ 2   ⊂ 3   ⊂ 4   ⊂ 5   ⊂ 6   ⊂ 7   ⊂ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

4C: Client Consultation

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree
(N/A) - Not Applicable

---

1. The client (intended user) was given the opportunity to provide input early in the project development stage.

    ⊂ 1   ⊂ 2   ⊂ 3   ⊂ 4   ⊂ 5   ⊂ 6   ⊂ 7   ⊂ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

2. The client was kept informed of the project's progress.

    ⊂ 1   ⊂ 2   ⊂ 3   ⊂ 4   ⊂ 5   ⊂ 6   ⊂ 7   ⊂ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

211

3. The value of the project was discussed with the client.

   1   2   3   4   5   6   7   N/A
  Strongly   Neutral   Strongly
  Disagree   Agree

4. The limitations of the project were discussed with the client (e.g. what the project was not designed to do).

   1   2   3   4   5   6   7   N/A
  Strongly   Neutral   Strongly
  Disagree   Agree

5. The client was told whether or not their input was assimilated into the project plan.

   1   2   3   4   5   6   7   N/A
  Strongly   Neutral   Strongly
  Disagree   Agree

4D: Technical Tasks

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree
(N/A) - Not Applicable

---

1. Specific project tasks were well performed.

   1   2   3   4   5   6   7   N/A
  Strongly   Neutral   Strongly
  Disagree   Agree

2. The project engineers and other technical people were competent.

   1   2   3   4   5   6   7   N/A
  Strongly   Neutral   Strongly
  Disagree   Agree

3. The technology used to support the project worked well.

   1   2   3   4   5   6   7   N/A
  Strongly   Neutral   Strongly
  Disagree   Agree

4. The appropriate technology (equipment, training programs, etc.) was selected for project success.

   1   2   3   4   5   6   7   N/A
  Strongly   Neutral   Strongly
  Disagree   Agree

5. The people implementing the project understood it.

   1   2   3   4   5   6   7   N/A
  Strongly   Neutral   Strongly
  Disagree   Agree

4E: Project Schedule/Plan

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree
(N/A) - Not Applicable

---

1. We knew which activities contained slack time or slack resources which could be utilized in other areas during emergencies.

   ⌐ 1   ⌐ 2   ⌐ 3   ⌐ 4   ⌐ 5   ⌐ 6   ⌐ 7   ⌐ N/A
   Strongly   Neutral   Strongly
   Disagree   Agree

2. There was a detailed plan (including time schedules, milestones, manpower requirement, etc.) for the completion of the project.

   ⌐ 1   ⌐ 2   ⌐ 3   ⌐ 4   ⌐ 5   ⌐ 6   ⌐ 7   ⌐ N/A
   Strongly   Neutral   Strongly
   Disagree   Agree

3. There was a detailed budget for the project.

   ⌐ 1   ⌐ 2   ⌐ 3   ⌐ 4   ⌐ 5   ⌐ 6   ⌐ 7   ⌐ N/A
   Strongly   Neutral   Strongly
   Disagree   Agree

4. Key personnel needs (who, when) were specified in the project plan.

   ⌐ 1   ⌐ 2   ⌐ 3   ⌐ 4   ⌐ 5   ⌐ 6   ⌐ 7   ⌐ N/A
   Strongly   Neutral   Strongly
   Disagree   Agree

5. There were contingency plans in case the project was off schedule or off budget.

   ⌐ 1   ⌐ 2   ⌐ 3   ⌐ 4   ⌐ 5   ⌐ 6   ⌐ 7   ⌐ N/A
   Strongly   Neutral   Strongly
   Disagree   Agree

4F: Communications

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree
(N/A) - Not Applicable

---

1. The results (decisions made, information received and needed, etc.) of planning meetings were published and distributed to applicable personnel.

   ⌐ 1   ⌐ 2   ⌐ 3   ⌐ 4   ⌐ 5   ⌐ 6   ⌐ 7   ⌐ N/A
   Strongly   Neutral   Strongly
   Disagree   Agree

2. Individuals/groups supplying input received feedback on the acceptance or rejection of their input.

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$$\begin{array}{cccccccc} \bigcirc 1 & \bigcirc 2 & \bigcirc 3 & \bigcirc 4 & \bigcirc 5 & \bigcirc 6 & \bigcirc 7 & \bigcirc \text{N/A} \end{array}$$

Strongly
Disagree

Neutral

Strongly
Agree

3. When the budget or schedule was revised, the changes and the reasons for those changes were communicated to all members of the project team.

$$\begin{array}{cccccccc} \bigcirc 1 & \bigcirc 2 & \bigcirc 3 & \bigcirc 4 & \bigcirc 5 & \bigcirc 6 & \bigcirc 7 & \bigcirc \text{N/A} \end{array}$$

Strongly
Disagree

Neutral

Strongly
Agree

4. The reasons for changes to existing policies/procedures were explained to members of the project team, other groups affected by the changes, and upper management.

$$\begin{array}{cccccccc} \bigcirc 1 & \bigcirc 2 & \bigcirc 3 & \bigcirc 4 & \bigcirc 5 & \bigcirc 6 & \bigcirc 7 & \bigcirc \text{N/A} \end{array}$$

Strongly
Disagree

Neutral

Strongly
Agree

5. All groups affected by the project knew how to make problems known to the project team.

$$\begin{array}{cccccccc} \bigcirc 1 & \bigcirc 2 & \bigcirc 3 & \bigcirc 4 & \bigcirc 5 & \bigcirc 6 & \bigcirc 7 & \bigcirc \text{N/A} \end{array}$$

Strongly
Disagree

Neutral

Strongly
Agree

4G: Trouble Shooting

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree
(N/A) - Not Applicable

---

1. The project manger was not hesitant to enlist the aid of personnel not involved in the project in the event of problems.

$$\begin{array}{cccccccc} \bigcirc 1 & \bigcirc 2 & \bigcirc 3 & \bigcirc 4 & \bigcirc 5 & \bigcirc 6 & \bigcirc 7 & \bigcirc \text{N/A} \end{array}$$

Strongly
Disagree

Neutral

Strongly
Agree

2. "Brainstorming" sessions were held to assess where problems were most likely to occur.

$$\begin{array}{cccccccc} \bigcirc 1 & \bigcirc 2 & \bigcirc 3 & \bigcirc 4 & \bigcirc 5 & \bigcirc 6 & \bigcirc 7 & \bigcirc \text{N/A} \end{array}$$

Strongly
Disagree

Neutral

Strongly
Agree

3. In case of project difficulties, project team members knew where to go for assistance.

$$\begin{array}{cccccccc} \bigcirc 1 & \bigcirc 2 & \bigcirc 3 & \bigcirc 4 & \bigcirc 5 & \bigcirc 6 & \bigcirc 7 & \bigcirc \text{N/A} \end{array}$$

Strongly
Disagree

Neutral

Strongly
Agree

4. I was confident that problems that arose could be solved.

$$\begin{array}{cccccccc} \bigcirc 1 & \bigcirc 2 & \bigcirc 3 & \bigcirc 4 & \bigcirc 5 & \bigcirc 6 & \bigcirc 7 & \bigcirc \text{N/A} \end{array}$$

Strongly
Disagree

Neutral

Strongly
Agree

5. Immediate action was taken when problems came to the project team's attention.

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Project Managment Office (PMO) Manager/Representative Questionnaire

by Christine Dai
Doctoral Candidate
Management Science Department
The George Washington University

Thank you for participating in this survey. Your participation is crucial to the success of this research. Please **follow the instructions carefully** and **answer every question**. All responses will remain anonymous. Please do not reveal your name or your organization's name in any of these responses.

When you are finished entering your answers, click the "Submit" button at the bottom of the survey. Once you have clicked the "Submit" button, your survey is finished, and you cannot go back and change any answers. Also, do not exit until you have received the message indicating that your survey has been successfully submitted.

General Information on Project Management Office

The questionnaire attempts to obtain information with respect to your organization's **current** project management environment. One of the indicators is having project management office (PMO) functions and services.

PMO **functions and services** include providing some or all of the following:

> Project management standards and methods,
> Project historical archives,
> Project administrative support,
> Human resource and staffing assistance,
> Training, and
> Consulting and mentoring.

For this survey, a PMO is defined as an organizational entity established to **assist** project managers and teams throughout the organization in implementing project management principles, practices, methodologies, tools and techniques.

Note that a PMO may also be called a project office, project support office, program management office, project management center of excellence, or comparable capability under some other names not mentioned above.

1. My organization has some kind of a formal PMO (you can select more than one):

    ☐ Some people perform PMO functions and services as a full-time job responsibility.

    ☐ Some people perform PMO functions and services as part of their job description.

    ☐ Some contractors are used to provide PMO functions and services.

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2. What is the number of part time staff (internal members of the organization) performing PMO functions and services? Type N/A if it is "not applicable" for your case.

3. What is the number of full time staff (internal members of the organization) performing PMO functions and services? Type N/A if it is "not applicable" for your case.

4. What is the number of part time staff (outside contractors) performing PMO functions and services? Type N/A if it is "not applicable" for your case.

5. What is the number of full time staff (outside contractors) performing PMO functions and services? Type N/A if it is "not applicable" for your case.

6. Which of the following services and functions does your PMO provide (you can select more than one)?

    ☐ Project management standards and methods

    ☐ Project historical archives

    ☐ Project administrative support

    ☐ Human resource and staffing assistance

    ☐ Training

    ☐ Consulting and mentoring

    ☐ Other

7. To what management level does the PMO report?

    ○ Top/upper management

    ○ Middle/departmental management

8. What is the title (level) of the person in charge of the PMO?

9. What is its approximate annual funding level (in US dollars) for the PMO?

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10. What is the annual budget (in US dollars) of the organization the PMO is designed to serve?

11. When was the PMO officially established (MMYYYY)?

12. What management level approved its establishment?

      ◦ Top/upper management

      ◦ Middle/departmental management

13. What was the primary cause motivating the establishment of the PMO?

2000 chars max

14. Does the PMO have a mission statement?

      ◦ Yes.

      ◦ No.

15. If your answer to the previous question is "Yes," please provide the mission statement.

2000 chars max.

16. What policy document(s) have been issued concerning the PMO (e.g., a charter)?

218

2000 chars max

17. **Please provide any additional information or comments in this text box.**

2000 chars max

Submit Survey

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Project Manager Questionnaire

by Christine Dai
Doctoral Candidate
Management Science Department
The George Washington University

Thank you for participating in this survey. Your participation is crucial to the success of this research. Please **follow the instructions carefully** and **answer every question**. All responses will remain anonymous. Please do not reveal your name or your organization's name in any of these responses.

When you are finished entering your answers, click the "Submit" button at the bottom of the survey. Once you have clicked the "Submit" button, your survey is finished, and you cannot go back and change any answers. Also, do not exit until you have received the message indicating that your survey has been successfully submitted.

Background Information

Please think of **a completed project** in which you have **recently** been involved. An example would be:

> Opening a new facility
> A new product introduction
> A departmental reorganization
> Staffing a new department
> Moving to a new building
> Designing a new product
> Acquiring a LAN
> Developing a new application software

1. Which of the following best describes the end product about which you are responding?

   ◌ Physical facility

   ◌ Hardware, equipment, or appliance development

   ◌ Food, drug, or soft goods development

   ◌ New or improved process or software development

   ◌ Service or test

   ◌ Study/Report

   ◌ Department recorganization or moving to a new facility

   ◌ Other [ ]

2. Which of the following best describes your individual role in the project about which you are responding?

   ◌ Project manager

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    $\cap$ Support manager on project team

    $\cap$ Project team member (technical)

    $\cap$ Project team member (administrative)

    $\cap$ Member of business unit affected by the project

    $\cap$ Other

3.   Briefly describe your selected project, giving its title and specific goal:

4.   Project started date (MMYYYY):

5.   Project close-out date(MMYYYY):

6.   Project was primarily to serve the needs of:

    $\cap$ Interal customer

    $\cap$ External customer

    $\cap$ Both

    $\cap$ Unknown

7.   Size of the project (in US dollars):

    $\cap$ USD < $100,000

    $\cap$ $100,000 < USD <1 million

    $\cap$ $1 million < USD < $10 million

    $\cap$ $10 million < USD < $50 million

    $\cap$ USD > $50 million

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8.   Approximate team size of the project (ongoing team size):

9.   Approximate team size of the project (peak team size):

10. Industry in which the completed project was performed:
      ○   Manufacturing
      ○   Construction
      ○   Engineering
      ○   Business Management
      ○   Software Development
      ○   Telecommunications
      ○   Computers/Data Processing/Information Technology
      ○   Other

11. Years of your full-time work experience:

12. Total time (in years) spent working on projects:

Part One: Project Performance

The following questions relate to your evaluation of the ultimate performance of the completed project in which you **have recently been** involved. Please indicate the number showing the extent to which you agree or disagree with the following statements as they relate to outcome of the **completed** project.

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree
(N/A) - Not Applicable

---

1.   This project was completed on schedule.

      ○ 1   ○ 2   ○ 3   ○ 4   ○ 5   ○ 6   ○ 7   ○ N/A
      Strongly   Neutral   Strongly
      Disagree   Agree

2.   This project was completed within budget.

$\bigcirc_1$ $\bigcirc_2$ $\bigcirc_3$ $\bigcirc_4$ $\bigcirc_5$ $\bigcirc_6$ $\bigcirc_7$ $\bigcirc$ N/A

Strongly   Neutral   Strongly
Disagree   Agree

3. The end product/service that was developed works.

$\bigcirc_1$ $\bigcirc_2$ $\bigcirc_3$ $\bigcirc_4$ $\bigcirc_5$ $\bigcirc_6$ $\bigcirc_7$ $\bigcirc$ N/A

Strongly   Neutral   Strongly
Disagree   Agree

4. The end product/service is used by its intended client/users.

$\bigcirc_1$ $\bigcirc_2$ $\bigcirc_3$ $\bigcirc_4$ $\bigcirc_5$ $\bigcirc_6$ $\bigcirc_7$ $\bigcirc$ N/A

Strongly   Neutral   Strongly
Disagree   Agree

5. The end product/service has directly benefited the intended client/users through increased efficiency.

$\bigcirc_1$ $\bigcirc_2$ $\bigcirc_3$ $\bigcirc_4$ $\bigcirc_5$ $\bigcirc_6$ $\bigcirc_7$ $\bigcirc$ N/A

Strongly   Neutral   Strongly
Disagree   Agree

6. The end product/service has directly benefited the intended client/users through increased employee effectiveness.

$\bigcirc_1$ $\bigcirc_2$ $\bigcirc_3$ $\bigcirc_4$ $\bigcirc_5$ $\bigcirc_6$ $\bigcirc_7$ $\bigcirc$ N/A

Strongly   Neutral   Strongly
Disagree   Agree

7. Given the problem for which the end product/service was developed, this project seems to do the best job of solving that problem, i.e., it was the best choice among the set of alternatinves.

$\bigcirc_1$ $\bigcirc_2$ $\bigcirc_3$ $\bigcirc_4$ $\bigcirc_5$ $\bigcirc_6$ $\bigcirc_7$ $\bigcirc$ N/A

Strongly   Neutral   Strongly
Disagree   Agree

8. I was satisfied with the process by which this project was carried out.

$\bigcirc_1$ $\bigcirc_2$ $\bigcirc_3$ $\bigcirc_4$ $\bigcirc_5$ $\bigcirc_6$ $\bigcirc_7$ $\bigcirc$ N/A

Strongly   Neutral   Strongly
Disagree   Agree

9. We were confident that non-technical operational startup problems would be minimal, because the project was readily accepted by its intended client/users.

$\bigcirc_1$ $\bigcirc_2$ $\bigcirc_3$ $\bigcirc_4$ $\bigcirc_5$ $\bigcirc_6$ $\bigcirc_7$ $\bigcirc$ N/A

Strongly   Neutral   Strongly
Disagree   Agree

10. Use of this end product/service led directly to improved performance for the client/users.

$\bigcirc_1$ $\bigcirc_2$ $\bigcirc_3$ $\bigcirc_4$ $\bigcirc_5$ $\bigcirc_6$ $\bigcirc_7$ $\bigcirc$ N/A

Strongly   Neutral   Strongly
Disagree   Agree

11. Use of this end product/service led directly to improved decision making for the client/users.

$\overset{\curvearrowright}{1}$ $\overset{\curvearrowright}{2}$ $\overset{\curvearrowright}{3}$ $\overset{\curvearrowright}{4}$ $\overset{\curvearrowright}{5}$ $\overset{\curvearrowright}{6}$ $\overset{\curvearrowright}{7}$ $\overset{\curvearrowright}{}$ N/A

Strongly   Neutral   Strongly
Disagree   Agree

12. The end product/service had a positive impact on those who made use of it.

$\overset{\curvearrowright}{1}$ $\overset{\curvearrowright}{2}$ $\overset{\curvearrowright}{3}$ $\overset{\curvearrowright}{4}$ $\overset{\curvearrowright}{5}$ $\overset{\curvearrowright}{6}$ $\overset{\curvearrowright}{7}$ $\overset{\curvearrowright}{}$ N/A

Strongly   Neutral   Strongly
Disagree   Agree

13. The results of this project offered a definite improvement in performance over the way client/users used to perform these activities.

$\overset{\curvearrowright}{1}$ $\overset{\curvearrowright}{2}$ $\overset{\curvearrowright}{3}$ $\overset{\curvearrowright}{4}$ $\overset{\curvearrowright}{5}$ $\overset{\curvearrowright}{6}$ $\overset{\curvearrowright}{7}$ $\overset{\curvearrowright}{}$ N/A

Strongly   Neutral   Strongly
Disagree   Agree

14. All things considered, this project was a success.

$\overset{\curvearrowright}{1}$ $\overset{\curvearrowright}{2}$ $\overset{\curvearrowright}{3}$ $\overset{\curvearrowright}{4}$ $\overset{\curvearrowright}{5}$ $\overset{\curvearrowright}{6}$ $\overset{\curvearrowright}{7}$ $\overset{\curvearrowright}{}$ N/A

Strongly   Neutral   Strongly
Disagree   Agree

Part Two: Environmental Factors

The second part of this questionnaire attempts to measure the relative presence of project management office (PMO) functions and services in the environment in which the reported project was performed.

For this survey, a PMO is defined as an organizational entity established to assist project managers and teams throughout the organization in implementing project management principles, practices, methodologies, tools and techniques.

Note that a PMO may also be called a project office, project support office, program management office, project management center of excellence, or comparable capability under some other names not mentioned above.

2A: Project Management Standards and Methods

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree
(N/A) - Not Applicable

---

1. Assistance was provided in developing project proposal (assigning a proposal manager, selecting a proposal writing team, establishing a proposal development schedule, securing management approval for the bid, etc.)

$\overset{\curvearrowright}{1}$ $\overset{\curvearrowright}{2}$ $\overset{\curvearrowright}{3}$ $\overset{\curvearrowright}{4}$ $\overset{\curvearrowright}{5}$ $\overset{\curvearrowright}{6}$ $\overset{\curvearrowright}{7}$ $\overset{\curvearrowright}{}$ N/A

Strongly   Neutral   Strongly
Disagree   Agree

2. Methods for change requests (how to be initiated, routed, approved, etc.) were available.

$\overset{\curvearrowright}{1}$ $\overset{\curvearrowright}{2}$ $\overset{\curvearrowright}{3}$ $\overset{\curvearrowright}{4}$ $\overset{\curvearrowright}{5}$ $\overset{\curvearrowright}{6}$ $\overset{\curvearrowright}{7}$ $\overset{\curvearrowright}{}$ N/A

Strongly   Neutral   Strongly
Disagree   Agree

224

3. Risk assessment procedures (risk identification, impact analysis, response development, etc.) were established.

    ◦ 1   ◦ 2   ◦ 3   ◦ 4   ◦ 5   ◦ 6   ◦ 7   ◦ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

4. Documentation standards (progress/status reports and time sheets, etc.) were used.

    ◦ 1   ◦ 2   ◦ 3   ◦ 4   ◦ 5   ◦ 6   ◦ 7   ◦ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

5. Project closeout processes/techniques were used.

    ◦ 1   ◦ 2   ◦ 3   ◦ 4   ◦ 5   ◦ 6   ◦ 7   ◦ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

2B: Project Historical Archives

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree
(N/A) - Not Applicable

---

1. Information on changes to project plans from prior projects were readily available.

    ◦ 1   ◦ 2   ◦ 3   ◦ 4   ◦ 5   ◦ 6   ◦ 7   ◦ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

2. Risk management documents from prior projects were readily available.

    ◦ 1   ◦ 2   ◦ 3   ◦ 4   ◦ 5   ◦ 6   ◦ 7   ◦ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

3. Variance analyses (plan vs. actual) from prior projects were readily available.

    ◦ 1   ◦ 2   ◦ 3   ◦ 4   ◦ 5   ◦ 6   ◦ 7   ◦ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

4. Information on successful/unsuccessful projects was readily available.

    ◦ 1   ◦ 2   ◦ 3   ◦ 4   ◦ 5   ◦ 6   ◦ 7   ◦ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

5. A database of lessons learned was available.

    ◦ 1   ◦ 2   ◦ 3   ◦ 4   ◦ 5   ◦ 6   ◦ 7   ◦ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

2C: Project Administrative Support

225

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree
(N/A) - Not Applicable

---

1. Administrative staff met regularly with project team members to ensure that a project binder/website was kept up-to-date.

   $\complement$ 1 $\complement$ 2 $\complement$ 3 $\complement$ 4 $\complement$ 5 $\complement$ 6 $\complement$ 7 $\complement$ N/A
   Strongly   Neutral   Strongly
   Disagree   Agree

2. Assistance was provided to help document project results in standard formats as the project was carried out.

   $\complement$ 1 $\complement$ 2 $\complement$ 3 $\complement$ 4 $\complement$ 5 $\complement$ 6 $\complement$ 7 $\complement$ N/A
   Strongly   Neutral   Strongly
   Disagree   Agree

3. A project "war room" was made available where participants could store working documents and conduct meetings.

   $\complement$ 1 $\complement$ 2 $\complement$ 3 $\complement$ 4 $\complement$ 5 $\complement$ 6 $\complement$ 7 $\complement$ N/A
   Strongly   Neutral   Strongly
   Disagree   Agree

4. Project management software was standardized in the organization.

   $\complement$ 1 $\complement$ 2 $\complement$ 3 $\complement$ 4 $\complement$ 5 $\complement$ 6 $\complement$ 7 $\complement$ N/A
   Strongly   Neutral   Strongly
   Disagree   Agree

5. Project management software was made available for use.

   $\complement$ 1 $\complement$ 2 $\complement$ 3 $\complement$ 4 $\complement$ 5 $\complement$ 6 $\complement$ 7 $\complement$ N/A
   Strongly   Neutral   Strongly
   Disagree   Agree

2D: Human Resource/Staffing Assistance

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree
(N/A) - Not Applicable

---

1. Assistance was received in identifying the proper person to manage the project.

   $\complement$ 1 $\complement$ 2 $\complement$ 3 $\complement$ 4 $\complement$ 5 $\complement$ 6 $\complement$ 7 $\complement$ N/A
   Strongly   Neutral   Strongly
   Disagree   Agree

2. The project manager received assistance in identifying the proper skill requirements for the project.

   $\complement$ 1 $\complement$ 2 $\complement$ 3 $\complement$ 4 $\complement$ 5 $\complement$ 6 $\complement$ 7 $\complement$ N/A
   Strongly   Neutral   Strongly
   Disagree   Agree

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3. The project manager received assistance in gathering data for conducting performance evaluations of project team members.

       1   2   3   4   5   6   7   N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

4. Guidelines were received with regard to granting awards or other types of recognition.

       1   2   3   4   5   6   7   N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

5. Assistance was received to conduct recruiting for project staff outside the organization.

       1   2   3   4   5   6   7   N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

2E: Training

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree
(N/A) - Not Applicable

---

1. Project team members received assistance in identifying and documenting their existing skill sets.

       1   2   3   4   5   6   7   N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

2. Project team members received introductory training on what project management does and how it fits into an organization.

       1   2   3   4   5   6   7   N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

3. Project team members received adequate training on relevant project management software packages.

       1   2   3   4   5   6   7   N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

4. Project team members received financial or management support to attend training courses to fill strategic training needs.

       1   2   3   4   5   6   7   N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

5. Appropriate one-on-one training/coaching was provided.

       1   2   3   4   5   6   7   N/A

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2F: Consulting and Mentoring

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree
(N/A) - Not Applicable

1. Assistance to ensure the utilization of relevant project management methodologies was provided.

    ⊙ 1   ⊙ 2   ⊙ 3   ⊙ 4   ⊙ 5   ⊙ 6   ⊙ 7   ⊙ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

2. Assistance in choosing solutions to enable the team to resolve unexpected problems in a timely fashion was provided.

    ⊙ 1   ⊙ 2   ⊙ 3   ⊙ 4   ⊙ 5   ⊙ 6   ⊙ 7   ⊙ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

3. The project manager received mentoring on the unique measures that must sometimes be taken to manage a project successfully.

    ⊙ 1   ⊙ 2   ⊙ 3   ⊙ 4   ⊙ 5   ⊙ 6   ⊙ 7   ⊙ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

4. Upper management received suggestions on the unique measures that must sometimes be taken to ensure successful projects.

    ⊙ 1   ⊙ 2   ⊙ 3   ⊙ 4   ⊙ 5   ⊙ 6   ⊙ 7   ⊙ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

5. Group sharing sessions were convened in person or electronically for project managers.

    ⊙ 1   ⊙ 2   ⊙ 3   ⊙ 4   ⊙ 5   ⊙ 6   ⊙ 7   ⊙ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

Part Three: Other Factors

The third part of this questionnaire attempts to measure the relative contribution of some factors that are not typically considered project management office (PMO) functions and services but, based on previous research, have been found to affect a project's performance. Please indicate the number showing the extent to which you agree or disagree with the following statements as they relate to activities occurring in the project about which you are reporting.

3A: Project Mission

(1) - Strongly Disagree
(4) - Neutral

228

(7) - Strongly Agree
(N/A) - Not Applicable

---

1. The goals of the project were in line with the general goals of the organization.

    ⌀ 1 ⌀ 2 ⌀ 3 ⌀ 4 ⌀ 5 ⌀ 6 ⌀ 7 ⌀ N/A

    Strongly   Neutral   Strongly
    Disagree   Agree

2. The basic goals of the project were made clear to the project team.

    ⌀ 1 ⌀ 2 ⌀ 3 ⌀ 4 ⌀ 5 ⌀ 6 ⌀ 7 ⌀ N/A

    Strongly   Neutral   Strongly
    Disagree   Agree

3. The results of the project benefited the parent organization.

    ⌀ 1 ⌀ 2 ⌀ 3 ⌀ 4 ⌀ 5 ⌀ 6 ⌀ 7 ⌀ N/A

    Strongly   Neutral   Strongly
    Disagree   Agree

4. I was enthusiastic about the chances for success of the project.

    ⌀ 1 ⌀ 2 ⌀ 3 ⌀ 4 ⌀ 5 ⌀ 6 ⌀ 7 ⌀ N/A

    Strongly   Neutral   Strongly
    Disagree   Agree

5. I was aware of and could identify the beneficial consequences to the organization of the success of that project.

    ⌀ 1 ⌀ 2 ⌀ 3 ⌀ 4 ⌀ 5 ⌀ 6 ⌀ 7 ⌀ N/A

    Strongly   Neutral   Strongly
    Disagree   Agree

3B: Top Management Support

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree
(N/A) - Not Applicable

---

1. Upper management was responsive to our requests for additional resources, if the need arose.

    ⌀ 1 ⌀ 2 ⌀ 3 ⌀ 4 ⌀ 5 ⌀ 6 ⌀ 7 ⌀ N/A

    Strongly   Neutral   Strongly
    Disagree   Agree

2. Upper management shared responsibility with the project team for ensuring the project's success.

    ⌀ 1 ⌀ 2 ⌀ 3 ⌀ 4 ⌀ 5 ⌀ 6 ⌀ 7 ⌀ N/A

    Strongly   Neutral   Strongly
    Disagree   Agree

3. I agreed with upper management on the degree of the project manager's authority and responsibility for the project.

229

$\begin{array}{cccccccc} \circ & \circ & \circ & \circ & \circ & \circ & \circ & \circ \\ 1 & 2 & 3 & 4 & 5 & 6 & 7 & \text{N/A} \end{array}$

Strongly   Neutral   Strongly
Disagree   Agree

4.   Upper management supported the project team in a crisis.

$\begin{array}{cccccccc} \circ & \circ & \circ & \circ & \circ & \circ & \circ & \circ \\ 1 & 2 & 3 & 4 & 5 & 6 & 7 & \text{N/A} \end{array}$

Strongly   Neutral   Strongly
Disagree   Agree

5.   Upper management granted us the necessary authority and supported our decisions concerning the project.

$\begin{array}{cccccccc} \circ & \circ & \circ & \circ & \circ & \circ & \circ & \circ \\ 1 & 2 & 3 & 4 & 5 & 6 & 7 & \text{N/A} \end{array}$

Strongly   Neutral   Strongly
Disagree   Agree

3C: Client Consultation

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree
(N/A) - Not Applicable

---

1.   The client (intended user) was given the opportunity to provide input early in the project development stage.

$\begin{array}{cccccccc} \circ & \circ & \circ & \circ & \circ & \circ & \circ & \circ \\ 1 & 2 & 3 & 4 & 5 & 6 & 7 & \text{N/A} \end{array}$

Strongly   Neutral   Strongly
Disagree   Agree

2.   The client was kept informed of the project's progress.

$\begin{array}{cccccccc} \circ & \circ & \circ & \circ & \circ & \circ & \circ & \circ \\ 1 & 2 & 3 & 4 & 5 & 6 & 7 & \text{N/A} \end{array}$

Strongly   Neutral   Strongly
Disagree   Agree

3.   The value of the project was discussed with the client.

$\begin{array}{cccccccc} \circ & \circ & \circ & \circ & \circ & \circ & \circ & \circ \\ 1 & 2 & 3 & 4 & 5 & 6 & 7 & \text{N/A} \end{array}$

S   Neutral   Strongly
                                    Agree

4.   The limitations of the project were discussed with the client (e.g. what the project was not designed to do).

$\begin{array}{cccccccc} \circ & \circ & \circ & \circ & \circ & \circ & \circ & \circ \\ 1 & 2 & 3 & 4 & 5 & 6 & 7 & \text{N/A} \end{array}$

Strongly   Neutral   Strongly
Disagree   Agree

5.   The client was told whether or not their input was assimilated into the project plan.

$\begin{array}{cccccccc} \circ & \circ & \circ & \circ & \circ & \circ & \circ & \circ \\ 1 & 2 & 3 & 4 & 5 & 6 & 7 & \text{N/A} \end{array}$

Strongly   Neutral   Strongly
Disagree   Agree

3D: Technical Tasks

230

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree
(N/A) - Not Applicable

---

1. Specific project tasks were well performed.

    ⌐ 1 ⌐ 2 ⌐ 3 ⌐ 4 ⌐ 5 ⌐ 6 ⌐ 7 ⌐ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

2. The project engineers and other technical people were competent.

    ⌐ 1 ⌐ 2 ⌐ 3 ⌐ 4 ⌐ 5 ⌐ 6 ⌐ 7 ⌐ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

3. The technology used to support the project worked well.

    ⌐ 1 ⌐ 2 ⌐ 3 ⌐ 4 ⌐ 5 ⌐ 6 ⌐ 7 ⌐ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

4. The appropriate technology (equipment, training programs, etc.) was selected for project success.

    ⌐ 1 ⌐ 2 ⌐ 3 ⌐ 4 ⌐ 5 ⌐ 6 ⌐ 7 ⌐ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

5. The people implementing the project understood it.

    ⌐ 1 ⌐ 2 ⌐ 3 ⌐ 4 ⌐ 5 ⌐ 6 ⌐ 7 ⌐ N
    Strongly   Neutral   Strongly
    Disagree   Agree

3E: Project Schedule/Plan

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree
(N/A) - Not Applicable

---

1. We knew which activities contained slack time or slack resources which could be utilized in other areas during emergencies.

    ⌐ 1 ⌐ 2 ⌐ 3 ⌐ 4 ⌐ 5 ⌐ 6 ⌐ 7 ⌐ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

2. There was a detailed plan (including time schedules, milestones, manpower requirement, etc.) for the completion of the project.

    ⌐ 1 ⌐ 2 ⌐ 3 ⌐ 4 ⌐ 5 ⌐ 6 ⌐ 7 ⌐ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

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3. There was a detailed budget for the project.

    ⌒ 1   ⌒ 2   ⌒ 3   ⌒ 4   ⌒ 5   ⌒ 6   ⌒ 7   ⌒ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

4. Key personnel needs (who, when) were specified in the project plan.

    ⌒ 1   ⌒ 2   ⌒ 3   ⌒ 4   ⌒ 5   ⌒ 6   ⌒ 7   ⌒ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

5. There were contingency plans in case the project was off schedule or off budget.

    ⌒ 1   ⌒ 2   ⌒ 3   ⌒ 4   ⌒ 5   ⌒ 6   ⌒ 7   ⌒ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

3F: Communication

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree
(N/A) - Not Applicable

---

1. The results (decisions made, information received and needed, etc.) of planning meetings were published and distributed to applicable personnel.

    ⌒ 1   ⌒ 2   ⌒ 3   ⌒ 4   ⌒ 5   ⌒ 6   ⌒ 7   ⌒ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

2. Individuals/groups supplying input received feedback on the acceptance or rejection of their input.

    ⌒ 1   ⌒ 2   ⌒ 3   ⌒ 4   ⌒ 5   ⌒ 6   ⌒ 7   ⌒ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

3. When the budget or schedule was revised, the changes and the reasons for those changes were communicated to all members of the project team.

    ⌒ 1   ⌒ 2   ⌒ 3   ⌒ 4   ⌒ 5   ⌒ 6   ⌒ 7   ⌒ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

4. The reasons for changes to existing policies/procedures were explained to members of the project team, other groups affected by the changes, and upper management.

    ⌒ 1   ⌒ 2   ⌒ 3   ⌒ 4   ⌒ 5   ⌒ 6   ⌒ 7   ⌒ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

5. All groups affected by the project knew how to make problems known to the project team.

    ⌒ 1   ⌒ 2   ⌒ 3   ⌒ 4   ⌒ 5   ⌒ 6   ⌒ 7   ⌒ N/A
    Strongly   Neutral   Strongly
    Disagree   Agree

3G: Trouble Shooting

(1) - Strongly Disagree
(4) - Neutral
(7) - Strongly Agree
(N/A) - Not Applicable

1. The project manager was not hesitant to enlist the aid of personnel not involved in the project in the event of problems.

   $\quad$ 1 $\quad$ 2 $\quad$ 3 $\quad$ 4 $\quad$ 5 $\quad$ 6 $\quad$ 7 $\quad$ N/A
   Strongly $\qquad\qquad$ Neutral $\qquad\qquad$ Strongly
   Disagree $\qquad\qquad\qquad\qquad\qquad$ Agree

2. "Brainstorming" sessions were held to assess where problems were most likely to occur.

   $\quad$ 1 $\quad$ 2 $\quad$ 3 $\quad$ 4 $\quad$ 5 $\quad$ 6 $\quad$ 7 $\quad$ N/A
   Strongly $\qquad\qquad$ Neutral $\qquad\qquad$ Strongly
   Disagree $\qquad\qquad\qquad\qquad\qquad$ Agree

3. In case of project difficulties, project team members knew where to go for assistance.

   $\quad$ 1 $\quad$ 2 $\quad$ 3 $\quad$ 4 $\quad$ 5 $\quad$ 6 $\quad$ 7 $\quad$ N/A
   Strongly $\qquad\qquad$ Neutral $\qquad\qquad$ Strongly
   Disagree $\qquad\qquad\qquad\qquad\qquad$ Agree

4. I was confident that problems that arose could be solved.

   $\quad$ 1 $\quad$ 2 $\quad$ 3 $\quad$ 4 $\quad$ 5 $\quad$ 6 $\quad$ 7 $\quad$ N/A
   Strongly $\qquad\qquad$ Neutral $\qquad\qquad$ Strongly
   Disagree $\qquad\qquad\qquad\qquad\qquad$ Agree

5. Immediate action was taken when problems came to the project team's attention.

   $\quad$ 1 $\quad$ 2 $\quad$ 3 $\quad$ 4 $\quad$ 5 $\quad$ 6 $\quad$ 7 $\quad$ N/A
   Strongly $\qquad\qquad$ Neutral $\qquad\qquad$ Strongly
   Disagree $\qquad\qquad\qquad\qquad\qquad$ Agree

Submit Survey

APPENDIX E

COLLECTION OF MOTIVATION FOR PMO ESTABLISHMENT
FROM SURVEYS

A collection of motivations for the establishment of PMOs came from the random and the targeted surveys. Per agreement with the respondents, organization's names were removed.

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E (Part I)   Motivation Details - PMI Random Survey

New president.

Project instability, lack of control.

Problems planning and executing projects leading to projects delivered late, over budget, and not performing according to customer expectations and requirements.

POOR PROJECT MANAGEMENT PROCESSES IN PLACE AND POOR RECORD OF SUCCESS FOR PROJECTS.

The project was too big for the organization to handle as part of their operational structure.

Control and organize projects.

Lack of planning, process, estimating, tracking.

Test product.

We are a matrix organization, heavily into projects. Aerospace and Government' contracts determined that this organization would be set up with PMO's at the start of this organization in the mid 1960's.

Many projects with multiple delivery dates Product slippages Changes in scope Need to establish standards in Need to manage

client relationship.

Obligation to move the organization to Software Engineer Institute (SEI) Level 2 and then Level 3. Contractual obligation with client.

The cost of not setting it up. Supports justification of technology investments and better business/IT alignment.

Centralized control, consistent project approach.

Need for executive awareness of projects - executive dashboard.

Provide Project On Time On Budget On Scope.

To provide consistency to practitioners in the areas of tools, templates, processes and procedures.

Reorganization.

Competition: In this industry, it was critical that we create a PMO to justify, rank schedule and prioritize projects. We are very dedicated to project management training and support our employees to become certified in PM and PMP.

Organizational (Project) failures leading to internal and external recommendations.

Employer's business practice considering scope and scale of the project.

Projects missing milestones, poor project management.

Inefficient execution of multiple projects in multiple international locations. Ownership/responsibility conflicts. Cost and schedule overruns.

Centralize reporting/control of capital dollars.

Significant financial accounting and reporting issues.

Need to improve project execution.

Control and Monitor the Supply Chain Initiative.

Standardization and improved delivery.

A request by the external customer to provide the project management and tracking functions within the organization.

All major alliances have PMO established for the project start and life cycle. part of startup team, for project build assistance during life cycle primary role is for reporting, billing, questions and overall monitoring.

Internal/external customer & sales team support.

Improved effectiveness in processes and projects.

Troubled / Failed Projects.

Projects ran over schedule and budget consistently; lack of focus.

Unknown specifics, believe it was a desire to stay "competitive" or "stay up with the Jones's".

The need to deliver projects on time and resolve project issues in a timely manner.

To consolidate a large corporation's (over 100k employees) business units on financial systems as quickly as possible to achieve a multi-million dollar cost savings. The project I am

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using for the survey is a sub-project of the above project. I manage several projects for this overall project.

Standardization.

Need for project information to budget and capture project status on top ten enterprise-wide projects.

Improve implementation of technical platform enhancements.

To ensure that all project managers were using the same software and adhering to the same standards.

CEO saw results of other project initiatives & liked the results. Based on the positive experiences, the PMO was created.

Gain control over extensive list of projects that were not being completed in a timely fashion with measurable results.

New CIO established it.

Desire to improve project performance.

Complexity and volume of activity.

Poor internal customer satisfaction resulting from frequent cost and schedule overruns on internal IT projects. Desire to move to a "pooled" IT resource scenario vs. the current "departmental" model. Desire to work on more projects concurrently, with centralized oversight, for shorter durations, to maximize ROI and prove the value of retaining an internal IT department vs. outsourcing.

PMO supports a large, multi-year, IT Outsourcing contract.

QS9000 (automotive version of ISO9000) required by OEMs drove many suppliers to formalize their product development processes and implement program management; this is what happened here.

To stop profit erosion on contracts over $2,000,000 in cost.

To complete more projects with the same amount of dollars.

Undefined: Organizational Structure Roles and Responsibilities Program/Project Approach Strategies Goals.

We sell the service to our customers for service integration.

Keep track of spending on client projects. Consistency in project management

Inconsistent processes and results from the different development areas in the company. Varied skill levels for Project Management. Inconsistent reporting of project status and tracking of costs.

Improve effectiveness of systems development. Report non-compliance to existing standards and practices. Maintain and support project management tools.

Centralizing information and capitalizing on corporate knowledge base.

Program was out of control. Behind schedule, over budget, missing milestones, lack of project documentation, too many PM's were not following the methodology, no program metrics, etc.

Control of project costs and schedules as reported by an independent source.

Cost avoidance, cost savings, effective project implementation.

To improve the level of Project Management for the total (national) organization. To provide an avenue to share ideas and methods that have been effectively used in different regions with the rest of the organization. To better match project

To get all project managers using the same standards and guidelines, holding them accountable to schedules and budgets. The PMO would take the data and provide metrics to upper management for more accurate and better business decisions. This was not able to be done prior to the PMO.

Improved and consistent project management.

PM management realized the value of PMO functions in further developing PM in the company, giving better efficiencies to business overall.

Customer and Project Requirements.

The funding authority utilized a PMO on a 15 million dollar project that implemented in 1994 (at our insistence). The project implemented on-time and within budget. Much of the credit for that was attributed to the PMO and practices/processes utilized. The client's working managers were not at all cooperative, and considered the PMO and their processes as nothing but a major annoyance, if not downright hindrance. That perception changed a little with the success of the project. The client manager was sold however, and insisted on the establishment of a PMO on this project.

We are subcontracted to represent the client in the design and construction management of the current expansion project. We are required by federal law when federal money is used.

Needed a more formalized approach to managing/controlling projects, as well as a emphasis on training project managers.

It was recognized that administrative and other project management support was needed to help project managers and project teams complete their projects.

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We established a new company that is a specialty contractor that provides only Project Controls assistance.

Bring global consistency to the management of projects across the Corporation.

To improve our bottom line.

The desire to establish Project Management as a Core competency of our company.

Consistency in PM function, knowledge sharing.

Bring different departments involved in a project in [company name] in matters relating to timelines, resources and expectations.

We do not have a dedicated PMO. We do, however, have one full time employee who supports the PM and then we hire as many as 8-10 temporary people to support the PM and construction manager in the field office.

Difficulty in successfully executing projects. Our department not only has "free standing" project management, we are under the same umbrella as the Business Analysts.

Because I campaigned for it.

A dedicated staff of project managers was needed to prioritize and development projects for the Business Operations area. Current untrained staff in a cross-functional organization were too often pulled back into line work when high volume were experienced; organization could not meet financial goals based on projects not being completed.

The need to coordinate, document and justify projects and related costs.

Failing projects.

Deliver projects on time and on budget.

To have a better project management and to bring a better control over the project. Also to have a centralized reporting team.

Government Earned Value Management Systems requirements.

To remove the chaos from the project management process.

Uniform processes for managing external, out-of-scope projects for IT outsourcing organization.

Provide professional oversight and optimization of company resources and technology.

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Projects often not delivering in time with over budget figures leading to clients dissatisfaction.

Size & Level of Effort requirements for Program.

Control new product development activities.

Establish Project management methodologies within the business, with a consistent model for operations. A quote from the PM COC Overview: [company name]'s Project Management Center of Excellence (PM/COE) was established at the beginning of 1997 to ensure that [company name]'s commitment to becoming a project-based business is achieved. [company name]'s Chairman and the Corporate Executive Committee decided in November 1996 to put a corporate-wide, worldwide initiative into action to define and execute the steps which [company name] must take during the next several years to strengthen its project management capabilities. This decision was based on a white paper - "Raising Project Management to a Core Competence in [company name]."   .

Failed projects that cost much money.

Tracking/Monitoring issues, risk management, change requests and orders, investigative reporting for system testing, HR tracking, schedules. The PMO will also provide archival services, project history, and be used to analyze lessons learned. It is used on a daily basis by upper management.

Lack of process to execute launch of products.

My organization is a projectized (project oriented) enterprise. We make are living on outsourced development projects.

Desire by management to have standard Project deliverables and processes.

Standardize and promote project management tools & techniques.

We do project management for each project. Each project team is responsible for the project management of their project. I am in that company from 12 years and from 12 years we did project management. The budget for project management depend on the budget of the project. Usually the project management is almost 30% of the engineering cost.

Better follow-up of the contract, help to Project managers, facilitating the coordination work.

Communication management plan.

Too many project were late and over budget (70%).

Project late, over spent and users not satisfied.

Efficiency and speed in completing infrastructure projects.

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To provide a source of, and repository for, corporate project management knowledge and assistance.

Lack of ROI on investment in major, corporate initiatives.

Consistency in project execution and establishment of a Project Life Cycle Methodology.

No standard project implementation throughout organization, no audit trail or project history, inconsistency resulting in project delays and dissatisfaction.

Need for centralized Program Management for all projects.

The company has offices across the Nation. The primary cause motivating the establishment of the PMO was to ensure no office would be penalized for excessive financial burden for access to support in all aspects of new project implementation.

Improve Project Management with tracking.

(1) Prepare for External Audit of Technology Projects (2) Maintain archive and legal documents concerning projects (3) Archive project charters, Board Minutes, project plans and progress reports.

Recognition of PM efficiency.

Accountability, Leadership and Responsibility.

E (Part II) Motivation - PMO Targeted Survey

A decrease in company profitability associated with large projects overrunning. This was due to a lack of a Project Management methodology and standardized system not being in place and the proper flags being raised in time to prevent large overruns. The company is getting too large to manage projects via phone calls and e-mails.

Ensure more consistent project management training and use of system development life cycle methodology.

National requirements for security.

Increase / retain competitive advantage, lower cost of delivery, improve quality / customer satisfaction.

Improving project definition, evaluation and execution. Meet or exceed cost and schedule objectives.

The primary cause for establishment of a PMO centers on what is essentially information management and distribution. The motivation factors are: 1. To orchestrate projects from the top to avoid the danger of "Overdosing on Projects; 2. To ensure that projects are launched with a clear view of their potential value to the business; 3. To maintain a minimum Critical Mass of activity in an Organization to harness all its Resources; 4. To avoid the "more action, less thinking" mind set and replace it with a clear view of the Value the projects are suppose to deliver so as to ensure that all projects are in-sync with the Organization's Strategic Goals; 5. To help the Organization maximize the impact of its investments in business change by helping it do the Right.

Needed a one stop shop to effectively manage a large government contract. Needed a small diverse group to tailor to all of project's administrative needs.

Over allocation of IT human resources.

Better program management support for our customers and to streamline the huge organization the SPO came from.

To assist government in performing business management.

Development of Software capability (2.3 M LOC) to track Logistic data as it is put on and removed from weapon systems.

PMO established before I began working in it; however, I suspect the PMO was formed to maintain and modernize certain organizational supply systems software.

The primary cause for establishing the PMO was to improve the performance of supply systems within the Air Force. The PMO centralized the software improvement/development efforts for nine supply management systems in a single office so requirements and funding could be identified, managed, and completed. The original objectives, which were achieved, were (1) to integrate these nine separate systems and (2) to make them real-time in their performance. The

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new (current) cause for the PMO is maintenance of these now legacy systems as they become modernized in a web-based environment.

Inability to successfully deliver projects combined with demonstrated success on a pilot project using PMO concepts.

Need for better project management of R&D projects.

Improving the delivery of Information Technology Project and raising the competence of Project management.

Resource utilization efficiency. Centralized competence development.

Many projects are over budget, late and with poor quality.

The need for a PMO is recognized by the relatively lack of depth and experience of the project leads and managers within the organization I represent. Too many projects were in trouble for lack of consistent processes, tools, and methodology. Many projects were falling behind schedule by considerable amounts due in part to lack of accountability and experience. By establishing a PMO processes have been implemented to establish a consistent and uniform method of managing projects, establishing scope, performing risk management, budget control, and mentoring of project team members.

Troubled Projects.

New customers, new area of services that has not been provided before.

To provide stewardship to the PM processes, ensuring ownership and continuous improvement in the manner we do business.

Primary focus is on evolving our processes as a result of our lessons learned.

Lack of formal "Project Manager" positions or job descriptions. No common approach to projects. Not learning from project to project.

Volunteer effort, as a PM Council, was unable to provide the required level of support due to the demands of the full-time job responsibilities.

- Operational control of the projects - Competence development.

To improve IT project performance (budget/schedule) Eliminating redundancy.

Improved project quality and coordination among various groups needed to complete project work.

Desire for more efficiency and effectiveness in achieving project outcomes; working consistently across the organization.

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Run away projects.

The organization had no idea of the various efforts spread out in it.

Communication. Enabling better understanding of status and project performance.

Change in how we undertake product development was needed, specifically stronger infrastructure and more productive system with checks and balances that provide real support for program managers.

Formalize customer-contact areas of the company in one services department, with PMO being a group within that department.

Create local support to project needs, be the key interface with other project offices abroad.

Multiple projects were initiated.

Many companies coming together as one company with diverse backgrounds across the country. Important to have a common approach to project management. Also decided to be vendor-independent therefore needing own approach. Our focus is also on Knowledge Management which will help with capturing historical data.

It was shut down recently, so these are past tense answers.

The PMO was established in response to a desire to improve project management practice and consistency of practice throughout the organization, with the goals of reducing costs and increasing customer service. A survey conducted at that time found that existing practice could benefit from industry best practice, and it was determined that a PMO could best provide the guidance, standards and controls that were needed.

Lack of Project Successes.

Rapid growth both internally and within our industry sparked a need for enterprise wide standards for leading larger and larger projects and a knowledge center housing such leaders, their historical data, and training efforts in project management.

To continually improve the infrastructure for Project Managers by delivering effective tools and processes to: - reduce administrative overhead - increase effective deployment of resources - increase level of support for managing client expectations - increase value to clients - facilitate sharing of project knowledge - provide templates to reduce cost and risk. To support the organization's Emfisys vision of maximizing shareholder value.

A large number of strategically crucial projects led by coordinators with little or no consistency across projects.

Inconsistent PM methods being used by project personnel. Project personnel needed to spend more time on technical details and less on timing schedule construction and status.

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To bring some standardization and rigor to the management of projects while at the same time allowing enough flexibility to meet the needs of different teams. A secondary reason is to manage the way in which new work is brought into the IT organization. This is called the new work flow process and manages the work flow and estimation of projects for billing purposes.

Delivery of developed software to clients on time, within budget, to specifications, and fit for use.

Provide a centralized organization to define PM standards, rollout out standards and tools, and otherwise increase the rigor of project management on our projects to ensure their success.

Functional managers from the technical areas, acting as project leaders, were no longer able to successfully manage projects. Projects had become complex and the work required crossed many functional. There was a need for dedicated project managers who were not aligned with any specific functional area.

To bring software development projects to successful completion.

To provide a central repository of project related information. To provide a unit that could act as a non-biased department neutral project participant that could coordinate the efforts of multiple areas of the organization. To provide a unit that would coordinate the efforts of all corporate level projects that could track financial performance and evaluate whether a project was achieving the benefits that the project sponsor expected to achieve.

To Improve project on time, on Budget delivery. Establish a consistent methodology among various development groups. Improve Project Management.

COMPETITIVE ADVANTAGE.

I thought it would be a professional way to manage projects etc as CIO.

Financial accountability at the project level.

Coordination of Y2K activities across 40 countries.

Purpose: The [company name] Information Technology Management Team (ITMT) has determined there is a need to improve the capability for managing projects within the organization. The ITMT has elected to establish a Project Management Center Of Excellence (PMCOE) with the responsibility, accountability and requisite authority to enable the IT organization to achieve this strategic objective. **Vision:** The [company name] IT organization will achieve a "world-in-class" proficiency in the consistent application of common Project Management standards, processes, and procedures to ensure that quality is incorporated into core Information Technology business processes and projects. **Mission:** To provide the leadership that will enable the [company name] IT organization to manage its Programs, Projects, Services, and Support utilizing sound project management methodologies, standards, practices and procedures. To ensure Project Management, Internal Quality, and Project Tollgate processes are adopted enterprise-wide efficiently and effectively as a result of a continuous improvement of project management knowledge, skills and capability. Strategy: Create an environment within the [company name] Global IT organization that supports the alignment of projects with strategic corporate goals and objectives where the organization embraces project management as an

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intrinsic enabler as it seeks to attain its goals and objectives within the context of its vision, mission, goals, and objectives. **Goals & Objectives:** To establish project management practices as the natural means to accomplishing work to the degree it becomes part of the organization's culture. Define and institutionalize Project Management processes across the organization.

Inconsistent methods for project management, many projects missing deadlines, no ability to provide consolidated reporting to upper management on portfolio status and actual activity.

The need for a PMO started in the IS department because of the increasing number of in-house projects. The PMO was then moved to an Enterprise level due to the need for Project Management that covers both business & IS.

Consolidation and coordination of projects across the parent company's business units (located throughout the Asia - Pacific area).

Provide dedicated resources to the implementation and maintenance of a common project planning software system.

The primary reason was to assist the organization in the advancement of project management.

Needed a group dedicated to helping consultants conduct their work in a well organized fashion. Also needed a way to schedule and track staffing.

Ability to deliver projects on-time, within budget, and meet or exceed customer satisfaction. Ability to monitor success of the projects delivered.

IS had a number of project managers working as lone rangers to help implement new enhancements. The PMO was created to help organize and improve the PM function by adopting standards, best practices and integrated project oversight and review. The organization believed that system enhancements would be delivered quicker and with a higher degree of quality if a PMO was put in place.

An external benchmarking study showed our capital performance to be 14% worse than average and 25% worse than best in class.

Improving the management of Service Parts, for Service Sheet Metal for New Product Introductions and Products that "Build out" as they reach the end of their product life cycle, production build.

Poor project performance. Lack of plans, planning system and expertise in PM.

Need for improved Project Management knowledge. Retention issues with our strongest staff. Need to strengthen our ability to deliver for our internal and external customers.

Business need a coordinating function as contact towards the development sites round the globe. All products we get out to the market need to be prepared for and as there are lots of products and a complex preparation there are no other alternatives than to have project office.

The widening of the scope of the PSO to that of a Project Office for S&T will carry certain benefits that will need to be quantified as each accountable function of the office is developed. Components of this proposal are in operation in other IT companies (Hewlett Packard for instance), though the centralization of all project management influences and activities is not prevalent. The scope of the plan is such that it should be attacked with an integrated program that strongly suggests we strike up a partnership with a company specializing in project management to jointly develop the deliverables. Some of the benefits provided by this integrated approach will be: Project Managers will receive JIT training on tools and methodology. Education will be based upon a vendor-supplied program that will push our project managers towards internationally recognized certification. The program will be developed in partnership with Royal Learning Network. Project managers will be operating a standard desktop planning and management tool suite. Data will be centrally stored for re-use in modeling and planning future applications and project reporting for the CIO. The Project Office will have the authority to monitor and checkpoint projects on a regular basis and be empowered to "red flag" projects quickly, giving the Management Committee the opportunity to deal with potential problems before they get out of control. Standards and process will be centrally managed, and improvement targeted towards long term goals related to moving S&T up the SEI-CMM scale. Organizing ourselves along these lines will ensure S&T moves rapidly along the SEI CMM scale and will highlight us as a business leader in the project management arena.

Provide training, tools, systems, methodologies, and consulting to ensure excellent projects. My organization executes its projects under contract to external clients and poor performance is NOT an option.

We are a University facilities office. We use our PMO to track project work requests, the status of projects, and recharges to clients. We use it to standardize project management tools, schedules, and budgetary processes. It is also used to track and record project budget status and funding.

Put organization to chaos – improve efficiency; establish standards.

Weak application of standard project management processes & inconsistent reporting of project status.

Effectiveness in managing large scale, cross-functional projects.

The PMO was established to apply project management standards across all divisions within the company.

Establishment of project management methodology Assistance/support to project managers.

- Management lack of faith in project numbers. - Lack of uniformity and quality of project deliverables. - Questionable best use of project staff. - Inability to meet project schedules. - Inability to manage project risks. - Not meeting customer expectations.

Standardize project management procedures / templates. Definition and measurement of key project-success variables. Consultation and training.

Better prioritize projects then manage them within budget and time. Help company to focus on key projects rather than trying to do several things at once.

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Our PMO was started in Information Technology as a result of most company-wide projects being managed out of the IT dept. The CIO felt a need for a "formalized project management approach". After 18 months piloting it in IT, the PMO is now moving to a corporate-wide role.

The primary motives were to standardize processes and improve efficiency and effectiveness.

Increase of project business versus run rate business.

Part of a program to improve project management after a number of factors indicated the need: Internal project reviews, Employee Opinion Survey Results, Customer Feedback, and New emphasis in RFPs received.

Required infrastructure and processes for ISO 9001 certification.

Project Execution. Meet customer commitments. Reduce time to market.

Project over runs in dollars and time plus quality issues.

To improve effectiveness for oversight of federally funded project delivery.

Company's internal IT department split from the company. All IT projects were then essentially "outsourced." Previously our projects were managed by the professionals that were now a part of this separate company. It was time to educate our internal resources on project management.

Failed projects and the need to have: 1. central control of all projects 2. Standards and organizational maturity improvement 3. More successful projects (predictable outcome).

To increase the project management expertise within the organization. To standardize project management practices and to improve the success rate of implementing projects.

The organization/department went through a major reorganization. Management was not satisfied with project management performance.

To establish a "management by projects" environment for the department.

Revenue generation Customer satisfaction Process improvement Profit improvement.

Short term: Increase Project Success by establishing consistent standards and methods for controlling and tracking projects. Long term: Change companies project management culture.

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APPENDIX F

COLLECTION OF PMO MISSION STATEMENTS FROM SURVEYS

A collection of PMO mission statements came from the random and the targeted surveys. Per agreement with the respondents, organization's names were removed.

F (Part I)   Mission Details - PMI Random Survey

To deliver Project Manukau in a cost effective manner on schedule for the betterment of the project's stakeholders.

Provide PM best practices across the enterprise. (Experts, processes, and tools) Short version.

A competency center designed to create, consolidate and leverage best practices for project development, management and analysis within CIM Administration. It professionalizes project leadership and is dedicated to coordinating multiple projects related to business goals. It functions as a hub for managing information about projects, rather than the projects themselves.

The Corporate Process Office exists at the corporate level and is responsible for the development and standardization of 'Project-related' methodologies, tools, processes, products, services and project related infrastructure for the Corporation.

To provide direction and leadership to the project team to insure timely completion of projects within the budget constraints imposed.

To support successful delivery of organizational endeavors.

Provide detail planning, scheduling, coordination and implementation to ensure a successful conversion of customer telecommunications services.

Reduce Troubled / Failed Projects.

Sorry unknown by me, most mission statements however follow the company mission statement which basically is: Provide safe quality on time product to the customer (U.S. Gov)

The Project Management and Integration Department will provide the company with the best innovative and structurally sound solutions for the changing business environment. The department is responsible for implementing the lowest cost solutions to meet the business needs through systemic project management, re-engineering practices, and technology solutions. Consistent project management methodology will be practiced and mentored to others in the corporation. We will maintain and continually enhance our application and practices in project management.

Ensure that we are doing the right projects. Maximize opportunity for success on large scale and/or cross-divisional projects. Early detection of potential problems.

The Project Management Office (PMO) is dedicated to the collective management of projects, quality, costs, schedules, and resource management from a credible, logistical perspective. The PMO provides a centralized method for balancing the enterprise-wide portfolio of projects on a day-to-day basis by employing best practices and state-of-the-art approaches to project and quality management. On a project level, the PMO provides project and quality management expertise, project support services, coaching, and mentoring to project managers

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and project teams throughout the organization. Areas of management and support responsibility within the PMO include: Maintenance of Project Management and Quality Management methodologies Maintenance of information related to current projects Librarian for information from past projects Support of best practices through: WBS templates Deliverable (or product) templates Resource allocation information Project estimates Phase review facilitation Requirements gathering facilitation Post project closedown facilitation On an enterprise level, the PMO has the responsibility of gathering data relative to the portfolio of projects and for compiling reports useful for analysis and early detection of potential trouble spots. The PMO acts in the capacity of resource allocation tracker, project status administrator, project health monitor, and project change controller. The PMO is also responsible for the professional development of project managers in the organization.

Using PMI methodologies, to constantly improve and advance PM results and efficiencies for projects and clients.

To support the delivery organizations in providing world class project management processes and training to ensure projects are completed on time, within budget and exceed the customer's expectations.

Our vision is to be the premier provider of turn around / shutdown management services in our industry..."the industry's turn around professionals". To that end our mission is to focus on continuous improvement of turnaround processes while providing our customers with exceptional, effective, value added services. This is accomplished through recognizing and rewarding the initiative, dedication and unique talents of each of our employees.

Something to the effect of: "Developing and Implementing the Best Practices in the field of Project Management."

Support the organization's strategic direction by effectively executing and managing corporate wide initiatives. Utilizing exceptional negotiation, interpersonal and organizational skills with standardized Project Management process will allow us to complete projects on time and within budget while meeting and/or exceeding internal and external customer expectations.

Provide quality project management support by utilizing the appropriate tools and techniques of project management to support and development projects within time, scope and budget for the (three separate)organizations of (company name).

Increase the timeliness, effectiveness and quality of IT project delivery in support of business goals.

To ensure the successful project delivery and enable to successfully meet its delivery and project goals.

On the [company name] account the Program Management Organization (PMO) is the local Global Infrastructure Services (GIS) Project Resource Management (PRM) organization. Our vision is to be the preeminent provider of project management services within CSC. Our Mission is to establish a customer and CSC recognized professional project management organization that will ensure the successful management and completion of projects.

I am not at work at the moment, so to paraphrase: it exists to support the success of the project(s).

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Coordinate the on-time implementation of projects. (2000 chars. max. could never be an effective mission statement!!)

Like I said that depend for each project.

Do not have a copy with me but it was very generic and standard "Provide PM support to improved general PM competency and support PM specific effort" kind of.

I do not have it available here but simply put it's: Through adversity to the stars."

Provide support to the organization and corporate project teams through the provision of Project Manager Selection and Training; Project Management Environment, Methods and Tools; Project Control, Reporting and Risk Management Support; and Resource Services.

The purpose of the Process Improvement and Quality Group is to: - move the organization forward toward product excellence and service leadership as perceived by our customers, partners, competitors and stakeholders, - by undertaking the role of change agent, - enabling continuous process improvement throughout the organization.

To lead the development of National Operations and provide operations and implementation support required for new and existing projects. To provide marketing and technical expertise to the Divisions of the company from technical evaluation of new opportunities to on-going product development and enhancement, marketing, sales, and field support.

The Program Management Office provides the overall leadership in maximizing the return of information technology expenditures and has a leadership role for developing and applying the governance processes around information technology.

F (Part II) Mission Details - PMO Targeted Survey

Development/Implementation of an automated effective Project Management System using Microsoft Project as the core application supported by training, checklists, templates, and reporting managed by a set of standard business practices.

"To guide the organization in improving project management capability and maturity by maintaining internal and external dialogue to seek out best practices and opportunities for improvement." "To support a consistent and repeatable practice of project management through centralized information, research and guidance." "To create an association of people throughout the organization who are skilled in the art and science of project management for the purposes of networking and mutual support."

That our company become a PROJECT BASED business that applies and integrates project management into all core business processes and systems.

Lead definition and evaluation of company's project portfolio, establishing and promoting use of project management standards and methods, creating and applying tools to control project performance and objectives.(this is a free translation of an Spanish written mission statement).

To better organize and control the scope of projects and to provide a long-term vision of transferring project management knowledge throughout the organization so that PM becomes endemic to the culture.

To improve IT's effectiveness in portfolio, program and project management.

Provide our customers the right information at the right time and place, enabling agile combat support.

To provide decision support information to Air Force managers by providing access to accurate aggregate reliability and maintenance data which is critical for increasing the readiness and sustainability of USAF weapon systems.

Our PMO "is a world-class provider of information solutions to the U.S. Air Force, the Defense Finance and Accounting Service (DFAS) and other Government agencies. In this capacity, the PMO performs functions necessary to develop, acquire, maintain and modify/upgrade software systems under its cognizance, in accordance with customer needs/requirements and through the application of best quality management procedures and practices. The PMO's primary objective is to provide high quality products and services, on time, on schedule, and within initially agreed cost. Our range of services covers the whole system development spectrum - from requirements definition, to development, implementation, training, and maintenance. Our services are specifically tailored to the needs of the user and include, among others, consulting, project management, and systems integration support.

To standardize project management disciplines [Organization]-wide To provide guidance to [Organization] Project Managers which will result in successful project implementations that are: On Time Within Budget Meet Performance Measures.

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We are still working on the word-something, but this is our mission: 1. Running growth projects in excellent fashion 2. Develop organic PM capability inside our R&D Center and throughout the rest of the company.

The PMO will coordinate the development of internal and external IS processes to effectively manage information Systems's resources, finances and assets to improve service quality, department productivity and overall effectiveness through a Systems Development Methodology and information security program creating a consistent and standardized environment.

To implement customer project successfully as to meet customer expectation and satisfaction in terms of cost, time, quality and scope.

Create an Integrated Product Delivery process so reliable, effective and responsive that our customers identify us as giving them a competitive advantage.

Prevent Troubled Projects and provide Quality Assurance Support.

The mission of the Project Management Competency Center is to continuously strive to improve the success of projects involving Information Technology and to seek out opportunities to enhance the project management capabilities of the IT department and the organization.

"Our mission is to advocate and support the implementation of best-in-class project management practices, processes, and principles across (company name)."

"The Project Office belongs to the top within regarding Project Management, Quality, Process and Improvement Focus."

Plan, Organize, lead, and control IT projects while collaborating with the business to deliver expected results.

We do not have a "Mission Statement" per se. We do have a comprehensive description of the PMO role though out our processes which was developed by the PMO team.

The mission of the Project Office is to structure and promote an environment in which processes, methods and tools for systems development, change management and project management are optimally employed and continuously improved to support the business in achieving [company]'s strategic goals.

Deliver value to the Service Delivery Centers through project management.

Objectively evaluate and effect major improvements in every dimension of the product development spectrum.

To develop, implement and support (our company's) methods and best practices for the sale and delivery of (our company's) services, while facilitating the capture and sharing of expertise, thereby consistently delivering quality services to our clients.

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PMO Goal: To continuously improve the project management skills and processes through effective coaching and introduction of best practices.

To Improve Our Customers' Business Operations by Providing and Promoting Project Management Knowledge and Expertise.

To make successful in its enterprise-wide endeavors through standardized project management principles and methods.

Institutionalize a world-class Project Management methodology in the Innovation Center. Partner with Divisions to improve project planning, execution and closure.

Support the Manufacturing Engineering community in receiving machinery and equipment on time.

To create a project start-up, scheduling, and control process for the technology group in a way that is flexible, yet rigorous, with guided documentation and standardized reporting so that consistency and rigor are brought to project and resource management to better address the needs of our customers.

The PMO will provide a robust repository of disciplined, repeatable, pragmatic processes, combined with "hands-on" mentoring & in-depth, objective, executive level reporting to create a process-centric, project management environment that yields consistently predictable results. We will do this by creating cooperative teaming arrangements with our internal and external customers to ensure generated processes yield consistently improved results throughout the organization, for the individual team member on a daily basis, and by ensuring reporting allows for clear visibility into the status of all projects.

Our Mission is to be a value-added support organization, within our Application Development community, promoting a disciplined project management environment. We will provide process improvements, procedures, methods, tools and mentoring to facilitate the integration of project management best practices within our organization.

To provide project management services to the corporation; to ensure that corporation projects are implemented on time, within budget and within scope.

The GPMO will provide a robust repository of disciplined, repeatable, pragmatic processes, combined with "hands-on" mentoring & in-depth, objective, executive level reporting to create a process-centric, project management environment that yields consistently predictable results. We will do this by creating cooperative teaming arrangements with our internal and external customers to ensure generated processes yield consistently improved results throughout the organization, for the individual team member on a daily basis, and by ensuring reporting allows for clear visibility into the status of all projects.

Our mission is to support the organization's goals and initiatives through guiding the planning, execution and control of projects and to mentor the organization in the use of the (organizations) project management methodology. "A project is defined as a temporary endeavor undertaken to create a unique produce or service. Temporary means that every project has a definite beginning and a definite end. Unique means that the product or service is different in some distinguishing way from all similar products or services".

Establish a Project Support Office to support the project managers, in an effort to achieve the objectives of improved project management, project delivery and communication. The PSO will define items such as the Project life Cycle, implement an automated project management tool, establish a project management training and certification program, and introduce principles of repeatability and process improvement.

Project managers serve two customers: the external customer, and [company name]. Both invest in projects, and both expect a return on their investment. And because of the often complex, risky nature of projects, both are regularly looking for status updates and reassurances that the project is on plan, within budget, and achieving the desired outcomes. To the external customer, the project probably represents a mission critical initiative to change or improve the company's business operations and performance. The outcome is the hands of the project team so the level of anxiety and impatience the customer exhibits is understandable. But as demanding as our customers are, many project managers will readily attest that [company name] is typically the more demanding and more difficult of the two customers to satisfy. This is largely due to the fact that our customer projects span multiple business units within [company name]. And each business unit has their own expectations and business requirements. And they all look to the project manager to fulfill those requirements. Additionally, the PM has a responsibility to the team – not only to provide clear guidance and direction in how they execute the project plan, but to their careers. Their livelihood and their careers are impacted by their participation in the project. Then there are the many third-parties or subcontractors that participate in [company name] projects. They have the expectations, demands and business requirements that the [company name] business units have; and they have the same employee demands that the [company name] team members have. Within the Professional Services organization project managers have a 'dues to the club' responsibility to their respective Practice, and to the project management profession. Every customer project represents new experiences, new learning, and new solutions content, and for the business to grow, it must capture those learning and solutions in order to grow our practice expertise, and our project management capability.

To raise the project and programme standards with the organization.

To develop a [company name] UK Centre of Excellence for Project Management which assures consistent proactive and planned behaviours driving towards improved project performance, real-time monitoring and increased effectiveness across the UK business.

Add value to the business by - providing project planning and project management support to strategic projects and business units encouraging good project management practices to the extent that they become a core competence across the department.

PMCoE Charter Purpose: The [company name] Information Technology Management Team (ITMT) has determined there is a need to improve the capability for managing projects within the organization. The ITMT has elected to establish a Project Management Center Of Excellence (PMCOE) with the responsibility, accountability and requisite authority to enable the IT organization to achieve this strategic objective. Vision: The [company name] IT organization will achieve a "world-in-class" proficiency in the consistent application of common Project Management standards, processes, and procedures to ensure that quality is incorporated into core Information Technology business processes and projects. Mission: To provide the leadership that will enable the [company name] IT organization to manage its Programs, Projects, Services, and Support utilizing sound project management methodologies, standards, practices and procedures. To ensure Project Management, Internal Quality, and Project Tollgate processes are adopted enterprise-wide efficiently and effectively as a result of a continuous improvement of project management knowledge, skills and capability. Strategy: Create an environment within the [company name] Global IT organization that supports the alignment of projects with strategic corporate goals and objectives where the organization embraces project management as an

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intrinsic enabler as it seeks to attain its goals and objectives within the context of its vision, mission, goals, and objectives. **Goals & Objectives:** To establish project management practices as the natural means to accomplishing work to the degree it becomes part of the organization's culture. Define and institutionalize Project Management processes across the organization. Methodology: Establish a PM Network Management comprised of ITMT members that will function as a forum to discuss project management issues and support PMCOE efforts to satisfy the Charter Purpose, Vision, Mission, Goals and Objectives. The PM Network members shall also participate individually in the development and output of the following teams: Project Review and Authorization: Responsible for ensuring proposed projects align with organization strategic goals and objectives. Responsible for developing the requirements for reviewing, evaluating, and approving proposed projects, including business case criteria, proposal format, and development and submittal process. Responsible for the creation and oversight of a project chartering process. Project Health Check: Responsible for reviewing and approving project "Readiness" to proceed by ensuring that applicable project start-up process deliverables have been satisfied prior to project start-up as well as establishing "Readiness" prior to the to start of each subsequent project phase. Project Management Standards and Methods: Responsible for identifying and developing the project management standards and methods that include: policies, processes, and procedures that will be owned, distributed, monitored and maintained by the PMCOE. Project Management Qualification/Certification: Responsible for developing the criteria for a project management qualification and certification program that includes project management career path requirements, education and training requirements, testing criteria, and validation processes. Teams will be formed to address each of these key functions and they shall also develop their specific roles, responsibilities, accountability and requisite authority. Critical Success Factors: To ensure a successful startup and continuance of the PMCOE, the following activities must be supported: Partner with senior management to plan and dynamically manage the organization's change from what it is now to a new, revitalized organization, where Project Management (PM) is the primary means of accomplishing the organization's strategic goals and objects and permeates all levels of the organization. Management understands and accepts that the PMCOE will be evolving over time, on a consistent pace with the organization's ability to manage the change affecting their PM maturity. Management is committed to *ensuring the PMCOE is accepted and supported at all levels of the IT organization. *Ensure that PMCOE implementation plan is consistent and aligns with corporate goals and objectives. *Ensure the PMCOE implementation budget is in alignment with IT funding goals and objectives. *Ensure deployment of resources are in alignment with IT goals and objectives. *Ensure risks associated with the PMCOE implementation are assessed and managed. *Information, communication, and reporting structure support the PMCOE implementation. *Mandate and ensure the project planning execution and configuration are consistent with corporate goals and objectives. *Provide personnel evaluation system that reinforces project management as a team strategy in the company's business philosophy. *Facilitate project feasibility determination and project initiation of work-in-progress and future work that is defined as "projects." The PMCOE shall lead and facilitate the evaluation and feasibility of Program / project portfolio management as it relates to strategic decision making in support of new projects during the project initiation phase. *Define PM core competencies and PM skills as a part of an internal qualification and certification process for project managers within the organization. *To support the growth and development of the project team staffing, education and training. *Provide a home for career path project managers and the project management support staff. *The PMCOE shall be responsible for the determination and oversight of "special projects" that are mission critical to the strategic direction of the company or where such projects have or could have a pervasive impact on the corporate goals and objectives. *The PMCOE shall ensure the funding gates and limits are constant with an approved schedule of values. *The PMCOE shall lead and facilitate project close-out, lessons learned, process improvement, better estimating, building and using models for strategic decision making. *The PMCOE shall support the IT (NAO & EAO) MBP objectives. *The PMCOE shall support the IT (NAO & EAO) cost containment/reduction initiatives. PMCOE Roles, Responsibilities, Accountability, and Authority: (Various capacities) Leadership Role Establishment of the IT organization's Project Management policies, processes, procedures, methodology, standards, skills, capability, maturity and support. Responsibility Establishment of a

capability maturity framework through the integration of a project management methodology. Establish process development, process management and process improvement programs as a way of doing business. Define the core skills and competencies required. Develop education and training programs to facilitate the just-in-time transfer of project management skills and knowledge. Accountability Performance attributes and measures shall be established using the project planning process. Authority Requisite authority that is sufficient to require conformance to methodology, standards and skills. Consulting Role Facilitate, integrate and support the development of enterprise –wide information technology in support of the corporate strategies in: *Business systems; *Communication; *Quality programs; *Human resource; *Financial management Responsibility Co-develop and manage the implementation of sound technology practices, which provides the capability for timely distribution of project information across the enterprise. Co-develop an in-process quality improvement program that is fully integrated into the planning process and managed accordingly. Identify and manage project requirements for: *Capacity (availability and productivity); *Capability (competency development, skills & training); *Culture. (work environment, communication, team building, & compensation) Development of project budgets, actual performance and financial forecast in support of the corporate financial systems. Accountability Negotiated within the relationship. Authority Negotiated within the relationship. Mentoring Roles Advance the development of personal growth in project management skills and techniques within the corporate culture. Responsibility Facilitate, integrate and support the transfer of project management skills and core competencies through an organized mentoring program. Accountability Honest, open and caring. Authority Not required.

To establish a Project Selection, Development, Management and Control Infrastructure and Support Environment that enables I.T.S. Development and Support Teams to deliver commitments to our Customers that are On Time, within Budget, within Scope and with Quality Results.

To be the Preferred provider of dynamic project management services & support; enabling our bus. partners to achieve success.

"Create a competitive advantage by combining discipline and creativity with a questioning mentality and a commitment to customer service and communication". PMO is part of the Business Development Team, this is the BDT mission statement.

We will provide world class project management processes and methodologies, translated through tools, training and resources to the [company name] organization, that will establish them as the benchmark for world-class drug development.

To provide Systems & Technology with a focused program for Project Management, wherein S&T will develop and deploy a Project Management Center of Excellence which will professionalize project management by: providing processes, tools and support to project managers, centralizing the development of project management resources, centralizing the monitoring and reporting of projects and project information, and successfully applying the Project Office initiatives to any end-to end business endeavor following project management disciplines.

The mission of the UTPMI is: build a project management culture through mentoring, training, assessment and in a-systems implementation of project management principles and practices; way that inspires and encourages project participants and stakeholders; so that xxxx company achieves improved business results while enhancing the skills of it's people.

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INSTITUTIONALIZE COMMON PROCESSES AND SYSTEMS THAT PROVIDE QUALITY, COST EFFECTIVE, SERVICE SHEET METAL PART AVAILABILITY TO INSURE CONTINUED CUSTOMER ENTHUSIASM THROUGHOUT THE VEHICLE LIFE CYCLE OF GM PRODUCTS.

Provide Project Management processes, expertise, leadership and support to all Project Managers, Department Managers and Project Team members to improve overall project performance and reduce lead-time to market.

Our Mission: - Define and communicate the standard for Project Management. - Create the project portfolio and make it available to all PMs and Senior Managers. - Create the PM toolkit. - Create and schedule the initial PM Education program, execute initial PM education for all team members. - Establish a PM Mentoring program. - Establish a PM career track. Our Vision: - At every level of our organization, we always deliver on every commitment. - Business people love doing business with us, and they tell their friends about us on the golf course and over dinner. - Everyone knows we're the best software project implementers in the world: great project managers and IT superstars are desperate to work on our projects.

The Office of Project Management will create an environment of excellence in project planning and execution. The Office of PM will ensure that the organization has the skills and processes in place to deliver projects on-time, within budget, and with high customer satisfaction.

The Project Office will provide a centralized pool of resources to serve as the objective advocates and implementation arm for all enterprise projects. The Project Office will succeed in reaching its goals by using structure, collaboration, and efficient communications.

The Project Management and Integration Department is responsible for implementing project-based solutions to meet the needs of cross-functional Corporate Headquarter initiatives through systemic project management, re-engineering practices, and technology solutions. Consistent project management methodology will be practiced and mentored to others in the corporation. The Project Management guide will serve as the foundation for our project management practices. We will maintain and continually enhance [company name]'s application of practices in project management technologies.

Provision of world class support and services. (not verbatim!)

Mission: To successfully deliver new and unique information technology products that meet customer business area change requirements. Program Objectives: 1)Meet or exceed established parameters for each customer IT project. 2)Enable an MIS project-centric environment which champions the mechanisms for successful IT delivery. 3)Facilitate MIS project, people, and procurement processes to achieve increasing capability maturity.

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The Strategic Implementation Office (SIO) serves as the Program Office for AAA Michigan. SIO has three primary functions: Consulting and Standards, Administrative Support, and Training Services. The Consulting and Standards function of SIO oversees all strategic projects at AAA Michigan. This includes both technology projects and non-technology projects. The SIO is responsible for defining the appropriate framework to establish, monitor, and report on project progress. It also researches and advocates good practices in Project Management for the entire AAA Michigan organization. The Administrative Support function manages processes that have been centralized for more efficient operation. This group provides support to the entire Information Systems Department. The SIO has the responsibility within ISD to verify and track employee data as it relates to workplace activity. The SIO is also responsible for the yearly, monthly, and quarterly coordination of the headcount budget. The SIO is also the facilitator of hiring, training, preparing budgets, tracking projects, and managing strategic project reporting and tracking. The Training Services function facilitates technology training for staff at AAA Michigan. In addition to researching classes and training vendors, this group also registers staff for classes and tracks and reports on training taken. This group is also responsible for coordinating the project management training and certification program.

The mission of the project office is to proactively support all interrelated project teams and initiatives in ways that encourage effective project planning, reporting, collaboration and administration. The project office will work closely with project managers and team leaders to identify, document ad monitor project vital signs in order for senior management to accurately gauge the progress of each project and effectively manage the dependencies between them.

To ensure that the right policies, practice, and systems are in place to effectively support the project business, and to ensure that the projects business is predictable and profitable.

To enable projects with the processes and tools required for successful project management.

To develop functional competency, create and support an XXX environment with repeatable practices in order to consistently achieve project and business goals.

PM Mission is to add value to the organization by assuming a leadership role to deliver products and process, within budget, in conformance to customer specifications. We will continue to grow in the industry by building professionalism within Project Management and by promoting continual improvement and teamwork.

To assist our clients in achieving the highest quality in project delivery with unmatched value.

Project Management Consulting's mission is to maximize Our Company's benefit from its IT development investment by ensuring projects deliver the expected value on time and within budget. This mission is accomplished by the following: * Providing leadership in project management practices. * Providing project management consulting services.

To enable 'our company' to establish itself as a premier solutions organization capable of delivering our solution sets in a predictable fashion Establish 'our company' as a Market Leader in the Field of Project Management.

"With excellent planning and execution of our projects, we secure cost effectiveness and customer satisfaction".

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To implement a Project Management Office that will establish and support standard project management practices throughout the organization, provide project management training/coaching to ensure effective project management and provide project management for major projects in future.

Our Mission is to work with the business community and IT to support corporate direction, enable change, and strengthen the IT capability to deliver cost effective IT solutions. We will provide services to bolster current and advance future accomplish this by: Providing a simple technology that support [company name]'s business direction. Developing an empowered staff efficient processes and methodologies. Developing and possessing the knowledge, skills and attitude required. Application delivery plan that will get the right people focused on the right Fostering an environment that is projects, in the right way at the right time. Creative, collaborative, and fun yet focused on deliverables.

To serve (the client) by providing responsive, reliable information management services in an efficient, cost-effective manner.

We empower our business divisions by introducing industry project management practices, resulting in improved customer satisfaction, higher quality deliverables, a single point of accountability, and financial management which all contribute to the department's financial bottom line.

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APPENDIX G

COLLECTION OF PMO POLICY DOCUMENTS FROM SURVEYS

A collection of PMO policy statements came from the random and the targeted surveys. Per agreement with the respondents, organization's names were removed.

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G (Part I)   Policy Statements - PMI Random Survey

Policy Documents.

Entire web site dedicated to Project Management methodologies, PM Training and PM certification.

Action items, Charters, Issue Management, Risk Management, Plans, Project Docs, etc.

There is a Program Operating Plan that is written for each project.

Project manager handbook with background, Logistic, program policies, roles and responsibilities.

IT Governance Policy. PMO Charter.

A services-oriented organizational structure that: Incorporates best project management practices Leverages cross project synergies Standardizes Project Management components Identifies complex project dependencies Supports IM alignment with strategic business objectives.

Mission, Charter, PM Procedures, MIS Reporting, Tool Sets PM Policy.

Charter Mission Statement Objective Reporting Matrix Review Boards.

Internal NASA project management policy documents.

Department guidebooks for each element comprising the project team. Frequently overlapping functions and responsibilities have not been addressed by senior management.

Charter, Methodology, Templates.

A Project Management Standard Operating Procedure has been put in place and approved by Quality Assurance management.

Project plans, documents of understanding with many supporting organizations.

A reference manual.

Several internal Policies and Procedures establishing the Project Office; a project charter for establishing the PO; a PM Guidebook containing the mandatory PM methodology.

The organization's Board of Directors issued a resolution endorsing the mission

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statement.

Charter, org structure, standard forms and templates.

Project management news briefing; project charter.

Charter Web Site Online Reporting All project Data folders are tracked Elec.

Have developed a Quality Assurance process.

We have charter & mission statements and as best practice database fully accessible to all employees of the company for reference.

Charter Project Mgmt Document Service Level Agreement Statement of Work Schedule template.

Project Management Guide - the guide provides a framework for all projects, regardless of size or stage of development. This methodology is available to all business units throughout the organization.

Goals Objectives Project Prioritization Process Benefits Realization Process Status Reporting Issue Management Scope Change Management Resource Allocation.

All that has been distributed are some process guidelines for Project Management.

Mission Statement and Charter.

A work breakdown structure was established along with a responsibilities matrix assigning backup and support responsibilities for each activity. Procedures documents were written up for each position.

Charter, Goals, Objectives all displayed on corporate web page.

18 process document governing the PMO processes. Also a Responsibilities matrix that defines PMO vs project and Operating unit responsibilities.

All projects being bid with costs in excess of $2M will include a fee for services to be provided by the PMO.

Charter Project Proposal Project Plan Organizational Model Process and Procedural Standards Schedule and Resource Planning Cost Accounting Plan Implementation Strategy Performance Measurements Methodology.

Pricing, Bid & Proposal, Time tracking, etc.

There was a SOW .

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Project charter estimating tools WBS weekly status reports time tracking project management software.

A charter.

Charter, plans, schedule for compliance by all projects, QA review standards, etc.

Charter.

Project Methodology Manual which includes introduction statements. This could be interpreted as a charter statement.

Project Charter Documentation Standards Change Management Process Issue Management Process Automated Timesheets Process Lessons Learned Review Process Risk Management Process Standardized Reports.

Contract.

Charter Business requirements template Project management templates/standards.

Incorporated.

Creation of the PMO Charter. Internal Project Management Training curriculum and Certification guidelines. Creation of Technical Project Manager and Business Project Manager job classes. Project Management mentoring guidelines.

cmm L2 policy statements, charter.

There was an official charter issued. The heads of the other departments have met with the PM department to develop project partnership strategies.

Department operations manual, product life cycle.

Charter, Workflows (Initiate through Close) Competency Based Assessment of Personnel Mission Statement.

Departments established policies in relation to project management.

Charter.

I do not have any documents.

Various documents detailing the proper use of documentation used to support the PMO.

PMO Quality Plan.

I suppose that they have an operations document in place but it is unknown. PMO is not

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highly visible.

Charter for establishment as well as standardized deliverables as lifecycle documents.

Vision, mission, strategic objectives, Business Process SOP, Alliance Project Process SOP.

The [company name] charter - In November 1996, [company name] consolidated its efforts to become a project-based business and established the Project Management Center of Excellence (PM/COE). The PM/COE would develop and implement corporate wide strategy and plans for achieving organizational competence in project management. It would establish and drive a consistency of approach, a network of knowledgeable practitioners, and supportive business processes and systems. Finally, it would establish and maintain a professional project management community within [company name] and act as the interface between [company name]'s community and other internal and external professional communities. Delivery and implementation would be through deployment leaders within the business units and the geographies.

Project Management Plan PMO Training Document Ongoing updates of revisions Policy documents as requested by the [state name] Dept. of Info. Technology, and [state name] Dept. of Finance.

Charter vision value statements priority processes performance expectations.

Currently my company is at CMM level 3 for process which includes numerous policy documents based on best practice following the industry targeted. This is in addition to ISO 9001 certifications.

Charter, standards.

Communication Management Plan Documentation standards Templates Risk Management Change Request procedure.

The organization been very structured, the PMO was very well define on paper, not necessarily corresponding to the every day reality.

Project Charter Job Descriptions Scope Statement.

Corporate Investment and Project Management Method, that includes a full lifecycle approach and breakdown of templated project activity, and the role of the PMO.

Roles & Responsibilities document prepared with other groups within the organization. Standard templates for use in projects (charter, business case, project status reports, etc).

Statement of Work Proposal Scope Change Document Project Report Card.

None. The PMO is provided a framework from the President and all staff members are self-directed.

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G (Part II)   Policy Statements - PMO Targeted Survey

Policy Documents.

- Project Management Guide that includes 3 sections. The first section is a project management checklist to be used by the PM. The checklist contains hyperlinks to the second section which goes into detail for each step and provides screen captures and rationale. The last section contains the common vocabulary and the overall project management methodology accepted by the company. Hence, the 3 sections can be used by varying levels of skilled PMs. Section 1 for the experienced PM familiar with the company processes. Section 2 for the less experienced PMs Section 3 for everyone to read and understand the company's view of Project Management. - A Project Office Charter is in the works for sign off by the executive stakeholders (President & VP) - Various e-mails outlining requirements as the PO evolves - A Project Office Intranet containing said documentation and links to our internal bi-weekly Project Office magazine that focuses on the PMI knowledge areas, MSP tips/tricks specific to the organizational needs and some PM humor. - PowerPoint presentations communicating were we are going and what we have accomplished. These presentations are also posted to our intranet and communicate to our stakeholders the status in getting the PO off the ground.

Project charter and standard operating procedures.

Program Management Directives.

Executive steering committee directive Professional development policy Management Systems policy Method policy Tools policy Intellectual Capital Management policy Knowledge Network policy Quality Assurance Policy Executive Measurements policy.

Mission statement, functions and PMO´s organization approved by company´s Project and Engineering Manager.

Charter.

An Account Plan.

Charter, project management policy.

Charter, Acquisition Program Baseline Documents.

Operational Readiness Document, Program Management Directive, Program Objective Memorandum.

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I believe the PMO does NOT have a charter. I am not aware of any policy documents specifically related to this PMO.

Security Safety Product Configuration Control.

A charter was issued in the early 80's when the PMO was started. Over the years as the program has evolved, other documents have come into being. Often general direction to improve data systems from top levels of management were translated into Operational Requirements Documents (ORDs) and Acquisition Program Baseline (APB) documents. The APB captures the scope, cost, and schedule for the program and is reviewed and approved at the top levels of management. Quarterly reports and Monthly activity reports to these same levels provide the on-going status of these projects relative to the APB.

Project Charter Project Tracking System Concept Paper Project Management Methodology.

Project Management Methodology Resource Management Process Monthly project review process Project Assessment Review process.

PMO Operating Plan.

Work instruction for Project management.

PM Strategy and Implementation Plan that I am currently working on.

A charter as well as management support.

Quality Assurance Processes.

Vision, mission, charter objectives goals.

No official Policy document has been issued. We've used informal documents - a monthly newsletter, a PM page on the company intranet, etc. to introduce the organization to what our PMCC is about and how we can assist.

Internal organization announcement.

Policy statement from the CEO.

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The Capital Project Cost Reduction Initiative (CPCRI) was issued in August of 1998. This document represented a comprehensive 2-year cross-functional study of the entire capital project process. Many changes were implemented in our processes as a result which further defined the PMO role.

Organizational charter Implementation charter Annual planning documents.

Charter.

Not really. There was an Andersen study (Powerpoint format) done and approved by Sr. Mgmt.

We have numerous SOP's regarding methodology.

Presentations both for the executive and the practitioners.

The PMO was established based on a Statement of Work, which included definition of the vision and case for action, expected scope of work, key customer groups, deliverables to those groups, measures of success, expected economic impact, and implementation approach.

Business Justification Document, Organization Chart.

PMO Methodology Document Organizational Chart Job Descriptions.

"These are currently being established. The standard PM process we are introducing will by ISO 9001 certified this year. As part of that, the PMO (or Quality Office in ISO terms) will be mandated as the official office looking after the ""Quality System"". Top management has stood up at internal symposiums and has sent out memos indicating their support for the PMCC work, and their commitment for implementing standard PM processes and tools."

PMO Charter Project Management Process Document Project Startup Workshop Process Monthly Review Process Project Closure Process.

An orientation to the function and purpose of the PMO is personally delivered by the Directors of Manufacturing Engineering to all personnel. An orientation handout is provided at that time.

None but a Project Management policy is in the works.

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A charter, and policies on requirements management, project planning, project tracking and oversight, subcontractor management, quality assurance, configuration management, organizational process definition, organizational process focus, and training.

Within our Charter, we include vision, mission, guiding principles, Project Office model, roles and responsibilities, tie-in with the line of business strategy, and specific offerings.

Software Development Life Cycle Methodology; Roles and Responsibilities; Project Control and Change Control.

A charter, and specific policies on seven key areas, such as training.

A departmental team charter was developed and issued.

Project Charter. PM Training through a local University.

NUMBERED POLICIES NUMBERED STANDARDS APPROVAL BOARD CHARTERS BEST PRACTICES & TEMPLATES.

Project standards.

Charter, Project Brief, Key Performance Indicators.

None specifically. It sort of just drifted into place.

Project Management Methodology Guidelines (PMMG) The standards which govern how projects will be managed, based on PMI's PMBOK.

Project Charter, Business Value Analysis, Annual Review Document (Planned vs. Delivered projects, improvement measurements, etc.)

Official Company Announcement Communication plan.

Managing contractors Policies and procedures Project Environment (templates etc) minimum requirements.

A multitude of internal documents, but nothing issued to the external organization.

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No Charter has been issued but we have responsibility matrices and process flowcharts to define roles and boundaries.

Charter and White paper.

Charter document.

Project Charter Document of Understanding Commitment to Deliver Risk Management Communication Management Implementation Plan Multiple schedules Mentoring Rollout plan.

- Project Management Element in loss control system, supported by an audit guide and annual audit. - Methodology, Phases and Front End Loading Procedures - Project Baseline plan, Work Breakdown Structure, Scheduling, Cost, Risk, Contracting, change control, Monitoring and reporting guidelines.

The Service Sheet Metal PMO has an annual renewable charter that is governed by a GM Executive level steering committee that meets quarterly and is represented by GMSPO, GM Metal Fabricating Division, and other GM North American Operations operating groups. The Charter includes roles and responsibilities, as well as a well-defined set of metrics that determine the effectiveness of the new business processes that were put into place back in 1998.

PMO is integrated into corporate Policy & Procedures.

Charter. Product/Service Descriptions.

There have lately been defined what decisions that shall be taken and where. Is it the line or the projects that shall take the decisions and what kind of decisions. What Sr mgr's must be involved in certain decisions and middle mgt when is it enough with them? So this has been specified and agreed and there are monthly meetings to focus on these issues and keeps the meetings.

A complete website describing mission, role, available training, tools, documentation, and access to PM information systems is the primary vehicle by which the PMO operates.

A flowchart for tracking work orders and contract documents for approval, bidding, and awarding through our procurement office.

Charter, Project Initiation, Project Impact, Project Steering Committee.

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Project Management Guidelines governing the management of projects, including the communications and presentations with senior management.

None. Lots of talk. Lots of email. Lots of verbal plans. Lots of time investigating. No direction. No policies. No charter. So far, no-value-added.

None. Only internal communication, website, roles and responsibilities.

The Project Management Support Office is a formal and permanent part of the business organization structure. Within the PMSO, we have drafted formal policies covering the following areas: - Project Planning - Project Tracking - Risk Management - Requirements Management - Configuration Management.

None -- only presentations about the role of the people involved.

Organizational Charter has been published for the Program Office itself. Have also published standards for project charters, value propositions (cost/benefit), issue resolution and a number of other project standards.

There is a charter, vision statement, mission statement, objectives, annual goals, reporting mechanisms and a methodology/approach that is followed.

Project Definition Report, Project Charter, Status Reports, Roles and Responsibilities Document, Communication Management Plans, Project Evaluation Report, Lessons Learned.

Yearly Operating Plan.

Business Plan to establish PMO. Executive Sponsor Letter. Project Management Handbook documenting Project Management Methodology. Project Management Professional Development Program.

PMO identifies standards for project charter, test records, project issue log, project change request log, approvals.

In process of creating a Project Management Process, practices and methodologies. Standard project documentation (used now) Project Charter Project Plan Communication Plan Risk Plan.

Charter Organization Chart Standard operating procedures Standard processes Metrics on all project to upper management (earned value etc).

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Project Implementation Plan.

President statement Company Policy on what is expected from PMO and it function.

A Project Management Proposal including objectives etc. was prepared and presented to all staff.

The PO is made up of 3 areas: 1 Planning 2. Training 3. Process & Methods All 3 areas have mission statements and goals that cascade from the PO goals and mission. Numerous process documents have been created. A Quarterly newsletter.

A Charter, A Strategic Plan, A Project Management Methodology, Several Project Management Guidelines.

PMO Charter PM Methodology Statement of Work Risk Assessment Change Management.

PIR - Project Initiation Report Communications Plan.

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APPENDIX H

REGRESSION ASSUMPTION CHECK

In developing regression models, regression assumptions (linearity, homoskedasticity, and normality) were checked both for the random and the targeted data. Records are collected for reviewing.

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H.1 Assumption Check for the Random Sample – SLR for PMO (Chapter 5)

To check the normality of residuals in the simple linear models, the Shapiro-wilk W statistic was used. In this test, the null hypothesis H_0 is the favorable claim that the residuals are normally distributed. Thus, as long as the p-value is above the α value of 0.05, we can be confident in this claim. Results showed (Table H.1.1) that the distribution residuals appeared not to be normal for all six models. The presence of influential outlying observations was a major cause.

Independent Variable	H_0	W Test Value	p-Value	Conclusion: Reject H_0
ST		0.885	<0.0001	Yes
AR		0.828	<0.0001	Yes
NAD	Normal	0.837	<0.0001	Yes
NHR		0.857	<0.0001	Yes
NTR		0.854	<0.0001	Yes
CN		0.851	<0.0001	Yes

Table H.1.1 Normality Assumption Check for the Random Sample

To examine homoscedasticity, a White's test was performed to assess whether equal variance was indicated in the residuals for each model. Similar to the W statistic above, the null hypothesis H_0 is the favorable claim that the residuals have constant variance. Thus, as long as the p-value is above the α value of 0.05, we can be confident in this claim. According to the first and second moment specification results, conclusions were reached at a 95% confidence level that the residual variance in each model was constant for variables AR, NAD, NTR and CN; the residual variance in each model was not constant for variables ST and NHR (Table H.1.2).

Independent Variable	H_0	Chi-Square Value	p-Value	Conclusion: Reject H_0
ST		10.480	<0.0053	Yes
AR		1.454	>0.4833	No
NAD	Homoscedasticity	1.9067	>0.3855	No
NHR		8.152	<0.0170	Yes
NTR		5.062	>0.0796	No
CN		4.711	>0.0949	No

Table H.1.2 Homoscedasticity Assumption Check for the Random Sample

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For the assumption of linearity, a Lack-of-Fit F test was performed to examine whether a linear function is a good fit to the data. As with the previous assumption checks, the null hypothesis H_0 is a favorable claim and a p-value is above the α value of 0.05 permits us to be confident in this claim. As shown in Table H.1.3, the model for variables AR, NAD, NHR and NHR passed this test, but variables ST and CN did not.

Independent Variable	H_0	F Value	p-Value	Conclusion: Reject H_0
ST		2.119	<0.0004	Yes
AR	A linear regression model is appropriate	1.086	>0.3535	No
NAD		0.632	>0.8861	No
NHR		1.256	>0.1375	No
NTR		0.872	>0.6977	No
CN		1.684	<0.0112	Yes

Table H.1.3 Linearity Assumption Check for the Random Sample

Finally, it was judged that there was no autocorrelation among residuals since the sample was taken from a cross section of respondents rather than a time-series data set.

Table H.1.4 presents the summary results from regression assumption tests of homoscedasticity, linearity and normality.

Model	Homoscedasticity	Linearity	Normality
DV = ST	No	No	No
DV = AR	Yes	Yes	No
DV = NAD	Yes	Yes	No
DV = NHR	No	Yes	No
DV = NTR	Yes	Yes	No
DV = CN	Yes	No	No

Table H.1.4 Summary of Assumption Check for the Random Sample

Since violation of homoscedasticity occasionally causes the corresponding violation of normality, remediation of heteroskedasticity was addressed first. The two independent variables considered were ST and NHR.

For the model "DV = ST," the weighted least squares technique was employed, utilizing estimates of the residual variances σ^2 based on the observed data. The outcome

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resulted in an improvement of the model's homoscedasticity and linearity. However, it did not correct the lack of normality (Table H.1.5).

Independent Variable	H₀	Test Value	p-Value	Conclusion: Reject H₀
ST	Homoscedasticity	Chi-square value: 2.994	>0.4003	No
	A linear regression model is appropriate.	F value: 1.388	>0.0747	No
	Normal	W value: 0.86886	<0.0001	Yes

Table H.1.5 Remediation Results for Model's Independent Variable ST

For the model "DV = NHR," the weighted least squares technique was chosen for remediation. As a result, homoscedasticity was achieved, but not normality. In addition, the model's regression fitness value decreased from 0.1375 to 0.0753, though this value was still within an acceptable range (Table H.1.6).

Independent Variable	H₀	Test Value	p-Value	Conclusion: Reject H₀
NHR	Homoscedasticity	Chi-square value: 1.5216	>0.0.6773	No
	A linear regression model is appropriate	F value: 1.3507	>0.0753	No
	Normal	W value: 0.572584	<0.00001	Yes

Table H.1.6 Remediation Results for Model's Independent Variable NHR

For the model "DV = CN," Tukey's "Ladder of Powers" was employed. By transforming the dependent variable DV to its reciprocal (1 / Y), a regression fit was achieved. Also, the model's homoscedasticity was improved. However, normality in the residuals was not accomplished (Table H.1.7).

Independent Variable	H₀	Test Value	p-Value	Conclusion: Reject H₀
CN	Homoscedasticity	Chi-square value:3.80	0.1493	No
	A linear regression model is appropriate	F value: 1.3179	>0.1139	No
	Normal	W value: 0.4922	<0.0001.	Yes

Table H.1.7 Remediation Results for Model's Independent Variable CN

For the models "DV = AR," "DV = NAD," and "DV = NTR," no remediation was found to improve the lack of normality while maintaining homoscedasticity and linearity. In fact, none of the six simple regression models satisfied the regression error term ε_i assumption of normality of the residuals. However, among assumptions they are not equally "robust." The normality assumption can be ignored when the sample size is large enough, for then the central-limit theorem can be invoked.[*]

H.2 Assumption Check for the Targeted Sample – SLR for PMO (Chapter 7)

To check the normality of residuals in the simple linear models, the Shapirowilk W statistic was used. In this test, the null hypothesis H₀ is the favorable claim that the residuals are normally distributed. Thus, as long as the p-value is above the α value of 0.05, we can be confident in this claim. Results (Table H.2.1) showed that the distribution residuals appeared normal for all six models (with predictors ST, AR, NAD, NHR, NTR and CN) at a 95% confidence level. The model with predictor variable NTR presented the weakest case, though its residuals could still be considered normal. It is suspected that the presence of an outlier was a major cause.

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[*] Michael S. Lewis-Beck, "Applied Regression – An Introduction," SAGE Publications, Page 30, 1983.

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Independent Variable	H₀	W test Value	p-Value	Conclusion: Reject H₀
ST		0.9723	0.4339	No
AR		0.9728	0.4517	No
NAD	Normal	0.977	0.612	No
NHR		0.9771	0.615	No
NTR		0.9529	0.07	No
CN		0.9637	0.2056	No

Table H.2.1 Normality Assumption Check for the Targeted Sample

To examine homoscedasticity, a White's test was performed to assess whether equal variance was indicated in the residuals for each model. Similar to the W statistic above, the null hypothesis H_0 is the favorable claim that the residuals have constant variance. As long as the p-value is above $\alpha = 0.05$, we can be confident in this claim. According to the 1st and 2nd moment specification results, the residual variance in each model could be considered identical at a 95% confidence level (see Table H.2.2).

Independent Variable	H₀	Chi-Square Value	p-Value	Conclusion: Reject H₀
ST		1.4881	0.4752	No
AR		4.4464	0.1083	No
NAD	Homoscedasticity	1.9532	0.3766	No
NHR		4.5715	0.1017	No
NTR		3.7690	0.1519	No
CN		3.4929	0.1744	No

Table H.2.2 Homoscedasticity Assumption Check for the Targeted Sample

For the assumption of linearity, a Lack-of-Fit F test was performed to examine whether a linear function is a good fit to the data. As with previous assumption checks, the null hypothesis H_0 is a favorable claim and a p-value is above the α value of 0.05 permits us to be confident in this claim. Table H.2.3 shows that each model passed the test.

Finally, it was judged that there was no autocorrelation among residuals since the sample was taken from a cross section of respondents rather than a time-series data set.

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Independent Variable	H_0	F Value	p-Value	Conclusion: Reject H_0
ST	A linear Regression model is Appropriate	1.0733	0.4246	No
AR		1.6556	0.1037	No
NAD		0.9256	0.5579	No
NHR		0.4857	0.9624	No
NTR		0.7050	0.7906	No
CN		1.1674	0.3455	No

Table H.2.3 Linearity Assumption Check for the Targeted Sample

Table H.2.4 presents the summary results from regression assumption tests of homoscedasticity, linearity and normality.

Model	Homoscedasticity	Linearity	Normality
DV = ST	Yes	Yes	Yes
DV = AR	Yes	Yes	Yes
DV = NAD	Yes	Yes	Yes
DV = NHR	Yes	Yes	Yes
DV = NTR	Yes	Yes	Yes
DV = CN	Yes	Yes	Yes

Table H.2.4 Summary of Assumption Check for the Targeted Sample

H.3 Assumption Check for the Targeted Sample – MLR for PMO (Chapter 7)

Model #1: DV = 4.986 + 0.148*ST + 0.085*AR

In checking for outliers and influential observations, the "Hat Matrix" technique was employed to identify outlying X observations. Any X values greater than $2*p/n$ would be labeled as x-outliers, and three observations qualified. For identifying outlying Y observations, the Studentized Deleted Residual technique was employed. Any Y value greater than $t_{\alpha = .10/n, n-p-1}$ (conservative) or $t_{\alpha = .10, n-p-1}$ (less conservative) were classified as Y outliers. Only one Y outlier was identified using the conservative method, and five were identified by the less conservative approach. For identifying influential cases, Cook's Distance technique was employed. The magnitude of any influential i^{th} case on

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all n fitted values are compared against $F_{\alpha = .50, p, n-p}$. No influential case was identified. All outlier analysis is presented in Table H.3.1.

```
Hat diagonal cutoff is     0.12
Deleted RSTUDENT cutoff (Conservative) is     3.28
Deleted RSTUDENT cutoff (Less Conservative) is     1.68
Cook's distance cutoff is     0.80


OBS  OBS   COOKD       H      RSTUDENT  RST_1  RST_2  H_FLAG  COOKFLAG
 1   06   0.00578   0.11657    0.35926                         *
 2   20   0.11950   0.34252   -0.82687                         *
 3   21   0.04778   0.03863    1.94156           *
 4   23   0.08983   0.05913   -2.14563           *
 5   26   0.12750   0.12179    1.69206           *      *
 6   27   0.29792   0.05204   -4.88742    *      *
 7   28   0.05833   0.04699    1.93580           *
```

Table H.3.1 Regression Outlier Analysis for Independent Variables ST and AR

An investigation was performed on those survey responses that were associated with the outliers identified above. No systematic cause for these peculiarities, such as a procedural error or common project type, was discovered. Data recording errors were not a concern since a web-based survey was used, although there may have been an error by the respondent in entering information on the website. Thus, these outliers appeared to be random occurrences and thus represented a valid segment of the population. To support the goal of generalization, all X and Y outlying cases were kept.

The Shapirowilk W statistic was used to check the assumption of normality in the residuals. The test showed that the distribution of the model residuals were normal at a 95% confidence level. A White's test was performed to examine homoscedasticity of the variables. According to the first and second moment specification results, the assumption of constant variance was supported at a 95% confidence level. For the assumption of linearity, a lack-of-fit F-test showed that a linear function represented a good fit to the data. See Table H.3.2.

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Model	H_0	Test Value	p-Value	Conclusion: Reject H_0
ST + AR	Homoscedasticity	Chi-square value: 5.7066	>0.3358	No
	A linear regression model is appropriate.	F value: 0.6942	>0.7640	No
	Normality	W value: 0.9820	<0.7890	No

Table H.3.2 Regression Assumption Checks for Independent Variables ST and AR

Model #2: DV = 4.986 + 0.152*ST + 0.077*NHR

In checking for outliers and influential observations, the "Hat Matrix" technique was employed to identify outlying X observations. Any X values greater than $2*p/n$ would be labeled as x-outliers, and six observations qualified. For identifying outlying Y observations, the Studentized Deleted Residual technique was employed. Any Y value greater than $t_{\alpha = .10/n, n-p-1}$ (conservative) or $t_{\alpha = .10, n-p-1}$ (less conservative) were classified as Y outliers. No Y outliers were identified using the conservative method, and six were identified by the less conservative approach. For identifying influential cases, Cook's Distance technique was employed. The magnitude of any influential i^{th} case on all n fitted values were compared against $F_{\alpha = .50, p, n-p}$. No influential case was identified. All outlier analysis is presented in Table H.3.3.

```
Hat diagonal cutoff is    0.12
Deleted RSTUDENT cutoff (Conservative) is    3.28
Deleted RSTUDENT cutoff (Less Conservative) is    1.68
Cook's distance cutoff is    0.80
```

OBS	OBS	COOKD	H	RSTUDENT	RST_1	RST_2	H_FLAG	COOKFLAG
1	02	0.06610	0.06820	-1.67676		*		
2	11	0.13426	0.12778	1.68984		*	*	
3	19	0.02865	0.12534	0.77120			*	
4	20	0.01258	0.17764	-0.41438			*	
5	21	0.02462	0.02125	1.89313	*			
6	23	0.21756	0.08734	-2.78995	*			
7	26	0.12155	0.14066	1.51242			*	
8	38	0.00002	0.14875	0.01796			*	
9	44	0.11129	0.10419	1.72898	*			
10	46	0.06635	0.05925	-1.82001	*			
11	49	0.00585	0.11812	-0.35871			*	

Table H.3.3 Regression Outlier Analysis for Independent Variables ST and NHR

An investigation was performed on those survey responses that were associated with the outliers identified above. No systematic cause for these peculiarities, such as a procedural error or common project type, was discovered. Data recording errors were not a concern since a web-based survey was used, although there may have been an error by the respondent in entering information on the website. Thus, these outliers appeared to be random occurrences and thus represented a valid segment of the population. To support the goal of generalization, all X and Y outlying cases were kept.

The Shapirowilk W statistic was used to check the assumption of normality in the residuals. The test showed that the distribution of the model residuals were normal at a 95% confidence level. A White's test was performed to examine homoscedasticity of variables. According to the first and second moment specification results, the assumption of constant variance was supported at a 95% confidence level. For the assumption of linearity, a lack-of-fit F test showed that a linear function represented a good fit to the data. See Table H.3.4.

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Model	H_0	Test Value	p-Value	Conclusion: Reject H_0
ST + NHR	Homoscedasticity	Chi-square value: 7.6843	>0.1745	No
	A linear regression model is appropriate.	F value: 3.2511	>0.4182	No
	Normal	W value: 0.9708	<0.3913	No

Table H.3.4 Regression Assumption Checks for Independent Variables ST and NHR

Model #3: DV = 4.728 + 0.169*ST + 0.083*NTR

In checking for outliers and influential observations, the "Hat Matrix" technique was employed to identify outlying X observations. Any X values greater than $2*p/n$ would be labeled as x-outliers, and six observations qualified. For identifying outlying Y observations, the Studentized Deleted Residual technique was employed. Any Y value greater than $t_{\alpha = .10/n, n-p-1}$ (conservative) or $t_{\alpha = .10, n-p-1}$ (less conservative) were classified as Y outliers. No Y outliers were identified using the conservative method, and six were identified by the less conservative approach. For identifying influential cases, Cook's Distance technique was employed. The magnitude of any influential i^{th} case on all n fitted values were compared against $F_{\alpha = .50, p, n-p}$. No influential case was identified. All outlier analysis is presented in Table H.3.5.

An investigation was performed on those survey responses that were associated with the outliers identified above. No systematic cause for these peculiarities, such as a procedural error or common project type, was discovered. Data recording errors were not a concern since a web-based survey was used, although there may have been an error by the respondent in entering information on the website. Thus, these outliers appeared to be random occurrences and thus represented a valid segment of the population. To support the goal of generalization, all X and Y outlying cases were kept.

```
Hat diagonal cutoff is    0.12
Deleted RSTUDENT cutoff (Conservative) is    3.28
Deleted RSTUDENT cutoff (Less Conservative) is    1.68
Cook's distance cutoff is    0.80

  OBS  OBS    COOKD        H      RSTUDENT  RST_1  RST_2  H_FLAG  COOKFLAG
   1   18   0.00082   0.13219    0.12554                    *
   2   19   0.04434   0.13716    0.91313                    *
   3   20   0.09840   0.25764   -0.92082                    *
   4   21   0.02720   0.02176    1.97210           *
   5   23   0.17341   0.07105   -2.78571           *
   6   26   0.12277   0.12986    1.59603                    *
   7   28   0.02520   0.02128    1.91587           *
   8   37   0.02186   0.02081   -1.79686           *
   9   39   0.02841   0.02714   -1.78766           *
  10   46   0.16571   0.09880   -2.21436           *
  11   49   0.00111   0.12242    0.15303                    *
  12   50   0.00307   0.13043   -0.24517                    *
```

Table H.3.5 Regression Outlier Analysis for Independent Variables ST and NTR

The Shapirowilk W statistic was used to check the assumption of normality in the residuals. The test showed that the distribution of the model residuals were normal at a 95% confidence level. A White's test was performed to examine homoscedasticity of variables. According to the first and second moment specification results, the assumption of constant variance was supported at a 95% confidence level. For the assumption of linearity, a lack-of-fit F-test showed that a linear function represented a good fit to the data. See Table H.3.6.

Model	H₀	Test Value	p-Value	Conclusion: Reject H₀
ST + NTR	Homoscedasticity	Chi-square value: 9.8242	>0.0804	No
	A linear regression model is appropriate.	F value: 123.9574	>0.0712	No
	Normal	W value: 0.9701	<0.3631	No

Table H.3.6 Regression Assumption Checks for Independent Variables ST and NTR

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H.4 Assumption Check for the Random Sample – SLR for CSFs (Chapter 8)

To check the normality of residuals in the simple linear models, the Shapirowilk W statistic was used. In this test, the null hypothesis H_0 is the favorable claim that the residuals are normally distributed. Thus as long as the p-value is above the α value of 0.05, we can be confident in this claim. Results in Table H.4.1 shown that the distribution of residuals appeared non-normal for all eight models (with predictors MI, MG, CL, TT, SP, CM TS, and PMO Index) at a 95% confidence level. It is suspected that the presence of influential outlying observations was a major cause.

Independent Variable	H_0	W Test Value	p-Value	Conclusion: Reject H_0
MI		0.9571	0.0001	Yes
MG		0.9042	0.0001	Yes
CL		0.9410	0.0001	Yes
TT	Normal	0.9325	0.0001	Yes
SP		0.9347	0.0001	Yes
CM		0.9369	0.0001	Yes
TS		0.9364	0.0001	Yes
PMO Index		0.8636	0.0001	Yes

Table H.4.1 Normality Assumption Check for the Random Sample

To examine homoscedasticity, a White's test was performed to assess whether equal variance was indicated in the residuals for each model. Similar to the W statistic above, the null hypothesis H_0 is the favorable claim that the residuals have constant variance. Thus as long as the p-value is above the α value of 0.05, we can be confident in this claim. According to the first and second moment specification results, conclusions were reached at a 95% confidence level that the residual variance in each model, MI, TT, and PMO Index, was constant. Conclusions were reached at a 95% confidence level that the residual variance in each remaining model, MG, CL, SP, CM, and TS, was not constant. See Table H.4.2.

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Independent Variable	H₀	Chi-Square Value	p-Value	Conclusion: Reject H₀
MI		5.0981	>0.0782	No
MG		8.3679	<0.0152	Yes
CL		7.0761	<0.0291	Yes
TT	Homoscedasticity	5.2396	>0.0728	No
SP		10.7042	<0.0047	Yes
CM		9.0403	<0.0109	Yes
TS		6.3252	<0.0423	Yes
PMO Index		5.5285	>0.0630	No

Table H.4.2 Homoscedasticity Assumption Check for the Random Sample

For the assumption of linearity, a Lack-of-Fit F-test was performed to examine whether a linear function is a good fit to the data. As with the previous checks, the null hypothesis H_0 is a favorable claim and a p-value above the α value of 0.05 permits us to be confident in this claim. As shown in the Table H.4.3, no models passed this test.

Independent Variable	H₀	F Value	p-Value	Conclusion: Reject H₀
MI		2.7655	0.0001	Yes
MG		1.6792	0.0134	Yes
CL	A linear regression	1.8358	0.0142	Yes
TT	model is appropriate	2.1224	0.0015	Yes
SP		2.6992	0.0001	Yes
CM		1.6090	0.0244	Yes
TS		1.7742	0.0112	Yes
PMO Index		1.5025	0.0260	Yes

Table H.4.3 Linearity Assumption Check for the Random Sample

Finally, it was judged that there was no autocorrelation among residuals since the sample was taken from a cross section of respondents rather than a time-series data set. Table H.4.4 presents the summary results from regression assumption tests of homoscedasticity, linearity and normality.

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Model	Homoscedasticity	Linearity	Normality
DV = MI	Yes	No	No
DV = MG	No	No	No
DV = CL	No	No	No
DV = TT	Yes	No	No
DV = SP	No	No	No
DV = CM	No	No	No
DV = TS	No	No	No
DV = PMO Index	Yes	No	No

Table H.4.4 Summary of Assumption Check for CSF Variables for the Random Sample

For the model "DV = MI," the weighted least squares technique was employed for remediation. The outcome resulted in an improvement of model's homoscedasticity and linearity (Table H.4.5).

Independent Variable	H_0	Test Value	p-Value	Conclusion: Reject H_0
MI	Homoscedasticity	Chi-square value: 6.9312	> 0.0741	No
	A linear regression model is appropriate	F value: 1.4861	>0.0844	No
	Normal	W value: 0.9564	<0.0001	Yes

Table H.4.5 Regression Assumption Check for Independent Variable MI for the Random Sample

For the model "DV = MG," the weighted least squares technique was employed for remediation. The outcome resulted in an improvement of model's homoscedasticity and linearity (Table H.4.6).

Independent Variable	H_0	Test Value	p-Value	Conclusion: Reject H_0
MG	Homoscedasticity	Chi-square Value: 1.959	> 0.5810	No
	A linear regression model is appropriate	F value: 1.1315	>0.2912	No
	Normal	W value: 0.8916	<0.0001	Yes

Table H.4.6 Regression Assumption Check for Independent Variable MG for the Random Sample

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For the model "DV = CL," the weighted least squares technique was employed for remediation. The outcome resulted in an improvement of model's homoscedasticity and linearity (Table H.4.7).

Independent Variable	H₀	Test Value	p-Value	Conclusion: Reject H₀
CL	Homoscedasticity	Chi-square value: 6.9408	> 0.0738	No
	A linear regression model is appropriate.	F value: 0.5464	>0.9559	No
	Normal	W value: 0.9409	<0.0001	Yes

Table H.4.7 Regression Assumption Check for Independent Variable CL for the Random Sample

For the model "DV = TT," the weighted least squares technique was employed for remediation. The outcome resulted in an improvement of model's homoscedasticity and linearity (Table H.4.8).

Independent Variable	H₀	Test Value	p-Value	Conclusion: Reject H₀
TT	Homoscedasticity	Chi-square value: 3.9708	>0.2646	No
	A linear regression model is appropriate.	F value: 1.2310	>0.2058	No
	Normal	W value: 0.9166	<0.0001	Yes

Table H.4.8 Regression Assumption Check for Independent Variable TT for the Random Sample

For the model "DV = SP," the weighted least squares technique was employed for remediation. The outcome resulted in an improvement of model's homoscedasticity and linearity (Table H.4.9).

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Independent Variable	H₀	Test Value	p-Value	Conclusion: Reject H₀
SP	Homoscedasticity	Chi-square Value: 3.8050	>0.2833	No
	A linear regression model is appropriate.	F value: 1.4266	>0.0713	No
	Normal	W value: 0.9177	<0.0001	Yes

Table H.4.9 Regression Assumption Check for Independent Variable SP for the Random Sample

For the model "DV = CM," the weighted least squares technique was employed for remediation. The outcome resulted in an improvement of model's homoscedasticity and linearity (Table H.4.10).

Independent Variable	H₀	Test Value	p-Value	Conclusion: Reject H₀
CM	Homoscedasticity	Chi-square value: 2.0556	>0.5610	No
	A linear regression model is appropriate.	F value: 0.8615	>0.6895	No
	Normal	W value: 0.9058	<0.0001	Yes

Table H.4.10 Regression Assumption Check for Independent Variable CM for the Random Sample

For the model "DV = TS," the weighted least squares technique was employed for remediation. The outcome resulted in an improvement of model's homoscedasticity and linearity (Table H.4.11).

Independent Variable	H₀	Test Value	p-Value	Conclusion: Reject H₀
TS	Homoscedasticity	Chi-square value: 5.9278	>0.1152	No
	A linear regression model is appropriate.	F value: 0.7162	>0.8611	No
	Normal	W value: 0.9216	<0.0001	Yes

Table H.4.11 Regression Assumption Check for Independent Variable TS for the Random Sample

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The weighted least squares technique improved homoscedasticity and linearity for the variables MI, MG, CL, TT, SP, CM, and TS. However, their normality status did not improve. It is suspected that influential outlying observations were the cause. No further remediation was considered since all six variables obtained their linearity status, and the normality assumption can be ignored when the sample size gets large enough, for then the central-limit theorem can be invoked.

For the model "DV = PMO Index," Tukey's "ladder of Powers" technique was employed to improve its linearity status. By using an exponential transformation on the dependent variable, a valid regression fit was achieved, as well as the homoscedasticity . However, the model's normality improvement did not occur (Table H.4.12). It is suspected that influential outlying observations were the cause.

Independent Variable	H₀	Test Value	p-Value	Conclusion: Reject H₀
PMO Index	Homoscedasticity	Chi-square value: 1.295	>0.5233	No
	A linear regression model is appropriate	F value: 1.2716	>0.1251	No
	Normal	W value: 0.9362	<0.0001	Yes

Table H.4.12 Regression Assumption Check for Independent Variable PMO for the Random Sample

H.5 Assumption Check for the Random Sample – MLR for CSFs (Chapter 8)

In checking for outliers and influential observations, the "Hat Matrix" technique was employed to identify outlying X observations. Any X values greater than $2*p/n$ would be labeled as x-outliers, and six observations qualified. For identifying outlying Y observations, the Studentized Deleted Residual technique was employed. Any Y value greater than $t_{\alpha = .10/n, n-p-1}$ (conservative) or $t_{\alpha = .10, n-p-1}$ (less conservative) was classified as a Y outlier. No Y outliers were identified using the conservative method, and six were identified by the less conservative approach. For identifying influential cases, Cook's

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Distance technique was employed. The magnitude of any influential i^{th} case on all n

fitted values are compared against $F_{\alpha = .50, p, n-p}$. No influential cases were found. Table

H.5.1 summarizes these results for the 40 observations which were either outliers or

influential cases.

Investigation was given to those survey responses that were associated with either

X or Y outliers, or influential elements such as observation 181, which has an

RSTUDENT value of -6.92, compared to the cutoff conservative value of 3.58. The

reasons for the peculiarities, such as procedural error or some other extraordinary event,

were not apparent. Data recording errors were not a concern since a web-based survey

was used, although there may have been an error by the respondent in entering

information on the website. Nevertheless, it seemed that these unusual observations

represented a valid segment of the population. To maintain generalizability, all outliers

(including observation 181) were kept.

Regression assumption checks were performed for the model "DV = 0.573 +

0.264MI + 0.235CL + 0.231TT + 0.183TS + 0.069SP $-$ 0.123CM." with results reported

in Table H.5.2. The tests indicated passing results for the model's homoscedasticity and

linearity, but not for normality. No further remediation was considered since all six

variables obtained their linearity status (see Table H.5.2).

Independent Variables	H_0	Test Value	p-Value	Conclusion: Reject H_0
MI, CL, TT, TS, CM, SP	Homoscedasticity	Chi-square value: 29.7766	>0.3243	No
	A linear regression model is appropriate.	F value: 1.2042	>0.4707	No
	Normal	W value: 0.9198	<0.0000	Yes

Table H.5.2 Summary of Assumption Check for CSF Multiple Linear Regression for the Random Sample

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Hat diagonal cutoff is    0.06
Deleted RSTUDENT cutoff (Conservative) is    3.58
Deleted RSTUDENT cutoff (Less Conservative) is    1.65
Cook's distance cutoff is    0.91
```

OBS	OBS	COOKD	H	RSTUDENT	RST_1	RST_2	H_FLAG	COOKFLAG
1	004	0.01165	0.08181	-0.95644			*	
2	010	0.01038	0.07124	0.97310			*	
3	035	0.01995	0.11887	-1.01744			*	
4	039	0.00238	0.11208	-0.36230			*	
5	044	0.12029	0.14776	2.22346		*	*	
6	056	0.02761	0.01866	-3.25794		*		
7	065	0.00240	0.07195	-0.46504			*	
8	066	0.00191	0.12198	0.30918			*	
9	074	0.04849	0.06748	2.18426		*	*	
10	076	0.00003	0.09906	0.04588			*	
11	077	0.01351	0.03265	-1.68081		*		
12	083	0.00896	0.13596	0.63055			*	
13	087	0.00772	0.06562	0.87655			*	
14	089	0.04173	0.11875	1.47629			*	
15	090	0.13358	0.05900	-3.99144	*	*		
16	097	0.02144	0.02954	-2.24091		*		
17	100	0.01698	0.12412	0.91543			*	
18	101	0.01221	0.02870	-1.70839		*		
19	114	0.01052	0.01793	-2.02271		*		
20	115	0.06540	0.13258	1.73860		*	*	
21	119	0.00927	0.01427	-2.13456		*		
22	123	0.00384	0.07455	-0.57666			*	
23	128	0.02999	0.02827	2.72529		*		
24	134	0.03329	0.14302	1.18281			*	
25	136	0.00547	0.12064	-0.52728			*	
26	144	0.01111	0.02770	-1.65897		*		
27	153	0.00270	0.07565	-0.47978			*	
28	154	0.01896	0.13455	0.92360			*	
29	163	0.00420	0.06632	0.64277			*	
30	164	0.00173	0.10140	0.32689			*	
31	181	0.07426	0.01301	-6.91922	*	*		
32	183	0.02879	0.04736	-2.02761		*		
33	187	0.01579	0.03201	1.83833		*		
34	190	0.00250	0.06298	0.50955			*	
35	204	0.02249	0.06366	1.52634			*	
36	205	0.05831	0.08902	2.05878		*	*	
37	206	0.13725	0.10945	-2.84074		*	*	
38	208	0.02624	0.14313	1.04881			*	
39	215	0.01428	0.02683	-1.91595		*		
40	229	0.06028	0.06666	-2.45857		*	*	

Table H.5.1 Multiple Regression Influential Outlier Analysis for CSF Independent Variables for the Random Sample

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H.6 Assumption Check for the Targeted Sample – SLR for CSFs (Chapter 8)

To check the normality of residuals in the simple linear models, the Shapirowilk W statistic was used. In this test, the null hypothesis H_0 is the favorable claim that the residuals are normally distributed. Thus, as long as the p-value is above the α value of 0.05, we can be confident in this claim. Results showed that the distribution of residuals appeared normal for seven models (with predictors MI, MG, CL, TT, CM TS, and PMO Index) at a 95% confidence level, but not for model with predictor SP (Table H.6.1). It is suspected that the presence of influential outlying observations was a major cause.

Independent Variable	H_0	W Test Value	p-Value	Conclusion: Reject H_0
MI		0.9544	>0.0821	No
MG		0.9538	>0.0770	No
CL		0.9542	>0.0797	No
TT	Normal	0.9741	>0.4947	No
SP		0.9462	>0.0340	Yes
CM		0.9566	>0.1027	No
TS		0.9501	>0.052	No
PMO Index		0.9790	>0.6802	No

Table H.6.1 Normality Assumption Check for the Targeted Sample

To examine homoscedasticity, a White's test was performed to assess whether equal variance was indicted in the residuals for each model. Similar to the W statistic above, the null hypothesis H_0 is the favorable claim that the residuals have constant variance. Thus as long as the p-value is above the α value of 0.05, we can be confident in this claim. According to the first and second moment specification results, conclusions were reached at a 95% confidence level that the residual variance in each model, MI, MG, CL, TT, SP, CM, and TS, was constant. Conclusions were reached at a 95% confidence level that the residual variance in model PMO Index was not constant (Table H.6.2).

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Independent Variable	H₀	Chi-Square Value	p-Value	Conclusion: Reject H₀
MI		0.3550	0.8347	No
MG		3.2725	0.1947	No
CL		0.9076	0.6352	No
TT	Homoscedasticity	0.5008	0.7785	No
SP		1.1014	0.5765	No
CM		1.0885	0.5803	No
TS		0 9432	0.6240	No
PMO Index		10.4214	0.0055	Yes

Table H.6.2 Homoscedasticity Assumption Check for the Targeted Sample

For the assumption of linearity, a Lack-of-Fit F test was performed to examine whether a linear function is a good fit to the data. As with the previous assumption checks, the null hypothesis H_0 is a favorable claim and a p-value above the α value of 0.05 permits us to be confident in this claim. As shown in the Table H.6.3, the models with predictors MI, MG, CL, SP, CM, TS and PMO passed the test, but not the model with predictor TT.

Independent Variable	H₀	F Value	p-Value	Conclusion: Reject H₀
MI		0.8780	>0.5607	No
MG		1.2024	>0.3190	No
CL	A linear regression	1.5631	>0.1328	No
TT	model is appropriate	2.0327	>0.0456	Yes
SP		0.7586	>0.7172	No
CM		0.9226	>0.5530	No
TS		1.1910	>0.3230	No
PMO Index		0.3256	*	No

Table H.6.3 Linearity Assumption Check for the Random Sample
*The F statistic value was smaller than critical value 3.15
$(df_1 = k-1 = 48, df_2 = n-(k+1) = 2)$

Finally, it was judged that there was no autocorrelation among residuals since the sample was taken from a cross section of respondents rather than a time-series data set.

Table H.6.4 presents the summary results from regression assumption tests of homoscedasticity, linearity and normality.

Model	Homoscedasticity	Linearity	Normality
DV = MI	Yes	Yes	Yes
DV = MG	Yes	Yes	Yes
DV = CL	Yes	Yes	Yes
DV = TT	Yes	No	Yes
DV = SP	Yes	Yes	No
DV = CM	Yes	Yes	Yes
DV = TS	Yes	Yes	Yes
DV = PMO Index	No	Yes	Yes

Table H.6.4 Summary of Assumption Check for CSFs of the Targeted Sample

For the model "DV = TT," the weighted least squares technique was employed for remediation. The outcome resulted in an improvement of model's linearity, though its p-value of 0.0503 was barely beyond the significance level of 0.05 (Table H.6.5).

Independent Variable	H₀	Test Value	p-Value	Conclusion: Reject H₀
TT	Homoscedasticity	Chi-square value: 1.1986	>0.7533	No
	A linear regression model is appropriate.	F value: 1.9925	>0.0503	No
	Normal	W value: 0.9747	<0.5170	No

**Table H.6.5 Regression Assumption Check for CSF Variable TT
from the Targeted Sample**

For the model "DV = SP," Tukey's "ladder of Powers" was employed. By transforming the independent variable SP using an exponential function (e^{SP}), residual normality was achieved (Table H.6.6).

Independent Variable	H₀	Test Value	p-Value	Conclusion: Reject H₀
SP	Homoscedasticity	Chi-square value: 1.9284	>0.3283	No
	A linear regression model is appropriate.	F value: 0.6897	>0.7838	No
	Normal	W value: 0.9525	<0.0666	No

**Table H.6.6 Regression Assumption Check for CSF Variable TT from
the Targeted Sample**

For the model "DV = PMO Index," the weighted least squares technique was employed for remediation. The outcome resulted in an improvement of model's homoscedasticity (Table H.6.7).

Independent Variable	H₀	Test Value	p-Value	Conclusion Reject H₀
PMO Index	Homoscedasticity	Chi-square value: 5.3258	> 0.1494	No
	A linear regression model is appropriate.	F value: 1.5024	*	No
	Normal.	W value: 0.9819	<0.7874	No

Table H.6.7 Regression Assumption Check for CSF Variable PMO Index from the Targeted Sample
*The F statistic value was smaller than critical value 3.15
$(df_1 = k-1 = 48, df_2 = n-(k+1) = 2)$

H.7 Assumption Check for the Targeted Sample – MLR for CSFs (Chapter 8)

In checking for outliers and influential observations, the "Hat Matrix" technique was employed to identify outlying X observations. Any X values greater than $2*p/n$ would be labeled as x-outliers, and two observations qualified. For identifying outlying Y observations, the Studentized Deleted Residual technique was employed. Any Y value greater than $t_{\alpha = .10/n, n-p-1}$ (conservative) or $t_{\alpha = .10, n-p-1}$ (less conservative) was classified as a Y outlier. No Y outliers were identified using the conservative method, and six were identified by the less conservative approach. For identifying influential observations, Cook's Distance technique was employed. The magnitude of any influential i^{th} case on all n fitted values are compare against $F_{\alpha = .50, p, n-p}$. One influential case was found. Table H.7.1 summarizes these results for the 7 observations which were either outliers or influential cases.

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Hat diagonal cutoff is    0.15
Deleted RSTUDENT cutoff (Conservative) is    3.28
Deleted RSTUDENT cutoff (Less Conservative) is    1.68
Cook's distance cutoff is    0.85


OBS OBS    COOKD      H      RSTUDENT   RST_1  RST_2  H_FLAG  COOKFLAG
 1   14   0.02315  0.52506   0.28662                    *
 2   21   0.14182  0.11214   2.20277      *
 3   23   0.07284  0.04449  -2.65449      *
 4   27   0.17815  0.14875  -2.08891      *
 5   39   0.03946  0.04062  -1.98953      *
 6   46   0.05758  0.07706  -1.69276      *
 7   52   1.16530  0.44219   2.56146      *       *               *
```

**Table H.7.1 Multiple Regression Influential Outlier Analysis for
CSF Variables from the Targeted Sample**

Deeper investigation was given to those survey responses that were associated with either X or Y outliers, or influential elements such as observation 52. The reasons for the peculiarities, such as procedural error or some other extraordinary event, were not apparent. Data recording errors were not a concern since a web-based survey was used, although there may have been an error by the respondent in entering information on the website. Nevertheless, it seemed that those unusual observations represented a valid segment of the population. To maintain generalizability, all observations were kept.

Regression assumption checks were performed for the model "DV = 1.692 + 0.366MI + 0.238TT + 0.099CL," with results reported in Table H.7.2. The outcome indicated passing results for the model's homoscedasticity. The tests indicated passing results for the model's homoscedasticity, linearity, and normality.

Independent Variables	H₀	Test Value	p-Value	Conclusion: Reject H₀
MI, CL, TT	Homoscedasticity	Chi-square value: 6.9513	>0.6796	No
	A linear regression model is appropriate.	F value: 4.2488	>0.0552	No
	Normal.	W value: 0.9814	<0.7701	No

**Table H.7.2 Summary of Assumption Check for Multiple Regression Model
from the Targeted Sample**

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