THE ROLE OF THE PROJECT MANAGEMENT OFFICE ON INFORMATION TECHNOLOGY PROJECT SUCCESS

by

Jacob S. Stewart

WERNER (DON) GOTTWALD, Ph.D., Faculty Mentor and Chair

DIANE STOTTLEMEYER, Ph.D., Committee Member

DORETHEA T. POMFRET, D.M, Committee Member

Raja K. Iyer, Ph.D., Dean, School of Business and Technology

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Philosophy

Capella University

January 2010

www.manaraa.com

UMI Number: 3396515

All rights reserved

INFORMATION TO ALL USERS
The quality of this reproduction is dependent upon the quality of the copy submitted.

In the unlikely event that the author did not send a complete manuscript
and there are missing pages, these will be noted. Also, if material had to be removed,
a note will indicate the deletion.

UMI 3396515
Copyright 2010 by ProQuest LLC.
All rights reserved. This edition of the work is protected against
unauthorized copying under Title 17, United States Code.

ProQuest LLC
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106-1346

www.manaraa.com

© Jacob S. Stewart, 2010

www.manaraa.com

Abstract

The rate of failed and challenged Information Technology (IT) projects is too high according to the CHAOS Studies by the Standish Group and the literature on project management (Standish Group, 2008). The CHAOS Studies define project success as meeting the triple constraints of scope, time, and cost. Assessing critical success factors is another way of measuring project success (Dai, 2001). A proposed solution for improving the success rate of projects has been implementing a Project Management Office (PMO) which is sometimes referred to as a Program Management Office.

The purpose of this study was to gather data to determine if the presence of a PMO improves IT project success based upon the triple constraints and critical success factors. The triple constraints are derived from traditional project success factors; critical success factors are additional variables used to measure project success. The study also considered what impact the type of PMO had on IT project success.

Data was collected about IT projects including success criteria and the type of PMO services. Having a formal PMO was not found to have a statistically significant impact on IT project success as compared to the other PMO levels. Having dedicated resources in an organization performing PMO functions was found to have a statistically significant impact on IT project success.

www.manaraa.com

المنارة للاستشارات
www.manaraa.com

Dedication

This work is primarily dedicated to the two most influential people in my life: my wife, Darlene Miller Stewart, for supporting me on this journey; and my late mother Avanell Chumley Stewart, for her example of living a Christian life and always working hard to glorify God in all you do. It is also dedicated to my four children, Sarah Elizabeth, Jacob McClellan III, Micah Stephen, and Timothy Matthew, along with my father Jacob Danny Stewart, and sisters Theresa Andrea Vandegrifft, Deborah Arlene Cramer, and Sandra Lee Patten.

www.manaraa.com

Acknowledgments

I would like to acknowledge my Committee Chair, Dr. Don Gottwald, along with Committee Members Dr. Terri Pomfret and Dr. Diane Stottlemeyer, for their guidance, support, and assistance on this journey. I would also like to acknowledge the Project Management Institute (PMI) Information Systems Special Interest Group (ISSIG) members for participating in the survey, and Don Kingsberry for the opportunity to see Project Management Office (PMO) best practices firsthand.

I would like to thank Dr. Phil A. Brown for all of his assistance, especially with the statistical analysis. I would also like to thank Bob Churchman and Dr. Marvin Robertson for constantly encouraging me throughout this process.

www.manaraa.com

Table of Contents

www.manaraa.com

www.manaraa.com

www.manaraa.com

List of Tables

www.manaraa.com

www.manaraa.com

www.manaraa.com

List of Figures

www.manaraa.com

المنارة للاستشارات
www.manaraa.com

CHAPTER 1. INTRODUCTION

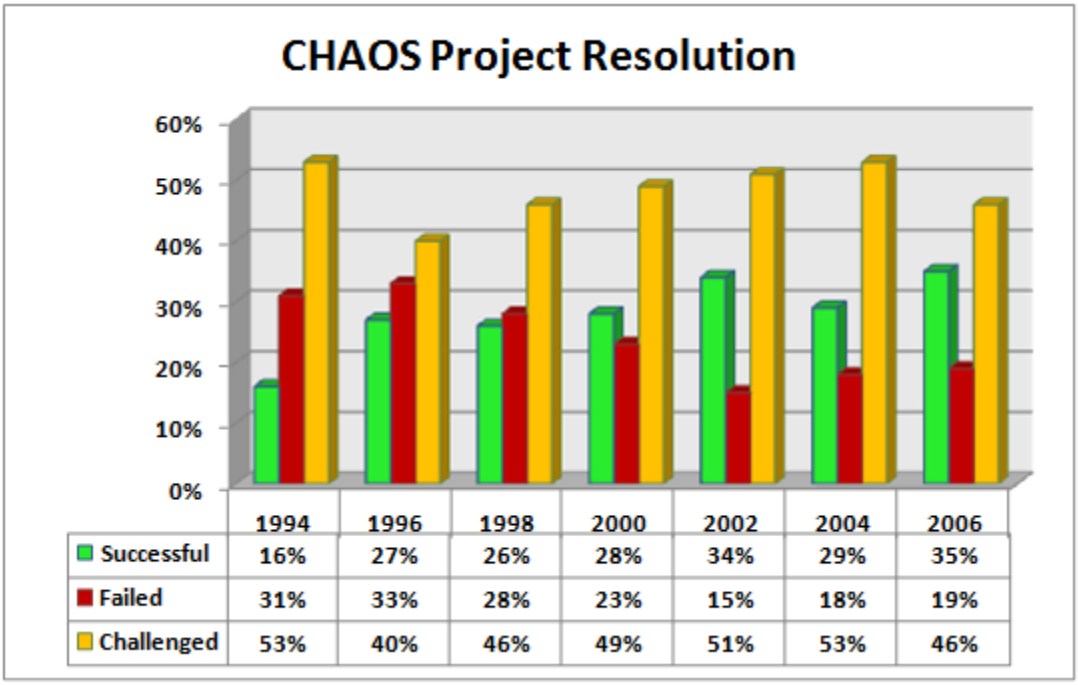
Introduction to the Problem

Over the last several decades, a number of publications have addressed the issue of software projects being over budget, behind schedule, and not meeting stakeholder expectations (Ewusi-Mensah, 1997; Hartman & Ashrafi, 2002; Mahaney & Lederer, 2006; Shore, 2005; Standing, Guilfoyle, Lin, & Love, 2006; Suardi, 2004). The Standish Group (2008), publishers of the CHAOS studies, reported that software projects generally did not meet one or more of the cost (budget), time (schedule), or scope requirements. These requirements are referred to in project management as the triple constraint parameters (Schwalbe, 2006). Based upon the triple constraint criteria, the Standish Group (2008) classified projects into three types of outcomes: successful, challenged, or failed. A successful outcome must meet all three of the triple constraint parameters, a challenged outcome refers to a project that was completed and operational but did not meet one or more of the triple constraint parameters, and a failed outcome was a project that was started but was canceled at some time during the development life cycle. Factors for canceled projects included: incomplete requirements, lack of user involvement, lack or resources, unrealistic expectations, lack of executive support, changing requirements and specifications, lack of planning, functionality no longer needed, lack of IT management, and technology illiteracy (Standish Group, 2005).

The first CHAOS study of 1994 showed only 16% of projects as successful, 31% as failed, and 51% as challenged (Johnson, 2006). Over a twelve year period, some

www.manaraa.com

progress has been reported (Standish Group, 2008). However, as shown in figure 1, the majority of the projects are still assessed as failed or challenged according to the triple constraint parameters. The CHAOS study from 2006 indicated 35% of projects as successful, 19% of projects failed, and the remaining 46% were considered challenged (Standish Group, 2008).



	1994	1996	1998	2000	2002	2004	2006
Successful	16%	27%	26%	28%	34%	29%	35%
Failed	31%	33%	28%	23%	15%	18%	19%
Challenged	53%	40%	46%	49%	51%	53%	46%

Figure 1. CHAOS project resolution from 1994 to 2006.

The high rate of failed or challenged projects could be mitigated by increasing the project management maturity level in an organization (Ibbs & Reginato, 2002). The Center for Business Practices defines project management maturity as "the progressive development of an enterprise-wide project management approach, methodology, strategy, and decision making process" (2007, p. 10). Project management maturity is achieved through enterprise-wide project management processes including training, support, and project prioritization in alignment with the organization's corporate strategy

www.manaraa.com

(Pennypacker & Grant, 2003). Ibbs and Reginato (2002) found that organizations with more mature project management practices have improved project performance including more predictable project schedules and cost performance. J.K. Crawford's (2002a, 2006) studies showed the implementation of a Project Management Office (PMO) as an approach to improve an organization's project management maturity to enable improved project success.

A PMO can perform many functions, including creating a project management culture, improving project management maturity, implementing a project management methodology, project portfolio management, training, monitoring, and reporting project status (Block & Frame, 1998; Charavat, 2003; J.K. Crawford, 2002b, 2006; L. Crawford, 2006; Dai, 2001; Kerzner, 2003; Levatec, 2007; Levine, 2005). The functions could potentially contribute to improved IT project success leading to reduced costs, increased profits, and improved quality.

Many organizations have implemented PMOs with the goal of improving project management maturity and project success (Center for Business Practices, 2007; Pennypacker & Grant, 2003). This study describes the different types of PMOs, looks at past PMO research, and gathers data about the types of PMOs currently being used in IT organizations and their correlation to project success. The findings of this study could help justify PMO implementation in organizations with similar goals and help existing PMOs improve their impact on project success.

www.manaraa.com

Background of the Study

A project is "a temporary endeavor undertaken to create a unique product, service, or result" (PMBOK®, 2008, p. 442). The definition has its roots in ancient time when humans faced the challenge of creating something that was new and unique. Examples of project management and great projects from early history include, but are not limited to the Roman Aqueducts, the Great Wall of China, the Egyptian Pyramids, Hadrian's Wall, the Taj Mahal, and the Meriwether Lewis and William Clark Expedition (Cleland, 1999; Frame, 1995; Shenhar & Dvir, 2007).

Despite the significant effort spent on projects, project management did not evolve into a recognized discipline until the 20th century (Shenhar & Dvir, 2007). Frederick Taylor introduced scientific management which included analyzing each job to specify optimal procedures, matching skills with tasks to be performed, documenting worker performance, and the complete management and reporting of all work (Murch, 2001). Many project management techniques were the result of United States military projects (Cleland, 1999). One of these was the Gantt chart created by Henry Gantt for graphically representing the schedule for the construction of U.S. Navy ships during World War I (Murch, 2001). Other project management techniques included Program Evaluation Review Technique (PERT) and the Critical Path Method (CPM) created in the 1950s for the development of the U.S. Navy Polaris submarine (Marchewka, 2006). Other U.S. military and government projects that contributed to the development of formal project management include the Manhattan Project to build the atomic bomb during World War II (Cleland, 1999) and the National Aeronautics and Space Administration Mercury, Gemini, and Apollo projects (Cicmil & Hodgson, 2006).

www.manaraa.com

A significant development for the field of project management was the establishment of the Project Management Institute (PMI) in 1969 (Shenhar & Dvir, 2007). PMI has worked to establish project management standards across industries documented in the Project Management Body of Knowledge (PBMOK®, 2008). PMI was originally heavily represented by the construction industry. In recent years the influence of information technology (IT) has increased with the Information Systems Special Interest Group (ISSIG) becoming the largest Special Interest Group.

IT projects often are more complex and less predictable than other types of projects such as construction and engineering (Ewusi-Mensah, 1997; Kapur, 1999; Rodriquez-Repiso, Setchi, & Salmeron, 2007). IT projects often exceed their proposed budgets and/or schedules and did not always fulfill the objectives of their original scope (Standish Group, 2003). Support is needed to take a more holistic view of projects from a corporate perspective to promote a project management culture and increase an organization's project management maturity (J.K. Crawford, 2002a; L. Crawford, 2006). Improved project management maturity can help project managers get the information they need to manage projects more effectively and also provide stakeholders including management with more accurate completion and other project data (J.K. Crawford, 2006). A PMO can provide support to an organization in these areas as it works to improve project success (J.K. Crawford, 2002b).

As organizations have become more aware of the importance of project management there is a corresponding need for a systematic method of implementation and support of project management (Block & Frame, 1998). In addition to acquiring project scheduling software and sending employees to project management training,

www.manaraa.com

Block and Frame (1998) recommended establishing a project office. The project office name has evolved over time to become the project management office (PMO) for a majority of organizations as shown in Table 1 (Hobbs, 2007).

Table 1

Name of Organizational Entities

Name	Percentage
Project Management Office	59%
Name containing term "project" and somewhat similar to project management office	4%
Project Support Office	7%
Project Office	2%
Program Management Office	12%
Center of Excellence	2%
No name	2%
Other (a great variety with none greater than 1%)	12%

Project management has evolved from the use of tools and techniques on standalone projects to becoming an organizational capability integrated across multiple projects (L. Crawford, 2006). A PMO can provide a framework for organizations to improve project success across multiple projects (Kaufman and Korrapati, 2007). Dai (2001) conducted research into the contributions PMOs made to project management effectiveness and corresponding project success. She defined a PMO as "an organizational entity established to assist project managers and teams throughout the organization in implementing project management principles, practices, methodologies, tools, and techniques" (p. 1). Dai also found a positive relationship between the presence of a PMO and reported project success. Some of the benefits from establishing a PMO include project management standards and methods (Wells, 1999). Dai and Wells (2004)

www.manaraa.com

studied PMO features and their relationship to project performance and found "strong evidence that PM [project management] standards and methods are highly correlated with project performance" (p. 531). Dai and Wells further found that PMOs providing historical archives also had a significant correlation with project performance. Lee (2006) studied IT PMOs and found that they have positive effects on all nine of the PMI® knowledge areas (time, cost, scope, quality, risk, communications, human resources, procurement, and integration).

A common thread across project management literature (Dai, 2001; Dai & Wells, 2004; Ibbs & Reginato, 2002) indicates that the term project success is commonly used interchangeably with positive project performance. PMOs help to improve project management maturity in organizations by providing consulting, mentoring, training, reporting, methodologies, and standards for project management (J.K. Crawford, 2006). Ibbs and Reginato's (2002) study of project management maturity found:

1. Companies with more mature project management practices have better project performance
2. Project management maturity is strongly correlated with more predictable project management schedule and cost performance
3. Good project management companies have lower direct costs than poor project management companies (pp. 1-2).

Ibbs and Reginato (2002) showed the relationship between higher levels of project management maturity and effective project management. They also showed how lower levels of project management maturity jeopardize the likelihood of project success.

A common practice of defining project success is in terms of meeting the triple

www.manaraa.com

constraint parameters of project scope, cost, and time (Schwalbe, 2006). The CHAOS studies have shown that approximately 35% of IT projects are successful in meeting the triple constraint requirements (Standish Group, 2008). Failed projects that are canceled prior to completion have money and time invested in them without a production system being delivered. While challenged projects deliver a production system they suffer from one or more of the following symptoms; exceeding budget, exceeding schedule, and altering scope to less than what was originally expected when the project was initiated (Standish Group, 2003).

The popularity of project management has led many American corporations to "projectize their operations" (Kwak & Ibbs, 2000, p. 38). Projects have become the method by which organizations make investments in IT that create valued business assets (Lavingia, 2006). Forrester Research predicted U.S. IT spending of $572 billion in 2008 and $606 billion in 2009 (Murphy & Kolbasuk McGee, 2008). Considering the challenged and failed categories presented by the CHAOS studies (Standish Group, 2008), these U.S. IT investments could translate into a significant cost to organizations with inadequate or no return on investment.

The magnitude of IT project activity in organizations is constantly growing to meet the needs of the rapidly changing world (Shenhar & Dvir, 2007). IT projects continue to be canceled (fail) or be challenged with less than the planned performance in respect to budget, schedule, and scope (Standish Group, 2008). PMOs have been identified as a means to improve project management maturity, creating a project management culture in the organization, and leading to improved project success (J.K. Crawford, 2006; Dai, 2001; Dai and Wells, 2004; Lee, 2006; Stewart, 2004; Stewart &

www.manaraa.com

Kingsberry, 2003).

Statement of the Problem

Too many IT projects are not completed on schedule, on budget, and within scope, resulting in cost overruns, and missed business opportunities (Standish Group, 2008). This study investigated whether the presence of a PMO or PMO functions in an organization improves the rate of success for IT projects. In addition, the study examined the influence of professional certification of project managers, educational preparation of project managers, project size, team size, years of experience, and industry on the overall success rate of IT projects.

Purpose of the Study

The purpose of this study was to determine if the presence of a PMO or the presence of PMO functions when a formal PMO was not present resulted in higher IT project success rates. In addition, this study investigated the influence of PMP certification, education level, project budget size, and industry type on IT project success rates. The population for the research was members of the PMI ISSIG. By analyzing the relationship between different types of PMOs, PMO functions, and self reported success criteria, the findings of this research contributed to a better understanding of PMOs, IT project success, and the correlation between them.

Rationale

This study was designed to determine whether there is a relationship between IT

www.manaraa.com

project success and the implementation of a PMO. Based upon the survey results this study enhances the body of knowledge regarding project management approaches for IT projects within the context of a PMO. This study continued the work by Dai (2001) on PMOs and project success by focusing on IT PMOs and IT project success. Data gathered about the types of PMO functions most related to IT project success could be beneficial for structuring PMOs in the future. IT organizations could use the outcomes of this research to determine practices to implement for creating and redesigning their PMOs to help improve IT project success.

Research Questions

This study follows up on the research performed by Dai in *The Role of the Project Management Office in Achieving Project Success (*2001). Studies have shown some relationship between organizations with a PMO and reported project success (Dai, 2001; Dai & Wells, 2004). Lee (2006) has shown a relationship between IT organizations with a PMO and project success based upon performance in the PMBOK® (2008) nine project management knowledge areas. The goal of this study was to add to this body of research by examining the relationship between reported IT project success and the existence of an IT PMO or PMO functions when a formal PMO was not present.

The primary question addressed by this study was:

To what extent does the existence of a PMO contribute to reported IT project success?

In addition, the following subsidiary questions were asked in support of the primary question:

www.manaraa.com

Question 1: To what extent does PMP certification influence project success in organizations with a PMO and organizations without a PMO?

Question 2: To what extent does the project manager education level influence project success in organizations with a PMO and organizations without a PMO?

Question 3: To what extent does project size influence project success in organizations with a PMO and organizations without a PMO?

Question 4: To what extent does the type of industry influence project success in organizations with a PMO and organizations without a PMO?

Significance of the Study

The study contributes to the literature on the relationship between IT project success and the existence of a PMO or PMO functions. This study could provide support for more IT organizations implementing PMOs and PMO functions to improve their IT project success, with and improved project outcomes delivering more value back to the business. Favorable results of this study could be used by organizations in developing a business case for the implementation of a PMO or PMO functions.

Assumptions and Limitations

Assumptions

The following assumptions were made for this study:

1. The present study assumed that the presence of a PMO does make a difference in terms of successful completion of IT projects.

www.manaraa.com

2. Individuals participating had the appropriate skills and experience to participate in this survey.
3. Respondents had significant professional experience in managing IT projects.

Limitations

The following limitations were acknowledged for this study. These limitations may reduce or negate the potential generalizability of the findings beyond the present study:

1. The study participants were members of the PMI Information System Special Interest Group (ISSIG), which is comprised of PMI members in the IT industry. The findings of this study may not be generalizable to organizations that were not members of this group.
2. The respondents self declared having significant experience in managing IT projects.

Nature of the Study

The study used a non-experimental, descriptive research design to explore participant responses via a web-based survey. The results from the web-based survey were downloaded into the Statistical Package for the Social Sciences (SPSS) to perform quantitative analysis.

www.manaraa.com

Definition of Terms

Capability Maturity Model (CMM): A five-level model laying out a generic path to process improvement for software development in organizations (Schwalbe, 2006, p. G-2).

Capability Maturity Model Integration (CMMI): A process improvement model that addresses software engineering, system engineering, and program management and is replacing the old CMM ratings (Schwalbe, 2006, p. G-2).

Critical Success Factors (CSF): Indentify those factors that are necessary to meet the desired deliverables of the customer on a project. Typical CSFs can include the adherence to schedules, budgets, quality, and change control process along with the appropriateness and timing of signoffs (Kerzner, 2006b, p. 25).

Information Systems Special Interest Group: Community of over 13,000 PMI members interested in information system and information technology projects. Vision of the community is to become the preferred, global, collaborative, professional project management organization for all aspects of project management required for information systems, regardless of industry (PMI Information Systems Special Interest Group, n.d).

Information Technology (IT): The study, design, development, implementation, support, or management of computer-based information systems, particularly software applications and computer hardware (Baltzan, Phillips, & Haag, 2008, p. 566).

Information Technology Portfolio Management (ITPM): IT governance model based around how an organization invests its IT funds in various applications and infrastructure (Ward & Pepparad, 2002).

www.manaraa.com

Methodology: A system of practices, techniques, procedures, and rules used by those who work in a discipline (PMBOK®, 2008, p. 438).

Organizational Project Management: New sphere of management where dynamic structures in the firm are articulated as means to implement corporate objectives through project in order to maximize value (Aubry, Hobbs, Thuillier, 2007, p. 332).

Organizational Project Management Maturity Model (OPM3®): A standard developed under the stewardship of the Project Management Institute (PMI) for the purpose of providing a way for organizations to understand organizational project management and to measure their maturity against a comprehensive and broad-based set of organizational project management best practices (OPM3®, 2003, p. xiii).

Program: A group of related projects managed in a coordinated way to obtain benefits and control not available from managing them individually. Programs may include elements of related work outside of the scope of the discrete projects in the program (PMBOK®, 2008, p. 442).

Program Management: The centralized management of a program to achieve the program's strategic objectives and benefits (PMBOK®, 2008, p.442).

Project: A temporary endeavor undertaken to create a unique product, service, or result (PMBOK®, 2008, p. 442).

Project Management: The application of knowledge, skills, tools, and techniques to project activities to meet the project requirements (PMBOK®, 2008, p. 443).

www.manaraa.com

Project Management Body of Knowledge (PMBOK®): An inclusive term that describes the sum knowledge within the profession of project management. As with other professions such as law, medicine, and accounting the body of knowledge rests with the practitioners and academics that apply and advance it. The complete project management body of knowledge includes proven traditional practices that are widely applied and innovative practices that are emerging in the profession. The body of knowledge includes both published and unpublished material. The body of knowledge is constantly evolving. The PMI's PMBOK® Guide identifies the subset of project management body of knowledge that is generally recognized as good practice (PMBOK®, 2008, p. 443).

Project Management Information System (PMIS): An information system consisting of the tools and techniques used to gather, integrate, and disseminate the outputs of project management processes. It is used to support all aspects of the project from initiating through closing, and can include both manual and automated systems (PMBOK®, 2008, p. 443).

Project Management Institute (PMI): International society for project managers founded in 1969, with more than 230,000 members in more than 125 countries with representatives from virtually every major industry. PMI publishes standards and provides certification in area of project management (Gray & Larson, 2008).

Project Management Knowledge Area: An identified area of project management defined by its knowledge requirements and described in terms of its component processes, practices, inputs, outputs, tools, and techniques. Areas include integration, time,

www.manaraa.com

cost, scope, quality, risk, communication, human resources, and procurement (PMBOK®, 2008, p. 67, 443).

Project Management Lifecycle: A collection of generally sequential project phases whose name and number are determined by the control needs of the organization or organizations involved in the project. A life cycle can be documented with a methodology (PMBOK®, 2008, p. 368).

Project Management Maturity: The progressive development of an enterprise-wide project management approach, methodology, strategy, and decision making process (Center for Business Practices, 2007, p. 10).

Project Management Maturity Model (PMMM): A generic term for models that measure an organization's level of project management maturity. Both Crawford and Kerzner also used this name for their models (J.K. Crawford, 2002a; Kerzner, 2006a).

Project Management Office (PMO): An organizational body or entity assigned various responsibilities related to centralized and coordinated management of those projects under its domain. The responsibilities of a PMO can range from providing project management support functions to actually being responsible for the direct management of a project (PMBOK®, 2008, p. 443).

Project Management Professional (PMP): A person certified as a PMP by the Project Management Institute (Schwalbe, 2006, p. 29).

Project Manager (PM): The person assigned by the performing organization to achieve the project objectives (PMBOK®, 2008, p. 444).

www.manaraa.com

Project Portfolio Management (PPM): A set of business practices that brings the world of projects into tight integration with other business operations. It brings projects into harmony with the strategies, resources, and executive oversight of the enterprise and provides the structure and processes for project portfolio governance (Levine, 2005, p.1).

Systems Development Life Cycle (SDLC): The traditional methodology used to develop, maintain, and replace information systems (Hoffer, George, & Valacich, 2008).

Triple constraint: Project scope, time, and cost used as criteria for managing and evaluating projects (Schwalbe, 2006, p. 7).

www.manaraa.com

CHAPTER 2. LITERATURE REVIEW

Introduction

Projects are the way organizations develop and deploy information technology (IT). Types of IT projects include application software development, enterprise resource planning, infrastructure, and web development. Projects consist of the tasks to fulfill both the organizational and individual processes to support the deployment of IT. A concern in the IT industry is that many IT projects fail to meet original expectations in terms of schedule, cost, and scope. The Standish Group CHAOS studies have documented some of the challenges with IT projects (Johnson, 2006; Marchewka, 2006; Standish Group, 2003, 2008). Recent research suggests that the implementation of a PMO or PMO functions promotes the establishment of a project management culture that contributes to higher IT project success rates (J.K. Crawford, 2002a).

The Value of Project Management and PMOs

The Project Management Institute PMBOK® (2008) defines a project as "a temporary endeavor undertaken to create a unique product, service, or result" (p. 442). A common practice of defining project success is in terms of meeting the triple constraint parameters of project scope, cost, and time (Schwalbe, 2006). Leading research on IT project success is available in the CHAOS studies from the Standish Group (2008). The CHAOS studies used the criteria that for a project to be considered successful it must meet all three of the triple constraint parameters.

www.manaraa.com

A project with an outcome of challenged is one that that was completed but did not meet one or more of the triple constraint parameters. A project with an outcome of failed is one that was started, but is cancelled prior to completion. The first CHAOS study of 1994 showed only 16% of projects were considered successful, while 31% were failures, and the remaining 51% were challenged (Johnson, 2006). Over a 12 year period some progress has been reported in the number of projects that have a successful outcome. Figure 1 shows the majority of the projects are still considered as failures (canceled) or challenged. The CHAOS study of 2006 indicates 35% of projects have a successful outcome in meeting all three of the triple constraint parameters, while 19% were failures, and the remaining 46% were considered to be challenged (Standish Group, 2008).

In an attempt to improve project success rates organizations have started to implement PMOs (Hobbs, Aubry, & Thuillier, 2008). L. Crawford (2006) compared the traditional approach of managing standalone projects against the organizational approach that can be taken by implementing a PMO. Projects managed within the context of a PMO tend to evolve beyond the basic tools and techniques to create a more synergistic and holistic approach generally resulting in improved project success (L. Crawford, 2006).

Ibbs and Reginato (2002) researched the business value provided by project management and found that more mature project management practices lead to better project performance and more consistent and predictable project results. Ibbs and Reginato also concluded that good project management can actually cost less once organizations establish a functional level of project maturity. After reaching that

www.manaraa.com

functional level of project maturity, the project management cost ratio steadily decreases as project management maturity increases.

Thomas and Mullaly (2008) led a PMI sponsored effort with an international team of more than 48 researchers to determine the value of project management. They utilized a multi-method approach (both quantitative and qualitative) including surveys followed by case studies of 65 organizations around the world. More than half of the case study organizations showed measureable improvement from their implementation of project management practices. However they found a resistance to calculating return on investment (ROI) for the following reasons: lack of interest in the answer, fear of accountability, perceived complexity in measuring, and perception that the cost in time and effort to calculate it not worth the effort.

Thomas and Mullaly (2008) found other tangible results from implementing project management practices included "establishing credibility in the marketplace, responding to regulatory pressures, or simply to the increasing numbers of projects or internal complexity in managing projects" (p. 351). Additional value found from implementing project management practices included improvements in decision making, enhanced communications and collaboration, improvements in effective work cultures, alignment of approaches, terminology, and values within organizations; overall effectiveness of the organization and its management approach, and improved transparency, clarity of structures, roles, and accountability. A correlation was found between the intangible subjective value and the project management maturity level of the organization.

In contrast to the relatively stable business environment of the 1990s, Hobbs,

www.manaraa.com

Aubry, and Thuillier (2008) observed over the last decade there has been a contextual change for organizations to an environment of increased:

1. Competition
2. Rates of product, service, and process innovation
3. Emphasis on time to market

Because of these environmental changes, the response by organizations to these challenges has been to develop "new, more flexible organizational forms in which projects are both more numerous and more strategically important" (p. 547). Hobbs, Aubry, and Thuillier showed that many organizations were implementing PMOs to meet these new challenges in the business environment.

Kaufman and Korrapati (2007) proposed that the significance of a business trend could be shown in terms of the degree it is discussed in the industry literature. Table 2 shows the exponential growth in PMO research articles by the IT research and consulting firm Gartner from 2002 to 2006. They concluded that the "increasing interest in PMOs is indicative of the value businesses are placing on management, control, and business results expected from the projects and programs intended to bring about necessary business change" (p. 1). Based upon this and other research (Aziz, 2006; Dai, 2001; Dai & Wells, 2004; Jedd, 2006; Woerner & Aziz, 2006), PMOs have been promoted as a way to improve project success.

www.manaraa.com

Table 2

Gartner PMO Research by Year from 2002-2006

Year	Article Count
2002	1
2003	1
2004	5
2005	12
2006	50

Project Success

CHAOS studies

The Standish Group (2003) collected data concerning the factors of greatest impact on IT project success; Table 3 shows the top ten factors. A PMO providing a standard methodology, processes, and training can help to address all ten of these noted factors (J.K. Crawford, 2002b).

Table 3

CHAOS Studies Top Ten Success Factors

	CHAOS Studies Success Factor
1	User Involvement
2	Executive Support
3	Experienced Project Manager
4	Clear Business Objectives
5	Minimized Scope
6	Agile Requirements Process
7	Standard Infrastructure
8	Formal Methodology
9	Reliable Estimates
10	Skilled Staff

www.manaraa.com

Critical Success Factors

Pinto and Slevin's (1989) research found 10 critical success factors (CSF) that are important to successful project outcomes (shown in Table 4). Finch (2003) found Pinto and Slevin's 10 CSFs, also referred to as the Project Implementation Profile (PIP) also applied to IT projects. In addition to knowing the 10 CSFs it is also important to know when in a project they come into play (Pinto & Slevin, 1989), which is something that a PMO could assist project managers with.

Table 4

Pinto and Slevin Project Implementation Profile (PIP) Critical Success Factors (CSF)

	Critical Success Factor	Description
1	Project Mission	A clear sense of direction with clear initial goals
2	Top Management Support	A willingness and ability to provide resources, authority, and influence
3	Project Schedule/Plan	A detailed specification and schedule for project implementation
4	Client Consultation	Adequate communication, consultation, and active listening to and with the client
5	Personnel	Necessary personnel were selected, recruited, and trained
6	Technical Tasks	Required technologies and expertise were available
7	Client Acceptance	Final project was sold to the end-user
8	Monitoring and Feedback	Provision of comprehensive information at each implementation phase
9	Communication	An appropriate network for all necessary information to circulate among key players
10	Troubleshooting	An ability to handle unexpected crises and plan deviations

www.manaraa.com

Hartman and Ashrafi (2002) found that the "current literature on software projects shows that most of the software problems are of a management, organizational or behavioral nature, not technical" (p. 5). Table 5 shows a summary of their findings with the overall 10 most important critical success factors and corresponding project metrics.

Table 5

Hartman and Ashrafi Overall 10 Most Important Critical Success Factors and Metrics

Rank	Critical Success Factors	Project Metrics
1	Owner is informed of the project status and his/her approval is obtained at each stage	Project completed on time or ahead of schedule
2	Owner is consulted at all stages of development and implementation	Milestones are identified and met
3	Proper communication channels are established at appropriate levels in the project team	Deliverables are identified
4	The project has a clearly defined mission	The scope of the project is clearly defined and quantified
5	Top management is willing to provide the necessary resources (money, expertise, equipment)	Activities and logistical sequences are determined and scheduled (CPM)
6	The project achieves its stated business purpose	Project completion is precisely defined
7	A detailed project plan (including time schedule and milestones) with a detailed budget is in place	The project is completed within a predetermined budget
8	The appropriate technology and expertise are available	Resource requirements are identified and supplied as needed
9	Project changes are managed through a formal process	Responsibilities are assigned
10	The project is completed with minimal and mutually agreed scope changes	A specific new technology is adopted and accepted by end users

Project Leaders and Project Success

Project success has been correlated to the relationship between the project managers' personality and the project type (Dvir, Sadeh, & Malach-Pines, 2006). Sumner, Bock, and Giamartino (2006) studied the link between the characteristics of IT project managers and their project success. They found that project managers of more successful projects exhibited positive leadership behaviors for Kouzes and Posner's

www.manaraa.com

Leadership Practices Inventory (LPI) (2001), which consists of model the way, inspire a shared vision, challenge the process, enabling others to act, and encourage the heart. Successful projects are led by project managers, that in addition to technical and management knowledge, "also have leadership skills that are internally compatible with the motivation of the project team and externally compatible with client focus strategies" (Hyväri, 2006, p. 39).

Project Management Tools and Project Success

Besner and Hobbs (2006) found seven project management tools in high use and that also have great potential to increase contribution to project success include:

1. Lessons learned / post-mortems (retrospectives)
2. Requirements analysis
3. Scope statement
4. Work breakdown structure (WBS)
5. Project management software for monitoring of schedule
6. Project management software for task scheduling
7. Project management software for resource scheduling

Further they found project management tools with low use despite great potential to increase contribution to project success to include:

1. Database of lessons learned
2. Database of historical data
3. Database of risks
4. Database for cost estimating
5. Database (or spreadsheet) of contractual commitment data

www.manaraa.com

6. Project management software for multi-project scheduling/leveling
7. Project management software for monitoring of cost
8. Project management software for cost estimating
9. Project management software for resource leveling
10. Earned value
11. Feasibility study
12. Stakeholder analysis
13. Configuration review
14. Graphic representation of risk information

They also found that tools used extensively but with little contribution to project success, included:

1. Monte-Carlo analysis
2. Decision tree analysis
3. Pareto diagrams
4. Cause-and-effect diagrams.

Other Definitions of Project Success

Jugdev and Muller (2005) conducted a literature review of project management success and broke it down into four periods. Period 1 is project implementation and handover during the 1960s to 1980s. "Success is measured in subjective and objective ways and it means different things to different people" (p. 23). The focus is on the implementation phase of the project lifecycle. Period 2 is Critical Success Factor (CSF) lists during the 1980s to 1990s. During this period useful CSFs were identified and described, but were not grouped or integrated in a coherent manner.

www.manaraa.com

This led to Period 3 of CSF frameworks in the 1990s-2000s. First among these was Morris and Hough's (1987) which grouped project success in the following four categories of project functionality, project management, contractor commercial performance, and project termination. Cleland and Ireland (2002) looked at success from the degree that the technical project performance objectives were obtained and the contribution which the project made to the strategic mission of the organization. The span of CSFs was broadened by Kerzner (1987) beyond just project and project management to also include the project organization, senior management, and the environment. Hartman (2000) utilized the Strategically Managed Aligned Regenerative Transitional (SMART) project management framework with projects being strategically managed and aligned. Hartman also stated that "people…are the single most important part of project success" (p. 67).

Period 4 in Jugdev and Muller's (2005) literature review is the strategic project management of the 21st century, which is summarized by the following four conditions for project success:

1. Success criteria agreed upon with stakeholder before the start of the project
2. A collaborative working relationship maintained between the project sponsor and project manager (creating a partnership)
3. The project manager is empowered with flexibility to handle unforeseen circumstances
4. The project sponsor takes an interest in the performance of the project

Jugdev and Muller (2005) stated that project managers should be more effective at

www.manaraa.com

managing projects when they think about CSFs at the beginning of the project and use a specific CSF framework. Other best practices that Jugdev and Muller found that contribute to project success include: doing a stakeholder analysis at the beginning of the project (including the success category each stakeholder fits into), utilizing both efficiency and effectiveness measures, considering that success measures may change over the project and product life cycles, and developing good relationships and effective communication with key stakeholders (especially the project sponsor).

Norrie and Walker (2004) added the dimension of on-strategy to the traditional triple constraint parameters to form a quad constrained project management model for measuring project success. By tying in organizational strategy and utilizing a balanced scorecard framework it provides the project team with a broader perspective on project management success. The balanced scorecard framework is a tool for improving communication with both internal and external project stakeholders, and can help make complex strategy more understandable at the operational level.

De Wit (1988) contrasted project management success with actual project success. Project management success relates to managing the triple constraint parameters of time, cost, and scope; taking a broader view of project success from the perspective of the stakeholders throughout the project life cycle. Similarly, Cooke-Davies (2002) based project management success on the triple constraint parameters and project success against the overall objectives of the project. Likewise Baccarini (1999) broke success into project management success and product success.

Kanter and Walsh found "improving an organization's ability to develop and implement projects depended on the organization's skills and experience, past

www.manaraa.com

performances, management climate, and the specific project" (2004, p. 16). From their research they created five project success factors for IT projects which are:

1. Define and promulgate functional requirements and control changes
2. Develop realistic project schedules
3. Match skills to needs at the proper time
4. Know and respond to the "real" status of the project
5. Establish and control the performance of the contractors

Table 6 shows the success dimensions and measures utilized by Dvir, Sadeh, and Malach-Pines (2006) as criteria for determining if a project is successful. This model came from prior research on defense projects (Lipovestsky, Tishler, Dvir, & Shenhar, 1997). Organizational conditions can also impact project success. Hyväri (2006) found that project team communications is more critical for larger organizations, while in smaller organizations having adequate funds and resources is more critical.

www.manaraa.com

Table 6

Project Success Dimensions and Measures

Success Dimensions	Success Measures
Meeting design goals	Functional specifications Technical specifications Schedule goals Budget goals
Benefit to the end user	Meeting acquisition goals Answering the operational need Product entered service Reached the end-user on time Product had a substantial time for use Meaningful improvement of user operational level User is satisfied with product
Benefit to developing organization	Relatively high profit Opened a new market Created a new product line Developed a new technology capability Increased positive reputation
Benefit to the community, and national infrastructure	Contributed to critical subjects Maintaining a flow up updated generations Decreasing dependencies on outside sources Contribution to other projects

Thomas and Fernandez (2008) found that when IT project success criteria is formerly defined and measured, it improves project outcomes and utilization of project resources. Thomas and Fernandez identified three best practices of having an agreed upon definition of success, consistent measurement, and utilizing the results.

Project Failure

In addition to the research on IT project success, it is also of value to look at the research done on IT project failure. Fowler and Horan (2007) found four of six identified factors of project success to have a direct relationship with factors in literature most associated with IT failure. Kappleman, McKeeman, and Zhang (2006) found that long

www.manaraa.com

before a project failed there were early warning signs, which they classify as occurring in the first 20% of the project's initial schedule. They identified a "dominant dozen" early warning signs broken evenly into people-related and process-related risks. The people-related risks include lack of top management support, weak project manager, no stakeholder involvement and/or participation, weak commitment of the project team, team members lack requisite knowledge and/or skills, and subject matter experts are overscheduled. The process-related risks include lack of documented requirements and/or success criteria, no change control process (change management), ineffective schedule planning and/or management, communication breakdown among stakeholders, resources assigned to a higher priority project, and no business case for the project.

Icaovou (1999) provided a case study of Green Valley Hospital which showed what happens when the factors to help the transition from escalation to de-escalation are missed on turning around troubled software projects. Keil and Robey (1999) defined the escalation phase as "the period during which the respondent believed that the project needed to be terminated or redirected but instead continued to receive resources" (p. 71). The de-escalation phase is defined as "the period after which a decision was made to either terminate or redirect the project" (p. 71). During the time between escalation and de-escalation resources continued to be consumed by a project that should have been either cancelled or redirected.

Lyytinen and Hirschheim (1987) identified four major types of project failures: correspondence (or communication) failure; process failure; interaction failure; and expectation failure. Krauth (1999) provided the following reasons for IT project failure: insufficient awareness of organizational issues, insufficient involvement of users;

www.manaraa.com

inadequate training of users; and poor alignment of IT adoption to the business strategy. Standing, Guilfoyle, Lin, and Love (2006) found the top reasons for IT project failure "were lack of user support and involvement, lack of properly defined project scope, lack of executive managerial support and commitment, imprecise defined objectives and knowledge of the IT project, and poor project management and leadership" (p. 1153).

Uniqueness of IT Projects

Ewusi-Mensah (1997) provided several reasons why IT projects are vulnerable to cancelation (failure). They require intense collaboration between the following three groups of stakeholders; the project team, end users, and management. IT projects are based around group-oriented activities with diverse team members and business functions. IT projects are also conceptual in nature, leading to more uncertainty and risks. Finally IT projects can be capital intensive requiring significant investments of capital and human resources for business critical needs.

Kapur (1999) gave seven reasons why IT projects are more difficult to manage than engineering projects, especially civil engineering, where much of the body of knowledge of project management has been developed. Engineering projects usually have a more clearly defined end state, linear project phases, fabricating (vs. creating), deterministic deliverables, historical information, well-defined responsibilities, and consistent symbols and terminology. Pinto and Covin (1989) and Finch (2003) supported this in their comparison of construction projects with the more overtly risky R&D projects. Finch stated "construction projects are more routine, less innovative, and more predictable than R&D projects" (p. 37). He further proposed that this could be why engineering consultants, often chosen to exemplify good project management practice,

www.manaraa.com

can underestimate the requirements on an IT project.

Project Management Maturity

Maturity Models

Organizational project management maturity has been found to correlate with improved project management success (Wheatley, 2007; Yazici, 2009). Wheatley found the higher an organization's level of project management maturity was, the more positive the impact on the overall project performance. Wheatley proposed that organizations should pursue project management maturity while focusing on what best suits their needs (since one size does not fit all).

The Software Engineering Institute created the Capability Maturity Model (CMM), which along with its successor the Capability Maturity Model Integration (CMMI) is regarded as the prominent model for process maturity in the field of IT (Mullaly, 2006). For project management there have been several different maturity models developed. The PM Solutions Project Management Maturity Model (PMMM) was created by J. Kent Crawford, former President of the Project Management Institute (PMI). PMMM combined the basic levels of CMM, along with the nine project management knowledge areas from the PMI Project Management Body of Knowledge (PMBOK®, 2008); integration, risk, scope, communication, time, human resource, cost, quality, and procurement.

Table 7 shows how CMM relates to the PM Solutions PMMM (J.K. Crawford, 2002a). Kerzner's (2006a) PMMM is also mapped to the five levels, which increase with the level of project management maturity similar to the CMM levels of increasing

www.manaraa.com

software development process maturity.

Table 7

Mapping CMM to PMMM

Level	Software Engineering Institute Capability Maturity Model (CMM)	PM Solutions Project Management Maturity Model (PMMM)	Kerzner Project Management Maturity Model (PMMM)
5	Optimizing	Optimizing Process	Continuous Improvement
4	Managed	Managed Process	Benchmarking
3	Defined	Organizational Standards and Institutional Process	Singular Methodology
2	Repeatable	Structured Process and Standards	Common Processes
1	Initial	Initial Process	Common Language

The PM Solutions PMMM was used in a cross-industry benchmark of over 100 companies (Pennypacker & Grant, 2003), the results of which are shown in Table 8. The results show opportunities for improvement in the area of project management maturity. Another finding from the benchmark study was that size of the organization did not make a significant difference in the project management maturity level. PMOs play an important role in providing the structure to improve project management maturity in an organization (J.K. Crawford, 2002a; Kerzner & McIsaac, 2006).

www.manaraa.com

Table 8

PM Solutions PMMM Benchmark Results

PMMM Level	
1- Initial Process	13.7%
2- Structured Process and Standards	53.2%
3- Organizational Standards and Institutionalized Process	19.4%
4- Managed Process	7.3%
5- Optimizing Process	6.5%

Kerzner (2006a) described PMMM as the foundation for achieving excellence in project management. In Kerzner's version of PMMM (Table 7) the first two levels of common language and common processes have a medium degree of difficulty and can overlap with each other. The third level of Kerzner's PMMM is a singular methodology that has a high level of difficulty and cannot overlap with the second level of common processes. Kerzner found through his research that a project management methodology should be "designed to support the corporate culture, not vice-versa" (p. 898), and that what makes a methodology world-class is it's adaptability to the corporate culture. Kerzner provided examples of organizations that have developed world class project management methodologies: Compaq [HP] Services, Ericson, Nortel Networks, Johnson Controls, and Motorola. Kerzner's last two levels of benchmarking and continuous improvement (Table 7) have a low level of difficulty and can overlap with the previous level 3 of singular methodology.

Where CMM (or CMMI) focus on software development processes, and the different versions of PMMM focus on successful implementation of projects, PMI has

www.manaraa.com

developed the Organizational Project Management Maturity Model (OPM3®) that focuses on being the bridge between project success and organization strategy (OPM3®, 2003). OPM3® was developed by over 800 project management practitioners from 35 countries leveraging the prior work of 27 contemporary maturity models. OPM3® covers the three domains of projects, programs, and portfolio over a maturity continuum of standardize, measure, control, and continuously improve. OPM3® focuses on best practices which depend on capabilities which are measured by outcomes confirmed by key performance indicators (KPI). OPM3® has three interlocking elements of knowledge, assessment, and improvement, which are part of a five step closed loop cycle of:

1. Prepare for assessment
2. Perform assessment
3. Plan for improvement
4. Implement improvement
5. Repeat the process

Project Management Culture

Creating a project management culture inside an organization is an important step to improving project success in an organization (J.K. Crawford, 2002b; Rad, & Levin, 2003; Stanleigh, 2006). Kendra and Taplin (2004) researched IT project success and developed a four dimensional success model based on socio-technical system design describing the project management design elements by organizational level shown in Table 9. These four design elements are also considered to be project management success factors.

www.manaraa.com

Table 9

Project Management Design Elements by Organization Level

Element Type	Micro	Macro
Social	Project manager skills and competencies	Organizational structure at the project level
Technical	Performance measurement systems	Supporting management practices

Kendra and Taplin (2004) developed a project success model with the four project management design elements (success factors) from Table 9 surrounding a central focus of project management culture. The four design realm elements are connected by bidirectional arrows of values, with the entire model within the context of organizational cultural values. Kendra and Taplin also created a project management values framework, which is built around the core of project management subculture. The values within the project management subculture include: common project management language, collaborative teams, competent project managers, information technology, process oriented, and performance oriented. The PMO is a key part of the organizational structure section of the framework.

The PMO can play a vital role in helping to create and maintain a project management culture (Stanleigh, 2006). Signs of a project or project management culture include the following: a standardized project management methodology deployed and used throughout the organization, a meaningful and attractive career path for project managers, effective education, training, and certification for project managers, and training for team members and other stakeholders (including customers, managers, and senior executives), a standard suite of software tools to support project managers, and ongoing support through a PMO at the corporate level (J.K. Crawford, 2002b).

www.manaraa.com

Project Management Office (PMO)

PMO Definition

The Project Management Institute (PMI) defines a PMO as "an organizational body or unit assigned various responsibilities related to the centralized and coordinated management of those projects under its domain. The responsibilities of a PMO can range from providing project management support functions to actually being responsible for the direct management of a project" (PMBOK®, 2008, p.443).

A PMO can provide ways to increase IT efficiency and reduce costs while also improving on project delivery in respect to both time and budget (Santosus, 2003). PMOs vary in size, structure, and responsibilities, due to the environment and requirements of the organization they support. Some common functions of PMOs are project support, project management process/methodology, training, place for project managers to call home (from an organizational perspective), internal consulting and monitoring, project management software tools, project portfolio management, and mentoring, along with guidelines in areas such as professionalism, integrity, and diversity (Rad & Levin, 2002).

Types of PMOs

Kerzner (2003) and Pinto (2006) each defined three different categories of PMOs, which are shown along with their distinguishing features in Table 10. Kerzner's categories are based on the breadth of the organization covered. Pinto's categories are based on the scope of the functions the PMO provides.

www.manaraa.com

Table 10

PMO Type Categories

PMO type category	Distinguishing Features
Kerzner PMO categories	
Functional project office	Used in one functional area
Customer group project office	Best utilized for customer communication
Corporate project office	Strategic focus with services for the entire company
Pinto PMO Categories	
Weather station	Used only for tracking and monitoring (progress, budget, risk status)
Control tower	Supports project management as a business skill (standard measurement and enforcement, consulting)
Resource pool	Also owns all of the project managers from a human resource perspective

Hill (2004) created a PMO competency continuum with five stages. The first stage was made up of a project office for one or more projects which helped achieve project deliverables and objectives for cost, schedule, and resource utilization. Stage 2 was defined as the basic PMO providing a standard and repeatable PM methodology used across all projects. Stage 3 was defined as the standard PMO which establishes capability and infrastructure to support and govern a cohesive project environment. Stage 4 was defined as the advanced PMO applying an integrated and comprehensive project management capability to achieve business objectives. The final stage was defined as the center of excellence which manages continuous improvement and cross-department collaboration to achieve strategic business goals.

Letavec (2007) described PMOs as being able to function in three different types of roles. The first was consulting by advising on tools and techniques. Next was a knowledge management role by capturing and sharing lessons learned from projects. The

www.manaraa.com

final role was standards setting and ensuring compliance for standards of processes, tools, and reporting.

Hobbs and Aubry (2007) as the initial part of their research on PMOs, documented the typologies of PMOs. The results of their literature review are shown in Table 11. They split the topologies between the single-project project office and various forms of multi-project PMOs.

Table 11

Typologies of PMOs in the Literature

Author	Single-Project Entities	Multi-Project Entities			
Dinsmore (1999)	Autonomous Project Team	Project Support Office	Project Management Center of Excellence	Program Management Office	
Gartner Research Group		Project Repository	Coach	Enterprise	
Crawford (2002)	Level 1: Project Control Office	Level 2: Business Unit Project Office	Level 3: Strategic Project Office		
Englund, Graham, & Dinsmore (2003)		Project Support Office	Project Management Center of Excellence	Program Management Office	
Kendall & Rollins (2003)		Project Repository	Coach	Enterprise	"Deliver Now"
Garfein (2005)	Project Office	Basic PMO	Mature PMO	Enterprise PMO	

Hobbs and Aubry (2008) next completed a descriptive survey of 500 PMOs in search of developing a typology of PMOs. They found that PMOs are constantly evolving, staying in a particular form for only a few years before being restructured or dismantled. They characterized this as an historical process of creative destruction and

www.manaraa.com

co-evolution (Aubry, Hobbs, & Thuillier, 2008). PMOs are deeply embedded in their organizations, and they co-evolve together (Hobbs, Aubry, & Thuillier 2008). The results of 17 case studies by Hobbs and Aubry (2008) show that changes to PMOs are driven by internal organizational factors, such as changes in top management, and often broader changes in the organization. Changes in specific industries have consequences in business strategies that can then lead to changes in how an organization structured its projects and the resources working on them (Aubry, Hobbs, Thuiller, 2008). The studies also found that 54% of the PMOs were created in the last two years, and only 16% are over five years old (Hobbs & Aubry, 2007).

Hobbs and Aubry (2008) found a relationship between larger projects and the project management maturity level. They found IT PMOs to have almost exclusively internal customers. IT PMOs were found to have less decision-making authority and a culture that is less supportive than other types of PMOs. Finally, they found IT PMOs had their policies, methods, and recommendations followed more systematically than any other type of PMO. Two radically different approaches have been taken on whether to place project managers within the PMO. Over 30% of the organizations had their entire staff of project managers placed under the PMO. In contrast to this, nearly 30% of organizations had none of their project managers reporting directly to the PMO. Seventy nine percent of organizations with less than 100 employees place all of their project managers under the PMO, while larger organizations (greater than 30,000 employees) are the most likely to create PMOs with no project managers reporting directly to them.

Aubry, Hobbs, and Thuillier (2007) have conducted further research on how a PMO should not be considered as an isolated island in an organization, but instead is a

www.manaraa.com

"part of a network of complex relations that links strategy, projects, and structures and thus is a point of entry into the organization to study the foundations of organizational project management" (p. 328). The research led to the development of a new conceptual framework for organizational project management based upon innovation theory, sociology, and organizational theory. The framework is represented by the Venn diagram shown in Figure 2.

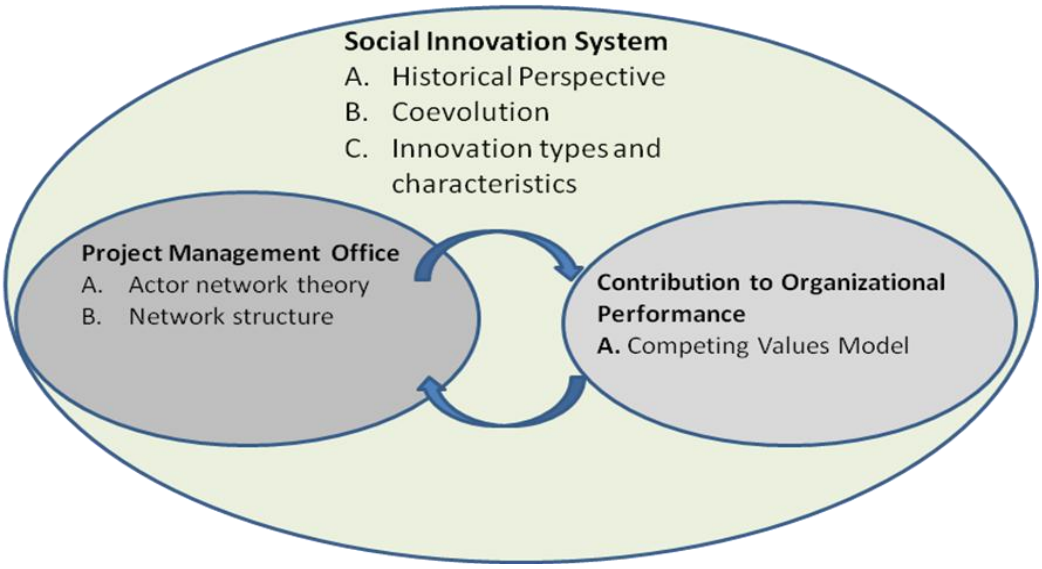


Figure 2. Organizational project management conceptual framework.

The social innovation system oval is based upon the historical perspective (Hughes, 1987), co-evolution (Van de Ven & Garud, 1994), and innovation types and characteristics (Drejer, 2004; Tether, 2005). The PMO oval is based upon the actor network theory (Callon & Law, 1989) and network structure (Hagstrom & Hedlund, 1999). The contribution to organizational performance oval is based upon the competing values model (Cameron & Quinn, 1999).

www.manaraa.com

PMO Best Practices

PMOs enable an organization to have a consistent project management approach across projects (Martin, Pearson, & Furumo, 2007). Rad (2001) identified additional benefits of a PMO as improvements in project performance in the areas of the triple constraint parameters (cost, schedule, and scope), utilization of people, and the recognition of project management discipline leading to improvements in organizational profitability.

Lee's (2006) results regarding IT PMOs and the PMBOK® nine project management knowledge areas found that: they exist in organizations of all sizes across industries, in more than 30% of the organizations a senior manager is the head of the IT PMO, more than 70% of IT PMOs manage less than 50 IT projects in a year, and IT PMOs seem to focus more on their primary functions relating to project management standards and project monitoring. Lee also found that more than 50% of the IT PMOs in his study had been established for two years or less.

Stanleigh (2005) conducted a global survey of individuals who implemented a PMO and identified best practices. Those best practices included:

1. Strategic alignment of projects with the organization's goals ensures executive sponsorship.
2. Development of the PMO as a service agency ensures that the PMO provides a valued service to the business rather than just performing as information consolidators and distributors.
3. Ensuring there is on-going communication both within the PMO and with the rest of the organization is critical to ensure executive support and

www.manaraa.com

provides an early warning system.

4. Effective planning in the creation stage of the PMO helps ensure success from the beginning.
5. The most successful PMOs placed their focus on training, mentoring, and leading by example.

Hobbs (2007) researched PMOs in practice, and has collected data on more than 500 PMOs. This research was also utilized in Hobbs and Aubry (2007) where the PMO function found to be most important was reporting project status to upper management, followed by developing and implementing a standard methodology. Other PMO functions found to be important in more than 60% of the PMOs were monitoring and control of project performance, developing competency of personnel (including training), implementing and operating a project information system, and providing advice to upper management.

Kerzner (2003) found the benefits of using a PMO are: standardization of operations, company rather than silo decision making, better capacity planning (i.e. resource allocations), quicker access to higher-quality information, elimination or reduction of company silos, more efficient and effective operations, less need for restructuring, fewer meetings that rob executives of valuable time, more realistic prioritization of work, and development of future general managers.

Kerzner (2003) also found key activities (or services) provided by a PMO are: project management information system, performance failure information system, postmortem analysis and documenting lessons-learned, dissemination of information, mentoring, development of standards and templates, project management benchmarking,

www.manaraa.com

business case development, customized training, managing stakeholders, continuous improvement, and capacity planning

PMI defines a methodology as "a system of practices, techniques, procedures, and rules used by those who work in a discipline" (PMBOK®, 2008, p. 438). PMOs can provide another valuable service for organizations by implementing and managing a project management methodology (Charavat, 2003; Comier, 2001; Hobbs & Aubry, 2007). "The purpose of a project management methodology is to provide a model approach, promote the use of best practices, and to clearly define what you are doing, so you can improve it. Key components of a project management methodology include a framework, guidelines, techniques, templates, samples, roles, project plans, milestones and phase exit reviews, and a focus on operational readiness and management of change" (Stewart, 2004, pp. 2-3).

Another best practice of PMOs is monitoring project progress and success with metrics, especially with an enterprise project management information system (Stewart & Kingsberry, 2003). Project metrics can include earned value for cost and schedule performance, resource utilization, issue tracking, schedule completion, and other scorecard characteristics management is interested in. Based upon research of IT project failures, long before project failure occurs there are often significant symptoms of early warning signs (Kappelman, McKeeman, & Zhang, 2006). Project metrics can be utilized as a predictive tool (Hartman & Ashrafi, 2002). A PMO working with an enterprise project management information system can catch these early warnings signs and proactively intervene to help get the project back on track (Stewart & Kingsberry, 2003).

www.manaraa.com

Project management training is another important service that PMOs can provide for project managers and project team members (McDonald, 2001). PMOs also can provide work support and promote professional interest by creating a project management community of practice in the organization (Thamhain, 2004). The PMO can also promote involvement with PMI including the local chapter to provide project managers with more opportunities for training, awareness of current trends, and collaboration with other project managers.

Kaufman and Korrapati (2007) presented a five part framework for PMOs to successfully implement IT projects. First was an organizational mandate for the PMOs charter and scope. Second was an orientation or philosophy to focus on results. Third was the mechanics of the PMO operations with clearly defined roles. Fourth was portfolio management including prioritization and reporting of metrics. The final part of the framework was project delivery focusing on success delivery of projects in respect to budget, time, scope, and quality.

Current State of the PMO

In *The State of the PMO 2007-2008: A Benchmark of Current Business Practices* by the Center for Business Practices (2007), PMOs were found to be growing in number and expanding in size. The research found the maturity level of a PMO is as important as the implementation of a PMO. As the PMO takes on more roles such as portfolio management and people management, it correspondingly increases its value to the organization. The differences between high-performing and low-performing organizations are that high-performing organizations were found to be more likely to have an enterprise PMO, have had their PMO in place longer, and evaluated project

www.manaraa.com

manager and team competency more often. PMOs in high-performing organizations also performed the following functions: strategy formulation, portfolio risk management, benefits realization analysis, contract preparation, outsourcing, project opportunity process development, resource assignment process development, and resource identification optimization. High-performing organizations were also found to have larger PMOs with more specialized roles (Center for Business Practices, 2007).

New Developments with PMOs

IT Project Portfolio Management

Project management traditionally focused on the effectiveness of the management of single projects. In today's organizations the managerial focus is shifting toward the concurrent management of a collection of projects as one large entity linked to the corporate business strategy (Dietrich & Lehtonen, 2005). Therefore a new emerging role PMOs play in IT organizations is providing governance and support for IT portfolio management (ITPM) and project portfolio management (PPM). ITPM is based around the process an organization uses to invest its IT funds in various applications and infrastructure (Ward & Pepparad, 2002). Related to this is PPM, which is a group of business practices that integrates projects with other business operations. PPM aligns projects with the strategies, resources, and executive oversight of the enterprise and providing the structure and processes for project portfolio governance (Levine, 2005, p.1)

Jeffery and Lelived (2004) provided valuable research on the new developments of ITPM. They found that while 89% of CIOs were aware of ITPM and 65% believed it had significant business value, only 17% were actually realizing the value of ITPM. The

www.manaraa.com

value of ITPM for organizations includes: cost savings, better alignment between IT spending and business objectives, and greater central coordination of IT investments across the organization. Based on these findings, Jeffery and Lelived created a four stage IT Portfolio Management Maturity Model, similar to the five levels of CMM and other maturity models. Stage 0 is ad hoc and uncoordinated with no process (Mullaly, 2006). Stage 1 is defined, with some standardization and centralization. Stage 2 is managed and includes demand management, financial metrics, and strategic alignment based on annual reviews. Stage 3 is synchronized, with strategic alignment based on frequent reviews, active portfolio management, benefits measured, feedback mechanism, and advanced valuation. The last three stages of the IT Portfolio Management Maturity Model are the critical ones (Jeffery & Lelived, 2004). Jeffery and Lelived provide several other ITPM best practices such as staged implementation (proving a pilot to expedite buy-in from other areas of the organization), trained and prepared staff, and business involvement from the beginning (communicate early and often).

The Dimension of the IT portfolio matrix (Jeffery & Lelived, 2004), is very similar to the Launch the Right Programs matrix used at Hewlett-Packard (HP) (Stewart & Kingsberry, 2003). The matrix showed business value on the vertical axis, and IT ability to execute successfully (risk) on the horizontal axis. Launched projects are those with high value and low risk, while those in the high value/high risk quadrant are postponed until the risk is lowered. Those with low value/low risk are retargeted to increase the value prior to launch, while those with low value/high risk are not launched (and require rethinking). In addition to the strategic alignment of IT and business strategies, HP also added the requirement of a business case providing financial

www.manaraa.com

justification for all project requests. A dollar value threshold was established for project requests being submitted to the IT/business steering committee. Requests above the threshold value had to be submitted to the CIO steering committee. Projects below this dollar level required the approval of the appropriate level of IT/business steering committee.

Agile Methods

PMOs in the past have gravitated to the traditional waterfall systems development life cycle (SDLC), which calls for the completion of a phase before proceeding with the next one. This was because it provides a logical, predictable, and easier to measure methodology than that of the new more agile SDLC methodologies. With new approaches to the SDLC like prototyping, rapid application development (RAD), eXtreme Programming, and other agile methodologies such as scrum, PMOs need to be flexible enough to embrace the benefits they provide, while still ensuring key project management critical success factors are met, and best practices are followed (Hoffer, George, & Valacich, 2008).

It is important for PMOs to be knowledgeable on the new agile methods their organization may wish to utilize (Augustine & Cuellar, 2006). By having an understanding of the new agile methods the PMO can also ensure they are actually being utilized, and are not just a smoke screen for a project to avoid using a traditional waterfall or any other approved SDLC. The PMO can also play a critical role in providing training on both project management fundamentals and the new SDLC alternatives.

In response to the *Manifesto for Agile Software Development*, there is now agile project management (Augustine, 2005). Highsmith (2004) defined six guiding principles

www.manaraa.com

for agile project management, which were:

1. Deliver customer value
2. Employ iterative feature-based delivery
3. Champion technical excellence
4. Encourage exploration
5. Build adaptive (self-organizing, self-disciplined) teams
6. Simplify

The first three principles dealt with creating customer value through innovative products, while the last three deal with the leadership-collaboration management style. This new approach to project management allows project teams to benefit from emerging new product development technologies.

In response to eXtreme programming, there is now eXtreme project management to address high speed, high change, high complexity, high risks, and high stress projects. While traditional project management is managing the known, eXtreme project management is managing the unknown, and is chaotic, messy, and unpredictable. "While traditional projects follow the classic model of ready-aim-fire, eXtreme project managers succeed by shooting the gun and then redirecting the bullet while not losing sight of their moving target" (DeCarlo, 2004a, p.7). For these extreme projects most of the assumptions of traditional projects are outmoded, with change not only being the norm, "but change is the project" (DeCarlo, 2004b, p. 51). PMOs can be valuable to eXtreme projects just like traditional projects as long they also support the approach needed for agile development. Augustine and Cuellar (2006) propose the Lean-Agile PMO as a way to move beyond the typical PMO focus on project management practices to align directly

www.manaraa.com

with the portfolio management of the organization, and support agile development.

Informal Project Management

Kerzner (2006b) proposed that the most significant change in project management in the past 20 recent years is the idea that informal project management does work. “In the 1950s and 1960s, the aerospace, defense and large construction industries were the primary users of project management techniques and tools” (p. 327). Since project management was new and contractors (and subcontractors) were used, customers wanted proof the system was working and thus project management became document intensive. Kerzner found that formal project management can be very expensive, and as an alternative to save costs he suggests utilizing an informal project management culture. An informal project management culture can be implemented based on the following four basic elements; trust, communication, cooperation, and teamwork.

Management of Change

Another function PMOs provide is support with management of change. Machiavelli found "there is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, then to take the lead in introducing a new order of things. Because the innovator has for enemies all those who have done well under the old conditions and lukewarm defenders in those who may do well under the new” (Brady & Soderlund, 2008, p. 467). McGuire and Hutchings (2006) studied organizational change through the Machiavellian perspective and found the challenges of understanding self-interest and motivation still relevant to managing organizational change in the 21st century. Al-Mudimigh (2007) found a project may be technically sound, but can still be an organizational failure from a business perspective without the proper engagement of

www.manaraa.com

the stakeholders and management of change.

For IT projects to make their desired impact the human factors need to be addressed by having the users involved throughout the project life cycle (Hornstein, 2008). To address this, a recent development in the field of project management is the management of change. Management of change allows the project team to approach change from the perspective of the three requirements for change, and the four management of change levers. The three requirements are awareness, skill development, and motivation. The management of change levers include: communication to address awareness, training for skill development, and organizational alignment along with incentives and rewards for motivation (Marks, 2007). Ensuring the target community is aware, trained, and properly motivated should contribute to improving the success rate of IT projects.

PMOs can also play a key role in helping project managers and project teams improve on how they approach conflict as a result of change. Verma (1998) presented three views of conflict, traditionalist, contemporary, and interactionist. The traditional view of conflict is that it was negative and should be avoided. The contemporary view of conflict is that it is inevitable and natural and can be either positive or negative. The interactionist view of conflict is that it is an important and necessary ingredient for performance.

Retrospectives and Lessons Learned

George Santayana said "Those who cannot remember the past are condemned to repeat it" (Boehm, 2006, p. 12). This may explain why capturing lessons learned is believe to be important to prevent repeating mistakes. Some PMOs are working with

www.manaraa.com

project teams to capture lessons learned to develop best practices and improve project management methodologies and tools (Stewart, 2004; Julian, 2008).

Retrospectives at the end of projects are a way of capturing lessons learned (Kasi, Keil, Mathiassen, & Pedersen, 2008; Verner & Evanco, 2005). Retrospectives can also be performed at the end of phases during the project (Lindstrom & Jeffries, 2004). Kerth (2001) proposed a retrospective as a method for obtaining each project team member's perspective of the project. While each team member is correct from their perspective, they may appear at first to contradict each other. Kerth proposed the retrospective facilitator with the role to pull all the different perspectives together, to complement each other and to fully understand the complexity of the entire story. This process helps in understanding complex projects and being able to truly learn from them, and increase collective wisdom for the organization (Glass, 2002).

Those who participate in a retrospective can gain valuable insight from the process and the lessons learned. A PMO can play a vital role in capturing the lessons learned from all projects and storing them in a repository (or knowledge management database) where they can be shared with all the project managers and project team members in the organizations (Stewart, 2004). Best practices found through the lessons learned and retrospective analysis could be applied to the project management methodology.

Virtual Teams and Collaboration

Two things prevalent in the early 21st century business environment are technological advances and increased complexity, including globalization (Friedman, 2005). Based upon these trends many businesses use virtual teams on projects and to

www.manaraa.com

solve problems (Nan & Hater, 2009). An important use of technology in the work place is collaborative tools to support virtual teams. Collaborative tools, which are also known as collaboration systems and groupware, are "IT-based tools that support the work of teams by facilitating the sharing and flow of information" (Haag, Baltzan, & Phillips, 2008, p.572).

Friedman (2005) explained the early 21st century global business environment in terms of 10 factors. The first factor was the fall of the Berlin wall on November 11, 1989 and the corresponding raising of Windows in personal computers. The second factor was Netscape's initial public offering on August 9, 1995, symbolizing the personal computer platform becoming an internet platform. The remaining factors were workflow software (enabling collaboration), open-sourcing (empowerment of individuals everywhere), outsourcing, off-shoring, supply chain (connecting global markets and increased specialization), in-sourcing, in-forming (information availability such as Google and Wikipedia), and finally digital, mobile, personal, and virtual technological enhancements.

Many of these ten forces have to do directly with collaboration and the tools that support it. The convergence of the flattening factors has led to "the creation of a global, web-enabled playing field that allows for multiple forms of collaboration – the sharing of knowledge and work – in real time, without regard to geography" (Friedman, 2005, p. 176). Another factor increasing the need for collaboration, especially across cultures is the outsourcing movement. Due to lower labor costs, significant amounts of IT work, especially software development, is being outsourced to other countries (Holmström, Fitzgerald, Ågerfalk, & Conchúir, 2006).

The terrorist attacks in the United States on September 11, 2001 are another

www.manaraa.com

reason for the increase in virtual teams and their collaboration needs. Air travel for meetings has become more expensive, riskier, and with the new safety measures, more of a hassle. In addition to the increase in expenses for businesses for travel, some employees are now not willing to take the personal risks and endure the personal inconvenience of traveling (Stewart, 2008).

Other changes in the business environment include mergers and acquisitions and telecommuting. When companies merge with and acquire other companies, it usually means additional locations for employees to be based out of. So instead of having all members a of project team co-located in one physical place, they are now more likely to be geographically spread out (Stewart, 2008). Telecommuting continues to increase, with more and more employees working out of their homes and in need of collaboration tools (Turban, King, Viehland, & Lee, 2006).

Another reason for the need of collaboration tools is the challenges of virtual teams working across different cultures (Stewart, 2006, Hildebrand, 2007). Culture is the "sum total of beliefs, rules, techniques, institutions, and artifacts that characterize human populations" (Ball, McCulloch, Frantz, Geringer, & Minor, 2002, p. 303). Six guidelines for doing business across cultures are: be prepared, slow down, establish trust, understand the importance of language, respect the culture, and understand components of culture (Ball, et al, 2002).

Having collaborative tools could be beneficial for following the six guidelines for doing business across cultures. Wang (2006) suggested that international project management was the most important area in IT education today. Trompenaars (1997) suggested several differences and challenges of working across cultures including:

www.manaraa.com

relationships and rules, the group and the individual, feelings and relationships, how far we get involved, how we accord status, and how we manage time. Global project managers have to deal with much more complex issues than in the past, and technology is a key to success. Technology needs to be used effectively including to all of its ramifications (Cleland & Garies, 1994).

In addition to collaboration tools, cultural awareness and training are also important for virtual teams (Duarte & Snyder, 2001). Curlee (2008) has researched how to best structure a PMO for virtual teams. A centralized PMO (as opposed to a decentralized PMO) was found to have more positive responses in the areas of: training, standard and agreed-on soft team processes, electronic communication and collaboration technology (availability and skills), and leaders establishing high expectations.

Summary

Project management provides value to organizations through IT projects to implement new and enhance existing systems (Ibbs and Reginato, 2002; Marchewka, 2006). Studies have found, however, despite the application of project management methods the success rate of many IT projects is less than desired (Johnson, 2006; Standish Group, 2008). This has cost organizations money, time, and missed business opportunities (Johnson, 2006). Research has shown that project management methods provide value to organizations by accomplishing IT projects on-time, within budget, and meeting the business requirements (Ibbs & Reginato, 2002).

A common way to measure project success is the traditional triple constraint parameters of time, cost, and scope (Schwalbe, 2006). Another means of measuring

www.manaraa.com

project success is through a critical success factors model (Dai, 2001; Finch, 2003; Pinto & Slevin, 2007). Critical success factors are defined from the perspective of the organization and customers.

Increasing an organization's project management maturity level and creating a project management culture has also been found to improve IT project success (J.K. Crawford, 2006). A method proposed to improve the IT project management maturity and create a project management culture is through the implementation of a PMO (J.K. Crawford, 2002b).

There are different types of PMOs, with different missions and focus (Hobbs & Aubry, 2007; Kerzner, 2003; Levatec, 2007; Pinto, 2006). The literature review findings suggest PMO best practices include standardization of project systems, common project methodology framed around the PMBOK®, standard reporting methods, and training (Center for Business Practices, 2007; Charavat, 2003; Cormier, 2001; Hobbs & Aubry, 2007; Kerzner, 2003; Lee, 2006; Martin, Pearson, & Furumo, 2007; Rad, 2001; Stanleigh, 2005; Stewart & Kingsberry, 2003). PMOs in IT organizations are also supporting new functions including: project portfolio management, agile methods, management of change, and collaboration for virtual teams (Augustine & Cueller, 2006; Center for Business Practices, 2007; Curlee, 2008; Hobbs & Aubry, 2007; Levine, 2005; Stanleigh, 2005; Stewart & Kingsberry, 2003, Stewart 2006; Stewart, 2008).

www.manaraa.com

CHAPTER 3. METHODOLOGY

Introduction

The purpose of this research was to understand if the presence of a PMO appears to correlate with improved IT project success. This research will add to the body of knowledge about PMOs and IT project success. Data gathered will help better understand the drivers of IT project success, types of PMOs in use, and the utilization of PMO functions.

Restatement of the Problem

The primary question addressed by this study was:

To what extent does the existence of a PMO or PMO functions when a formal PMO was not present contribute to reported IT project success?

In addition, the following subsidiary questions were asked in support of the primary question:

Question 1: To what extent does PMP certification influence project success in organizations with a PMO and organizations without a PMO?

Question 2: To what extent does the project manager education level influence project success in organizations with a PMO and organizations without a PMO?

Question 3: To what extent does project size influence project success in organizations with a PMO and organizations without a PMO?

Question 4: To what extent does the type of industry influence project success in organizations with a PMO and organizations without a PMO?

www.manaraa.com

Research Design

This quantitative study used a non-experimental descriptive research design to explore the relationship between the presence of a Project Management Office (PMO) and Information Technology (IT) project success. The data was collected via a web-based survey of project managers in the IT field. Prior to the actual survey of the study, a pilot study was performed with the survey instrument. A factor analysis was conducted to determine that the instrument measured the objectives of this study.

Setting for the Study / Participants

The setting for the study was the Project Management Institute (PMI) which consisted of over 271,638 members (Project Management Institute, 2008). Of those members 13,358 were members of the PMI Information Systems Special Interest Group (ISSIG) (PMI Information Systems Special Interest Group, n.d.). The ISSIG was made up of PMI members that work primarily on IT projects. The ISSIG members were current and former project managers that have the type of knowledge about PMOs and IT projects that was needed to provide the data to answer the research questions. The subject group was drawn exclusively from the ISSIG.

Data Collection Instruments

A web-based survey was the method used to obtain the data to answer the research question from the sample. The survey instrument was based upon one originally developed by Dai (2001). The link to the web-based survey was included in an invitation

www.manaraa.com

email sent to all ISSIG members, thus creating a convenience sample of those that actually responded (Fowler, 2002). ISSIG members had email addresses and were familiar with completing web-based surveys. The instructions and questions were made clear to prevent any misinterpretation of the web-based survey since there was not personal contact with the subjects (Fowler, 2002). The initial pilot study provided confidence that the instrument was clear and understandable. Based upon the high response rate reminder emails were not needed to increase participation.

The quantitative study was conducted with a survey instrument that was originally validated by some of the leading authorities in project management. The original validation group was considered leading authorities based upon their association with PMI, leading university project management programs, literature, training, and work with the development of the field of project management (Dai, 2001). The instrument was used to determine if there is a correlation between IT project success rates for IT organizations with a PMO, as opposed to IT organizations without a PMO.

The first part of the survey captured descriptive information about the respondents, the type of project they were describing, and their organization. The next section of the survey captured data about the performance of the project. The following section captured data about the type of PMO and PMO functions. The final section captured data about the project environmental factors for PMO functions of the project the respondent is describing.

www.manaraa.com

Validity

Validity in research is the extent to which a test measures what the researcher actually desires to measure (Cooper & Schindler, 2006). Content validity measures if the sample is representative of the population. The sample was a convenience sample of those that responded to the survey based upon the invitation email sent to the entire ISSIG membership. Based upon this population and a confidence level of 95% and confidence interval of 10, a sample of 95 was required (Survey Software Packages, n.d.). If the confidence level is increased to 99% and confidence interval set to 7, a sample of 331 was required. The 317 completed responses in the study at a 99% confidence level produced a confidence interval of 7.16.

Criterion-related validity is based on how well prediction and estimation are measured. The survey instrument had been validated by some of the leading authorities in project management (Dai, 2001). The original validating group selected by Dai consisted of Thomas R. Block, Davidson Frame, David Griffith, Joan Knutson, Paul C. Dinsmore, Jeffrey K. Pinto, John Sullivan, LeRoy Ward, and William G. Wells, Jr. The instrument was further validated by Dai's (2001) study.

Construct validity focuses on the accuracy and consistency of items in the survey. In addition to the previously mentioned validation by leaders in the field of project management, the survey instrument used a seven-point Likert scale for most questions. A Likert scale was chosen due to increased reliability compared to other scales and types of scales and questions (Cooper & Schindler, 2006). The remaining questions provided valid selections for the participant such as ranges for numeric values, and open ended questions were avoided.

www.manaraa.com

Reliability

Reliability determines the extent to which a measure provides consistent results and is a necessary part of obtaining validity (Cooper & Schindler, 2006). To improve reliability a previously validated instrument was used. Some questions and answers within the instrument were reworded using terms that are common to the IT profession. Additionally, questions that contained two or more questions at once or starting with the word "why" were omitted to minimize potential misinterpretations.

Pilot Study Results

Email invitations were sent to 40 IT professionals to participate in the pilot study, of which 20 responded. These participants were asked to complete the instrument, indicate the length of time needed to answer all of the items, and provide feedback regarding ambiguity of the questions. The responses were evaluated to determine if any changes were needed prior to conducting the full study.

Of the 20 responses to the pilot study, 17 were complete and downloaded into SPSS for analysis. The average time to complete the survey was 14.4 minutes. There were no issues of ambiguity reported by the participants.

Cronbach alpha test were performed to determine internal consistency on the 14 performance criteria and each of the six sets of project environmental factors. The Cronbach alpha for performance criteria at .901 showed adequate consistency for the study (Tables B1 and B2 in Appendix B). The Cronbach alpha for project management standards and methods, project history archives, project administrative support, human

www.manaraa.com

resources/staff assistance, training, and consulting and mentoring at .901, .911, .944, .825, .948, and .894 also showed adequate consistency for the study (Tables B3 and B4 in Appendix B).

Factor analysis was also performed on the pilot study using the extraction method of generalized least squares to confirm validity. For the 14 performance criteria communalities ranged from .760 to .999, with nine being greater than .950 (Table B5 in Appendix B). The six environmental factors were also found to be valid (Tables B6 and B7 in Appendix B). Communalities ranged from .685 to 919 for standards and methods, .651 to .856 for history archives, .435 to .955 for administrative support, .687 to .981 for human resources/staff assistance, .462 to .964 for training, and .702 to .899 for consulting and mentoring.

Data Collection Procedures

The invitation email described the purpose of the survey and also provided directions on how to complete the survey, and where the summary of the results can be found at a later time. Data was collected via Survey Monkey. The data was downloaded into an Excel file, which was then imported into the Statistical Package for the Social Sciences (SPSS) software version 16.0. Tests were performed in SPSS to validate the data and answer the research questions. Data from this study will be stored for seven years after publication and will be password protected on a CD-ROM.

The questions had close-ended answers, most using a seven-point Likert scale with the values of: strongly disagree, disagree, slightly disagree, neutral, slightly agree, agree, and strongly agree. Every element of the scale was clearly defined. The scale was

www.manaraa.com

also balanced through the consistent use of slightly and strongly to prevent bias. The scale was also used consistently throughout the survey to prevent confusion and errors (such as positive to negative, and then negative to positive).

Questions that did not use the Likert scale avoided extreme terms such as always and never. Some questions provided nominal choices for demographic data. There were no open-ended questions. The web-based functionality in Survey Monkey was utilized to prevent missing data and also provided validation of data as it was entered. The only way a respondent could not answer a required question was to exit the survey. All questions were required except some based upon the level of the PMO. If due to the selected PMO level a question was not required, then the respondent would not have seen that question.

Data Analysis

Data collected from the surveys were entered into an Excel file for analysis using SPSS Version 16.0. The analyses included a sample t-test, one-way ANOVA, MANOVA, and UNIANOVA (Figure 3). The results of the analysis are presented in Tables 20 through 26. A frequency chart was created for all questions showing the number of valid answers and missing answers (due to the question logic based on the type of PMO). Frequency tables were also created for each question to show the valid answers (Tables 14 through 19 and Tables B8 through B 22).

A sample t-test was performed to determine the extent to which a PMO contributes to IT project success. A factorial multivariate analysis of variance (MANOVA) was conducted to determine if there are differences in the perception of IT project success related to the items that are ancillary to the primary question, such as

www.manaraa.com

PMP certification of the project manager, project manager educational preparation, project size, project end product, and industry. A univariate analysis of variance (UNIANVOA) was also performed for projects with and without dedicated resources performing PMO functions for the project environmental factor areas of project management standards and methods, project historical archives, project administrative support, human resource/staff assistance, training, and consulting and mentoring.

Research Question	Variables	Statistical Analysis
To what extent does the existence of a PMO contribute to reported IT project success?	Dependent Overall Project Success Independent PMO Level	One-Way ANOVA Sample t-test
1. To what extent does PMP certification influence project success in organizations with a PMO and organizations without a PMO? 2. To what extent does the project manager education level influence project success in organizations with a PMO and organizations without a PMO? 3. To what extent does project size influence project success in organizations with a PMO and organizations without a PMO? 4. To what extent does the type of industry influence project success in organizations with a PMO and organizations without a PMO?	Dependent Overall Project Success Independent PMO Level Dedicated Employees (PMO Functions) PMP Certification Education Level Project Size (US$) Industry Environmental Factors Standards & Methods Historical Archives Administrative Support HR/Staff Assistance Training Consulting & Mentoring	One-Way ANOVA Sample t-test Factorial multivariate analysis of variance (MANOVA) Univariate analysis of variance (UNIANOVA)

Figure 3. Statistical Analysis.

www.manaraa.com

CHAPTER 4. DATA ANALYSIS AND RESULTS

Introduction

The purpose of this study was to gather data to better understand if the presence of a PMO and the performance of PMO functions are correlated with improved IT project success. A survey instrument created by Dai (2001) was utilized and was revalidated with a pilot study, prior to the actual data gathered for the study.

An email was sent by the Project Management Institute (PMI) Information Systems Special Interest Group (ISSIG) to its 13,358 members inviting them to participate in the survey (Appendix A). Four hundred fifty six ISSIG members responded to the online survey in surveymonkey.com, with 317 responses being complete and downloaded into SPSS for data analysis. The remaining 139 ISSIG members started the survey by entering the participant and project demographic data, but exited the survey before completing all of the performance criteria, PMO demographic data, and project environmental factor data, and were therefore excluded from the data analysis.

Description of the Participants

Table 12 shows the demographic composition of the participants for the data that was directly used in the primary and subsidiary research questions. Seventy six percent (n = 241) of the participants held the Project Management Professional (PMP) certification from the Project Management Institute (PMI). Ninety five point six percent of the participants were college educated; 48.3% (n = 153) had Bachelors degrees and 43.8% (n = 139) had Masters degrees; the two most frequent levels of education. Eighty five point

www.manaraa.com

two percent of the projects described by the participants had budgets less than or equal to $10 million, with $100,000 to $1 million (*n* = 108, 34.1%) and $1million to $10 million (*n* = 124, 39.1%) the most frequent ranges. While all of the projects were IT projects, the most common industries represented were government (*n* = 55, 17.4%), healthcare related (*n* = 42, 13.3%), computers/information technology (*n* = 38, 12.0%), manufacturing (*n* = 35, 11.0%), and other (*n* = 122, 38.5%).

www.manaraa.com

Table 12

Participants Descriptive Demographics Utilized in Research Questions

Demographic	Frequency	Percent
PMP Certified		
Yes	241	76.0
No	76	24.0
Level of Education		
High School	14	4.4
Bachelors	153	48.3
Masters	139	43.8
PhD	8	2.5
Other Doctorate	3	.9
Project Size (Budget US $)		
< $100,000	38	12.0
$100,00 - $1 million	108	34.1
$1 million - $10 million	124	39.1
$10 million - $50 million	25	7.9
> $50 million	22	6.9
Industry		
Computers/Information Technology	38	12.0
Construction	2	.6
Engineering	3	.9
Government	55	17.4
Healthcare related (Biology, Hospital, Pharmaceutical)	42	13.3
Manufacturing	35	11.0
Software development	7	2.2
Telecommunications	13	4.1
Other	122	38.5

More participant and project descriptive demographics not directly used in the research questions can be found in Tables B8 through B14 in Appendix B. The majority of participants had greater than 20 years of work experience (n = 175, 55.2%) (Table B8). Forty three point two percent (n = 137) of participants had 11 to 20 years of work

www.manaraa.com

experience with IT projects, and 27.4% (*n* = 87) had greater than 20 years of work experience with IT projects (Table B9). Seventy five point four percent (*n* = 239) of participants had the role of project manager on the reported project (Table B10).

Nearly half of the projects were application system development (41.0%, n = 130), followed by infrastructure design and development (*n* = 60, 18.9%), ERP implementation (*n* = 52, 16.4%) (Table B11). Almost half of the project had a customer type of internal (*n* = 154, 48.6%), with 23.3% (*n* = 74) for external customers, and 28.1% (*n* = 89) for both internal and external customers (Table B12). Most projects had 20 or less ongoing team members (*n* = 221, 69.7%) (Table B13), and also had a peak size of 20 or less team members (*n* = 161, 50.8%) (Table B14).

Project Performance Criteria

ISSIG members rated the success of their selected project on 14 project performance criteria as shown in Table 13. The project performance criteria and project environmental factors were measured on a balanced seven point Likert scale from strongly disagree (1) to strongly agree (7), with a midpoint of neutral (4).

For the question: *This project was completed on schedule,* 59.0% of respondents agreed or strongly agreed (*n* = 187). For the question: *This project was completed within budget*, 61.2% of respondents agreed or strongly agreed (*n* = 194). For the question: *The end product/service that was developed works*, 88.6% of respondents agreed or strongly agreed (*n* = 281).

For the question: *The end product /service is used by its intended client/users,* 91.8% of respondents agreed or strongly agreed (*n* = 291). For the question: *The end*

www.manaraa.com

product/service has directly benefited the client users through increased efficiency, 80.8% of respondents agreed or strongly agreed (n = 256). For the question: *The end product/service has directly benefited the client users through increased employee effectiveness*, 77.2% of respondents agreed or strongly agreed (n = 229).

For the question: *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)*, 77.3% of respondents agreed or strongly agreed (n = 245). For the question: *I was satisfied with the process by which this project was carried out*, 61.8% of respondents agreed or strongly agreed (n = 196). For the question: *I was confident that non-technical operational startup problems would be minimal, because the project was readily accepted by its intended client/users*, 54.6% of respondents agreed or strongly agreed (n = 173).

For the question: *Use of this end product/service led directly to improved performance for the client/users*, 73.8% of respondents agreed or strongly agreed (n = 234). For the question: *Use of this end product/service led directly to improved decision making for client/users*, 60.3% of respondents agreed or strongly agreed (n = 191). For the question: *The end product/service had a positive impact on those who made use of it*, 82.0% of respondents agreed or strongly agreed (n = 260).

For the question: *The results of this project offered a definite improvement in performance over the way client/users used to perform these activities*, 77.9% of respondents agreed or strongly agreed (n = 247). For the question: *All things considered this project was a success*, 79.2% of respondents agreed or strongly agreed (n = 251).

www.manaraa.com

This variable referred to as overall performance was used in the data analysis as the measurement for IT project success.

Table 13

Project Performance Likert Scale Frequencies (1 to 7)

	Strongly Disagree (1)	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree (7)	Mean
Schedule	19	41	27	18	25	79	108	5.08
Budget	17	28	27	19	32	97	97	5.21
Product Works	0	3	5	9	19	101	180	6.37
Used	1	2	3	14	6	94	197	6.44
Efficiency	3	4	2	24	28	117	139	6.08
Effectiveness	3	4	6	41	34	125	104	5.81
Alternatives	2	6	6	21	37	131	114	5.95
Process	8	12	35	15	51	131	65	5.34
Accepted	4	22	35	29	54	112	61	5.17
Improved	4	4	7	24	44	123	111	5.88
Decisions	5	4	8	57	52	113	78	5.52
Impact	4	3	4	17	29	134	126	6.06
Results	5	3	6	23	33	113	134	6.00
Overall	4	3	7	18	34	120	131	6.03

Table 14 shows the related statistics for the measurement of the project performance criteria. *This project was completed on schedule* had the lowest mean score at 5.08 (*SD* = 2.035). *The end product /service is used by its intended client/users,* had the highest mean score at 6.44 (*SD* = 0.942). *All things considered this project was a success*, had a mean of 6.03 (*SD* = 1.190).

www.manaraa.com

Table 14

Project Performance Statistics

	Mean	Standard Deviation	Median	Minimum	Maximum
Schedule	5.08	2.035	6	1	7
Budget	5.21	1.885	6	1	7
Product Works	6.37	0.951	7	2	7
Used	6.44	0.942	7	1	7
Efficiency	6.08	1.150	6	1	7
Effectiveness	5.81	1.237	6	1	7
Alternatives	5.95	1.172	6	1	7
Process	5.34	1.536	6	1	7
Accepted	5.17	1.569	6	1	7
Improved	5.88	1.224	6	1	7
Decisions	5.52	1.313	6	1	7
Impact	6.06	1.113	6	1	7
Results	6.00	1.240	6	1	7
Overall	6.03	1.190	6	1	7

PMO Descriptive Information

As shown in Table 15, almost half (49.8%, $n = 158$) of the organizations had a formal PMO. PMO functions were performed by dedicated employees in 15.8% ($n = 50$), and by part time resources in 16.1% ($n = 51$) of the organizations. Six point six percent ($n = 21$) of the organizations have plans to implement a PMO in the future, while in the remaining 11.7% ($n = 37$) of organizations no one performs PMO functions and there are no plans to do so.

www.manaraa.com

Table 15

PMO Level

Demographic	Frequency	Percent
PMO Level		
No formal PMO and no one performs any PMO functions	37	11.7
No formal PMO, but there are plans to implement a PMO in the future	21	6.6
PMO functions are performed on a part time basis, but no formal PMO has been established	51	16.1
PMO functions are performed by dedicated employees, but no formal PMO exists	50	15.8
A formal PMO exists	158	49.8

Additional descriptive information pertaining to PMOs can be found in Tables B15 through B22 in Appendix B. Seventy three point six percent (n = 117) of formal PMOs reported to top/upper management. The most common title of PMO leader was director (n = 73, 45.9%), followed by manager (n = 49, 30.8%), and vice president (n = 32, 20.1%). Thirty five point eight percent (n = 57) of PMOs had an annual budget of greater than $1 million, with 17.0% ($n$ = 27) at $500,000 to $1 million and 34.0% ($n$ = 54) at $100,000 to $500,000. Organization annual budgets reported included 18.2% (n = 29) at greater than $1 billion, 21.4% ($n$ = 34) at $100 million to $1 billion, and 36.5% ($n$ = 58) at $10 to $100 million (Table B15).

Most formal PMOs were five years old or less, with 40.3% (n = 64) two to five years old and 20.1% (n = 32) less than two years (Table B16). Top/upper management approved 93.1% (n = 148) of the PMOs (Table B17), and 73.0% (n = 116) had a mission statement (Table B18). Most PMOs did not use part time internal (n = 138, 52.9%)

www.manaraa.com

(Table B19) or part time external resources (80.1%, *n* = 209) (Table B21). Most PMOs had four less or full time internal (*n* = 133, 50.9%) (Table B20) and no full time external resources (*n* = 179, 68.6%) (Table B22).

Project Environmental Factors Descriptive Information

The project environmental factors are project critical success factors for functions that are performed and supported by a PMO. The project environmental factors were grouped into six areas, which included project management standards and methods, historical archives, administrative support, human resources (HR)/staff assistance, training, and consulting and mentoring (Dai, 2001). Each of the six areas had five functions which were measured. Tables 16 and 17 show the Likert frequencies for the project environmental factors, while Tables 18 and 19 show the corresponding statistics. Descriptions for each of the project environmental factor codes can also be found in Tables B23 and B24 in Appendix B. The project environmental factors were measured with a Likert scale from strongly disagree (1) to strongly agree (7), with a midpoint of neutral (4).

Standards and methods was the project environmental factor group with the highest mean value at 5.44 (*SD* = 1.767), and the highest median of six (agree). This group consisted of the following five measurements.

SM1. For assistance was provided in developing the project proposal 50.8% of respondents agreed or strongly agreed (*n* = 161).

SM2. For methods of change requests were available 72.6% of respondents agreed or strongly agreed (*n* = 230).

www.manaraa.com

SM3. For risk assessment procedures were established 58.7% of respondents agreed or strongly agreed (n = 186).

SM4. For documentation standards (progress/status reports, and time sheets, etc.) were used 78.5% of respondents agreed or strongly agreed (n = 249).

SM5. For project closeout process were used 62.8% of respondents agreed or strongly agreed (n = 199).

Historical archives was the project environmental factor group with the lowest mean value at 3.86 (SD = 2.028) and lowest median of four (neutral). This group consisted of the following five measurements.

HA1. For information on changes to project plans from prior projects were readily available 42.6% of respondents slightly agreed or agreed (n = 135).

HA2. For risk management documents from prior projects were readily available 36.0% of respondents slightly agreed or agreed (n = 114).

HA3. For variance analysis (plan vs. actual) from prior projects were readily available 37.2% of respondents strongly disagreed or slightly disagreed (n = 118).

HA4. For information on successful/unsuccessful project was readily available 37.5% of respondents disagreed or slightly disagreed (n = 119).

HA5. For a database of lessons learned was available 43.5% of respondents strongly disagreed or disagreed or agreed (n = 138).

The administrative support project environmental factor group had a mean value of 4.69 (SD = 2.139) with a median of five (slightly agree). This group consisted of the following five measurements.

www.manaraa.com

AS1. For administrative staff meet regularly with project team members to ensure a project binder/website was kept up to date 43.8% of respondents agreed or strongly agreed (n = 139).

AS2. For assistance was provided to help document project results in standard formats as the project was carried out 43.8% % of respondents slightly agreed or agreed (n = 139).

AS3. For a project "war room" was made available where participants could store working documents and conduct 37.5% of respondents strongly disagreed or disagreed (n = 119).

AS4. For project management software was standardized in the organization 56.8% of respondents agreed or strongly agreed (n = 180).

AS5. For project management software was made available for use 66.9% of respondents agreed or strongly agreed (n = 212).

www.manaraa.com

Table 16

Project Environmental Factors Likert Scale Frequencies (1 to 7)

	Strongly Disagree (1)	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree (7)	Mean
Standards & Methods								5.44
SM1	19	39	16	42	40	105	56	4.84
SM2	9	13	10	14	41	131	99	5.69
SM3	7	19	30	22	53	111	75	5.30
SM4	3	6	13	10	36	127	122	5.96
SM5	8	16	28	29	37	108	91	5.39
Historical Archives								3.86
HA1	32	59	22	25	70	65	44	4.30
HA2	36	69	32	35	59	55	31	3.95
HA3	38	80	39	44	49	36	31	3.69
HA4	30	67	52	36	48	55	29	3.90
HA5	52	86	41	29	42	38	29	3.48
Administrative Support								4.69
AS1	31	57	16	34	40	90	49	4.45
AS2	28	48	25	29	50	89	48	4.53
AS3	40	79	18	40	33	57	50	4.00
AS4	19	37	13	27	41	111	69	5.03
AS5	9	26	13	24	33	125	87	5.43

The human resources and staff assistance project environmental factor group had a mean value of 4.19 (*SD* = 2.244) with a median of four (neutral). This group consisted of the following five measurements.

HR1. For assistance was received in identifying the proper person to manage the project 45.7% of respondents agreed or strongly agreed (*n* = 145).

www.manaraa.com

HR2. For the project manager received assistance in identifying the proper skill requirements for the project 46.1% of respondents slightly agreed or agreed (n = 146).

HR3. For the project manager received assistance in gathering data for conducting performance evaluations of project team members 35.3% of respondents were neutral or slightly agreed (n = 112).

HR4. For guidelines were received to conduct recruiting for the project staff outside the organization 42.3% of respondents were neutral or slightly agreed (n = 134).

HR5. For assistance was received to conduct recruiting for project staff outside the organization 43.2% of respondents were neutral or slightly agreed (n = 137).

The training project environmental factor group had a mean value of 3.97 (SD = 2.104) with a median of four (neutral). This group consisted of the following five measurements.

TRN1. For project team members received assistance in identifying and documenting their existing skill sets 34.4% of respondents strongly disagreed or disagreed (n = 109).

TRN2. For project team members received introductory training on what project management does and how it fits into an organization 37.2% of respondents slightly agreed or agreed (n = 118).

TRN3. For project team members received adequate training on relevant project management software packages 36.0% of respondents were neutral or slightly agreed (n = 114).

www.manaraa.com

TRN4. For project team members received financial or management support to attend training courses to fill strategic training needs 35.0% of respondents strongly disagreed or disagreed (n = 111).

TRN5. For appropriate one-on-one training/coaching was provided 45.1% of respondents slightly agreed or agreed (n = 143).

The consulting and mentoring project environmental factor group had a mean value of 4.52 (SD = 1.991) with a median of five (slightly agree). This group consisted of the following five measurements.

CM1. For assistance to ensure the utilization for relevant project management methodologies was provided 48.3% of respondents slightly agreed or agreed (n = 153).

CM2. For assistance in choosing solutions to enable the team to resolve unexpected problems in a timely fashion was provided 46.4% of respondents slightly agreed or agreed (n = 147).

CM3. For the project manager received the mentoring on the unique measures that must sometimes be taken to manage a project successfully 40.1% of respondents slightly agreed or agreed (n = 127).

CM4. For upper management received suggestions on the unique measures that must sometimes be taken to ensure successful projects 44.8% of respondents slightly agreed or agreed (n = 142).

CM5. For group sharing sessions were convened in person or electronically for project managers 26.2% of respondents agreed (n = 83), and 15.1% (n = 48) of respondents respectively were neutral, slightly agreed, and strongly agreed.

www.manaraa.com

Table 17

Project Environmental Factors Likert Scale Frequencies (1 to 7)

	Strongly Disagree (1)	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree (7)	Mean
HR/Staff Assistance								4.19
HR1	12	40	28	52	40	100	45	4.73
HR2	19	47	21	52	51	95	32	4.52
HR3	34	67	28	70	42	52	24	3.85
HR4	32	61	22	98	36	48	20	3.85
HR5	32	53	15	102	35	58	22	4.00
Training								3.97
TRN1	36	73	35	61	47	46	19	3.71
TRN2	33	67	26	52	56	62	21	3.95
TRN3	29	63	28	63	51	62	21	3.99
TRN4	39	72	26	66	41	52	21	3.75
TRN5	26	37	28	51	62	81	32	4.44
Consulting & Mentoring								4.52
CM1	15	44	25	36	57	96	44	4.70
CM2	18	46	29	36	57	90	41	4.58
CM3	28	49	37	50	51	76	26	4.20
CM4	21	41	23	52	60	82	38	4.54
CM5	27	35	28	48	48	83	48	4.56

www.manaraa.com

Table18 shows the corresponding statistics for the project environmental factors for the standards and methods, historical archives, and administrative services groups.

Table 18

Project Environmental Factors Statistics

	Mean	Standard Deviation	Median	Minimum	Maximum
Standards & Methods	5.44	1.767	6	1	7
SM1	4.84	1.851	6	1	7
SM2	5.69	1.477	6	1	7
SM3	5.30	1.599	6	1	7
SM4	5.96	1.240	6	1	7
SM5	5.39	1.626	6	1	7
Historical Archives	3.86	2.028	4	1	7
HA1	4.30	1.983	5	1	7
HA2	3.95	1.940	4	1	7
HA3	3.69	1.901	4	1	7
HA4	3.90	1.879	4	1	7
HA5	3.48	1.967	3	1	7
Administrative Support	4.69	2.139	5	1	7
AS1	4.45	2.027	5	1	7
AS2	4.53	1.964	5	1	7
AS3	4.00	2.109	4	1	7
AS4	5.03	1.868	6	1	7
AS5	5.43	1.659	6	1	7

www.manaraa.com

Table19 shows the corresponding statistics for the project environmental factors for the human resources/staff assistance, training, and consulting and mentoring groups.

Table 19

Project Environmental Factors Statistics

	Mean	Standard Deviation	Median	Minimum	Maximum
HR/Staff Assistance	4.19	2.244	4	1	7
HR1	4.73	1.754	5	1	7
HR2	4.52	1.791	5	1	7
HR3	3.85	1.833	4	1	7
HR4	3.85	1.738	4	1	7
HR5	4.00	1.761	4	1	7
Training	3.97	2.104	4	1	7
TRN1	3.71	1.802	4	1	7
TRN2	3.95	1.851	4	1	7
TRN3	3.99	1.805	4	1	7
TRN4	3.75	1.852	4	1	7
TRN5	4.44	1.799	5	1	7
Consulting & Mentoring	4.52	1.991	5	1	7
CM1	4.70	1.793	5	1	7
CM2	4.58	1.825	5	1	7
CM3	4.20	1.833	4	1	7
CM4	4.54	1.792	5	1	7
CM5	4.56	1.884	5	1	7

www.manaraa.com

Responses to Research Questions

For the primary research question of "*to what extent does the existence of a PMO contribute to reported IT project success*", Table 20 shows the mean score of overall performance measurement of success based upon the Likert scale of strongly disagree (1) to strongly agree (7). Projects where PMO functions are performed by dedicated employees (but not a formal PMO) had the highest mean at 6.20 (*SD* = 1.081), followed by a formal PMO at 6.13 (*SD* = 1.125). Projects where there are no plans for a PMO had the lowest mean at 5.41 (*SD* = 1.343), followed by projects where PMO functions were only performed by part time resources at 5.96 (*SD* = 1.125). Table 20 also shows the higher the PMO level, the lower the value for standard deviation. This appears to show a trend of less variance in project outcome as the PMO level increases.

Table 20

PMO Level and Overall Performance Mean

PMO Level	N	Mean	Std. Deviation	Std. Error Mean
No PMO, no plans for a PMO	37	5.41	1.343	.221
No PMO, but plans in future	21	6.10	1.338	.292
PMO functions (part time)	51	5.96	1.296	.181
PMO functions (dedicated)	50	6.20	1.125	.159
Formal PMO	158	6.13	1.081	.086

Table 21 shows the mean for performance of overall project success between those organizations that have dedicated employees performing PMO functions and those that do not. When formal PMOs were combined with organizations that have dedicated employees performing PMO functions the mean was 6.14 (*SD* = 1.089) compared to 5.80

www.manaraa.com

(*SD* = 1.339) for projects where there are no employees dedicated to performing PMO functions.

Table 21

PMO Functions and Overall Performance Mean (Dedicated Employees)

PMO Functions	N	Mean	Std. Deviation	Std. Error Mean
No dedicated employees	109	5.80	1.339	.128
Dedicated employees	208	6.14	1.089	.076

Table 22 shows the results from one-way ANOVA tests for overall performance for analysis of variance for each of the variables of the primary and subsidiary research questions. PMO level ($F = 3.206$, sig. = .013) was significant in influencing overall performance. But having a formal PMO ($F = 2.92$, sig. = .131) compared to the other four PMO levels was not significant in influencing overall performance. When grouping the two levels with dedicated employees performing PMO functions ($F = 6.143$, sig. = .014) against the three levels without dedicated employees, the PMOs with dedicated employees was statistically significant in influencing overall performance. For data analysis purposes, participants have been regrouped into two PMO types: those with dedicated employees performing PMO functions and those without dedicated employees performing PMO functions.

The sample size required to study subsidiary question 1, the influence of PMP certification of the respondent, was sufficient with over 20 subjects in each group: PMP certified 241 and not certified 76. The overall performance mean for PMP certified was slightly lower than those that were not certified with the value of 6.01 (*SD* = 1.135) to

www.manaraa.com

6.07 (*SD* = 1.360). PMP certification was found to not be statistically significant (*F* = .116, sig. = .734) in influencing the overall performance.

Table 22

One-way ANOVA - Overall Performance

Attribute	Sum of Squares	Df	Mean Square	F	Sig.
PMO Level					
Between Groups	17.680	4	4.420	3.206	.013
Within Groups	430.118	312	1.379		
Total	447.798	316			
Formal PMO					
Between Groups	3.235	1	3.235	2.92	.131
Within Groups	444.563	315	1.411		
Total	447.798	316			
PMO Dedicated Employees					
Between Groups	8.565	1	8.565	6.143	.014
Within Groups	439.233	315	1.394		
Total	447.798	316			
PMP Certified					
Between Groups	.164	1	.164	.116	.734
Within Groups	447.634	315	1.421		
Total	447.798	316			
Education Level					
Between Groups	7.345	4	1.836	1.301	.270
Within Groups	440.453	312	1.412		
Total	447.798	316			
Project Size					
Between Groups	10.796	4	2.699	1.927	.106
Within Groups	437.002	312	1.401		
Total	447.798	316			
Industry					
Between Groups	11.142	8	1.393	.982	.450
Within Groups	436.656	308	1.418		
Total	447.798	316			

www.manaraa.com

Subsidiary question 2, the influence of education level of the respondent, the mean did not show a consistent pattern (Table 23). Sample size was 20 or above for bachelors (n = 153) and masters (n = 139) which had means of 6.16 (SD = 1.014) and 5.86 (SD = 1.289) respectively for performance overall. Education level was not significant (F = 1.301, sig. = .270) in influencing overall performance.

Subsidiary question 3, the influence of project budge size in US$, the mean also did not show a consistent pattern. Projects that were less than $100,000 ($n$ = 38) had a mean of 5.79 (SD = 1.339), followed by $100,000 - $1 million ($n$ = 108) with a mean of 6.14 (SD = 1.045), $1 million - $10 million ($n$ = 124) with a mean of 6.05 (SD = 1.222), $10 million - $50 million ($n$ = 25) with a mean of 6.24 (SD = 0.831), and greater than $50 million ($n$ = 22) with a mean of 5.50 (SD = 1.596). Project size in US$ was not significant in influencing overall performance (F = 1.927, sig. = .106).

Subsidiary question 4, the influence of industry, the mean for overall performance mean ranged from 5.00 to 6.33. For the industries with sample sizes of 20 or more, other industries (n = 122) with a mean of 6.17 (SD = 1.264) was the highest followed by manufacturing (n = 39) 6.09 (SD = 0.919), computers/IT (n = 38) 6.03 (SD = 1.1197), healthcare related (n = 42) 6.00 (SD = 1.269), and government (n = 55) 5.80 (SD = 1.458). Industry was not statistically significant in influencing overall performance (F = .982, sig. = .450).

www.manaraa.com

Table 23

Subsidiary Question Factor Overall Performance Mean

Attribute	N	Mean	Std. Deviation	Std. Error Mean
PMP Certified				
Yes	241	6.01	1.135	.073
No	76	6.07	1.360	.156
Education Level				
High School	14	6.07	1.817	.486
Bachelors	153	6.16	1.014	.082
Masters	139	5.86	1.289	.109
PhD	8	6.25	1.165	.412
Other Doctorate	3	6.33	1.155	.667
Project Size				
< $100,000	38	5.79	1.339	.217
$100,000 - $1 million	108	6.14	1.045	.101
$1 million - $10 million	124	6.05	1.222	.110
$10 million - $50 million	25	6.24	.831	.166
> $50 million	22	5.50	1.596	.340
Industry				
Computers/IT	38	6.03	1.197	.194
Construction	2	5.00	1.414	1.00
Engineering	3	6.33	.577	.333
Government	55	5.80	1.458	.197
Healthcare related	42	6.00	1.269	.196
Manufacturing	35	6.09	.919	.155
Software development	7	6.14	1.069	.404
Telecommunications	13	5.54	1.613	.447
Other	122	6.17	1.264	.091

The results of a UNIANOVA of overall performance for the variables of the four subsidiary questions and the dedicated employees performing PMO functions of the primary research question is shown in Table 24. For PMP certified the mean score was

www.manaraa.com

.20 higher for those with dedicated PMO employees. For non PMP certified the gap was even larger with .81 higher for those with dedicated PMO employees. Thus the results showed higher reported project success when the organization had dedicated resources performing PMO functions regardless of PMP certification.

The same outcome can be found on overall performance for all of the other subsidiary questions where there is a samples size of 20 for organizations with dedicated employees performing PMO functions and those without dedicated employees performing PMO functions. For the education level of bachelors and masters the overall performance mean is .17 and .61 higher respectively for dedicated employees performing PMO functions. For project size it increases .22 for projects in the $100,000 to $1 million range, and .37 for the $1 million to $10 million range. For the industry type of government it increases .63, and .37 for those who chose other for their industry. Therefore when there is a sufficient sample size for the values of the subsidiary question variables, those projects with dedicated employees performing PMO functions always had a higher mean for overall performance, than those projects without dedicated employees performing PMO functions.

www.manaraa.com

Table 24

UNIANOVA of Overall Performance

	Not Dedicated		Dedicated	
	N	Mean	N	Mean
PMP Certified				
Yes	84	5.88	157	6.08
No	25	5.52	51	6.33
Education Level				
High School	4	6.75	10	5.80
Bachelors	48	6.04	105	6.21
Masters	54	5.48	85	6.09
PhD	3	6.33	5	6.20
Other Doctorate	3	6.33	3	6.33
Project Size				
< $100,000	18	5.44	20	6.10
$100,000 - $1 million	40	6.00	68	6.22
$1 million - $10 million	40	5.68	84	6.05
$10 million - $50 million	6	6.33	19	6.21
> $50 million	5	5.80	17	5.41
Industry				
Computers/IT	7	6.00	31	6.03
Construction	2	5.00	2	5.00
Engineering	2	6.50	1	6.0
Government	23	5.43	32	6.06
Healthcare related	13	5.77	29	6.10
Manufacturing	13	6.31	22	5.95
Software development	5	6.20	2	6.00
Telecommunications	5	4.60	8	6.12
Other	39	5.92	83	6.29

www.manaraa.com

Tables 25 and 26 show the results of a MANOVA for overall performance with the project environmental factors compared with dedicated employees performing PMO functions and those without. For project management standards and methods all five factors were found to be statistically significant in influencing project success including: SM1 (assistance was provided in developing project proposal) (F = 6.068, sig. = .014), SM2 (methods of change requests were available) (F = 11.126, sig. = .001), SM3 (risk assessment procedures were established) (F = 4.114, sig. = .043), SM4 (documentation standards (progress/status reports, and time sheets, etc.) were used) (F = 5.861, sig. = .016), and SM5 (project closeout process were used) (F = 8.358, sig. = .004).

Project historical archives had four of the five factors that were found to be statistically significant in influencing project success including: HA1 (information on changes to project plans from prior projects were readily available) (F = 4.510, sig = .034), HA2 (risk management documents from prior projects were readily available) (F = 6.337, sig = .012), HA3 (variance analysis (plan vs. actual) from prior projects were readily available) (F = .5.259, sig. = .022), and HA5 (a database of lessons learned was available) (F= 14.640, Sig. = .000). HA4 (information on successful/unsuccessful project was readily available) (F = 3.644, sig. = .057) was not statistically significant.

Project administrative support had four of the five factors that were found to be statistically significant in influencing project success including: AS1 (administrative staff meet regularly with project team members to ensure a project binder/website was kept up to date) (F = 4.510, sig. = .034), AS2 (assistance was provided to help document project results ins standard formats as the project was carried out) (F = 6.337, sig. = .012), AS3 (a project "war room" was made available where participants could store working

www.manaraa.com

documents and conduct meetings) (F = 5.259, sig. = .022), and AS5 (project management software was made available for use) (F = 14.460, sig. = .000). AS4 (project management software was standardized in the organization) (F = 3.644, sig. = .057) was not statistically significant.

Human resources/staff assistance had three of the five factors that were found to be statistically significant in influencing project success including: HR1 (assistance was received in identifying the proper person to manage the project) (F = 6.945, sig. = .009), HR4 (guidelines were received to conduct recruiting for the project staff outside the organization) (F = 4.848, sig. = .028), and HR5 (assistance was received to conduct recruiting for project staff outside the organization) (F = 6.754, sig. = .010). HR2 (the project manager received assistance in identifying the proper skill requirements for the project) (F = .075, sig. = .785) and HR3 (the project manager received assistance in gathering data for conducting performance evaluations of project team members) (F = .152, sig. = .697) were not statistically significant.

www.manaraa.com

Table 25

MANOVA of Overall Performance with Environmental Factors

	Mean		Performance		Dedicated	
	Not Dedicated	Dedicated	F	Sig.	F	Sig.
Standards & Methods						
SM1	4.41	5.07	20.715	.000	6.068	.014
SM2	5.26	5.92	22.496	.000	11.126	.001
SM3	4.98	5.46	17.030	.000	4.114	.043
SM4	5.66	6.12	47.601	.000	5.861	.016
SM5	4.94	5.63	48.902	.000	8.358	.004
Historical Archives						
HA1	3.91	4.51	12.253	.001	4.510	.034
HA2	3.50	4.19	18.331	.000	6.337	.012
HA3	3.28	3.90	17.554	.000	5.259	.022
HA4	3.55	4.09	16.172	.000	3.644	.057
HA5	2.85	3.81	9.216	.003	14.640	.000
Administrative Support						
AS1	4.09	4.64	12.253	.001	4.510	.034
AS2	4.11	4.75	18.331	.000	6.337	.012
AS3	3.69	4.17	17.554	.000	5.259	.022
AS4	4.29	5.41	16.172	.000	3.644	.057
AS5	4.86	5.72	9.216	.003	14.640	.000
HR/Staff Assistance						
HR1	4.34	4.93	2.974	.086	6.945	.009
HR2	4.45	4.56	2.843	.093	.075	.785
HR3	3.88	3.84	2.293	.131	.152	.697
HR4	3.51	4.02	4.424	.036	4.848	.028
HR5	3.61	4.21	5.135	.024	6.754	.010

Training had none of the five factors that were found to be statistically significant in influencing project success. For consulting and mentoring two of the five factors were found to be statistically significant in influencing project success including: CM1 (assistance to ensure the utilization for relevant project management methodologies was

www.manaraa.com

provided) ($F = 4.114$, sig. = .043) and CM5 (group sharing sessions were convened in person or electronically for project managers ($F = 6.594$, sig. = .011). CM2 (assistance in choosing solutions to enable the team to resolve unexpected problems in a timely fashion was provided) ($F = .472$, sig. = .493), CM3 (the project manager received the mentoring on the unique measures that must sometimes be taken to manage a project successfully) ($F = 2.786$, sig. = .096), and CM4 (upper management received suggestions on the unique measures that must sometimes be taken to ensure successful projects) ($F = .456$, sig. = .500) were found to not be statistically significant.

Table 26

MANOVA of Overall Performance with Environmental Factors

	Mean		Performance		Dedicated	
	Not Dedicated	Dedicated	F	Sig.	F	Sig.
Training						
TRN1	3.67	3.73	12.626	.000	.051	.822
TRN2	3.72	4.07	8.988	.003	1.495	.222
TRN3	3.73	4.12	6.112	.014	2.234	.136
TRN4	3.44	3.91	14.381	.000	2.800	.095
TRN5	4.31	4.51	13.236	.000	.189	.664
Consulting & Mentoring						
CM1	4.33	4.90	32.159	.000	4.114	.043
CM2	4.40	4.68	19.377	.000	.472	.493
CM3	3.91	4.35	6.773	.010	2.786	.096
CM4	4.39	4.61	6.147	.014	.456	.500
CM5	4.13	4.79	11.861	.001	6.594	.011

www.manaraa.com

Summary

The online survey instrument was completed by 317 PMI ISSIG members. The data was downloaded into SPSS where the primary research question and four subsidiary questions were tested. This chapter included the statistical analyses that were used to summarize the data, describe the sample, and address the research questions. The conclusions and recommendations developed from these findings are included in Chapter 5.

www.manaraa.com

CHAPTER 5. DISCUSSION, IMPLICATIONS, RECOMMENDATIONS

Introduction

Organizations utilize Information Technology (IT) projects to implement new and enhance existing systems. Traditionally IT project success has been less than desired, costing organizations money, time, and missed business opportunities (Ibbs & Reginato, 2002; Standish Group, 2003). Methods of measuring IT project success include the traditional triple constraint parameters (time, cost, scope) and critical success factors. Methods presented to improve IT project success include increasing an organization's project management maturity level and creating a project management culture. Project Management Offices (PMO) can provide various project management support functions to improve the project management maturity level and help create a project management culture in an organization. Therefore PMOs have been proposed as a way to contribute to the goal of improved IT project success.

The objective of this study was to investigate the extent to which the presence of a PMO contributes to IT project success. The PMI ISSIG members were invited to participate in an online survey based upon an instrument originally created by Dai (2001). Four hundred fifty six ISSIG members responded to the online survey. Three hundred seventeen of the responses were complete and downloaded into SPSS for data analysis.

Results

The primary research question was "to what extent does the existence of a PMO contribute to reported IT project success?" The PMO levels were found to be statistically

www.manaraa.com

significant for influencing IT project success. The five PMO levels used in the study included the following:

1. Level 1 - No formal PMO, and no one performs PMO functions
2. Level 2 - No formal PMO, but there are plans to implement one in the future
3. Level 3 - PMO functions are performed on a part time basis
4. Level 4 - PMO functions are performed by dedicated employees
5. Level 5 - A formal PMO exists

A formal PMO (Level 5) compared to the other four PMO levels was not statistically significant in influencing IT project success. But when grouping those projects whose organizations had dedicated employees performing PMO functions with formal PMOs, there was statistical significance for influencing IT project success. Therefore data analysis was done comparing organizations with dedicated resources performing PMO functions to those without dedicated resources. Overall performance was measured on a Likert scale from strongly disagree (1) to strong agree (7). The mean score for overall performance was 6.14 (SD = 1.089) for projects in organizations with dedicated recourses performing PMO functions and 5.80 (SD = 1.339) for those without dedicated resources performing PMO functions. While this is not a large gap between the values for agree (6) and slightly agree (5), the difference that does exist shows a positive correlation for dedicated resources performing PMO functions. Forty nine point eight percent (n = 158) of respondents had a formal PMO, with another 15.8% (n = 50) having PMO functions performed by dedicated employees. Therefore 65.5% of respondents were in organizations that had dedicated full time resources performing PMO functions to

www.manaraa.com

support their projects. This is consistent with Dai's (2001) research on all types of projects. Dai found that the PMO presence through functions and services had a positive linear influence on reported project success, but there was not data to support that just having a formal PMO influenced reported project success.

The four subsidiary questions of the influence of PMP certification, education level, project size, and industry were all found to not be statistically significant in influencing IT project success. When there were sample sizes of 20 or more for both dedicated employees performing PMO functions and those without for each of the attributes of the subsidiary questions, the mean score of overall performance was always higher for those projects that had support from dedicated employees performing PMO functions. While there was not a large gap between the values for agree (6) and slightly agree (5) in each of these comparisons, the difference that does exist shows a positive correlation for dedicated resources performing PMO functions.

Data was gathered on 30 project environmental factors for functions to be performed by PMOs. Eighteen of the project environmental factors were found to be statistically significant to IT project success. For project management standards and methods all five of the PMO functions were found to be statistically significant to influencing IT project success. This included the following:

1. Assistance provided in developing project proposal
2. Methods of change request were available
3. Risk assessment procedures were established
4. Documentation standards (progress/status reports, and times sheets, etc.) Were used

www.manaraa.com

5. Project closeout procedures were used.

Four of the PMO functions for project historical archives were found to be statistically significant in influencing IT project success. This included the following:

1. Information on changes to project plans from prior projects were readily available
2. risk management documents from prior projects were readily available
3. Variance analysis (plan vs. Actual) from prior projects were readily available
4. A database of lessons learned was available.

Project administrative support had four PMO functions that were found to be significant in influencing IT project success. This included the following:

1. Administrative staff met regularly with project team members to ensure a project binder/website was kept up to date
2. Assistance was provided to help document project results in standard formats as the project was carried out
3. A project "war room" was made available where participants could store working documents and conduct meetings
4. Project management software was made available for use.

Human resources (HR)/staff assistance had three PMO functions that were found to be statistically significant in influencing IT project success. This included the following:

1. Assistance was received in identifying the proper person to manage the project

www.manaraa.com

2. guidelines were received to conduct recruiting for the project staff outside the organization
3. Assistance was received to conduct recruiting for project staff outside the organization.

None of the PMO functions for training were found to be statistically significant in influencing IT project success. Only two of the five PMO functions were found to be statistically significant for consulting and mentoring including the following:

1. Assistance to ensure the utilization for relevant project management methodologies was provided
2. Group sharing sessions were convened in person or electronically for project managers.

Conclusions

The data gathered supports that dedicated resources performing PMO functions was statistically significant and positively impacts IT project success. Interestingly a formal PMO was not found to be statistically significant as compared to the other PMO levels. This seems to indicate that the important factors are dedicated employees performing PMO functions rather than being formally called a PMO. The work done and support services provided impact IT project success more than the title given to those resources performing those functions. Hobbs' research with various others (Aubry, Hobbs, & Thuillier, 2007; Aubry, Hobbs, & Thuillier, 2008; Hobbs, 2007; Hobbs & Aubry, 2007; Hobbs & Aubry, 2008; Hobbs, Aubry, & Thuillier, 2008) has shown that

www.manaraa.com

PMOs are constantly evolving, and even the names of those performing PMO functions are varied. There appears to be agreement in the literature on the project management best practices which would be performed by a PMO (J.K. Crawford, 200b; Dai & Wells, 2004; Hill, 2004; Kaufman & Korrapati, 2007), but they could also be performed by other dedicated resources without the formal title of PMO (Dai, 2001).

As the PMO level increased, the standard deviation for the overall project success gradually decreased. Therefore, in addition to the higher IT project success mean values for dedicated employees performing PMO functions, there was also less variance of success as an organization moved up the PMO levels. This is consistent with the various project management maturity models from the literature review (Charavat, 2003; J.K. Crawford, 2002a, J.K. Crawford, 2006, Kerzner, 2006a; Stewart, 2004), where the more formalized and consistently followed a methodology and other processes are followed, it is suggested the more predictable the project results.

Smith (2005) found that PMP certified project managers had higher levels of project success than non-certified project managers. Gokaydin (2007) found PMP certified project managers outperformed non-certified project managers in the area of risk management. Based upon the data of this study PMP certification was found to not be as important for an IT project's success as having dedicated resources performing PMO functions to support the project. Interestingly the mean for IT project success for PMP certified project managers at 6.01 (SD = 1.135) was slightly lower than for those not certified at 6.07 (SD = 1.360). Likewise education level was not as important for an IT project's success as having dedicated resources performing PMO functions.

www.manaraa.com

The 18 project environmental factors that were found statistically significant for influencing IT project success and previously listed in the results section should be considered as best practices. PMOs should confirm they are performing these functions to increase the rate of IT project success. There are 12 other project environmental factors, which were not found to be statistically significant in this study. Based upon Dai's (2001) identification of these 12 factors as functions of the PMO presence, and other parts of the literature review, they could still be functions that PMOs need to perform.

Limitations

A limitation of this study was it focused on self reported project success on a given IT project, instead of all of the projects of an organization. Some organizations such as Hewlett Packard have thousands of IT project active at the same time (Stewart & Kingsberry, 2003). Some of the functions of a PMO, such as improving the project management maturity level, creating a project management culture, and performing project portfolio management are more focused at organizational capability. Based upon the literature review (J.K. Crawford 2006; Kerzner, 2006a; Levine, 2005) these functions should eventually contribute to individual project success.

This study is also limited by the age of the PMOs represented. Twenty point one percent (n = 32) of the formal PMOs were represented in this study were less than two years old. Another 40.3% (n = 64) were between two to five years old. Hobbs and Aubry (2008) similarly found 54% of PMOs they studied to be less than two year old and 30% between two to five years old. Lee (2006) found that more than 50% of the IT PMOs in his study had been established for two years or less. Therefore the self reported projects

www.manaraa.com

in this study may not be receiving all of the benefits of the PMO that other projects in organization might have now, or it might have received in the future as the PMO matured.

Another possible limitation of the study is the potential of a bias toward successful projects. Since respondents were self selecting the projects they reported on, there may have been a tendency to select projects that were more successful. Therefore less successful projects may not have been fully represented leading to less variation in the data collected.

Recommendations

This research focused on IT project success based upon the self reported overall performance measurement on an individual IT project. PMOs are also a relatively new concept in the field of IT. The following recommendations are made for further research:

1. Develop a study on the other 13 project performance criteria, and their relationship with the 30 project environmental factors of PMO functions. An area to focus on would be the 12 project environmental factors which were found to not be statistically significant in this study.
2. Develop a study to measure if PMPs are more discerning in their self reporting of project success compared to non-PMPs.
3. Develop a study measuring the degree that PMOs are supporting their organizations for new project management techniques and methods. This would include the areas of agile project management, project portfolio management, management of change, virtual teams, and collaboration. The first item to consider would be if the PMO positively supports

www.manaraa.com

implementing these project management techniques and methods. The second item to study would be if these new PMO functions lead to measureable improvements in IT project success.

4. Develop a follow-up study that could be performed at a later time, such as in three to five years, to see if there were significant changes in the data gathered. Attributes to compare could include IT project success, PMO types, and the project environmental factors of the PMO functions. Research into the following question: as PMOs mature do they also show an increase in positive impact on IT project success? The follow-up study could also include additional environmental factors for PMO functions supporting areas such as project portfolio management, agile project management, management of change, virtual teams, and collaboration. The current six groups of environmental factors could also be examined to see if there are new relevant PMO functions that need to be added.

www.manaraa.com

REFERENCES

Al-Mudimigh A.S. (2007). The role and impact of business process management in enterprise systems implementation. *Business Process Management Journal*, 13(6), 866-874.

Aubry, M., Hobbs, B., & Thuillier, D. (2007). A new framework for understanding organisational project management through the PMO. *International Journal of Project Management*, 25(4), 328-336.

Aubry, M., Hobbs, B., & Thuillier, D. (2008). Organisational project management: An historical approach to the study of PMOs. *International Journal of Project Management*, 26(1), 38-43.

Augustine, S. (2005). *Managing agile projects* (1st ed.). Upper Saddle River, NJ: Pearson Education.

Augustine, S. & Cuellar, R. (2006). The lean-agile PMO: Using lean thinking to accelerate project delivery. *Cutter Consortium*, 7(10), 1-24.

Aziz, L. (2006), The Program Management Office in healthcare information technology organizations. *Proceedings of the 2006 PMI North America Global Congress.*

Baccarni, D. (1999). The logical framework method for defining project success. *Project Management Journal*, 30(4), 25-32.

Ball, D., McCulloch, W., Frantz, P., Geringer, J., & Minor, M. (2002). *International Business: The Challenge of Global Competition* (8th Ed). New York: McGraw-Hill.

Baltzan, P., Phillips, A., & Haag, S. (2008). *Business driven technology* (3rd ed.). New York: McGraw-Hill/Irwin.

Besner, C. & Hobbs, B. (2006). The perceived value and potential contribution of project management practices to project success. *Project Management Journal*, *37*(3), 37-48.

Block, T.R, & Frame, J.D. (1998). *The project office.* Menlo Park, CA: Crisp Publications.

www.manaraa.com

Boehm, B. (2006). A view of 20th and 21st century software engineering. *Proceedings of the 28th international Conference on Software Engineering,* Shanghai, China, (2006, May 20-28). ICSE '06. ACM, New York, NY, 12-29.

Brady, T. & Söderlund, J. (2008). Projects in innovation, innovation in projects selected papers from the IRNOP VIII conference. *International Journal of Project Management*, 26(5), 465-468.

Brodbeck, F. (2001). Communication and performance in software development projects. *European Journal of Work & Organizational Psychology*, 10(1), 73-94.

Callon, M. & Law, J. (1989). *La proto-histoire d'un laboratoire ou le difficile marriage de la science et de l'economie*. Paris: Presses Universitiaries de France.

Cameron, K.S. & Quinn, R.E. (1999). *Diagnosing and changing organizational culture: Based on the competing values framework*. Reading, MA: Addison-Wesley.

Center for Business Practices. (2007). *The state of the PMO 2007-2008: A benchmark of current business practices.* Haverton, PA: Center for Business Practices.

Chan, Y., Huff, S., Barclay, D., & Copeland, D. (1997). Business Strategic Orientation, Information Systems Strategic Orientation, and Strategic Alignment. *Information Systems Research*, *8*(2), 125.

Charavat, J. (2003). *Project management methodologies: Selecting, implementing, and supporting methodologies and processes for projects* (1st ed.). Hoboken, NJ: John Wiley & Sons.

Cicmil, S. & Hodgson, D. (2006). New possibilities for project management theory: A critical engagement. *Project Management Journal*, 37(3), 111-122.

Cleland, D.I. (1999). *Project management: Strategic design and implementation* (3rd ed.). New York: McGraw-Hill.

Cleland, D.I. & Gareis, R. (1994). *Global project management handbook* (1st ed.). New York: McGraw-Hill.

Cleland, D.I. & Ireland, L. (2002). *Project management: Strategic design and implementation* (4th ed., Vol. 1). New York: McGraw-Hill.

Cook-Davies, T. (2002). The "real" success factors in projects. *International Journal of Project Management,* 20(3), 185-190.

Cooper, D. R., & Schindler, P. S. (2006). *Business research methods* (9th ed.). Boston: McGraw-Hill Irwin.

www.manaraa.com

Cormier, L. (2001). *Build your own project management methodology*, PMI Seminars/Symposium 2001, Nashville, TN.

Crawford, J.K. (2002a). *Project management maturity model: Providing a proven path to project management excellence* (1st ed.). New York: Marcel Dekker.

Crawford, J.K. (2002b). *The strategic project office: A guide to improving organizational performance* (1st ed.). New York: Marcel Dekker.

Crawford, J.K. (2006). The project management maturity model. *Information Systems Management*, 23(4), 50-58.

Crawford, L. (2006). Developing organizational project management capability: Theory and practice. *Project Management Journal*, *37*(3), 74-86.

Curlee, W. (2008). Modern virtual project management: The effects of a centralized and decentralized project management office. *Project Management Journal*, 39(S), S83-S96.

Dai, X.C. (2001) *The role of the project management office in achieving project success.* Ph.D. dissertation, The George Washington University, United States -- District of Columbia.

Dai, X.C. & Wells, W.G. (2004). An exploration of project management office features and their relationship to project performance. *International Journal of Project Management*, 22(7), 523-532.

DeCarlo, D. (2004a*). Extreme project management: Using leadership, principles, and tools to deliver value in the face of volatility* (1st ed.). San Francisco: Jossey-Bass.

DeCarlo, D. (2004b). Leading and managing extreme projects. *Leader to Leader*, 2004(34), 51-58.

De Wit, A. (1988). Measurement of project success. *International Journal of Project Management, 6*(3), 164-170.

Dietrich, P. & Lehtonen, P. (2005). Successful management of strategic intentions through multiple projects - Reflections from empirical study. *International Journal of Project Management,* 23(5), 386-391.

Dinsmore, P. C. (1999). *Winning in business with enterprise project management*. New York: AMACOM.

Drejer, I. (2004). Identifying innovation in surveys of services: A Schumpeterian

www.manaraa.com

perspective. *Research Policy*, 33(3), 551–62.

Duarte, D. & Snyder, N. (2001). *Mastering virtual teams* (2nd ed.). San Francisco: Jossey-Bass.

Dvir, D. Sadeh, A., Malach-Pines, A. (2006). Projects and project managers: the relationship between project managers' personality, project types, and project success. *Project Management Journal*, 37(5), 36-48.

Englund, R.I., Graham, R.J., & Dinsmore, P.C. (2003). *Creating the project office: A manager's guide to leading organizational change.* San Francisco: Jossey-Bass.

Ewusi-Mensah, K. (1997). Critical issues in abandoned information systems development projects: What is it about IS projects that make susceptible to cancellations? *Communications of the ACM*, 40(9), 74-80.

Finch, P. (2003). Applying the Slevin-Pinto project implementation profile to an information systems project. *Project Management Journal*, 34(3), 32- 39.

Fleming, Q.W. & Koppleman, J.M. (1998). Project teams: The role of the project office. *Cost Engineering,* 40(8), 33-36.

Fowler, F., Jr. (2002). *Survey research methods, applied social research methods series, volume 1*. Thousand Oaks, CA: Sage Publications.

Fowler, J.J. & Horan, P. (2007). Are information systems' success and failure factors related?: An exploratory study. *Journal of Organizational and End User Computing,* 19(2), 1-22.

Frame, D. (1994). *The new project management* (1st ed.). San Francisco: Jossey-Bass.

Friedman, T. (2005). *The world is flat: A brief history of the twenty-first century* (1st ed.). New York: Farrar, Strauss, Giroux.

Garfein, S.J. (2005). Strategic portfolio management: A smart, realistic and relatively fast way to gain sustainable competitive advantage. *Proceedings of the 2005 PMI North America Global Congress.*

Glass, R. (2002). Project retrospectives, and why they never happen. *IEEE Software*, 19(5), 112, 111.

Gokaydin, T. (2007). *Correlational study of projects managed by PMP certified and noncertified project managers.* Ph.D. dissertation, Capella University, United States -- Minnesota.

www.manaraa.com

Gray, C.F. & Larson, E.W. (2008). *Project management: The management process* (4th ed.). Boston: McGraw-Hill Irwin.

Haag, S., Baltzan, P., & Phillips, A. (2008). *Business driven technology* (2nd ed.). New York: McGraw-Hill/Irwin Inc.

Hagstrom, P. & Hedlund, G. (1999). *A three-dimensional model of changing internal structure in the firm*. In: Chandler A.D., Hastrom, P., Solvell, O. editors. The dynamic firm: The role of technology, strategy, organization, and regions. New York: Oxford University Press.

Hartman, F. (2000). *Don't park your brain outside: A practical guide to improving shareholder value with SMART project management* (1st ed.). Upper Darby, PA: Project Management Institute.

Hartman, F. & Ashrafi, R.I. (2002). Project management in the information systems and information technologies industries. *Project Management Journal*, *33*(3), 5-15.

Highsmith, J. (2004). *Agile project management*. Boston: Addison-Wesley.

Hill, G.M. (2004). Evolving the project management office: A competency continuum. *Information Systems Management*, 21(4), 45-51.

Hildebrand, C. (2007). Cross-cultural collaboration. *PM Network*, 21(3), 46–54.

Hirschheim, R. & Sabherwal, R. (2001). Detours in the path toward strategic information systems alignment. *California Management Review*, 44(1), 87-108.

Hobbs, B. (2007). *The multi-project PMO: A global analysis of the current state of practice.* Newton Square, PA: Project Management Institute.

Hobbs, B. & Aubry, M. (2007). A multi-phase research program investigating project management offices (PMOs): The results of phase 1. *Project Management Journal*, 38(1), 74-86.

Hobbs, B. & Aubry, M. (2008). An empirically grounded search for a typology of project management offices. *Project Management Journal*, 39(S), S69-S82.

Hobbs, B., Aubry, M., & Thuillier, D. (2008). The project management office as an organizational innovation. *International Journal of Project Management*, 26(5), 547-55.

Hoffer, J. A., George, J. F., & Valacich, J. S. (2008). *Modern systems analysis & design* (5th Ed.). Saddle River, NJ: Pearson Prentice Hall.

www.manaraa.com

Holmström, H., Fitzgerald, B., Ågerfalk, P.J., & Conchúir. E.O. (2006). Agile practices reduce distance in global software development. *Information Systems Managemen*t, 23(3), 7-18.

Hornstein, H. (2008). Using a change management approach to implement IT programs. *Ivey Business Journal Online*, 72(1).

Hughes, P.T. (1987). *The evolution of large technological systems.* In: Bijker WE, Hughes TP, Pinch TJ, editors. The social construction of technological systems: new directions in the sociology and history of technology. Cambridge: MIT Press.

Hyväri, I. (2006). Success of projects in different organizational conditions. *Project Management Journa*l, 37(4), 31-41.

Ibbs, W. & Reginato, J. (2002). *Quantifying the value of project management* (1st ed.). Newton Square, PN: Project Management Institute.

Iacovou, C. (1999). The IPACS project: when IT hits the fan. *Journal of Information Technology*, *14*(3), 267-275.

Jedd, M. (2006). PMO on the fast track. *PM Network*, 20(3), 62-69.

Jeffery, M., & Leliveld, I. (2004). Best practices in IT portfolio management. *MIT Sloan Management Review*, 45(3), 41-49.

Johnson, J. (2006). *My life is failure: 100 things you should know to a successful project leader* (1st ed.). West Yarmouth, MA: The Standish Group International.

Jugdev, K. & Muller, R. (2005). A retrospective look at our evolving understanding of project success. *Project Management Journal*, 36(4), 19-31.

Julian, J. (2008). How project management office leaders facilitate cross-project learning and continuous improvement. *Project Mangement Journal*, 39(3), 43-58.

Kanter, J. & Walsh, J.J. (2004). Toward more successful project management. *Information Systems Management*, 21(2), 16-21.

Kappelman, L., McKeeman, R., & Zhang, L. (2006). Early warning signs of IT project failure: The dominant dozen. *Information Systems Management*, *23*(4), 31-36.

Kapur, G.K. (1999). Why IT project management is so hard to grasp. *Computerworld*, 33(18), 32.

www.manaraa.com

Kasi, V., Keil, M., Mathiassen, L., & Pedersen, K. (2008). The post mortem paradox: a Delphi study of IT specialist perceptions. *European Journal of Information Systems*, 17(1), 62-78.

Kaufman, C. & Korrapati, R.B. (2007). A project management office (PMO) framework for successful implementation of information technology projects. *Proceedings of the Academy of Information and Management Sciences*, 11(1), 1-6.

Keil, M., & Robey, D. (1999). Turning around troubled software projects: An exploratory study of the deescalation of commitment to failing courses of action. *Journal of Management Information Systems*, 15(4), 63-87.

Kendall, G.I. & Rollins, S.C. (2003). *Advanced project portfolio management and the PMO: Multiplying ROI at warp speed.* Boca Raton, FL: J. Ross Publishing.

Kendra, K.& Taplin, L.J. (2004). Project success: A cultural framework. *Project Management Journal,* 35(1), 30-45.

Kerth, N. (2001). *Project retrospectives: A handbook for team reviews.* New York: Dorset House Publishing.

Kerzner, H. (1987). In search of excellence in project management. *Journal of Information Systems Management*, 38(2), 30-40.

Kerzner, H. (2003). Strategic planning for a project office. *Project Management Journal*, *34*(2), 13-25.

Kerzner, H. (2006a). *Project management: A systems approach to planning, scheduling, and controlling* (9th ed.). Hoboken, NJ: John Wiley and Sons.

Kerzner, H. (2006b). *Project management best practices: Achieving global excellence* (1st ed.). Hoboken, NJ: John Wiley and Sons.

Kerzner, H. & McIsaac, K. (2006). Maturity: Do or die? *PM Network,* 20(2), 31-35.

Kouzes, J.M. & Posner, B.Z. (2001). *Leadership practices inventory: Facilitator's guide* (2nd ed.). San Francisco: Jossey-Bass.

Krauth, J. (1999). Introducing information technology in small and medium sized enterprises. *Studies in Information and Control*, 8(1).

Kwak, Y.H. & Ibbs, C.W. (2000). Calculating project management's return on investment. *Project Management Journal*, 31(2), 38-47.

www.manaraa.com

Lavingia, N.J. (2001). Pacesetter project performance. *AACE International Transactions*, PM02, PM21-PM24.

Lee, Y.W. (2006). *The effect of PMO on IT project management: A summary of the survey results.* Honolulu, HI: Hawaii Pacific University.

Levatec, C.J. (2006). *The program management office: Establishing, managing, and growing values of a PMO* (1st ed.). Fort Lauderdale, FL: J. Ross Publishing.

Levine, H. (2005). *Project portfolio management: A practical guide to selecting projects, managing portfolios, and maximizing profits* (1st ed.). San Francisco: Jossey-Bass.

Lindstrom, L. & Jeffries, R. (2004). Extreme programming and agile software development methodologies. *Information Systems Management*, 21(3), 41-52.

Lipovetsky, S., Tishler, A., Dvir, D., & Shenhar, A. (1997). The relative importance of defense projects success dimensions. *R&D Management*, 27(2), 97-106.

Lyytinen, K. & Hirschheim, R. (1987). Information systems failures – a survey and classification of the empirical literature. *Oxford Surveys in Information Technology,* Vol. 4, 257-309.

Machiavelli, N. (1950). *The prince and the discourses*. New York: Random House.

Marchewka, J.T. (2006). *Information technology project management: Providing measurable organizational value* (2nd ed.). Hoboken, NJ: John Wiley and Sons.

Mahaney, R.C. & Lederer, A.L. (2006). The effect of intrinsic and extrinsic rewards for developers on information systems project success. *Project Management Journal*, 37(4), 42-54.

Marks, M.L. (2007). A framework for facilitating adaptation to organizational transition. *Journal of Organizational Change Management*, 20(5), 721-739.

Martin, N.L., Pearson, J.M., & Furumo, K. (2007). IS project management: size, practices, and the project management office. *The Journal of Computer Information Systems,* 47(4), 52-60.

McDonald, J. (2001). Why is software project management difficult? And what that implies for teaching software project management. *Computer Science Education*, 11(1), 55.

McGuire, D. & Hutchings, K. (2006). A Machiavellian analysis of organisational change. *Journal of Organizational Change Management*, 19(2), 192-209.

www.manaraa.com

Morris, P.W.G. & Hough, G.H. (1987). *The anatomy of major projects: A study of the reality of project management* (Vol. 1) Chichester, UK: John Wiley & Sons, Ltd.

Murch, R. (2001). *Project management: Best practices for IT professionals* (1st ed.). Upper Saddle River, NJ: Prentice Hall.

Mullaly, M. (2006). Longitudinal analysis of project management maturity. *Project Management Journal*, 37(3), 62-73.

Murphy, C. & Kolbasuk McGee, M. (2008). IT has been spared big cuts. So far ... *InformationWeek*, (1203), 19.

Nan, N. & Harter, D.E, (2009). Impact of budget and schedule pressure on software development cycle time and effort. *IEEE Transactions on Software Engineering*, 35(5), 624-637.

Norrie, J. & Walker, D.H.T. (2004). A balanced scorecard approach to project management leadership. *Project Management Journal,* 35(4), 47-56.

Pennypacker, J.S. & Grant, K.P. (2003). Project management maturity: An industry benchmark. *Project Management Journal*, 34(1), 4-11.

Pinto, J. (2006). *Project management: Achieving competitive advantage* (1st ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Pinto, J.K. & Covin, J.G. (1989). Critical factors in project implementation. *Technovation*, 9(1), 49-62.

Pinto, J.K. & Slevin, D.P. (1989). Critical success factors R&D projects. *Research Technology Management*, 32(1), 31-35.

PMI Information Systems Special Interest Group. (n.d.). Home page. Retrieved September 1, 2008, from http://www.pmi-issig.org/Home/tabid/36/Default.aspx

PMI Standard (2003). *Organizational project management maturity model (OPM3®): Knowledge foundation* (1st ed.). Newton Square, PA: Project Management Institute.

PMI Standard (2008*). A guide to the project management body of knowledge: PMBOK® guide* (4th ed.). Newton Square, PA: Project Management Institute.

Project Management Institute (2008, August). PMI fact file. *PMI Today*, p. 6.

Rad, P. (2001). Is your organization a candidate for project management office (PMO)? *AACE International Transactions,* PM71, 7.1-7.4.

www.manaraa.com

Rad, P & Levin, G. (2002). *The advanced Program Management Office: A look at function and implementation.* Boca Raton, FL: St. Lucie Press.

Rad, P. & Levin,G. (2003). Is your organization friendly to projects? *AACE International Transactions*, PM41-PM46.

Rodriguez-Repiso, L., Setchi, R., & Salmeron, J.L. (2007). Modelling IT projects success: Emerging methodologies reviewed, *Technovation*, 27(10), 582-594.

Santosus, M. (2003) Office discipline: Why you need a project management office. *CIO Magazine,* 16(18), 82-88.

Schwalbe, K. (2006). *Information technology project management* (4th ed.). Boston: Thompson Course Technology.

Shenhar, A.J. & Dvir, D. (2007). Project management research-the challenge and opportunity. *Project Management Journal*, 38(2), 93-99.

Shore, B. (2005). Failure rates in global IS projects and the leadership challenge. *Journal of Global Information Technology Management*, 8(3), 1-5

Smith, D. (2005). *PMP certification: Ensuring project success.* Retrieved December 8, 2009 from http://www.certmag.com/print.php?in=1281

Standing, C., Guilfoyle, A., Lin, C., & Love, P. (2006). The attribution of success and failure in IT projects. *Industrial Management & Data Systems*, 106(8), 1148-1165.

Standish Group. (2003). *CHAOS chronicles version 3.0*, West Yarmouth, MA: The Standish Group International.

Standish Group. (2005). *CHAOS*, West Yarmouth, MA: The Standish Group International.

Standish Group. (2008). *The trends in IT value.* Boston: The Standish Group International.

Stanleigh, M. (2005). *The impact of implementing a project management office – report on the results of the on-line survey.* Toronto, Ontario, Canada: Business Improvement Architects.

Stanleigh, M. (2006). From crisis to control: New standards for project management. *Ivey Business Journal Online*, 1-4.

www.manaraa.com

Stewart, J.S. (2004), Promoting project management maturity with an enterprise project management methodology. *Proceedings of the 2004 PMI North America Global Congress.*

Stewart, J.S. (2006), Cross culture project management. *Proceedings of the 2006 PMI North America Global Congress.*

Stewart, J.S. (2008), Project management collaboration tools. *Proceedings of the 2008 PMI North America Global Congress.*

Stewart, J.S. & Kingsberry, D. (2003), Implementing a global program management office. *Proceedings of the 2003 PMI North America Global Congress.*

Suardi, L. (2004). How to manage your software product lifecycle with MAUI. *Communications of the ACM,* 47(3), 89-94.

Survey Software Packages. (n.d.). Sample size calculator page. Retrieved September 1, 2008, from http://www.surveysystem.com/sscalc.htm

Sumner, M., Bock, D., & Giamartino, G. (2006). Exploring the linkage between the characters of IT project leaders and project success. *Information Systems Management,* 23(4), 43-49.

Tether, B.S. (2005). Do services innovate (differently)? Insights from the European innobarometer survey. *Industry Innovation, 1*2(2):153–84.

Thamhain, H.J. (2004). Team leadership effectiveness in technology-based project environments. *Project Management Journal*, *35*(4), 35-46.

Thomas, G. & Fernandez, W. (2008). Success in IT projects: A matter of definition? *International Journal of Project Management*, 26(7), 733-742.

Thomas, J. & Mullaly, M. (2008). *Researching the Value of Project Management.* Newton Square, PA: Project Management Institute.

Trompenaars, F. (1997). *Riding the waves of culture: Understanding diversity in global business* (2nd ed.). Burr Ridge, Illinois: Irwin Professional Publishing.

Turban, E., King, D., Viehland, D., & Lee, J. (2006). *Electronic Commerce: A Managerial Perspective 2006*. (4th ed.) Upper Saddle River, NJ: Pearson Prentice Hall.

Van de Ven,A.H. & Garud, R. (1994). *The coevolution of technical and institutional events in the development of an innovation*. In: Baum JAC, Singh JV, editors. Evolutionary dynamics of organizations. New York: Oxford University Press.

www.manaraa.com

Verma, V. K. (1998). *Project management handbook*. (edited by J. K. Pinto). San Francisco: Jossey-Bass.

Verner, J., & Evanco, W. (2005). In-house software development: What project management practices lead to success? *IEEE Software*, 22(1), 86-93.

Ward, J., & Peppard, J. (2002). *Strategic planning for information systems* (3rd ed.). New York: John Wiley & Sons.

Wang, A. J. (2006). IT education in the flattening world. *Proceedings of the 7th Conference on Information Technology Education*, 99–104.

Wells Jr., W. (1999). From the Editor. *Project Management Journal*, 30(1), 4.

Wheatley, M. (2007). Maturity matters. *PM Network*, 21(7), 48-53.

Woerner, B. & Aziz, L. (2006), Growing up … the information technology Program Management Office (PMO)'s journey from infancy to maturity. *Proceedings of the 2006 PMI North America Global Congress.*

Yazici, H.J. (2009), The role of project management and organizational culture in perceived performance. *Project Management Journal*, 40(3), 14-33.

www.manaraa.com

APPENDIX A. PROJECT MANAGEMENT INSTITURE MEMBERS

QUESTIONNAIRE

Background

1. Are you a certified Project Management Professional (PMP) by the Project Management Institute (PMI)?
    - Yes
    - No
2. What is the highest level of education you have completed?
    - Some High School
    - High School
    - Bachelors
    - Masters
    - PhD
    - Other Doctorate (ex-DBA)
3. Which of the following best describes the end product in the project about which you are responding?
    - Enterprise Resource Planning (ERP) implementation
    - Web development
    - Application system development
    - Infrastructure design and development
    - Other (please be sure this is a specific project and not ongoing operations)
4. 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 coordinator
    - Project team member (technical)
    - Project team member (administrative)
    - Member of business unit affected by the project
    - Project sponsor
5. This project was primarily to serve the needs of an :
    - Internal customer
    - External customer
    - Both
6. Average size of project I work with (in US dollars):
    - < $100,000
    - $1000,000 - $1 million
    - $1 million - $10 million
    - $10 million - $50 million
    - > $50 million
7. Approximate team size of the project (ongoing team):

www.manaraa.com

- < 5
- 5 – 10
- 11 – 20
- 21 – 50
- 51 - 100
- > 100

8. Approximate team size of the project (peak team size):
   - < 5
   - 5 – 10
   - 11 – 20
   - 21 – 50
   - 51 - 100
   - > 100
9. Industry of primary end user of the project:
   - Computers/Information Technology
   - Construction
   - Education
   - Engineering
   - Government
   - Healthcare related (Biology, Hospital, Pharmaceutical)
   - Manufacturing
   - Software development
   - Telecommunications
   - Other
10. Years of full-time work experience:
    - < 2
    - 2 – 5
    - 6 -10
    - 11- 20
    - > 20
11. Total time (in years) you have spent working on IT projects:
    - < 2
    - 2 – 5
    - 6 -10
    - 11- 20
    - > 20

www.manaraa.com

Project Performance	1 - Strongly Disagree 2 – Disagree 3 – Slightly Disagree 4 – Neutral 5 – Slightly Agree 6 - Agree 7 - Strongly Agree N/A – Not Applicable							
12. This project was completed on schedule	1	2	3	4	5	6	7	N/A
13. This project was completed within budget	1	2	3	4	5	6	7	N/A
14. The end product/service that was developed works	1	2	3	4	5	6	7	N/A
15. The end product /service is used by its intended client/users	1	2	3	4	5	6	7	N/A
16. The end product/service has directly benefited the client users through increased efficiency	1	2	3	4	5	6	7	N/A
17. The end product/service has directly benefited the client users through increased employee effectiveness	1	2	3	4	5	6	7	N/A
18. 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
19. I was satisfied with the process by which this project was carried out	1	2	3	4	5	6	7	N/A
20. I was 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
21. Use of this end product/service led directly to improved performance for the client/users	1	2	3	4	5	6	7	N/A
22. Use of this end product/service led directly to improved decision making for client/users	1	2	3	4	5	6	7	N/A
23. The end product/service had a positive impact on those who made use of it	1	2	3	4	5	6	7	N/A
24. The results of this project offered a definite improvement in performance over the way client/users used to perform these activities	1	2	3	4	5	6	7	N/A
25. All things considered this project was a success	1	2	3	4	5	6	7	N/A

www.manaraa.com

PMO Information

26. Indicate the best description of the overall level of PMO functions and services in the organization that conducted the reported project
    - 1 – No formal PMO and no one performs any PMO functions
    - 2 – No formal PMO, but there are plans to implement a PMO in the future
    - 3 – PMO functions are performed on a part time basis, but no formal PMO has been established
    - 4 – PMO functions are performed by dedicated employees, but no formal PMO exists
    - 5 – A formal PMO exists

If 1 or 2 is s selected in question 26, the respondent will be taken to the Environmental Factors section. If 3 or 4 are selected in question 26, the respondent will be taken to question 34.

27. To what management level does the PMO report?
    - Top/upper management
    - Middle/departmental management
28. What is the title (level) of the person in charge of the PMO?
    - Vice President
    - Director
    - Manager
    - Non-Management
29. What is the approximate actual funding level (in US dollars) for the PMO?
    - < $100,000
    - $1000,000 - $500,000
    - $500, 000 - $1 million
    - > $1 million
30. What is the annual budget (in US dollars) of the organization that the PMO Is designed to serve?
    - < $100,000
    - $1000,000 - $500,000
    - $500, 000 - $1 million
    - $1 million - $1 million
    - $10 million - $100 million
    - $100 million - $1 billion
    - > $1 billion
31. How many years ago was the PMO officially established?
    - < 2
    - 3 – 5
    - 5 – 10
    - 11 – 20
    - > 20
32. What management level approved its establishment?
    - Top/upper management

www.manaraa.com

- Middle/departmental management

33. Does the PMO have a mission statement?
    - Yes
    - No

34. What is the number of part time staff (internal members of the organization) performing PMO functions and services?
35. What is the number of full time staff (internal members of the organization) performing PMO functions and services?
36. What is the number of part time staff (outside contractors) performing PMO functions and services?
37. What is the number of full time staff (outside contractors) performing PMO functions and services?

Environmental Factors	1 - Strongly Disagree 2 – Disagree 3 – Slightly Disagree 4 – Neutral 5 – Slightly Agree 6 - Agree 7 - Strongly Agree N/A – Not Applicable							
Project Management Standards and Methods								
38. Assistance was provided in developing project proposal	1	2	3	4	5	6	7	N/A
39. Methods of change requests were available	1	2	3	4	5	6	7	N/A
40. Risk assessment procedures were established	1	2	3	4	5	6	7	N/A
41. Documentation standards (progress/status reports, and time sheets, etc..) were used	1	2	3	4	5	6	7	N/A
42. Project closeout process were used	1	2	3	4	5	6	7	N/A
Project Historical Archives								
43. Information on changes to project plans from prior projects were readily available	1	2	3	4	5	6	7	N/A
44. Risk management documents from prior projects were readily available	1	2	3	4	5	6	7	N/A
45. Variance analysis (plan vs. actual) from prior projects were readily available	1	2	3	4	5	6	7	N/A
46. Information on successful/unsuccessful project was readily available	1	2	3	4	5	6	7	N/A
47. A database of lessons learned was available	1	2	3	4	5	6	7	N/A
Project Administrative Support								

www.manaraa.com

48. Administrative staff meet regularly with project team members to ensure a project binder/website was kept up to date	1	2	3	4	5	6	7	N/A
49. Assistance was provided to help document project results ins standard formats as the project was carried out	1	2	3	4	5	6	7	N/A
50. 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
51. Project management software was standardized in the organization	1	2	3	4	5	6	7	N/A
52. Project management software was made available for use	1	2	3	4	5	6	7	N/A
Human Resource/Staff Assistance								
53. Assistance was received in identifying the proper person to manage the project	1	2	3	4	5	6	7	N/A
54. The project manager received assistance in identifying the proper skill requirements for the project	1	2	3	4	5	6	7	N/A
55. 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
56. Guidelines were received to conduct recruiting for the project staff outside the organization	1	2	3	4	5	6	7	N/A
57. Assistance was received to conduct recruiting for project staff outside the organization	1	2	3	4	5	6	7	N/A
Training								
58. Project team members received assistance in identifying and documenting their existing skill sets	1	2	3	4	5	6	7	N/A
59. 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
60. Project team members received adequate training on relevant project management software packages	1	2	3	4	5	6	7	N/A
61. 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
62. Appropriate one-on-one training/coaching was provided	1	2	3	4	5	6	7	N/A

www.manaraa.com

Consulting and Mentoring								
63. Assistance to ensure the utilization for relevant project management methodologies was provided.	1	2	3	4	5	6	7	N/A
64. 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
65. The project manager received the mentoring on the unique measures that must sometimes be taken to manage a project successfully	1	2	3	4	5	6	7	N/A
66. 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
67. Group sharing sessions were convened in person or electronically for project managers	1	2	3	4	5	6	7	N/A

<Submit Button>

Thank You for Completing the Survey

www.manaraa.com

APPENDIX B. SPSS RESULTS

Table B1

Cronbach Alpha for Pilot Study Project Performance Criteria Reliability Statistics

Cronbach Alpha	N of items
.901	14

Table B2

Cronbach Alpha for pilot Study Performance Criteria Item Statistics

	Mean	Std. Deviation	N
Performance Schedule	5.59	1.873	17
Performance Budget	5.65	1.539	17
Performance Works	6.12	1.453	17
Performance Use	6.65	.606	17
Performance Efficiency	6.00	1.732	17
Performance Effectiveness	5.76	1.921	17
Performance Alternatives	6.29	.772	17
Performance Process	5.88	1.495	17
Performance Accepted	5.12	1.691	17
Performance Improved	6.29	.849	17
Performance Decisions	6.41	.618	17
Performance Impact	6.47	.624	17
Performance Results	6.29	1.213	17
Overall Performance	6.24	1.251	17

www.manaraa.com

Table B3

Cronbach Alpha for Pilot Study Project Environmental Factors

Factor	Mean	Std. Deviation	N	Cronbach Alpha	N of Items
Standard & Methods				.911	5
SM1	5.35	1.967	17		
SM2	5.71	1.687	17		
SM3	5.18	1.944	17		
SM4	6.12	1.409	17		
SM5	5.65	1.539	17		
History Archives				.944	5
HA1	4.71	1.795	17		
HA2	4.29	1.863	17		
HA3	4.00	1.658	17		
HA4	4.35	1.730	17		
HA5	3.18	1.976	17		
Administrative Support				.825	5
AS1	4.59	2.093	17		
AS2	4.88	2.088	17		
AS3	4.59	2.210	17		
AS4	5.00	2.208	17		
AS5	5.53	1.972	17		
Human Resources/Staff Assistance				.948	5
HR1	4.88	1.996	17		
HR2	4.71	1.961	17		
HR3	4.06	2.410	17		
HR4	3.94	2.076	17		
HR5	4.12	2.233	17		

www.manaraa.com

Table B4

Cronbach Alpha for Pilot Study Project Environmental Factors

Factor	Mean	Std. Deviation	N	Cronbach Alpha	N of Items
Training				.913	5
TRN1	4.18	2.351	17		
TRN2	4.47	1.875	17		
TRN3	4.47	2.095	17		
TRN4	4.24	1.954	17		
TRN5	4.35	1.902	17		
Consulting & Mentoring				.894	5
CM1	4.82	2.007	17		
CM2	4.94	1.676	17		
CM3	4.65	2.060	17		
CM4	5.35	1.455	17		
CM5	5.47	1.463	17		

www.manaraa.com

Table B5

Factor Analysis for Pilot Study Performance Criteria Commonalities

	Initial
Performance Schedule	.984
Performance Budget	.894
Performance Works	.999
Performance Use	.886
Performance Efficiency	.901
Performance Effectiveness	.991
Performance Alternatives	.952
Performance Process	.974
Performance Accepted	.967
Performance Improved	.953
Performance Decisions	.760
Performance Impact	.919
Performance Results	.987
Overall Performance	.999

www.manaraa.com

Table B6

Factor Analysis for Pilot Study Project Environmental Factors

Factor	Initial	Final
Standard & Methods		
SM1	.865	.942
SM2	.919	.997
SM3	.685	.750
SM4	.830	.871
SM5	.823	.904
Overall Performance	.798	.893
History Archives		
HA1	.744	.803
HA2	.833	.890
HA3	.856	.903
HA4	.788	.843
HA5	.651	.717
Overall Performance	.113	.132
Administrative Support		
AS1	.954	.999
AS2	.955	.999
AS3	.435	.482
AS4	.769	.857
AS5	.781	.889
Overall Performance	.318	.348
Human Resources/Staff Assistance		
HR1	.847	.903
HR2	.836	.905
HR3	.687	.759
HR4	.981	.999
HR5	.979	.984
Overall Performance	.232	.293

www.manaraa.com

Table B7

Factor Analysis for Pilot Study Project Environmental Factors

Factor	Initial	Final
Training		
TRN1	.462	.508
TRN2	.770	.924
TRN3	.782	.816
TRN4	.956	.977
TRN5	.964	.984
Overall Performance	.560	.711
Consulting & Mentoring		
CM1	.702	.746
CM2	.899	.940
CM3	.841	.943
CM4	.791	.902
CM5	.711	.796
Overall Performance	.662	.771

Table B8

Participants Years of Work Experience

		Frequency	Percent	Valid Percent
Valid	< 2	2	.6	.6
	2 - 5	10	3.2	3.2
	6 - 10	32	10.1	10.1
	11 - 20	98	30.9	30.9
	> 20	175	55.2	55.2
	Total	317	100.0	100.0

www.manaraa.com

Table B9

Participants Years of Work Experience with IT Projects

		Frequency	Percent	Valid Percent
Valid	< 2	3	.9	.9
	2 – 5	24	7.6	7.6
	6 – 10	66	20.8	20.8
	11 - 20	137	43.2	43.2
	> 20	87	27.4	27.4
	Total	317	100.0	100.0

Table B10

Participants Role in the Project

		Frequency	Percent	Valid Percent
Valid	Project manager	239	75.4	75.4
	Support manager on project team	29	9.1	9.1
	Project coordinator	11	3.5	3.5
	Project team member (technical)	18	5.7	5.7
	Project team member (administrative)	5	1.6	1.6
	Member of business unit affected by the project	1	.3	.3
	Project Sponsor	14	4.4	4.4
	Total	317	100.0	100.0

www.manaraa.com

Table B11

End Product of the Project

		Frequency	Percent	Valid Percent
Valid	ERP implementation	52	16.4	16.4
	Web development	27	8.5	8.5
	Application system development	130	41.0	41.0
	Infrastructure design and development	60	18.9	18.9
	Other	48	15.1	15.1
	Total	317	100.0	100.0

Table B12

Customer Type of the Project

		Frequency	Percent	Valid Percent
Valid	Internal	154	48.6	48.6
	External	74	23.3	23.3
	Both	89	28.1	28.1
	Total	317	100.0	100.0

www.manaraa.com

Table B13

Size of Project in Ongoing Team Members

		Frequency	Percent	Valid Percent
Valid	< 5	44	13.9	13.9
	5 - 10	92	29.0	29.0
	11- 20	85	26.8	26.8
	21 - 50	62	19.6	19.6
	51 - 100	16	5.0	5.0
	> 100	18	5.7	5.7
	Total	317	100.0	100.0

Table B14

Size of Project in Team Members at Peak

		Frequency	Percent	Valid Percent
Valid	< 5	17	5.4	5.4
	5 – 10	59	18.6	18.6
	11- 20	85	26.8	26.8
	21 – 50	85	26.8	26.8
	51 – 100	35	11.0	11.0
	> 100	36	11.4	11.4
	Total	317	100.0	100.0

www.manaraa.com

Table B15

PMO Descriptive Information

Demographic	Frequency	Percent	Valid Percent
Level PMO reports to			
Top/upper management	117	36.9	73.6
Middle/departmental management	42	13.2	36.4
PMO Leader Title			
Vice President	32	10.1	20.1
Director	73	23.0	45.9
Manager	49	15.5	30.8
Non-Management	5	1.6	3.1
PMO Funding Level			
< $100,000	21	6.6	13.2
$100,00 - $500,000	54	17.0	34.0
$500,000 - $1 million	27	8.5	17.0
> $1 million	57	18.0	35.8
Organization Budget (US$)			
< $100,000	4	1.3	2.5
$100,00 - $500,000	5	1.6	3.1
$500,000 - $1 million	3	.9	1.9
$1 million - $10 million	26	8.2	16.4
$10 million - $100 million	58	18.3	36.5
$100 million - $1 billion	34	10.7	21.4
> $1 billion	29	9.1	18.2

www.manaraa.com

Table B16

Years the PMO has been Established

		Frequency	Percent	Valid Percent
Valid	< 2	32	10.1	20.1
	2 – 5	64	20.2	40.3
	6 – 10	52	16.4	32.7
	11 - 20	8	2.5	5.0
	> 20	3	.9	1.9
	Total	159	50.2	100.0
Missing	System	158	49.8	
Total		317	100.0	

Table B17

Level PMO was Approved By

		Frequency	Percent	Valid Percent
Valid	Top/upper management	148	46.7	93.1
	Middle/departmental management	11	3.5	6.9
	Total	159	50.2	100.0
Missing	System	158	49.8	
Total		317	100.0	

www.manaraa.com

Table B18

PMO Mission Statement

		Frequency	Percent	Valid Percent
Valid	Yes	116	36.6	73.0
	No	43	13.6	27.0
	Total	159	50.2	100.0
Missing	System	158	49.8	
Total		317	100.0	

www.manaraa.com

Table B19

PMO Internal Part Time Resources

		Frequency	Percent	Valid Percent
Valid	0	138	43.5	52.9
	1	28	8.8	10.7
	2	29	9.1	11.1
	3	17	5.4	6.5
	4	10	3.2	3.8
	5	9	2.8	3.4
	6	5	1.6	1.9
	7	1	.3	.4
	8	3	.9	1.1
	9	1	.3	.4
	10	10	3.2	3.8
	15	2	.6	.8
	20	1	.3	.4
	21	1	.3	.4
	30	2	.6	.8
	50	1	.3	.4
	75	1	.3	.4
	100	1	.3	.4
	1500	1	.3	.4
	Total	261	82.3	100.0
Missing	System	56	17.7	
Total		317	100.0	

www.manaraa.com

Table B20

PMO Internal Full Time Resources

		Frequency	Percent	Valid Percent
Valid	0	30	9.5	11.5
	1	30	9.5	11.5
	2	29	9.1	11.1
	3	27	8.5	10.3
	4	17	5.4	6.5
	5	30	9.5	11.5
	6	12	3.8	4.6
	7	9	2.8	3.4
	8	7	2.2	2.7
	9	2	.6	.8
	10	14	4.4	5.4
	11	2	.6	.8
	12	1	.3	.4
	14	4	1.3	1.5
	15	3	.9	1.1
	16	2	.6	.8
	17	1	.3	.4
	20	11	3.5	4.2
	21	1	.3	.4
	25	8	2.5	3.1
	30	3	.9	1.1
	31	1	.3	.4
	32	1	.3	.4
	40	1	.3	.4
	50	6	1.9	2.3
	56	1	.3	.4
	62	1	.3	.4
	68	1	.3	.4
	80	1	.3	.4
	100	2	.6	.8
	110	1	.3	.4
	400	1	.3	.4
	3000	1	.3	.4
	Total	261	82.3	100.0
Missing	System	56	17.7	
Total		317	100.0	

www.manaraa.com

Table B21

PMO External Part Time Resources

		Frequency	Percent	Valid Percent
Valid	0	209	65.9	80.1
	1	18	5.7	6.9
	2	12	3.8	4.6
	3	10	3.2	3.8
	4	2	.6	.8
	5	5	1.6	1.9
	10	2	.6	.8
	50	1	.3	.4
	450	1	.3	.4
	1200	1	.3	.4
	Total	261	82.3	100.0
Missing	System	56	17.7	
Total		317	100.0	

www.manaraa.com

Table B22

PMO External Full Time Resources

		Frequency	Percent	Valid Percent
Valid	0	179	56.5	68.6
	1	20	6.3	7.7
	2	15	4.7	5.7
	3	9	2.8	3.4
	4	9	2.8	3.4
	5	3	.9	1.1
	6	2	.6	.8
	7	3	.9	1.1
	8	1	.3	.4
	10	6	1.9	2.3
	12	2	.6	.8
	15	3	.9	1.1
	20	3	.9	1.1
	25	1	.3	.4
	50	1	.3	.4
	100	1	.3	.4
	175	1	.3	.4
	800	1	.3	.4
	2000	1	.3	.4
	Total	261	82.3	100.0
Missing	System	56	17.7	
Total		317	100.0	

www.manaraa.com

Table B23

Project Environmental Factors Descriptions

	Description
Standards & Methods	
SM1	Assistance was provided in developing project proposal
SM2	Methods of change requests were available
SM3	Risk assessment procedures were established
SM4	Documentation standards (progress/status reports, and time sheets, etc..) were used
SM5	Project closeout process were used
Historical Archives	
HA1	Information on changes to project plans from prior projects were readily available
HA2	Risk management documents from prior projects were readily available
HA3	Variance analysis (plan vs. actual) from prior projects were readily available
HA4	Information on successful/unsuccessful project was readily available
HA5	A database of lessons learned was available
Administrative Support	
AS1	Administrative staff meet regularly with project team members to ensure a project binder/website was kept up to date
AS2	Assistance was provided to help document project results ins standard formats as the project was carried out
AS3	A project "war room" was made available where participants could store working documents and conduct meetings
AS4	Project management software was standardized in the organization
AS5	Project management software was made available for use
HR/Staff Assistance	
HR1	Assistance was received in identifying the proper person to manage the project
HR2	The project manager received assistance in identifying the proper skill requirements for the project
HR3	The project manager received assistance in gathering data for conducting performance evaluations of project team members
HR4	Guidelines were received to conduct recruiting for the project staff outside the organization
HR5	Assistance was received to conduct recruiting for project staff outside the organization

www.manaraa.com

Table B24

Project Environmental Factors Descriptions

	Description
Training	
TRN1	Project team members received assistance in identifying and documenting their existing skill sets
TRN2	Project team members received introductory training on what project management does and how it fits into an organization
TRN3	Project team members received adequate training on relevant project management software packages
TRN4	Project team members received financial or management support to attend training courses to fill strategic training needs
TRN5	Appropriate one-on-one training/coaching was provided
Consulting & Mentoring	
CM1	Assistance to ensure the utilization for relevant project management methodologies was provided.
CM2	Assistance in choosing solutions to enable the team to resolve unexpected problems in a timely fashion was provided
CM3	The project manager received the mentoring on the unique measures that must sometimes be taken to manage a project successfully
CM4	Upper management received suggestions on the unique measures that must sometimes be taken to ensure successful projects
CM5	Group sharing sessions were convened in person or electronically for project managers

www.manaraa.com