

MODERN VIRTUAL PROJECT MANAGEMENT: THE EFFECTS OF A
CENTRALIZED AND DECENTRALIZED PROJECT MANAGEMENT OFFICE

by

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Of the Requirements for the Degree
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Abstract

One of the many challenges within the project management (PM) community is how to structure the project management organization (PMO) to optimize the value of virtual project managers. Some organizations choose to include the project managers as part of discrete sales or solution teams, with a small corporate group overseeing the PM methodology, training, and other miscellaneous responsibilities. Other businesses and organizations choose to centralize the project managers within the organization. The purpose of this quantitative research is to determine the degree to which a centralized PMO contributes to the success of a virtual project team. Earned Value Management, a standard of the Project Management Institute, is used to measure project success.

Dedication

This dissertation is dedicated to the memory of my father, Archie D. Borden. He always knew that I had the commitment and perseverance to accomplish what I set out to do, but he did not have the opportunity to see the results, and to the honor of my mother who was there to assist me morally and to help me through the varying trials and tribulations.

I would also like to dedicate this effort to my husband, Steve, and my children Paul, Sam, and Tiffany. Each one of my children believes that Mom is just an extension of the laptop. I thank them for being so patient. My husband has stood by my side through the entire effort and has given me the encouragement that was needed. I love each and every one of you.

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I would like to acknowledge the following individuals for all their help and support during the dissertation process. Because of their individual attention and persistence, I now know I have a quality product and am ready to take the next step in my life.

First, I would like to thank my mentor, Dr. Jay Klagge. His guidance through the research design and statistical process was instrumental in assisting me in developing a product that will add to the project management body of knowledge. The expertise and diligence of my committee members, Dr. Frank Toney and Dr. Mitzi Bond, were instrumental in ensuring the dissertation reflected the study's impact on the virtual project manager.

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CHAPTER I

Introduction

Project management provides senior executives insight into "what is happening" and "where things are going" within their organization (Project Management Institute [PMI], 2002, ¶ 1).

The intent of project management (PM) is to ensure that projects are delivered within budget and schedule and that they meet standards of the sponsor. *A guide to the Project Management Book of Knowledge (PMBOK), commonly referred to as the PMBOK (PMI, 2000), defines a project as a temporary situation. The project and its team are brought together to deliver a unique product or service. A project has a definite start and end date. It is not an ongoing operation or an everyday business. The project meets a business need or want that is normally funded and sponsored by an outside company or an internal senior manager.*

The Project Management Institute (PMI) was organized in 1969 and, at present, is the largest accrediting organization for project managers. PMI has fostered, nurtured, and been instrumental in establishing PM as a recognized discipline. Earned Value Management (EVM) is a standard established by PMI to measure project performance (PMI, 2000). EVM is a method to integrate the schedule, cost, and resources of a project (PMI, 2000). Planned Value (PV), Earned Value (EV), and the actual costs are three

independent variables that are related to one another to provide the project's Cost Variance (CV) and Schedule Variance (SV) (PMI, 2000). Planned Value was previously referred to as Budgeted Cost of Work Scheduled (BCWS) and Earned Value was previously referred to as Budgeted Cost of Work Performed (BCWP) (PMI, 2000). Normally, the results of CV and SV are measured in dollars; however, other units such as hours may be used. Cost Performance Index, Schedule Performance Index, Estimate at Completion, and Budget At Completion are other factors that may also be determined from the three independent variables.

Background of Problem

PM, today, is an art that combines the skills and knowledge of the project manager with the tools and techniques within the PM profession to deliver a product within the specifications required of the sponsor (PMI, 2000). PM has been viewed as a means to track and organize a project. Research indicates that for a company to succeed, there must be a view to the future while understanding the company's past (Brown & Eisenhardt, 1997). Brown and Eisenhardt (1997) found that the successful companies are not overly structured but that they allow chaos and flexibility, and promote independent thinking. As Brown and Eisenhardt (1997) suggest, if PM is to survive as a discipline the community must be flexible in incorporating technologies, instituting flexible

environments such as virtual project management, and assessing continually new ways to measure a project's success.

The Project Management Institute (PMI, 2000) has recognized nine management areas for which project managers have responsibility: cost, integration, human resources, procurement, time, quality, risk, communication, and scope.

Statement of Problem

One of the many challenges within the PM community is how and where to structure the Project Management Organization (PMO) to optimize the value of virtual project managers. Some organizations choose to include the project managers as part of discrete sales or solution teams, with a small corporate group overseeing the PM methods, training, and other miscellaneous responsibilities. This would be characteristic of a decentralized PMO (Ormand, Bruner, Birkemo, Hinderliter-Smith, & Veitch, 2000; Hales, 1999; Kerzner, 1998). Other businesses and organizations choose to centralize the project managers in one organization (PMI, 2000). These project managers receive direction and guidance from an overarching centralized PMO.

Cost/Schedule Control Systems Criteria (C/SCSC) was originally developed by the United States Government and introduced in a Department of Defense directive in 1967. It is defined as a means to measure the progress of a project by quantifying and integrating schedule and cost

performance metrics (Grskovich, 1990; Presutti, 1993; Singh, 1991). A part of C/SCSC is earned value that has developed into earned value management. The measurement for project success includes cost variance percent and schedule variance percent.

Cost and schedule variance are metrics advocated by the PMBOK (PMI, 2000) to calibrate a project's status at any one time. These two PM measurements are included on the survey to gauge the health of the project.

Centralized project managers report to a centralized PMO. A centralized PMO is defined as an organization to which project managers report and from which they receive direction, guidance, and oversight. The centralized or projectized PMO is responsible for processes, procedures, systems, and tools (PMI, 2000).

Decentralized project managers report to a decentralized PMO. A decentralized PMO is defined as a corporate group that oversees the PM methodology, training, and other miscellaneous responsibilities, but project managers do not report to this organization directly or in a matrix environment (Ormand, Bruner, Birkemo, Hinderliter-Smith, & Veitch, 2000; Hales, 1999; Kerzner, 1998).

Purpose of the Study

The purpose of this quantitative study is to determine whether a centralized project management organization or a decentralized project management organization provides

better support for the virtual project manager. The support areas tested in the survey are training, standard processes, electronic communication and collaboration technology, leader behavior, and team leader and team member competency. The Duarte and Snyder (2001) survey is used to test these variables. Additionally, the survey contains statements about personal and project demographics.

It is expected that cost and schedule will have a positive effect on a centralized PMO where a virtual project manager has a central organization to provide the necessary tools, training, technical infrastructure, leadership, and competent team members. Earned value management is the metric within the survey that evaluates reported cost and schedule by the project managers. Earned value management has been adopted by PMI as a best-in-class measurement and is defined as a means to measure the progress of a project by quantifying and integrating schedule and cost performance metrics and will be used as the metric to evaluate the relationship between the dependent and independent variables (PMI, 2000; Grskovich, 1990; Presutti, 1993; Singh, 1991).

Significance of the Study

One of the many challenges within the PM community is how to structure the PMO for virtual project managers. The project manager in a decentralized organization, which may

be referred to as a matrix organization, does not have an overarching organization that provides administrative and functional guidance and support, nor a structure for the virtual environment (Ormand, Bruner, Birkemo, Hinderliter-Smith, & Veitch, 2000; Hales, 1999). In the decentralized organization, the project manager may have at least two supervisors. This can create a difficult situation for the project manager. The project manager may decide upon an unpopular, strategic, and tactical direction that moves the project contrary to the functional supervisor's desires. However, the decision may be justifiable for the administrative supervisor and for the company (Kahai, Snyder, & Carr, 2001/2002).

Significance of the Study to Leadership

The PM leaders and senior leadership of a company need empirical evidence to determine the type of PMO that provides the greatest level of nurturing to the virtual project manager to enhance project success. Studies have indicated that one element of a company's survival depends on the flexibility of its infrastructure and its ability to meet changing market demands (Sandkuhl & Fuchs-Kittowski, 1999; Forrester & Drexler, 1999; Brown & Eisenhardt, 1997). To meet the demands of flexibility some companies have used technology to institute virtual project management that theoretically allows instantaneous communication with project team members (Roberts, Kossek, & Ozeki, 1998;

Boudreau, Loch, Robey, & Straud, 1998; Townsend & Demarie, 1998; Duarte & Snyder, 2001).

Research Questions

1. Are there reported differences in the training received by project managers working on virtual projects in a centralized PMO versus a decentralized PMO?

2. Are there reported differences in the use of standardized processes by project managers working on virtual projects in a centralized PMO versus a decentralized PMO?

3. Are there reported differences in levels of electronic communication and collaboration by project managers working on virtual projects in a centralized PMO versus a decentralized PMO?

4. Are there reported differences in leader behaviors perceived by project managers working on virtual projects in a centralized PMO versus a decentralized PMO?

5. Are there reported differences in competence and experience among team leaders and team members working on virtual projects in a centralized PMO versus a decentralized PMO?

6. Are reported differences (in questions one through five) more highly correlated with project managers' personal demographics than they are with the presence of a centralized or decentralized PMO?

7. Are reported differences (in questions one through five) more highly correlated with the size of the virtual project and the project managers' role than they are with the presence of a centralized or decentralized PMO?

8. Which of the preceding factors (in questions one through seven) has the highest degree of correlation with virtual project success measured by cost and schedule variances?

Hypotheses

Hypothesis and Null-hypothesis One - Project Manager Training

H1-0: There will be no reported differences in training received by project managers working on virtual projects in a centralized PMO versus a decentralized PMO.

H1-1: There will be reported differences in training received by project managers working on virtual projects in a centralized PMO versus a decentralized PMO.

Hypothesis and Null-hypothesis Two - Use of Standardized Processes

H2-0: There will be no reported differences in the use of standardized processes by project managers working on virtual projects in a centralized PMO versus a decentralized PMO.

H2-1: There will be reported differences in the use of standardized processes by project managers working on

virtual projects in a centralized PMO versus a decentralized PMO.

Hypothesis and Null-hypothesis Three - Levels of Electronic Communication and Collaboration

H3-0: There will be no reported differences in levels of electronic communication and collaboration by project managers working on virtual projects in a centralized PMO versus a decentralized PMO.

H3-1: There will be reported differences in levels of electronic communication and collaboration by project managers working on virtual projects in a centralized PMO versus a decentralized PMO.

Hypothesis and Null-hypothesis Four - Leader Behaviors

H4-0: There will be no reported differences in leader behaviors perceived by project managers working on virtual projects in a centralized PMO versus and decentralized PMO.

H4-1: There will be reported differences in leader behaviors perceived by project managers working on virtual projects in a centralized PMO versus and decentralized PMO.

Hypothesis and Null-hypothesis Five - Leader and Team Competence and Experience

H5-0: There will be no reported differences in competence and experience among team leaders and team members working on virtual projects in a centralized PMO versus a decentralized PMO.

H5-1: There will be reported differences in competence and experience among team leaders and team members working on virtual projects in a centralized PMO versus a decentralized PMO.

*Hypothesis and Null-hypothesis Six - Project Manager
Personal Demographics*

H6-0: Reported differences will not be more highly correlated with project managers' personal demographics than they are with the presence of a centralized or decentralized PMO.

H6-1: Reported differences will be more highly correlated with project managers' personal demographics than they are with the presence of a centralized or decentralized PMO.

*Hypothesis and Null-hypothesis Seven - Project Size and
Project Manager Role*

H7-0: Reported differences will not be more highly correlated with the size of the virtual project and the project managers' role than they are with the presence of a centralized or decentralized PMO.

H7-1: Reported differences will be more highly correlated with the size of the project and the project managers' role than they are with the presence of a centralized or decentralized PMO.

Hypothesis and Null-Hypothesis Eight - Project Success

H8-0: Project success will not be highly correlated with any of the preceding factors or with the presence of a centralized or decentralized PMO.

H8-1: Project success will be more highly correlated with some of the preceding factors or with the presence of a centralized or decentralized PMO.

Assumptions

The three assumptions for this study are as follows:

1. Participants will answer the survey truthfully.
2. Project managers with a current project management professional (PMP) certification are considered to understand the PMI principles of project management and can implement them adequately.
3. Project managers who are members of PM societies are more likely to respond to a survey using an electronic means of distribution and response. The PM societies send electronic surveys to membership on a regular basis.

Limitations

The three limitations for this study are as follows:

1. The researcher has a bias and preference towards technology and virtual teams and prefers to conduct business in this type of environment, and has done so for the past six years.
2. There is a lack of access to actual project

financial and schedule data. The reliability of the data will be limited to the honesty and memory of the survey respondents.

3. The researcher acknowledges that new terminology for Earned Value Management was created by PMI (PMI, 2000). However, many project management software tools still use the older terminology, and the newer terminology is not as well known; therefore, the older terminology will be used on the survey and within this document.

Delimitations

The researcher will email (Adria, 2000) the survey and incorporate the survey in the PM societies' newsletters and websites. Only project managers that respond and have been involved in a virtual project within the last twelve months will be considered for the study.

Definitions

For the purposes of this study the following terms are defined:

1. Virtual projects: These projects consist of more than 50% of the project team members not being resident in the same physical location, but are not necessarily dispersed over different time zones. Team members depend on technology to communicate, rarely or never meet face-to-face more than once every two weeks as a project team, and they make decisions about the project (Kelley, 2001; Townsend & DeMarie, 1998; Maznevski & Chudoba, 2000). It is

not unusual for one or two of the team members to rely on technology, however, it is more exceptional to have most members using technology to communicate with each other, the customer, and the project manager in order to accomplish objectives (Reinsch, 1999).

2. Centralized Project Management Organization: The organizational structure is designed such that the project managers, project coordinators, and other personnel performing project activities report to an administrative chain of command within the PMO. The project personnel are assigned to projects by the administrative chain of command. The centralized PMO is responsible for PM training, PM organizational processes, and technology used and implemented for project managers (Milosevic, Inman, & Ozbay, 2001; Toney, 2002). In addition, this organization is responsible for evaluating the project personnel's performance and compensation (Milosevic, Inman, & Ozbay, 2001; Toney, 2002).

3. Decentralized Project Management Organization: This small corporate or business unit organization is responsible for maintaining PM methods and/or training, and best practices. This type of PMO does not have a central decision-making authority. Authority may be delegated or collaborative, depending on the project (Ormand, Bruner, Birkemo, Hinderliter-Smith, & Veitch, 2000; Hales, 1999; Kerzner, 1998). Wren (1972) describes the decentralized organization as a matrix or project organization.

Therefore, a definition for the decentralized PMO is "an organizational structure in which the project manager shares responsibility with the functional managers for assigning priorities and for directing the work of individuals assigned to the project" (PMI, 2000, p. 203). The decentralized PMO may also be any organization responsible for PM functions.

4. Project Manager: The project manager is the "individual responsible for managing a project" (PMI, 2000, p. 205).

5. Project: A project is "a temporary endeavor undertaken to create a unique product, service, or result" (PMI, 2000, p. 204).

6. C/SCSC: A method "effectively integrating cost, schedule and technical performance management" (Abba, 1995, ¶ 1) on research and development projects, it was later extended to other types of projects (Frame, 1995, p. 206).

7. Earned Value: This is "the physical work accomplished plus the authorized budget for this work. The sum of the approved cost estimates for activities completed during a given period [sic]" (PMI, 2000, p. 201).

8. Earned Value Management: This is "a method for integrating scope, schedule, and resources, and for measuring project performance. It compares the amount of work that was planned with what was actually earned with what was actually spent to determine if cost and schedule performance are as planned" (PMI, 2000, p. 201).

9. Cost Variance Percent: The cost variance divided by one hundred equals the percent. Cost variance is "any difference between the budgeted cost of an activity and the actual cost of that activity" (PMI, 2000, p. 200).

10. Schedule Variance Percent: A schedule variance divided by one hundred equals the percent. Schedule variance is "any difference between the scheduled completion of an activity and the actual completion of that activity" (PMI, 2000, p. 208).

Summary

The PM discipline is still evolving (PMI, 2000) and is being affected by the rapid technology changes. This study will provide readers, PM leaders and senior leadership of a company empirical evidence to determine the type of PMO that provides the greatest level of nurturing to the virtual project manager to enhance project success.

Chapter II provides a literature review and history and trends of PM in decentralized and centralized organizations, virtual teams, and organizations. The review also contains the survey instrument areas: cost and schedule, training, organizational processes, technology, leadership, and member competence.

CHAPTER II

Literature Review

The purpose of this quantitative research study is to determine if a centralized or decentralized project management organization provides better support for a virtual project and contributes more to the success of the project. This research is being measured using a validated survey for virtual teams (Duarte & Snyder, 2001), which examines project management demographic data, including the practice of earned value management and the background of the project manager. To ensure a common understanding of the main ideas of this study, definitions are provided. The main concepts being reviewed at a macro and micro level include PM, teams, virtual projects, centralized organization, decentralized organization and leadership.

To assist in understanding the high level objectives and to map the variables to the literature review, the table below is provided.

Table 1

Literature Review Relationship Key

<i>Micro-Level</i>	<i>Macro-Level</i>
Virtual Project Management	History of Modern Project Management, Teams, Virtual Project Management, Modern and Postmodern Theories of Leadership And Project Management
Organization Type	Teams, Centralized Organizations, Decentralized Organizations
Training & Development	Leadership, Teams, Virtual Projects
Organizational Processes	Virtual projects
Electronic Communications & Collaborative Technologies	History of Modern Project Management, Teams, Virtual Projects
Leadership	Leadership, Modern and Postmodern Theories of Leadership and Project Management, Virtual Projects
Competence	Teams, Virtual environment, Centralized Organizations, Decentralized Organizations, Leadership

History of Modern Project Management

Documentation of Ancient engineering and architectural feats may have included project management principles. The Bible provides a detailed account of King Solomon building the Temple and his palace (1 Kings 5:1 - 7:51, King James Version), which were built around 966 B.C. The details include a list of supplies, dimensions, description of the exterior and interior, where the provisions came from, and a listing of resources. Additionally, the order in which the construction took place is also listed. The timeframe to build the temple was seven years, while the palace took thirteen years. Solomon declares, "I purpose to build an house unto the name of the Lord my God" (1 Kings 5:5, King James Version). The temple was built to glorify and thank God (1 Kings 5:5, King James Version).

The Egyptians, prior to Solomon, built great architectural structures, the Pyramids. The Egyptian Pyramids date from 2686-2125 B.C. Brier (2002) describes how the burial sites were constructed. The Egyptians appear to have used some project management concepts, including the management of resources, scope and quality, and integration management (Brier, 2002). These structures were built as a burial site that would assist the deceased to transition to the after life, as is the belief of the ancient Egyptians (Brier, 2002).

There is also evidence of project management principles in past East Asian cultures. Pheng and Lee (1997) provide comparisons of Zhuge Liang's book *Art of Management* and western project management practices. Liang's book was written approximately 1600 years ago in China. Liang was a Taoist. The Taoists believe that there is no absolute wrong or right. Pheng and Lee (1997) forwarded Liang's military concepts to project management concepts. Liang's thoughts about management include the following:

- organizations have to be organized and managed;
- organizations and war require strategies and tactics;
- the leadership of an army and organization has an important influence in shaping success;
- they both need high quality and committed people;
- they both thrive on information (Pheng & Lee, 1997, ¶ 2).

The PMBOK (PMI, 2000), as well as Toney (2002a), discuss the importance of the above qualities being necessary on a project.

The Inka Empire, 15th-16th A.D., exhibited project management skills in its road systems (Hyslop, 1984). The road system was characterized by being very straight, even with major obstacles and having several different types of buildings at junctures (Hyslop, 1984). Some of the buildings were military, religious, or political in nature.

There is also evidence that lodging existed for those that traveled the Inka road system, and lodging was within a day's travel or less (Hyslop, 1984). The speculation is that the road systems met a need of the Inka elite which was to meet communication and military needs (Hyslop, 1984). One may extrapolate that the Inka Empire may have used relatively advanced engineering principles for the road systems that in turn would have required some aspects of project management. The Inka's project management may have included resource, integration, and milestone management, but not included cost and schedule management.

Evidence of project management throughout the ages was documented by those in power. King Solomon, the Pharaohs, and the Inka Empire leaders were extremely wealthy and powerful (Brier, 2002; 1 Kings 5, King James Version; Hyslop, 1984) and did not demonstrate concern for cost and schedule. The PMBOK (PMI, 2000, p. 4) states that a project assists an organization to realize its business approach which normally includes meeting organizational strategies and project goal achievement, including budgets and timeframes (Toney, 2002a). The pyramids, the temples, and the many buildings in the Bible are to glorify God or the person in-charge of construction (Brier, 2002; 1 Kings 5, King James Version), with no regard to adhering to a schedule and budget.

These ancient projects' characteristics are different from modern project management. The PMBOK defines the work of project management as the following:

- Include competing demands for scope, time, cost, risk, and quality
- Resolves stakeholders with differing needs and expectations
- Specifies identified requirements (PMI, 2000).

The ancient architectural and engineering feats did not appear to have to compete with differing demands in the areas of scope, time, cost, risk, or quality. Solomon and Pharaoh were all-powerful during the construction, so they dictated the demands (Brier, 2002; 1 Kings 5). Also, the rulers were the stakeholders, and therefore, there were no "differing needs and expectations" (PMI, 2000, p. 6).

The beginnings of modern PM have been recognized as the late 1950s and early 1960s (Simpson, 1970) with the development of the Project Evaluation and Review Technique (PERT). PERT, a critical path method analysis, was developed for the Polaris submarine program. The program was so large that a computer-based system to track the development of the program had to be developed. The U.S. aerospace industry, the U.S. Department of Defense, and large U.S. construction companies drove the PM discipline during this era. The focus appeared to be on improving profitability while developing new technology (Simpson, 1970; Thomas, 2000).

PM techniques such as PERT, Critical Path Method (CPM), and Earned Value Management (EVM) are included in many computer tools, and most industries apply some forms of PM tools to their projects (Leifer, O'Connor, & Rice, 2001; Cascio, 2000; Toney, 2002a). Modern project management is defined as work on a project that competes for resources, scope, cost, and schedule (PMI, 2000) and in addition, uses modern metric techniques such as PERT, CPM and EVM (PMI, 2000; Leifer, O'Connor, & Rice, 2001), and technology to enhance communication speed and methodology practice (Toney, 2002a). Others further define PM to include planning, organizing, directing, and controlling events and company resources to achieve goals of the project's interested parties (Shtub, Bard, and Globerson, 1994; Lewis, 1998; Schwalbe, 2000).

Depending on the company's culture, the project manager's role can be vastly different. In a company culture that promotes project management, there may be several levels of project managers. Toney's (2002a, pp. 284-285) benchmark of a best-in-class project management organization has four different positions with increasing responsibility and knowledge. The levels are differentiated by education, skill, experience, and other factors that a PMO should evaluate when classifying project management talent.

The project manager may be given overall authority to achieve project objectives or may be relegated to a role of

monitoring tasks (Butler, 1973; Kerzner, 1998; Wilemon & Cicero, 1970; Kerzner, 2000; Frame, 1995). Within these two extremes, the project manager needs to understand the functional and organizational structure of the company, how to negotiate within the structure, and how to overcome the lack of clearly defined authority (Hodgetts, 1968; Goodman, 1967; Kerzner, 2000). Also, within these two extremes, the quality of the project management leadership can range from excellent to extremely bad (Toney, 2001).

Leifer, O'Connor, and Rice's (2001) studies find that within technology companies, the successful project manager is a communicator and a negotiator. The studies demonstrate that the successful project manager of leading edge technology products is able to identify "influential advisors" (2001) and potential customers to advocate the need of the radical technology changes. An earlier study by Dunne and Stahl (1978) supports the theory that formal authority is not as significant for the project manager and the project team to be successful. The influence of the project manager appears to exist "by virtue of his responsibility" (Dunne and Stahl, 1978, p. 139).

The project manager is viewed as an important decision-maker on a project. However, within this role, the project manager may fall victim to the concept of bounded rationality, biases, and heuristics (McCray, Purvis, & McCray, 2001). By understanding these shortcomings, the

project manager may be able to use them to his/her benefit by seeking additional input (McCray et al., 2001).

Earned Value has continued to be an important measurement and statusing tool for project managers, developed from the Cost/Schedule Control Systems Criteria (C/SCSC). In 1967, the U.S. Department of Defense adopted C/SCSC. This system is intended to help control major research and development projects by "effectively integrating cost, schedule and technical performance management" (Abba, 1995, ¶ 1). The U.S. military was spending millions of dollars on complex weapon systems, and at the end of a project phase had nothing of substance. In the early 1960s, it was realized that something had to change (Urli, 2000).

The U.S. Air Force has established a set of 35 criteria that constitutes an acceptable management system (Grskovich, 1990; Presutti, 1993). The criteria have evolved into the C/SCSC which has now become the Earned Value system. Earned Value has continued to be an integral part of PM tools, and the concept is at the foundation of training for new project managers. EV continues to be a part of government regulations overseeing projects. The agencies that include Earned Value Management are the U.S. Department of Defense, NASA, the U.S. Postal Service and the U.S. Department of Energy (Shtub, Bard, & Globerson, 1994, p. 483; Kerzner, 1978). PMI includes Earned Value as

the core means for understanding the status of the project (PMI, 2000). Evidence exists that EV is not the best method to use for statusing projects. Evidence suggests customer satisfaction, milestone tracking, tying deliverables to milestones, and critical path monitoring are just as effective as EV (Toney, 2002a; Toney, 2002b).

Toney's (2002b) benchmarking data suggests that only 46% of the 117 companies reviewed used Earned Value. Many of the companies viewed EV metrics as being complicated, an administrative burden, and difficult to interpret the schedule in terms of dollars (Toney, 2002b, p. 218). Milestone reporting and a percentage complete method are used in lieu of EV in many of these organizations (Toney, 2002a,b).

Technology and globalization have altered the traditional PM environment (Montoya-Weiss, Massey, & Song, 2001; Townsend & DeMarie, 1998). Technology has allowed many projects to shift away from the traditional office setting. Technology allows and even encourages businesses to conduct PM in a virtual environment (Leifer, O'Connor, & Rice, 2001; Dess & Rasheed, 1995).

Studies indicate that project managers leading virtual project teams need to be comfortable with technology (Duarte & Snyder, 2001; Reinsch, 1999). The project manager must be able to use the technology as a tool rather than letting the technology dictate his/her style. Many allow

technology to drive how the business or project is established rather than viewing technology as a tool.

The project manager may also be responsible, as a leader, to ensure that the technology is supportive of the team dynamics. The project manager must be able to manipulate or work around the systems in order to improve dynamics within the virtual team environment.

Guss (1998, ¶7) defines a virtual project as follows:

A temporary group of trained people separated by geographic, temporal or psychological distance, who work across organizational forms, depend on face-to-face and remote communication with the intent of satisfying business requirements of sharing skills and working toward common team and client goals.

Guss (1998) further states that virtual project teams might work with support personnel in a more traditional office environment, but that the project team is still a virtual team. No longer does geography dictate business opportunity (Guss, 1998).

Teams

A common theme throughout the research is that a team is not simply a group of individuals. A common goal, purpose, and interdependence are characteristic of a team (Axelrod, 2002; Frame, 1995; Kerzner, 1998; Katzenbach & Smith, 1994). A successful team relies on each member to achieve the common goal.

Within business, team members are normally assigned by management. Axelrod (2002) points out that within business,

it is perceived that the team members did not have a choice. However, Axelrod (2002) states that the team member has three choices:

1. Participate willingly,
2. Sabotage the team, or
3. Leave while staying in place.

When team members choose to belong to the team, they normally perform the work with care.

A traditional work team as described by Katzenbach and Smith (1994) is "a small number of people with complementary skills who are committed to a common purpose, performance goals, and approach for which they hold themselves mutually accountable" (§ 14). This is distinguished from a working group. The working group makes "its contribution through the aggregate, independent, and discrete contributions of its individual members as individuals" (1994, § 15).

Katzenbach and Smith (1993) state that a business team fails because the team is a working group versus a team. The working group does not have a common purpose, nor is it self-defining. The senior ranking individual, not necessarily the true leader of the team, likely leads a working group. A working group has self-interests and has to report progress and issues to a supervisor.

Research by Sethi, Smith, and Park (2001) contradicts the findings of Katzenbach and Smith. The research indicates a positive correlation between senior management

oversight and cross-functional teams that are successful in new product development (Sethi et al., 2001). Holland, Gaston, and Gomes' (2000) qualitative research supports Sethi et al. (2001). Both studies state that senior management oversight is productive for cross-functional teams, as long as risk-taking is encouraged.

Robertson and Tippet (2002) research studies on various government, government contractors, and private industry project teams conclude that team health is important to team success. A team's perception that senior management provides support as necessary is one of the 28 attributes for a successful team. A major conclusion is that successful project teams can be attributed to longevity and team training. The authors' (2002) recommendation is that a team receive appropriate training and maintain team cohesion from project to project.

Yetton, Martin, Sharma, and Johnston (2002) research studies on New Zealand and United Kingdom Information Systems (IS) project teams had similar conclusions as Robertson & Tippet (2002), Sethi et al. (2001), and Holland et al. (2000). An IS project team more often succeeds when the team works cohesively and has team experience, when senior management provides support and oversight, and when an end user or a client is involved as an integral and essential team member.

Non-traditional work teams or cross-functional teams go across an organization's boundary. A cross-functional

team may have representatives from manufacturing, engineering, sales, product development and other entities to resolve a design issue (Ghosn, 2002; Sethi, Smith, & Park, 2001; Holland, Gaston, & Gomes, 2000; Denison & Hart, 1996). Forrester and Drexler (1999) found that teams work better when certain organizational traits are present when:

- Processes overlap functional organizations;
- Speed is important;
- The organization is complex and needs to rapidly respond to market conditions;
- Innovation and learning are key components of the organization; and
- Tasks to be completed require technology to communicate (Forrester & Drexler, 1999).

The above traits can be extrapolated to the virtual project. The need for a virtual project based environment will enhance project success.

Roberts, Kossek, and Ozeki (1998) describe the aspatial manager as a manager who moves to many countries during his/her career or a manager who lives in one geographical location but travels. This new style manager understands cross-cultural differences and can use the different cultures together to form a successful virtual team.

Duarte and Snyder (2001), through their research, identify seven types of virtual teams, but for the purposes

of this study only networked and project teams will be described:

- Networked teams
- Parallel teams
- Project or product-development teams
- Work or production teams
- Service teams
- Management teams
- Action teams (p. 5)

The networked teams and project teams are very similar in nature. Both teams cross geographic and organizational boundaries and time, and both have a common purpose. A project team maintains cohesiveness for a set period of time, whereas a networked team has no defined time and tasks are normally routine operations. A project team's tasks are non-routine (Duarte & Snyder, 2001, pp. 5-6).

A virtual team has added complexity, and several success factors must be present to be successful (Duarte & Snyder, 2001). A virtual team has the added complexity of technology and crossing time, organizational, and geographical boundaries. Duarte and Snyder's (2001) studies indicate that the fluidity of the virtual team made collaboration difficult since workflows may differ, cultures may clash, goals may be different, and technologies may be incompatible.

"...virtual teams entail much more than technology and computers" (Duarte & Snyder, 2001, p. 9). They include

seven factors for success, and technology is only one of the factors. The other six are as follows:

1. Human resource policies
2. Training and on-the-job education and development
3. Standard organizational and team processes
4. Organizational culture
5. Leadership support of virtual teams
6. Team-leader and team-member competencies (Duarte & Snyder, 2001, pp. 12-13).

Modern Virtual Projects

Modern Virtual Projects are when more than 50% of the project team members are not resident in the same physical location, but are not necessarily dispersed over different time zones. The team depends on technology to communicate, rarely or never meets face-to-face more than once every two weeks as a project team, and team members themselves make decisions about the project (Kelley, 2001; Townsend & DeMarie, 1998; Maznevski & Chudoba, 2000). It is not unusual for one or two of the team members to rely on technology; however, it is more exceptional to have most members using technology to communicate with each other, the customer, and the project manager in order to accomplish objectives (Reinsch, 1999).

The beginnings of an early virtual organization is seen with Moses in the Bible and the Roman and British Empires. In the Bible, Jethro chides Moses for not

delegating day-to-day responsibilities to responsible men (Exodus 18:17-23, King James Version; Shafritz & Ott, 1996, p. 29). Moses heeds the advice of his father-in-law and chooses "able men out of all Israel, and made them heads over the people..." (Exodus 18:25, King James Version). Moses delegates his power to a few to enforce and keep the law of the land. This became known as the "management of exception" (Shafritz & Ott, 1996, p. 29).

This concept (Shafritz & Ott, 1996) continues in history from the time of the rule of Caesar to the period of the British Empire. Communication is extended virtually through the placement of rulers in outlying lands and their use of human messengers. However, modern virtual organizations use technology to have almost instantaneous communication.

Hage and Powers (1992) believe that "another epoch is now in the making," and Jacques (1996) also echoes the sentiment that "present-day organizations may be in the midst of transformational change." Jacques (1996) also comments that viewing problems in the same manner might also be a dilemma. The study suggests that business organizations are being altered due to technology. Networking technology, which includes information and communication, has created a new manner in which businesses communicate (Townsend & DeMarie, 1998; Townsend, DeMarie, & Hendrickson, 1998). The sophistication of technology is allowing companies to establish project management

organizations that mirror traditional office PMOs (Toney, 2002a).

Reinsch's (1999) studies of telecommuting programs or virtual programs indicate that a strong and stable relationship with a supervisor greatly increases the success of the telecommuting environment. Within a virtual PM environment, this stability is not the norm. Most projects consist of a team of individuals who may or may not know each other, and who are assigned to a project in a matrix management relationship.

Maznevski and Chudoba (2000) suggest that leaders of effective virtual teams require face-to-face meetings initially to build camaraderie among members of the team. Jarvenpaa and Leidner (1999) also suggest that face-to-face meetings should occur periodically for effective virtual team leadership. Hinds and Bailey's (2000) studies support the finding that face-to-face meetings enhance the success of virtual teams. Trust is essential to the virtual environment's success, and the face-to-face meetings increase the trust among the participants (Maznevski & Chudoba, 2000; Jarvenpaa & Leidner, 1999)

Training and learning are major factors in the virtual environment's success (Townsend & DeMarie, 1998; Duarte & Snyder, 2000). A virtual team appears to be more successful when training is conducted on communication skills and communication technology (Townsend & DeMarie, 1998). Townsend & DeMarie's (1998) studies indicate that

technology training should occur more often for virtual teams than for traditional teams since technology is the mainstay for communication and is evolving at a fast pace. Duarte and Snyder (2001) find that a successful virtual project team distributes "learnings within the team and beyond to the wider organization" (p. 127).

As a result of their study, Roberts, Kossek, and Ozeki (1998) find that executives dealing with virtual projects have three common issues: ensuring the correct skills are in the correct region/area when needed (§ 13), disseminating innovative and "state of the art knowledge and practices" (§ 14), and identifying the talent throughout the organization (§ 15). English is the business language for all the companies within the study. However, this did hinder the virtual organization because of the different English grammar, English not being a native language, and the nuances of the various English versions.

Roberts et al. (1998) also find that leaders in the eight companies are least adept at developing virtual solutions for teams. NASA was the most progressive institution with virtual solutions. In fact, virtual reality is used to train astronauts residing in countries other than the United States (Roberts et al., 1998).

An organization may institute change by implementing a double loop method of learning (Bergquist, 1993, p. 81), which could be advantageous in a virtual environment. This method takes advantage of the company's and employee's

knowledge and incorporates it back into the organization's processes and procedures. This method also can provide a catalyst for a streamlined, efficient, and ever-evolving organization that meets the demands of geographically dispersed clients, employees, and the company.

Boudreau, Loch, Robey, and Straud (1998) note that a virtual organization augments its chances of success by using a "federation concept" (¶ 13). The federation concept is described by Boudreau et al. (1998) as partnerships, joint ventures, consortia, and other creative alliances that change over time and with the needs of the virtual organization. This federation may include alliances with other organizations within the company or outside partners that may be required for success (Boudreau et al., 1998). This type of federation has been successful for the B-1 Bomber project, which had over 2000 corporations working together. Other successful corporations who employ the federation concept include Sun Microsystems, Nike, and Reebok (Boudreau et al., 1998).

The seamless integration of the technology within the organization and among the federation members (Boudreau et al., 1998) allows local projects to have the support of a worldwide virtual organization, and the client does not realize that the product is a result of several companies or organizations. A well-run virtual organization should be able to function with very little regard to geographical distance and time barriers. According to Boudreau et al.

(1998), a well-run federated virtual environment must be technologically seamless, responsive to local needs, and have the centralization necessary for efficiency.

Additionally, a federated virtual organization must be flexible and responsive to the needs of the environment (Boudreau, Loch, Robey, & Straud, 1998). Partnerships and alliances will disband as needed, and new alliances will be established depending on the needs of the project and/or organization.

Centralized Organizations

Centralized organizations are characterized as being central authorities with decision-making powers (Zabojnik, 2002). Zabojnik's (2002) research states that centralized decision making is more costly than previously estimated. He determines, mathematically, that a worker who is delegated a task that he/she does not agree with must be compensated more for reward and cannot be penalized for failure. He further recommends that a subordinate, although perhaps less informed, should make the decision on how to proceed with or on a project.

According to Boudreau, Loch, Robey, and Straud (1998), a global strategy that is used by many corporations is to have a centralized organization. This global strategy is characterized as having a headquarters in one country while operations are performed in many other countries.

Jiang, Klein, and Chen (2001) research provides further evidence that the project manager's success in centralized or decentralized organizations requires senior management's support and active participation. The research concludes that the project manager must be involved early in the proposal or business case development to enhance an information technology (IT) project's success.

A Centralized Project Management Organization (PMO) is defined as an organizational structure in which the project managers, project coordinators, and other personnel performing project activities report to an administrative chain of command within the PMO. The project personnel are assigned to projects by the administrative chain of command. The centralized PMO is responsible for PM training, project management organizational processes, and technology used and implemented for project managers (Milosevic, Inman, & Ozbay, 2001). In addition, this organization is responsible for evaluating the project personnel's performance (Milosevic, Inman, & Ozbay, 2001; Kerzner, 1998).

Traditionally Information Systems organizations have been centralized. However, a study conducted by Kahai, Snyder, and Carr (2001/2002) notes a trend in Fortune 1000 companies in the United States. IS departments are transitioning to a hybrid of decentralized and centralized management (Kahai, Snyder, & Carr, 2001/2002). Resources are becoming decentralized while the decision authority is

still centralized (Kahai et al., 2001/2002). Finally, the study by Kahia, Snyder, and Carr (2001/2002) found that each company surveyed struggles for the control of the resources and how best to unitize the resources.

Orwig and Brennan (2000) studies find that companies such as professional services companies that were project-based had better project management success over those companies that were decentralized and were not able to replicate project management methodologies. Quality standards such as benchmarking, statistical controls and flowcharting are key to the survival of centralized or project-based organizations (Orwig & Brennan, 2000).

Bacon (1990) notes this trend and refers to it as "Systems Decentralization" (¶ 1). Fourteen companies are reviewed in the study. Allowing the different organizations to decide on the type of systems needed and then having a centralized organization responsible for tying the systems together is more powerful than a single centralized organization determining the needs of the users (Bacon, 1990). The underlying issue revealed in the study is that those companies that do not envision the potential of an interwoven technology structure are unable to define clearly how to implement the architecture.

Decentralized Organizations

A decentralized PMO may be characterized as a small corporate or business unit organization that is responsible

for maintaining PM methods and/or training, and best practices. This type of PMO does not have a central decision-making authority. Authority may be delegated or collaborative depending on the project (Ormand, Bruner, Birkemo, Hinderliter-Smith, & Veitch, 2000; Hales, 1999; Kerzner, 1998). Wren (1972) describes the decentralized organization as a matrix or project organization. Therefore, a definition for the decentralized PMO is "an organizational structure in which the project manager shares responsibility with the functional managers for assigning priorities and for directing the work of individuals assigned to the project" (PMI, 2000, p. 203). The decentralized PMO may also be any organization responsible for PM functions.

Boudreau, Loch, Robey, and Straud (1998) extend the description to a multinational strategy. A company that performs with a multinational strategy is focused on the local competition in each area and responds accordingly, with little or no direction from a centralized headquarters (Boudreau et al., 1998). The decentralized project management organization may have little authority over projects. Benchmark data (Toney, 1999) implies that decentralized project organizations hinder the attainment of project goals since the project manager has to borrow resources and reports to two bosses.

According to Boudreau et al. (1998), a successful organization will balance the needs of a multinational

strategy. It is decentralized, coupled with the global centralized efficiency, and has the ability to learn across cultural boundaries. Toney's (1999) studies indicate that a best practice for the project organization is to "build partnerships with and gain support from senior executives" (p. 20).

Kock's (2000) research studies 38 process improvement teams. The teams are located in Brazil and New Zealand. The results provide evidence that a decentralized, virtual team is more adept at brainstorming, has no need for a clearly defined leadership or hierarchy, and shows a reduction in the overall costs. However, the same study yields a neutral effect on the actual quality of the redesign of the process (Kock, 2000).

Kock's (2000) study also notes that the more radical the process redesign, the less likely the team will use a decentralized approach. This is isolated to three teams. Decentralization and a virtual team are most advantageous for business process re-engineering that requires incremental rather than radical change (Kock, 2000, ¶ 47). Kock's (2000) findings are supported by an earlier study conducted by Eom and Lee (1999). The conclusions of Eom and Lee (1999) are that a virtual team is more adept at providing incremental solutions for less cost.

According to Duarte and Snyder (2001) studies, a virtual team is more likely to succeed in a non-hierarchical, less authoritarian culture. This is supported

by Kock's (2000) and Eom and Lee's (1999) studies, but Kahai, Snyder, and Carr (2001/2002), Kerzner (2000), and Boudreau et al. (1998) found that a virtual team is more successful with clearly defined workflows and goals.

Leadership

Bass (1995, pp. 37-38) states that each person had a different view of leadership; therefore, each person defined leadership differently. Academics and business leaders have not come to an agreement on the definition of leadership. Most people characterize a leader in terms that are valuable and precious to their own sense of reality (Keller).

Effective leaders today are seen as mentors and teachers. They identify, coach, train, and cajole the future leaders of tomorrow. Leaders are about providing results through the employees in the organization. The results are not through the coercion of the employees, but through the desire of a team to see everyone succeed. The leader is also the advocate and sponsor for a team or, in other words, the team's servant. The leader ensures that the tools are in place for mutual success (O'Toole, 1996).

O'Toole (1996) cites a NASA study that demonstrates that even in a crisis, a leader who involves his/her subordinates will make better decisions and will not compromise his/her authority (1996, p. 85). When the leader promotes an atmosphere of teamwork and instills proper

communication and learning, then diversity is valued (Anderson et al., 1998, Senge, 1995, Taborda, 2000).

The above paragraphs imply that leadership attributes and skill sets are not a concrete list that a project manager can review. Toney's (1999) benchmarking data finds that the character, background, and traits of a superior project manager includes the following:

- Truthfulness/honesty;
- College degree and/or Project Management Professional certification; and,
- Two and one-half year's management and team leader experience.

Other attributes are noted but are deemed of less importance.

Toney's (1999) benchmarking data further indicate that the superior project manager is professional in leading and managing; is competent in the technical field of the project; can articulate the vision to the project team; is constantly goal-oriented; and relates the goals to the organization. In addition, the project manager understands how to take advantage of opportunities and is review alternatives (Toney, 1999; Toney, 2002a).

The project manager's leadership style benefits from establishing an effective way to promote trust and collaboration in a faceless environment. Creative manners and opportunities help the project manager establish trust

(Block, 1993; Toney, 1999; Duarte & Snyder, 2001). The effective project manager establishes trust between him/herself and each team member (Harshman & Harshman, 1999), and among the project team members. Studies indicate that without this trust, a virtual team is more likely to fail (Cascio, 2000; Hage & Powers, 1992; Kezsbom, 2000).

Roberts, Kossek, and Ozeki's (1998) study finds that executives in eight major U.S. corporations agree that it is difficult to establish trust in a "cross-cultural" environment (¶ 21). This lack of trust leads to the companies establishing duplicate processes and procedures and different systems, which results in many international companies instead of one cohesive enterprise.

Trust is an integral part of a successful virtual team (Anderson et al., 1998; Duarte & Snyder, 2001; Lipnack & Stamps, 1999). Supervisors within this environment need to also trust and respect virtual employees (Anderson et al., 1998), since the visual clues and interrelationships are not present.

Handy (1995) concludes that trust is a major component of a successful virtual team. This is supported by the studies done by Duarte and Snyder (2001, p. 83). To maintain trust, a leader of a virtual team should "set and maintain values, boundaries, and consistency" (p. 83). This becomes even more important in the virtual team since the team membership may be fluid and for some short-lived. To

build and maintain trust with a short-term member is even more difficult, according to Stuart and Duarte (2001).

Technology and people, according to Lipnack and Stamps (1999a), have accelerated virtual and networked teams. A networked team may be the next step for virtual teams (Lipnack & Stamps, 1999a, 1999b). A networked team relies on technology and forms and disbands as needed. The networked team may have many virtual teams. Lipnack and Stamps (1999a) suggest that hierarchy cannot be disbanded but may need to change with each team. A networked team "shares leadership" (Lipnack & Stamps, 1999b). A person brings a set of skills to the team and when the skill is needed, the person steps into the leadership role. Lipnack and Stamps (1999b) also suggest that the networked team must be linked to the organization not only in a hierarchical matter but also horizontally.

Constantine (1993) suggests that the project manager's leadership style should conform to the type of organization. A project manager whose leadership style is not flexible in leadership style may not drive the project toward a successful finish. Constantine (1993) provides the example that a laissez-faire leadership style will not work in a random team environment. Instead, the project manager should be viewed as one of the guys in order to be successful.

Duarte and Snyder (2001) studies of virtual teams find that a successful virtual team has a leadership structure

within the company and organization that has a "culture that values teamwork, communication, learning, and capitalizing on diversity" (p. 20). Duarte and Snyder (2001) describe a leadership style based on the culture of the organization. An idea of culture is not a common thread in the literature.

Modern and Postmodern Theories of Leadership And Project Management

The modern theories of leadership from the 1960s until today will be reviewed as trends. These dates correspond with the history of modern project management. These general leadership trends will be based upon those described by Bass (1990) and Chemers (1995). These theories will be mapped to Toney's (1999; 2002a) benchmarking data for project management leadership and Duarte and Snyder's (2001) virtual project manager's leadership attributes and characteristics.

According to Chemers (1995), the modern leadership era generally is recognized as beginning around 1949 and ending in 1984. The post-modern leadership era follows the modern and continues through today (Wren, 1995). The contingency theory would correspond to the modern leadership era, while transformational theories would closely follow the post-modern era of leadership (Bass, 1990).

Wren (1972) describes the modern era of leadership and management as one of "principles and process" (p. 407). The

principles describe how to manage and provide for future learning, whereas the process is what is done and can provide the framework for future theories (Wren, 1972). One of the major theories of this time is known as the trait theory. The trait theory is an extension of the great man theory (Bass, 1990) which depends on a set of traits that a person is born with and where in society he/she is born. The trait theory discredits the idea of the caste system and only focuses on the idea that leaders are born with the traits.

Fiedler's (1967) leadership contingency model is another major theory of the modern era. Fiedler (1967) does not believe in an ideal leadership theory, but that the leadership style is dictated by the situation. Bass (1990) studies also describe the contingency theory as a different means to view leadership. Bass (1990) describes the contingency theory as interaction between workers and management. Bass (1990) sees this form of leadership as task- and relations-oriented, depending on the various situations that translate to how well the group performs. Hersey and Blanchard (1969) took Fiedler's theory and added a third dimension - effectiveness. Other dimensions were added by others, which continues to underline the difficulties of defining leadership (Bass, 1990).

Toney's (1999; 2002a) benchmarking data indicates that traits in and of themselves are not important to the success of the project manager and the project. The traits

give the person the "potential for leadership" (Toney, 1999, p. 50), but the traits must be supplemented with a project management skill set and professionalism. Toney's (1999, p. 36; 2002a) data also indicates that the project manager's consistent behavior over the life of the project assists with team members taking on risk. When the project manager changes his/her style to accommodate the situation at hand, he/she may create confusion among the project members because consistent behavior is not seen in the leadership of the project manager.

Duarte and Snyder (2001) note that virtual leadership has to value teamwork and diversity (p. 20). All levels of the organization must value virtual teamwork or it is difficult for the project to attain its goals (Duarte & Snyder, 2001). The leader should clearly identify procedures and goals, and constantly reinforce this with the team members. Many leaders in the virtual environment state that they are the "glue" that keeps the team together and are flexible enough to meet the demands of the virtual teams (Duarte & Snyder, 2001, p. 22).

The post-modern era sees a trend toward effectiveness. Workers and senior management are transitioning toward a leader that has the knowledge and is effective in relaying it to the group and not on a leader simply because of the leader's personality characteristics (Bass, 1990). During this era, technology has increased the speed at which

information becomes available, and the education level of the average worker has also increased (Bass, 1990).

Transformational leadership is characteristic of the post-modern era. Burns (1989) identifies the transformational leader as someone who recognizes that followers' higher needs must be satisfied to ensure the full potential of a follower.

The project manager should have technical proficiency of the project's technology on small to medium projects, but as the project's complexity increases, the project management proficiencies become more important (Toney, 1999). Clark and Fujimoto (1991) studies also support that the leader should have the technical knowledge required on the project.

Toney's (1999) benchmark establishes a best practice for the project manager as a person who "adapts the application of best practices and competencies to different cultures" (p. 73). The transformational project leader understands the needs of the members and adapts rules and regulations to increase the relationship and trust among the members and between leader and member.

Duarte and Snyder (2001) in their studies find that the successful virtual leader is competent and adept at the following:

- Developing and transitioning team members;
- Developing and adapting organizational processes to meet the team's needs;

- Allowing leadership to transition when appropriate; and
- Ensuring the team receives appropriate training for virtual communications and technology and skill sets (Duarte & Snyder, 2001).

Each of the characteristics and qualities which are listed by Toney (1999) and Duarte & Snyder (2001) emphasizes the need of the project manager to be transformational, to understand the needs of the team members, and to pass on knowledge so that the project is successful.

Summary

The purpose of this quantitative study is to determine whether a centralized project management organization or a decentralized project management organization provides better support for the virtual project manager. The survey originally constructed by Duarte and Snyder (2001) for effective virtual teams has been adopted for this research. The project organizations, via the Duarte and Snyder (2001) survey, is evaluated for training and development, organizational processes, communication technology, leadership, and member competence. This study seeks to validate previous research conducted in the areas of virtual project teams and their relative success in centralized and decentralized PMOs, and to advance the existing literature in these areas.

Townsend and DeMarie (1998) and Duarte and Snyder's (2001) research indicates that there appears to be a correlation between virtual teams' successes and communication technology training. Reinsch (1999) and Sethi et al. (2001) indicate training in team communication methods also enhances a team's success. The survey evaluates the training and development project managers receive.

Virtual teams normally do not have the ability to assess each other's working habits visually. Toney's (1999) benchmark data indicate and Frame (1995) emphasizes that a virtual project succeeds more often when team members have confidence in the leader and in each other. Survey participants will answer questions regarding their perception of the team leader and the members' competence on the project team.

Organizational processes are the foundation of many PM methodologies. The literature research provides conflicting results as to the necessity of detailed PM processes for project teams. There is no research found that specifically addressed virtual project teams and the merits of organizational processes. The literature appears to favor more organizational processes in a centralized organization versus a decentralized one, although there is literature that provides conflicting results.

Chapter II provides background and research data that suggest that positive leadership in a virtual environment

is based on trust and support (Maznevski & Chudoba, 2000; Jarvenpaa & Leidner, 1999, Lipnack & Stamps, 1999a, b). The trust and support that leadership provides in this type of project organization ultimately appears to drive the performance of the virtual project. Leadership is a component of the survey that is used in this study.

Technology continues to provide the ability for a project team to communicate without the necessity to be co-located and face-to-face (Guss, 1998; Reinsch, 1999; Toney, 1999). This allows organizations and companies to seek to reduce overhead expenditures and to promote the viability of virtual organizations. Communication technology is also another component of the survey.

This type of communication technology has also been used in distribution of the survey instrument for this dissertation study which is explained in Chapter III. The research methodology for this quantitative study is also presented with a review of the proposed survey instrument and the statistical means to evaluate resulting data.

CHAPTER III

Methods

The intent of Chapter III was to determine the degree to which a virtual project manager was supported in a centralized versus decentralized PMO. It was expected that cost and schedule were affected positively in a centralized PMO where a virtual project manager has a central organization to provide the necessary tools, training, technical infrastructure, leadership, and competent team members. Earned value management was the metric within the survey which evaluated the reported cost and schedule by the project managers. Earned value management was adopted by PMI as a best-in-class measurement and was defined as a means to measure the progress of a project by quantifying and integrating schedule and cost performance metrics (PMI, 2000; Grskovich, 1990; Presutti, 1993; Singh, 1991).

Field Entry

The presidents of two PM societies were approached to distribute the survey via email to its membership and to post the survey on its website. The confidentiality and purpose statements were included in the survey when posted on the website or distributed via email. See Appendix A for the PM societies' approval and consent.

Population Sample

The PM societies sent the survey via email to its membership and by posting it on their respective websites.

The estimated PM population is 1500 project managers. The PM societies are a local chapter of PMI and a PMI Specific Interest Group. Any project manager may access the website.

The project managers in the PM societies represented a cross-section of many industries that use PM skills. Examples of these industries include banking, Information Technology (IT), automotive, healthcare, pharmaceuticals, construction, government, independent PM contractors, and finance. The project managers may be new or experienced, and may be certified by PMI. It is expected that enough of the population will have virtual PM experience.

Setting

Principles of PM, such as planning and managing, have been used by every civilization. PM was used to build roads and construct buildings. However, in the 1950s and 1960s, modern PM began to evolve. During this timeframe, projects became more complex and required more than just the traditional planning and monitoring. The industry needed management of schedule, budget, risk, and resources. The first efforts were led by the U.S. Government to monitor status on cost plus contracts. The Cost/Schedule Control Systems Criteria was created.

Technology continues to enhance and modify the methods and tools used within the PM industry. Technology appears to be driving PM to adapt to a virtual environment. Traditionally, in the PM industry there have been

centralized and decentralized project management organizations.

Instrumentation

The project managers must have virtual PM experience and must be willing to answer questions on the survey regarding cost/revenue and schedule data about virtual projects, PM training, and tools and technologies provided by the PMO.

This research was an organizational investigation studying training development, standard organizational processes, technology, leadership, and project team members' competence within the PM industry. A survey was used to collect quantitative data. The PM survey was sent electronically to all known project managers within the defined population. The survey is contained in Appendix B with the email and website verbiage inviting participation, along with the purpose and confidentiality statements in Appendix C.

The demographics of the project managers, the types of virtual projects, and the organization have been established to understand the study population. Chi-Square analysis was done on the demographic data to understand the fitness for use. The collected data should also identify opportunities where future research may be needed.

Survey

The survey was designed to collect quantitative data including team operations and effectiveness on a virtual project team. The project managers were asked to provide information about one virtual project they participated on within the last year. The project managers were asked to provide data about the projects, including cost and schedule baseline and the range of deviation from the baseline.

A Likert-type survey was developed for this research. The survey was derived from existing PM and virtual teams research questionnaires (Duarte & Snyder, 2001; Lurey, 1998). The survey consisted of 22 Likert-type questions/statements and 12 yes/no, multiple-choice questions, and fill-in-the-blank statements. The survey included questions/statements on the following:

1. Project Managers' demographics
2. Project information
3. Training
4. Organizational Processes
5. Technology
6. Leadership
7. Competence

Training, organizational processes, technology, leadership, and competence statements were from Duarte and Snyder's (2001) survey. The survey was formatted in such a

fashion as to make it relatively easy for the participants to complete. An electronic means was used to complete the survey to enhance participation. It was expected that project managers in this study would be accustomed to an information technology environment. Therefore, a survey that incorporated technology would likely be completed and submitted by the project manager.

Data Organization

The schedules and the cost/revenue parameters of each of the virtual team projects were reviewed. A table was developed to map each project to the type of PMO and the deviations of cost and schedule from the baseline to determine the percent of deviation based on earned value management metrics. To standardize the data, the deviations of cost and time were stated as a percentage of the baseline. Earned value management is an industry standard within the PM community.

The United States Air Force originally developed earned value (EV) in 1967. The methodology was designed to provide an integrated cost and schedule and a quantitative assessment of a project's status. The specific metrics that the project manager was asked to provide in the demographic data is the Cost Variance percentage (CV%) and the Schedule Variance percentage (SV%).

The mathematical formula for CV% is as follows:

$$(BCWP - ACWP)/BCWP$$

BCWP - Budgeted Cost of Work Performed

ACWP - Actual Cost of Work Performed

The mathematical formula for SV% is as follows

$$(BCWP - BCWS)/BCWS$$

BCWP - Budgeted Cost of Work Performed

BCWS - Budgeted Cost of Work Scheduled

These are standard terms and measurements used in the PM industry. Most well known PM tools, such as MS Project® or Primavera®, have built these formulas within the product.

Survey Organization

According to Duarte and Snyder (2001), the success of a virtual team can be assessed by seven criteria: human resource policies, training development, standard organizational processes, electronic communication and collaboration technology, organizational culture, leadership, and competence (2001). Duarte and Snyder (2001) defined one of the types of virtual teams as a project team. All but the organizational culture Likert-style statements can be extended to examine the effectiveness of the centralized and decentralized PMOs.

Each section of the survey (Duarte & Snyder, 2001) consisted of four statements. Section one of the survey measured formal training and on-the-job learning. Two additional statements were added to section one. These statements were:

1. I took advantage of the available training.
2. The training increased my project management skillset.

Processes were measured in section two. Section three measured collaboration and communication technology. The remaining two sections measured leadership and competence. Written permission to use the survey is contained in Appendix D.

Research Survey Instrument

The survey has been divided into eight sections to align with the eight hypotheses presented in Chapter 1. Below is the list of the sections, the area being evaluated, and the survey questions that map to the evaluated area.

Section 1 - Project Manager Training (Questions 1-6)

Section 2 - Use of Standardized Processes (Questions 7-10)

Section 3 - Levels of Electronic Communication and Collaboration (Questions 11-14)

Section 4 - Leader Behaviors (Questions 15-18)

Section 5 - Leader and Team Competence and Experience (Questions 19-22)

Section 6 - Project Manager Personal Demographics (Questions 23-29)

Section 7 - Project Size and Project Manager Role (Questions 30-32)

Section 8 - Project Success (Questions 33-35)

Statistical Analysis

A Chi-Square analysis was used to evaluate the demographic data as it related to the centralized and decentralized project manager. Additionally, the same type of analysis was used to evaluate the relation of project size, the project manager's role, and whether the metrics of cost and schedule were dependent on centralized or decentralized. The analysis was a comparison of the virtual projects in the centralized and the decentralized PMOs. Chi-Square was also used to determine statistically significant statements. Correlations and significance of relationships among statements in each category were also evaluated. It was also recognized that insufficient data may be collected for any one or more of these variables and may have to be deleted from the analysis.

Survey Instrument

The data collection tool was a validated survey from Duarte and Snyder (2001). See Appendix D for written consent to use. Original project financial data were not available for review. Therefore, the survey participant was asked to answer questions regarding project financial data and earned value metrics. The researcher depended on the honesty of the respondents of the survey.

This study was generalized, to the degree possible, for the PM industry. It was not targeted for any one

specific industry, but to provide overarching data regarding virtual projects' cost and schedule results in centralized versus decentralized PMOs. The resultant data cannot be generalized for traditional face-to-face PM environments or specific project virtual environments. This study should provide data for PM leadership in how to structure the PMO.

The data for this study were obtained with a survey. The survey was sent to project managers in two PM societies. A consent form was included as a part of the survey, and was included in the confidentiality statement. This study has no direct benefit to the individual participant, but does have benefit to the PM industry. Participants' names and company information were not used. Names and company information were deleted and were not included as part of the final findings.

Summary

The survey provided statistical information to discern the merits of the centralized project management organization versus the decentralized project management organization. The survey demographic data and five survey areas were compared and contrasted against project managers in centralized PMOs and those in decentralized PMOs. The findings are presented in Chapter IV.

CHAPTER IV

Presentation and Analysis of Data

One of the many challenges within the Project Management community is how and where to structure the Project Management Organization for virtual project managers. Some organizations choose to include the project managers as part of discrete sales or solution teams, with a small corporate group overseeing the PM methods, training, and other miscellaneous responsibilities (PMI, 2000). This would be characteristic of a decentralized PMO or matrix management. Other businesses and organizations choose to centralize the project managers in one organization, commonly referred to as a projectized organization (PMI, 2000). These project managers receive direction and guidance from an overarching centralized PMO.

The purpose of this quantitative research study was to determine the degree to which a virtual project manager was supported in a centralized versus decentralized PMO. It was expected that cost and schedule were affected positively in a centralized PMO where a virtual project manager had a central organization to provide the necessary tools, training, technical infrastructure, leadership, and competent team members. Earned Value was the method used to evaluate the reported cost and schedule. EV was adopted by PMI as a best-in-class measurement and was defined as a means to measure the progress of a project by quantifying

and integrating schedule and cost performance metrics (PMI, 2000; Grskovich, 1990; Presutti, 1993; Singh, 1991).

Approximately, 1500 project managers in two Project Management societies were asked to complete a survey. The project managers represented a cross section of industries. Examples of these industries include banking, Information Technology (IT), automotive, healthcare, pharmaceuticals, construction, government, independent PM contractors, and finance. The project managers may be new or experienced, and may be certified by PMI or not. A total of 73 project managers replied to the survey. This number represented 4.8% of the membership of the two PM societies. Thirteen surveys were rejected for one or more of the following reasons:

- The project manager was not a virtual project manager;
- The survey was not completed properly; and/or
- The survey was incomplete.

This research was an organizational investigation studying training development, standard organizational processes, technology, leadership, and project team members' competence within the PM industry. A validated survey was used to collect quantitative data (Duarte & Snyder, 2001). All further discussion related to the survey statements is acknowledged as Duarte and Snyder's (2001) and no longer will be cited in the remainder of Chapter IV.

Demographic data was added to the survey, including gender, experience, metrics used on the project, and certification. The PM survey was sent electronically to all known project managers in one PM society, while the other society chose to post the survey on its website.

A Chi-Square analysis was used to evaluate the demographic data as it related to a centralized and decentralized project manager. Additionally, the same type of analysis was used to evaluate the relation of project size, the project manager's role, and whether the metrics of cost and schedule were dependent on a centralized or decentralized PMO. Chi-Square was also used to determine statistically significant statements within each of the categories. For the purposes of this study, levels of significance of 0.010 or greater were considered significant. Correlations and significance of relationships among statements in each category were also evaluated.

Questions 24 through 28 related to the demographics of the project manager. The demographics included gender, project management certification, and years of experience. The statistical analysis revealed no statistical significance between centralized and decentralized project managers.

Similarly, questions 30 through 32 were statistically insignificant. These questions included the project's dollar value and the role of the project manager. The lack of data supplied for questions 33 through 35, which

included project success measurements, rendered this part statistically insignificant.

The demographic data according to the statistics did not significantly affect the centralized and decentralized project manager sample. Therefore, all detected differences are attributable to the hypotheses and not to the demographic differences. The lack of differences within the demographic variables and project variables caused research questions and hypotheses six through eight to be within the scope of this study.

Each of the remaining five hypotheses' data is presented in the following manner.

- The statement of research question and hypothesis
- A summary table with significant statements and correlation
- The overall Chi-Square values and the acceptance or rejection of the null hypothesis (H0)
- Those questions with significant Chi-Square values, by centralized (C) and decentralized (D)
- The correlation of centralized versus decentralized project managers.

*Research Question #1 and Hypothesis One - Project
Management Training*

Research Question

Are there reported differences in the training received by project managers working on virtual projects in a centralized PMO versus a decentralized PMO?

Hypothesis (H01)

There will be no reported differences in training received by project managers working on virtual projects in a centralized PMO versus a decentralized PMO.

Discussion

The statistical analysis indicated that there were reported differences in the training received by project managers working on virtual projects in a centralized PMO versus a decentralized. To further clarify hypothesis one, Table 2 presents the significant statements and correlations between statements. Based on statistical data, shown in Table 3, the null hypothesis (H01) for training was rejected. The research question was positive since there were reported differences in the training received. The centralized virtual project managers perceived that they had access to cultural training (Statement 4) and there was adequate access for all to databases that had learning opportunities (Statement 6).

Table 2

Hypothesis One Summary Table

<i>Hypothesis #1</i>	<i>Significance</i>	<i>Correlations Centralized</i>	<i>Correlations Decentralized</i>
H1-0: There will be no reported differences in training received by project managers working on virtual projects in a centralized PMO versus a decentralized PMO.			
Survey Section 1 Training and Development Statements (Duarte & Snyder, 2001)			
1. There is good access to technical training.		Positive correlation to Statement 4 (LOS 0.001)	Positive correlation to Statement 4 (LOS 0.001)
2. I took advantage of the available training.			
3. The training increased my project management skillset.			
4. There is access to training in working across cultures.	Yes, Stronger for Project Managers in Centralized PMOs	Positive correlation to Statement 6 (LOS 0.005)	
5. There are methods available for continual and just-in-time learning, such as Web-based training.		Positive correlation to Statement 6 (LOS 0.001)	
6. There are mechanisms, such as lessons-learned databases, for sharing across boundaries.	Yes, Stronger for Project Managers in Centralized PMOs		

Table 3

Chi-Square Data for Training

<i>Chi-Square</i>	<i>0.005</i>	<i>0.010</i>	<i>0.050</i>
X2 calc	88.858		
df	10		
X2 crit	25.188	23.209	18.307
	0.005	0.010	0.050
Statement 4	25.788		
Statement 6	32.166		

Access to training in working across cultures and to lessons-learned databases for sharing were the two statements (Statements 4 and 6) that were responded to favorably by centralized versus decentralized project managers (see Tables 3 and 4). The statistical data for the virtual project managers in a centralized organization consistently reported better access to cross-cultural training and access to lessons-learned databases, over the decentralized virtual project managers.

Table 4

Proportions Centralized/Decentralized

<i>Measure and Variable</i>	<i>S4</i>		<i>S6</i>	
	C	D	C	D
Agree/Strongly Agree	44.0	24.2	56.0	30.3
Disagree/Strongly Disagree	32.0	54.5	36.0	51.5

As indicated in Table 4, these two statements (Statements 4 and 6) also had a positive correlation among the centralized virtual project managers. This correlation did not exist for the decentralized virtual project managers. This data supported the hypothesis that training, especially cross-cultural and databases with lessons-learned, was more readily available in the centralized organization (see Tables 2 and 4).

Access to training in working across the cultures (Statement 4) also had a positive correlation to the technical training provided (Statement 1) (see Tables 2 and 5). The level of significance was the same for both the centralized and decentralized project managers. This was the only correlation that resulted for the significant questions for the decentralized project managers (See Table 5). The research question positively correlates to the data reported by the centralized virtual project managers. Differences were seen in the training received by the

virtual project managers in a centralized versus a decentralized PMO.

Centralized project managers showed a positive correlation between the availability of continual learning and just-in-time learning (Statement 5) and the availability of lessons-learned databases (Statement 6). This correlation was only seen with the centralized project management respondents (see Tables 2 and 5). The statistical data suggested that a centralized virtual project manager had better access to cultural training. Statistically, the centralized virtual project managers reported positively to having access to databases which appeared to allow for continual and just-in-time learning.

Table 5

Correlation Levels of Significance

<i>Centralized PMs</i>			
<i>Statements</i>	S1	S4	S5
S4	0.001		
S6		0.005	0.001
<i>Decentralized PMs</i>			
<i>Statements</i>	S1	S4	S5
S4	0.001		

*Research Question #2 and Hypothesis Two - Use of
Standardized Processes*

Research Question

Are there reported differences in the use of standardized processes by project managers working on virtual projects in a centralized PMO versus a decentralized PMO?

Hypothesis (H02)

There will be no reported differences in the use of standardized processes by project managers working on virtual projects in a centralized PMO versus a decentralized PMO.

Discussion

Centralized project managers reported differences in standardized processes (see Table 6). To clarify hypothesis two further, Table 6 presents the significant statement and correlations between statements. Based on this data, shown in Table 7, the null hypothesis (H02) for standardized processes was rejected. The data suggested that standardized processes and agreed upon soft processes were correlated positively to the centralized project management community. An affirmative answer was appropriate for the research question since there was a difference in one statement in Hypothesis Two.

Table 6

Hypothesis Two Summary Table

<i>Hypothesis #2</i>	<i>Significance</i>	<i>Correlations Centralized</i>	<i>Correlations Decentralized</i>
H2-0: There will be no reported differences in the use of standardized processes by project managers working on virtual projects in a centralized PMO versus a decentralized PMO.			
Survey Section 2 Standardized Processes (Duarte & Snyder, 2001)			
7. There are standard and agreed-on technical team processes used throughout the organization and with partners.		Positive correlation to Statement 8 (LOS 0.001)	Positive correlation to Statement 8 (LOS 0.001)
8. There are standard and agreed-on "soft" team processes used throughout the organization and with partners.	Yes, stronger for Project Managers in Centralized PMOs		
9. Adaptation of processes is encouraged when necessary.		Positive correlation to Statement 8 (LOS 0.005)	Positive correlation to Statement 8 (LOS 0.010)
10. The culture supports shared ways of doing business across teams and partners.			Positive correlation to Statement 8 (LOS 0.010)

Table 7

Chi-Square Data for Standardized Processes

<i>Chi-Square</i>	<i>0.005</i>	<i>0.010</i>	<i>0.050</i>
X2 calc	55.053		
df	6		
X2 crit	18.548	16.812	12.592
Statement 8	42.323		

Centralized virtual project managers responded positively to having standard and agreed-on "soft" team processes that were used throughout the organization and with partners (Statement 8) versus the decentralized virtual project managers (see Tables 7 and 8). The reported data suggested that centralized virtual project managers had consistent written direction to refer to and a culture that communicated acceptable non-written policy.

Table 8

Proportions Centralized/Decentralized

<i>Measure and Variable</i>	<i>S8</i>	
	<i>C</i>	<i>D</i>
Agree/Strongly Agree	64.0	33.3
Disagree/Strongly Disagree	28.0	51.5

For both the centralized and decentralized virtual project managers, standard and "soft" team processes (Statement 8) were positively correlated with standard and agreed upon technical team processes (Statement 7) (see Tables 6 and 9). Additionally, with both virtual project manager groups there was a positive correlation between the standard and "soft" team processes (Statement 8) and the encouragement to adapt processes when necessary (Statement 9). This correlation was stronger with the centralized project managers (see Tables 6 and 9). The correlation appeared to imply that technical team processes need to be present for the virtual project manager to have the fullest use of the processes. Additionally, both communities emerged as being willing to adapt processes, as necessary, although it was a stronger correlation in the centralized environment.

The decentralized project managers also had a positive correlation to Statement 10. A culture that supported sharing ways of doing business across teams and partners (Statement 10) was a positive correlation to having standard and "soft" team processes (Statement 8). The correlation suggested that the decentralized project managers may have a greater need to share successful ways of doing business among the community, since there was no central authority.

Table 9

Correlation Levels of Significance

<i>Centralized PMs</i>			
<i>Statement</i>	<i>S7</i>	<i>S9</i>	<i>S10</i>
Statement	S7	S9	S10
S8	0.001	0.005	
<i>Decentralized PMs</i>			
<i>Statement</i>	<i>S7</i>	<i>S9</i>	<i>S10</i>
S8	0.001	0.010	0.010

*Research Question #3 and Hypothesis Three - Electronic
Communication and Collaboration Technology*

Research Question

Are there reported differences in levels of electronic communication and collaboration by project managers working on virtual projects in a centralized PMO versus a decentralized PMO?

Hypothesis (H03)

There will be no reported differences in levels of electronic communication and collaboration by project managers working on virtual projects in a centralized PMO versus a decentralized PMO.

Discussion

The centralized virtual project managers reported a difference in the levels of electronic communication and

collaboration. Table 10 is made available to present the significant statements and correlations between statements. Based on this data shown in Tables 10 and 11, the null hypothesis (H03) for technology was rejected. Statement 14 was agreed to almost equally by the centralized and decentralized project managers (see Table 8). More centralized project managers responded neutrally, whereas the decentralized project managers responses were skewed toward disagreeing with Statement 14 (see Table 11). As shown in Table 10, the answer to the research question was yes, because Statement 14 was different between the two environments.

Table 10

Hypothesis Three Summary Table

<i>Hypothesis #3</i>	<i>Significance</i>	<i>Correlations Centralized</i>	<i>Correlations Decentralized</i>
H3-0: There will be no reported difference in levels of electronic communication and collaboration by project managers working on virtual projects in a centralized PMO versus a decentralized PMO.			
Survey Section 3 Electronic Communication and Collaboration (Duarte & Snyder, 2001)			
11. There are consistent standards for electronic communication and collaboration tools across the organization.			Positive correlation to Statement 14 (LOS 0.010)
12. There are ample resources to buy and support state-of-the-art electronic communication and collaboration technology.			
13. People from all functional areas have equal access to, and are skilled in using, electronic communication and collaboration technology.		Positive correlation to Statement 14 (LOS 0.001)	Positive correlation to Statement 14 (LOS 0.001)
14. People from all geographic areas have equal access to, and are skilled in using, electronic communication and collaboration technology.	Yes, stronger	for Project Managers in Centralized PMOs	

Table 11

Chi-Square Data for Electronic Communication

<i>Chi-Square</i>	<i>0.005</i>	<i>0.010</i>	<i>0.050</i>
X2 calc	190.39		
df	6		
X2 crit	18.548	16.812	12.592
Statement 14	165.02		

The centralized and decentralized project managers agreed about equally (see Table 8) that personnel in all geographic locations had the same access and were skilled in using technology to communicate and collaborate (Statement 14). However, the decentralized project managers responded more negatively than the centralized, while the centralized respondents were more neutral. The variation between the two groups appeared that over half of the decentralized respondents did not agree that the community had equal access to the technology needed to conduct business. In the centralized community, the respondents were positive or neutral which may indicate that adequate technology was provided to the project management community.

Table 12

Proportions Centralized/Decentralized

<i>Measure and Variable</i>	<i>S14</i>	
	C	D
Agree/Strongly Agree	40.0	39.4
Disagree/Strongly Disagree	24.0	54.5

The centralized and decentralized project managers' responses demonstrated a positive correlation between personnel in all geographic locations (Statement 14) and in all functional areas (Statement 13). Both had the same access and skill in using technology to communicate and collaborate (see Table 13). The correlation suggested that the various companies of the respondents might have a standard technology which employees were expected to adopt.

As shown in Tables 10 and 13, the decentralized project managers' responses also indicated a positive correlation between having consistent standards for communicating and collaborating electronically (Statement 11) and personnel in all geographic locations having equal access and skills in using the communication and collaboration technology (Statement 14). The centralized community did not have this correlation. The lack of a correlation may have indicated that the centralized virtual project managers had different levels of technology for the

various geographic locations, depending on the need of the area.

Table 13

Correlation Levels of Significance

<i>Centralized PMs</i>		
<i>Statement</i>	<i>S11</i>	<i>S13</i>
S14		0.001
<i>Decentralized PMs Statement</i>		
<i>S11</i>	<i>S13</i>	
S14	0.010	0.001

Research Question #4 and Hypothesis Four - Project Management Leader Behavior

Research Question

Are there reported differences in leader behaviors perceived by project managers working on virtual projects in a centralized PMO versus a decentralized PMO?

Hypothesis (H04)

There will be no reported differences in leader behaviors perceived by project managers working on virtual projects in a centralized PMO versus and decentralized PMO.

Discussion

The centralized virtual project managers reported differences in all four statements (Statements 15 through 18). Table 14 is provided to further clarify the

significant statements and correlations between statements. Based on this data, shown in Tables 14 and 15, the null hypothesis (H04) for leader behaviors was rejected. This section was more absolute than the previous three hypotheses, since all statements in this section were supported by the statistical data. Since all statements were positive for the centralized PMO, the research question was yes, because there were differences in the responses.

Table 14

Hypothesis Four Summary Table

<i>Hypothesis #4</i>	<i>Significance</i>	<i>Correlations Centralized</i>	<i>Correlations Decentralized</i>
H4-0: There will be no reported difference in leader behaviors perceived by project managers working on virtual projects in a centralized PMO versus a decentralized PMO.			
Survey Section 4 Leader behaviors (Duarte & Snyder, 2001)			
15. Leaders set high expectations for virtual team performance.	Yes, stronger for Project Managers in Centralized PMOs	Positive correlation to Statements 16 (LOS 0.001) and 18 (LOS 0.005)	Positive correlation to Statements 16 and 18 (LOS 0.010) and 18 (LOS 0.001)
16. Leaders help gain the support of customers and other stakeholders.	Yes, stronger for Project Managers in Centralized PMOs	Positive correlation to Statements 15 (LOS 0.001) and 17 (LOS 0.001)	Positive correlation to Statement 15 (LOS 0.010)
17. Leaders allocate resources for the training and technology associated with virtual teams.	Yes, stronger for Project Managers in Centralized PMOs	Positive correlation to Statement 16 (LOS 0.001)	Positive correlation to Statement 18 (LOS 0.001)
18. Leaders model behaviors such as working across boundaries and using technology effectively.	Yes, stronger for Project Managers in Centralized PMOs	Positive correlation to Statement 15 (LOS 0.005)	Positive correlation to Statement 15 (LOS 0.001) and 17 (LOS 0.001)

Table 15

Chi-Square Data for Leader Behavior

<i>Chi-Square</i>	<i>0.005</i>	<i>0.010</i>	<i>0.050</i>
X2 calc	115.86		
df	6		
X2 crit	18.548	16.812	12.592
Statement 15	18.758		
Statement 16	25.711		
Statement 17	48.575		
Statement 18	22.813		

Statement 15, as shown by Tables 14 and 15, was agreed to more so by centralized project managers versus decentralized. Proportionally more decentralized project managers disagreed with Statement 15 than did the centralized project managers. Leaders in the centralized community, according to the data, established higher expectations (Statement 15) than in the decentralized group.

As shown by Tables 14, 15, and 16, the centralized project managers responded positively to Statement 16. Leaders in the centralized group were more likely to gain the support of customers and stakeholders (Statement 16) according to the respondents. The lack of agreement within the decentralized virtual project managers may have resulted due to the differing goals of the various

functional managers, which may have resulted in a confusing message being portrayed to the project team.

The decentralized group disagreed that the leaders allocated the necessary resources for training and technology for the virtual teams (Statement 17), whereas the centralized community respondents agreed with this statement (see Tables 14 and 16). This data suggested that the centralized PMO understood the needs of the virtual project management team and ensured that the resources needed were represented properly to allocate the appropriate funds. The decentralized PMO community, among the respondents, indicated that there was not a central group that advocated the needs of the virtual project team.

Statement 18, similar to Statement 17, was positive for the centralized project managers (see Tables 14 and 16). The perception among those virtual project managers in the centralized PMO provided evidence that the leaders of the organization modeled the expected behavior with other organizations and with the ability to use the technology (Statement 18). In the centralized PMO, the focus was on the project managers' needs and the leaders projected the expected behavior. Since there are normally various leaders on a project in a decentralized organization, the model behavior may not be consistent with what may be needed with the project management community and/or the virtual teams' needs.

Table 16

Proportions Centralized/Decentralized

<i>Measure and Variable</i>	<i>S15</i>		<i>S16</i>		<i>S17</i>		<i>S18</i>	
	C	D	C	D	C	D	C	D
Agree/Strongly Agree	80.0	63.6	72.0	51.5	44.0	27.3	60.0	39.4
Disagree/Strongly Disagree	8.0	27.3	16.0	12.1	24.0	57.6	20.0	42.4

Both the centralized and decentralized project managers responded in such a manner that there were three positive correlations between statements in each group (see Table 17). The centralized project managers' responses demonstrated positive correlations between Statements 15 (Leaders set high expectations) and 16 (Leaders gain support), between Statements 16 (Leaders gain support) and 17 (Leaders allocated resources), and between Statements 15 (Leaders set high expectations) and 18 (Leaders modeled expected behavior). The decentralized project managers' positive correlation between leaders setting high expectations (Statement 15) and leaders gaining support among other organizations and stakeholders (Statement 16) was not as strong as with the centralized project managers. The suggested implication in the centralized PMO was that the leaders had a stronger understanding of the needs and

what was required for the success of the virtual project team.

The virtual project managers in the decentralized organization had a stronger positive correlation between leaders setting high expectations (Statement 15) and leaders modeling the expected behavior (Statement 18) than the centralized project managers. The implication with this correlation may be related to centralized PMO leaders being more rounded leaders; the correlation was present but not as strong as with the decentralized. Within the decentralized community, the project managers may more clearly see the distinction since the leaders were not centralized but were scattered throughout the organization.

The positive correlation between leaders that allocated the needed resources for training and technology (Statement 17) and leaders that modeled the expected behavior (Statement 18) was unique to the decentralized project managers. As with the previous correlation, the decentralized project managers may have been more aware of this relationship, since there was not a centralized group that provided the needed resources. In the centralized PMO, the resources were allocated, and there was not a clear distinction between the leader's behavior and the needed resources.

Table 17

Correlation Levels of Significance

<i>Centralized PMs</i>			
<i>Statements</i>	<i>S15</i>	<i>S16</i>	<i>S17</i>
S16	0.001		
S17		0.001	
S18	0.005		
<i>Decentralized PMs</i>			
<i>Statements</i>	<i>S15</i>	<i>S16</i>	<i>S17</i>
S16	0.010		
S18	0.001		0.001

*Research Question #5 and Hypothesis Five - Team Leaders and
Team Members Competence*

Research Question

Are there reported differences in competence and experience among team leaders and team members working on virtual projects in a centralized PMO versus a decentralized PMO?

Hypothesis (H05)

There will be no reported differences in competence and experience among team leaders and team members working on virtual projects in a centralized PMO versus a decentralized PMO.

Discussion

Statements 19 through 21 were reported differently by the centralized project managers. To further clarify Hypothesis Five, Table 18 has documented the significant statements and correlations between statements. Based on the data, shown in Tables 18 and 19, the null hypothesis (H05) for competence and experience among team leaders and team members was rejected. This section was not as absolute as Hypothesis Four (leader behaviors), but was stronger than Hypotheses One through Three (training, standardized processes, and electronic communication and collaboration), since all but one statement in this section was supported by the statistical data. Additionally, the research question was answered yes, since differences were present.

Table 18

Hypothesis Five Summary Table

<i>Hypothesis #5</i>	<i>Significance</i>	<i>Correlations Centralized</i>	<i>Correlations Decentralized</i>
H5-0: There will be no reported difference in competence and experience among team leaders and team members working on virtual projects in a centralized PMO versus a decentralized PMO.			
Survey Section 5			
Team Leaders and Team Members Competence (Duarte & Snyder, 2001)			
19. Team <u>leaders</u> are experienced in working in virtual environments.	Yes, stronger for Project Managers in Centralized PMOs	Positive correlation to Statements 20 (LOS 0.001), 21 (LOS 0.001), and 22 (LOS 0.001)	Positive correlation to Statements 20 (LOS 0.001), 21 (LOS 0.001), and 22 (LOS 0.001)
20. Team <u>members</u> are experienced in working in virtual environments.	Yes, stronger for Project Managers in Centralized PMOs	Positive correlation to Statements 19 (LOS 0.001), 21 (LOS 0.001), and 22 (LOS 0.001)	Positive correlation to Statements 19 (LOS 0.001), 21 (LOS 0.005), and 22 (LOS 0.001)
21. Team <u>leaders</u> are experienced in working across organizational and cultural boundaries.	Yes, stronger for Project Managers in Centralized PMOs	Positive correlation to Statement 19 (LOS 0.001), 20 (LOS 0.001), and 22 (LOS 0.001)	Positive correlation to Statement 19 (LOS 0.001), 20 (LOS 0.005), and 22 (LOS 0.001)
22. Team <u>members</u> are experienced in working across organizational and cultural boundaries.		Positive correlation to Statement 19 (LOS 0.001), 20 (LOS 0.001), and 21 (LOS 0.001)	Positive correlation to Statement 19 (LOS 0.001), 20 (LOS 0.001), and 21 (LOS 0.001)

Table 19

Chi-Square Data for Competence/Experience

<i>Chi-Square</i>	<i>0.005</i>	<i>0.010</i>	<i>0.050</i>
X2 calc	78.255		
df	6		
X2 crit	18.548	16.812	12.592
Statement 19	21.477		
Statement 20	19.109		
Statement 21	27.889		

As shown by Table 20, the centralized project managers agreed to Statements 19 through 21 and the degree of agreement was very close (≤ 8 percentage points). Team leader and team member competency and experience (H5) were positive in the centralized PMO for all areas except in for team member experience working across functional and cultural boundaries (see Table 18). The centralized PMO project managers perceived the team leaders and team members to be experienced in working in virtual projects and the team leaders to be competent working across functional and cultural boundaries. It may be concluded that in a decentralized PMO, the leaders did not emphasize or provide project managers and team members with enough experience to become competent in a virtual environment.

Table 20

Proportions Centralized/Decentralized

<i>Measure and Variable</i>	<i>S19</i>		<i>S20</i>		<i>S21</i>	
	C	D	C	D	C	D
Agree/Strongly Agree	68.0	45.5	64.0	42.4	72.0	48.5
Disagree/Strongly Disagree	16.0	33.3	20.0	33.3	20.0	21.2

As shown in Table 21, the centralized and decentralized project managers had the same positive correlations for the following sets of statements:

- Statements 19 (Team leaders experienced in virtual projects) and 20 (Team members experienced in virtual projects)
- Statements 19 (Team leaders experienced in virtual projects) and 21 (Team leaders experienced working across boundaries)
- Statements 19 (Team leaders experienced in virtual projects) and 22 (Team members experienced working across boundaries)
- Statements 20 (Team members experienced in virtual projects) and 22 (Team members experienced working across boundaries)
- Statements 21 (Team leaders experienced working across boundaries) and 22 (Team members experienced working across boundaries).

Table 21 has one other correlation shown. The correlation between Statements 20 (Team members experienced in virtual projects) and 21 (Team leaders experienced working across boundaries) was stronger for the centralized versus the decentralized project managers. It appeared that in both groups the competence and experience of the team leader and team members were important within the virtual environment. All statements within this hypothesis related to each other, within both project management environments. This was the only section that demonstrated such a strong correlation between all the statements.

Table 21

Correlation Levels of Significance

<i>Centralized PMs</i>			
<i>Statements</i>	<i>S19</i>	<i>S20</i>	<i>S21</i>
S20	0.001		
S21	0.001	0.001	
S22	0.001	0.001	0.001
<i>Decentralized PMs</i>			
<i>Statements</i>	<i>S19</i>	<i>S20</i>	<i>S21</i>
S20	0.001		
S21	0.001	0.005	
S22	0.001	0.001	0.001

Earned Value Data

Only twelve project managers responded that cost and schedule variance were maintained on the project. The respondents were evenly divided, six centralized and six decentralized. The expected result had been that the centralized project managers would maintain cost and schedule variances more often than decentralized. A centralized project management organization tends to be a projectized organization (PMI, 2000) and concentrates on metrics and processes. Therefore, it would have been expected that Earned Value would be embraced by the organization.

Of those twelve project managers that reported cost and schedule metrics, the proportions revealed that the centralized project managers were slightly better in cost variance, but neither group had a variance over 15% (see Table 22). In schedule variance, both groups were approximately equal, except the centralized group's worst schedule variance was slightly better than the decentralized group (see Table 16).

Table 22

Proportions CV and SV

<i>Measure and Variable</i>	<i>Cost Variance (CV)</i>		<i>Schedule Variance (SV)</i>	
	C	D	C	D
	≤ 5%	66.6	33.3	50.0
≥ 5.1% to 15%	33.3	66.6	33.3	33.3
≥ 15.1% to 20%			16.6	
≥ 20.1% to 50%				16.6

Summary

The purpose of this quantitative study was to determine whether a centralized project management organization provided better support for the virtual project manager versus a decentralized project management organization. The support areas tested in the survey were training, standard processes, electronic communication and collaboration technology, leader behavior, and team leader and team member competency. The Duarte and Snyder (2001) survey was used to test these variables. Additionally, project managers responded to statements about personal and project demographics.

It was expected that cost and schedule were affected positively in a centralized PMO where a virtual project manager has a central organization to provide the necessary tools, training, technical infrastructure, leadership, and

competent team members. Earned Value was the metric used within the survey to evaluate reported cost and schedule by the project managers. Earned Value was adopted by PMI as a best-in-class measurement and was defined as a means to measure the progress of a project by quantifying and integrating schedule and cost performance metrics and will be used as the metric to evaluate the relationship between the dependent and independent variables (PMI, 2000; Grskovich, 1990; Presutti, 1993; Singh, 1991).

The study had a total of eight hypotheses and eight research questions. The Chi-Square analysis revealed that there was no statistical difference among the demographic data. This rendered hypotheses and research questions six through eight null and void for this study. The demographics included in the three hypotheses and research questions were as follows:

- Personal demographics (Hypothesis and research question 6)
- Size of project and project manager's role (Hypothesis and research question 7)
- Degree of project success as related to demographics and type of PMO (hypothesis and research question 8).

Since the statistical analysis rendered the demographic data insignificant, all differences detected for Hypotheses One through Five were attributed to the

differences between centralized and decentralized PMOs. For Hypotheses One through Five, the null hypothesis was rejected based on the Chi-Square statistical analysis (see Tables 2, 3, 6, 7, 10, 11, 14, 15, 18, and 19). Significant variables existed within each section as they related to each hypothesis. The two leadership areas, leader behavior (Hypothesis Four) and team leader competence (Hypothesis Five), had the strongest significance. Leader behavior (Hypothesis Four) had variability with each of the four statements, while team leader and team member competence (Hypothesis Five) had variability with three of the four statements. Accordingly, research questions one through five were answered in the affirmative based on the statistical data. The data for hypotheses and research questions one through five indicated centralized virtual project managers were more positive in the following areas than their counterparts in a decentralized PMO:

- Technical and just-in-time training (Statements 4 and 6)
- Standard and agreed-on soft team processes
- Electronic communication and collaboration technology was available and team members were skilled in its use (Statement 14)
- Leaders established high expectations (Statement 15), assisted in gaining support for various stakeholders (Statement 16), provided the necessary

training and technology resources (Statement 17), and modeled expected behavior (Statement 18)

- Team leaders and members were experienced in virtual environments (Statement 19 and 20) and team leaders were experienced in working across organizational boundaries (Statement 21).

Each of the five hypotheses had positive correlations between statements for both the centralized and decentralized project managers. Each of the four statements within Hypothesis Five (team leader and team member competency) correlated strongly to each of the others, indicating the importance of competence in the virtual environment. Leader behavior (Hypothesis Four) had similar correlations between the two groups of project managers. With both of the leader hypotheses (Hypotheses Four and Five) having such correlation between each statement, it was possible to view the importance of leader behavior and competence as relevant within both PMOs.

Hypothesis Two (standard processes) and hypothesis Three (electronic communication/collaboration) each had one statement that was significant. Standard and "soft" processes (Statement 8) electronic communication and collaboration technology (Statement 14) were the two relevant statements. For Hypothesis Two, there were three positive correlations and for Hypothesis Three there were two. Within hypothesis two, both the centralized and decentralized virtual project managers and the standard and

"soft" team processes (Statement 8) were positively correlated with standard and agreed upon technical team processes (Statement 7). Additionally, with both virtual project manager groups there was a positive correlation between the standard and "soft" team processes (Statement 8) and the encouragement to adapt processes when necessary (Statement 9). This correlation was stronger with the centralized project managers (see Tables 6 and 9).

For Hypothesis Three, the centralized and decentralized project managers' responses demonstrated a positive correlation between personnel in all geographic locations (Statement 14) and in all functional areas (Statement 13). Both had the same access and skill in using technology to communicate and collaborate (see Table 13).

Training (H1) had two significant statements, access to training in working across cultures (Statement 4) and mechanisms for sharing learning across boundaries (Statement 6). There were three positive correlations with the significant questions among the centralized and only one within the decentralized group. The two significant statements (Statements 4 and 6) also had a positive correlation among the centralized virtual project managers. This correlation did not exist for the decentralized virtual project managers.

Availability of continual learning and just-in-time learning (Statement 5) was positive to the availability of lessons-learned databases (Statement 6). This correlation

was only seen with the centralized project management respondents (see Tables 2 and 5). The statistical data suggested that a centralized virtual project manager had better access to cultural training. The centralized virtual project managers statistically reported positively to having access to databases that appeared to allow for continual and just-in-time learning. Availability of continual learning and just-in-time learning (Statement 5) positively correlated to the availability of lessons-learned databases (Statement 6). This correlation was only seen with the centralized project management respondents (see Tables 2 and 5).

The project metric data, cost and schedule variances, were not statistically significant. However, twelve project managers, six from a centralized and six from a decentralized, provided metrics for a virtual project. The data was almost identical. It was expected that the data would have been better for a centralized PMO.

Chapter V will present findings, recommendations, and interpretation of the data presented in the literature review (Chapter II) and the statistical data (Chapter IV) within the limitations of this study. The significance of the interpretations will be highlighted for leaders within the project management community to understand how project managers view the support they receive in a centralized versus a decentralized project management organization.

CHAPTER V

Summary and Recommendations

The goal of this research was to determine if the nurturing of virtual project managers was more focused in a centralized versus a decentralized project management organization. The areas assessed were training, standardized processes, electronic communication and collaboration, leader behavior and team leader and team member competency and experience. It was expected that a virtual project in a centralized PMO would be more successful in respect to cost and schedule because the project managers would receive more focused attention. The cost and schedule were reviewed using Earned Value, which the Project Management Institute considered as a best-in-class metric (PMI, 2000).

Two project management societies with a total population of approximately 1500 project managers were given access to the survey. The survey was sent to one society's membership via email. The other society sent an email to the membership with a URL link to the survey. A total of 73 surveys were received and 13 were rejected for various reasons. This represented approximately 4.8% of the population.

Chi-Square analysis was done on all the data received. There were eight hypotheses and eight research questions with one hypothesis and one research question for each of the five sections of the validated Likert-style survey

(Duarte & Snyder, 2001). Three hypotheses and three research questions were developed to test the demographic data. The two statements on cost and schedule metrics were invalid because of insufficient response (see Table 16). The Chi-Square analysis of the demographic data revealed it to be insignificant. Project managers were also asked to provide project demographics.

The findings from the five hypotheses clearly demonstrated that a centralized project management organization, as a whole, was more beneficial to the virtual project manager in the areas of training (H1), standard processes (H2), electronic communication and collaboration (H3), leadership (H4), and leader/team competencies and experience (H5). However, this study cannot conclusively state that this resulted in virtual projects being more successful. The project metric data provided by those in the study proved statistically insignificant since there was not enough data provided.

The virtual project manager in a centralized project management organization was more satisfied with access to formal and on-the-job training; standard processes were more common and were followed; and technology was accessible by all team members (H1-3). These three areas, training (H1), standard processes (H2), and electronic communication and collaboration (H3), had only one or two statements that were strongly favored by the centralized

project manager. There were two significant statements in the training section:

- There is access to training in working across cultures, and
- There are mechanisms, such as lessons-learned databases, for sharing across boundaries (Duarte & Snyder, 2001).

There was one statement for standard processes and one for electronic communication and collaboration. The two statements are listed below:

- There are standard and agreed-on "soft" team processes used throughout the organization and with partners, and
- People from all geographic areas have equal access to, and are skilled in using, electronic communication and collaboration technology (Duarte & Snyder, 2001).

In the areas of leader behavior (H4), the Chi-Square statistics for all four statements demonstrated that the centralized PMO was more favorable. The statements are as follows:

- Leaders set high expectations for virtual team performance;
- Leaders help gain the support of customers and other stakeholders;
- Leaders allocate resources for the training and technology associated with virtual teams; and

- Leaders model behaviors such as working across boundaries and using technology effectively (Duarte & Snyder, 2001).

Three of the four statements for team leader and team member competency and experience (H5) also were predisposed to the centralized organization. The one statement that was similar in responses for both groups was that team members had experience working across boundaries, whether organizational or cultural. The three significant statements are as follows:

- Team leaders are experienced in working in virtual environments;
- Team members are experienced in working in virtual environments; and
- Team leaders are experienced in working across organizational and cultural boundaries (Duarte & Snyder, 2001).

The one statement that was not significant was "team members are experienced in working across organizational and cultural boundaries" (Duarte & Snyder, 2001, p. 15).

Project Management Training (Hypothesis One)

Recommendations

Duarte and Snyder's (2001) research found that providing the latest technology to virtual teams was not enough. There needed to be an equal amount of attention focused on technology and cultural awareness training for

the virtual team (Duarte & Snyder, 2001). The findings from this study indicated that the centralized project managers had better access to cultural training (Statement 4) and on-the-job training, such as lessons-learned databases (Statement 6). Of note, the centralized project managers indicated that technology was available and team members were skilled in using the technology (Hypothesis 3). When these two hypotheses were coupled, it appeared that the centralized PMO's leadership ensured that the proper training and technology were provided to the teams.

It is recommended that organizations with virtual project managers, whether a centralized or decentralized PMO exists, ensure that all team members are kept current on the technology being used, as well as, training for working with different cultures. The centralized organizations are statistically better at providing the virtual project managers with databases that allowed sharing and learning. Duarte and Stuart (2001) recommend establishing "shared lessons, databases, knowledge repositories, and chat rooms" (p. 17) to enhance virtual teams' learning opportunities. This is also supported by Toney (2002a), who states, "The best practices project organization has a personalized development and training program based on identification of skills and competencies needed by the individual or group" (p. 241).

Standard Organizational and Team Processes (Hypothesis Two)

Recommendations

Statement 8, "There are standard and agreed-on "soft" team processes used throughout the organization and with partners" (Duarte & Snyder, 2001, p. 13), was statistically positive for the centralized project managers. Based on the one statement, it was difficult to say whether all areas of standardized processes were better in the centralized versus the decentralized PMO. Numerous research studies demonstrated that standardized processes help the efficiency of projects and organizations (Duarte & Snyder, 2001; Toney, 2002a). A project normally had goals that include completion within budget and on schedule (PMI, 2000).

The recommendation is that standard processes within the organization are adapted for the virtual organization, as necessary. In addition, there should be agreed upon soft processes for the virtual environment, including items such as conflict-resolution and communication (Duarte & Snyder, 2001). The project manager and the team members must also be competent and understand the importance behind the standardization.

Adding to the importance of standardized processes were the results of hypothesis five, team leader and team member competency. This was positively correlated to the centralized project management organization. Toney (2002a)

states, "Project teams are more efficient when utilizing a repeatable and predictable approach" (p. 183). It, therefore, may be extrapolated that one of the reasons that team leaders and team members are more competent and experienced in a centralized PMO is due to the repeatable and standard processes.

Electronic Communication and Collaboration (Hypothesis Three) Recommendation

Duarte and Snyder (2001) emphasized that the electronic collaboration and communication technology need to meet the needs of the team. Toney's (2002) benchmark data supported Duarte and Snyder (2001). The technology needed to be customizable to meet the needs of the team (Toney, 2002). There was one statement for electronic communication and collaboration that was positive for the centralized project manager and stated that individuals from all geographic areas have equal access to and are skilled in using the communication and collaboration technology (Statement 14) (Duarte & Snyder, 2001).

It is difficult to come to any specific conclusions based on the one statement. However, it appears from this study that the centralized virtual project managers were more adept at using the technology offered. Whether the virtual project manager is centralized or decentralized, the main way that work is conducted is via technology that is provided. Therefore, the proper technology and

appropriate technology training are required to provide the team the tools to succeed.

Leader Behaviors (Hypothesis Four) Recommendations

Of the five hypotheses, the organizational leadership section statistically favored the centralized PMO. Duarte and Stuart (2001) emphasized "working across time and distance and with organizational partners is not just a temporary fad but a new way of doing business" (p. 20). The centralized project management organization's leadership statistically understood this new way of doing business. The leadership established high expectations of the virtual team but ensured that partners in and out of the organization supported the team. In addition, the leadership ensured that the virtual team has the resources and training to accomplish the work. The leadership also was a model of the desired behavior when working across time and distance and organizational boundaries.

Virtual leadership required a different skill set than the traditional face-to-face leadership. Trust was an integral aspect of a virtual team and studies indicated that without this trust a virtual team was more likely to fail (Cascio, 2000; Hage & Powers, 1992; Kezsbom, 2000). The organization's leadership must make a concerted effort to demonstrate to the whole organization the successes of a virtual team (Duarte & Snyder, 2001). The leaders of the

organization also support the virtual team by providing the needed resources (Duarte & Snyder, 2001).

In a centralized project management organization, the focus is on the project manager and the project. When project managers are spread through the organization the management has to provide administrative and leadership support to many different types of employees with differing needs. It is recommended that the organizational leadership ensure that a small overarching PMO be established to review the training, technology, processes, and competencies for the virtual project managers. This provides the virtual project teams with the understanding that there is trust and that the organization values the work and the results.

Team Leaders and Team Members Competence (Hypothesis Five)

Recommendation

This hypothesis was also very positive for the centralized project managers. It is of note that the two hypotheses that dealt with leadership activities had the most statements that were positive for the centralized virtual project manager. In hypothesis Five, three of the four statements correlated positively to the centralized PMO. The statements are as follows:

- Team leaders are experienced in virtual environments (Statement 19);

- Team members are experienced in virtual environments (Statement 20); and
- Team leaders are experienced working across boundaries (Statement 21).

The one statement that was not significant was for the team members working across boundaries (Statement 22).

Duarte and Snyder (2001) reported that virtual team leaders feel as though "they are the 'glue' that holds" (p. 22) the team together. They further emphasize the need for trust in a nearly faceless environment (Duarte & Snyder, 2001). This trust and 'glue' appeared to be in place more in the centralized environment. This may be due to the fact that the leaders in the centralized PMO understand what the virtual project manager needs and the daily problems he/she faces. The centralized organization needs to continue to emphasize and protect the needs of the virtual project team as they interact with senior management. This demonstration of support will serve to enhance the trust that is necessary in a virtual environment (Duarte & Snyder, 2001; Jarvenpaa & Leidner, 1999; Handy, 1980)

Earned Value Recommendations

Only twelve project managers responded that cost and schedule variance were maintained on the project. The respondents were evenly divided, six centralized and six decentralized. The expected result had been that the centralized project managers would maintain cost and

schedule variances more often than decentralized. A centralized project management organization tends to be a projectized organization (PMI, 2000) and concentrates on metrics and processes. Therefore, it would have been expected that Earned Value would be embraced by the organization.

Two recent studies, one by Toney (2002a) and a dissertation by Bassford (1999), provided conflicting results regarding the adoption of capturing cost and schedule variance. Toney's (2002a) benchmark data indicated that "only a handful use earned value" (p. 107) for schedule data and earned value for cost is "widely accepted" (p.107). Milestone tracking is used in lieu of schedule variance according to Toney's (2002a) study.

Bassford's (1999) dissertation is a study on earned value techniques used at the Department of Energy. It should be noted that within the U.S. Government, Earned Value is readily accepted. One of Bassford's (1999) findings was that earned value is a valuable technique but the issues for the metric not being used were attributed to a breakdown of communication. The root cause of the breakdown was that the analysis was not done "in a timely fashion" (p. 113), and those reading the reports did not understand the data and were unable to answer questions about specific parts of the project.

PMI's best-in-practice metrics for project performance was and continues to be Earned Value. It is recommended

that project management organizations and, more importantly, project managers provide quick and simple definitions of Earned Value on reports and provide the appropriate metrics to sponsors, functional managers, and chains of command. The project management organizations, whether centralized or decentralized, should also provide appropriate report formats to meet the needs of the constituent base of a project, but with care not to overburden the project manager and others with unnecessary reports.

Recommendations for Further Research

Based on the conclusions and findings of this study and the limitations encountered, the following is recommended for further study:

1. Similar studies of best-in-class organizations in different industries with virtual projects need to be studied. This would enhance the body of knowledge within the project management industry for virtual projects within specific industries.
2. Further studies need to be done with larger study groups to determine if demographics truly are insignificant to the hypotheses posited in this study.
3. A more encompassing study needs to be conducted to review the reasons that Earned Value, a best-in-class metric for assessing the status of a project,

is not more widespread within centralized and decentralized project management organizations.

4. A more in-depth study is needed in the area of technology and project management training to discover how the two are or are not complementary.
5. A relatively small sample of project managers was used. The Project Management Institute (PMI) has over 95,000 members. This study should be replicated and conducted in conjunction with the PMI Research Foundation to reach a much broader audience. The study would enhance the quality of the findings.

This study provides evidence that centralized project management offices provide better support services for the virtual project manager. The data on Earned Value, while statistically insignificant, did offer evidence that the best-in-class metric for statusing projects does not appear to be a standard practice in this study. This information needs to be further studied to understand the reasons and what is being used in its place.

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Appendix A

Letters providing authority to conduct survey

June 22, 2002

**North Carolina Piedmont Chapter
Attn: Susan Rizzi, President
Eastport Building
Millstream Road
Greensboro, NC 27430**

Dear Ms. Rizzi:

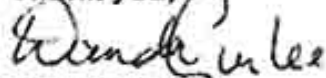
I am a student at the University of Phoenix working on a Doctor of Management in Organizational Leadership. I am requesting permission to send a project management survey to the membership of PMI Region 5. The purpose of the research is to determine the benefits of a centralized versus a decentralized project management office for virtual IT projects.

The membership would be asked to complete the survey and return the completed survey to me via email. The survey would take approximately twenty to twenty-five minutes to complete. The survey is voluntary and complete anonymity will be maintained. The results of the survey will be published but will not contain any names.

There is no direct benefit to individual project managers. However, this research is expected to provide valuable data to those that lead project managers in a virtual environment.

Please sign and date this letter on the below line, if you approve this request.

Thank you,



**Wanda Curlee
Doctor of Management, Candidate
4336 Sartin Road
Burlington, NC 27217**

Approved _____

Susan Rizzi, President

Date _____

6/25/02

June 22, 2002

PMI - Project Management Office SIG
Attn: Robert Johnston, Executive Chair

Dear Mr. Johnston:

I am a student at the University of Phoenix working on a Doctor of Management in Organizational Leadership. I am requesting permission to send a project management survey to the membership of PMI Region 5. The purpose of the research is to determine the benefits of a centralized versus a decentralized project management office for virtual IT projects.

The membership would be asked to complete the survey and return the completed survey to me via email. The survey would take approximately twenty to twenty-five minutes to complete. The survey is voluntary and complete anonymity will be maintained. The results of the survey will be published but will not contain any names.

There is no direct benefit to individual project managers. However, this research is expected to provide valuable data to those that lead project managers in a virtual environment.

Please sign and date this letter on the below line, or have a board member complete, if you approve this request.

Thank you,

Wanda Curlee
Doctor of Management, Candidate
4336 Sartin Road
Burlington, NC 27217

Approved Robert S. Johnston, PMP Date July 1,
2002

Printed Name: Robert S. Johnston,
PMP

Position: Executive Chair, PMI Program Management Office
Specific Interest Group (PMOSIG)

Appendix B

The copyrighted material titled “Project Management Survey” is available directly from the publisher or from many libraries in the following book:

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

Appendix C

Purpose and Confidentiality Statement for Emails and Newsletter

The purpose of this survey is to gather information regarding virtual projects for which you are a member. It is important to understand how virtual projects are influenced by project managers and team members in a centralized project management organization versus a decentralized project management organization.

Your participation in this survey is totally voluntary. In order to accomplish the goals of the survey your complete and honest participation is needed. For everyone that completes the survey your confidentiality will be maintained. Responses from all completed surveys will be compiled so that no one individual or company can be identified.

APPENDIX D

Permission to Use Survey

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PERMISSIONS DEPARTMENT
605 Third Avenue
New York, NY 10158-0812

TEL: 212.850.6011
FAX: 212.850.6008

May 21, 2002

Wanda Curlee
University of Phoenix – Online
4336 Sartin Road
Burlington, NC 27217

Dear Ms. Curlee:

RE: Your recent request for permission to republish pages 10, and 12-15 from Duarte/ MASTERING VIRTUAL TEAMS, 2E [ISBN: 0787955892]. This material will appear in your forthcoming dissertation, to be published by University of Phoenix in November 2002.

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