

PROJECT MANAGER PERSONALITY AS A FACTOR FOR SUCCESS

THESIS

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Abstract

Much has been written regarding project success, and one of the factors contributing to project success is the role of the project manager. Furthermore, project success can be enhanced by selecting the best project manager and by assigning project managers whose attributes best align with project type. This research investigated the ability of the project manager's personality to predict success using the "Big Five" personality model. United States Department of Defense project managers were surveyed to determine specific "Big Five" personality traits which were more likely to positively predict project manager success. The findings indicate conscientiousness and openness to experience were both statistically significant predictors of successful project managers. The results may be useful as one consideration when hiring project managers and when selecting project managers to best match certain project types.

To the Lady I have loved longer than I can remember

and to my family

"I thank my God upon every remembrance of you,
Always in every prayer of mine making request for you with all joy..."
Philippians 1:3, 4 (NIV)

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John Bedingfield

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PROJECT MANAGER PERSONALITY AS A FACTOR FOR SUCCESS

I. Introduction

Project management is a maturing profession, with many challenges. Although our understanding of project management, and criterion for successful project managers, has grown significantly since the 1960s, there is still much to explore. In particular, our understanding of how project manager personality might influence success has received little attention, and this thesis represents an initial exploratory research effort to elucidate the linkage between personality and project manager job performance. This chapter will preview the research by first describing an overview of the effort, including a preview of the key literature, the purpose of the research, and research questions, followed by a brief description of the research methodology, its importance, assumptions, and limitations. To begin the overview, an introduction to key terminology is helpful.

Background

A project is defined as "a temporary endeavor undertaken to create a unique product, service, or result" (Program Management Institute, 2004, p. 5). Consequently, project management is the "application of knowledge, skills, tools, and techniques to project activities to meet project requirements," and the Project Manager (PM) is the person responsible "for accomplishing the project objectives" (Program Management Institute, 2004, p. 8). Typically, the role of the project manager includes planning,

organizing, directing, and controlling the project (Program Management Institute, 2004; Kerzner, 2006).

By many indications, projects are in a state of crisis. In 1994, only 16 percent of software projects finished on time and on schedule (Standish Group, 1995). While the number improved in the 2001 study to 28 percent, there is debate about the rationale for the improvement; some believe the original study was flawed (Glass, 2006), while others believe the increase was directly attributable to the increase in the use of project management and project management skills (Berntsson-Svensson and Aurum, 2006). Regardless, a success rate of one out of three projects is still extremely low, especially when coupled with the cost of each unsuccessful project.

Within the Department of Defense (DoD), project management is the hallmark of the acquisition process, which is an expensive endeavor with many challenges. Mistakes made in the acquisition process represent waste and increased cost to the DoD. The Fiscal Year 2008 DoD budget request includes over $175 billion for procurement and research and development, of which $61 billion is allocated to the Air Force (Kosiak, 2007). A United States Government Accountability Office (GAO) report on the status of 64 DoD major acquisition programs identified 5 percent cost growth per year from 2004 to 2007, costing $165 billion dollars more than originally planned (United States Government Accountability Office, 2007, p.8). The same GAO assessment found 27 of the programs exhibited a cost increase of greater than 33 percent and a schedule increase of over 23 percent (United States Government Accountability Office, 2007, p. 9). A similar GAO assessment, conducted in 2006, of 23 major programs found 10 programs with development cost overruns greater than 30 percent, or schedule delays of at least one

year (United States Government Accountability Office, 2006). Cost overruns and late schedules delay delivery and fielding of critical technologies to warfighters currently engaged in struggles all over the world.

Furthermore, since the 30 percent waste must be recovered within the available budget, cost overruns degrade both capability fielding and the overall capability of the force. Currently, the Air Force is reducing overall military personnel by 40,000 Airmen, saving an estimated $4 billion to be used instead for the recapitalization of an aging fleet (Wynne, 2007). Reducing the Air Force's share of the 30 percent cost overrun by just 7 percent could save $4 billion and obviate the need to reduce critical personnel. A continuation of cost overruns at the current levels will almost certainly necessitate the need for further personnel reductions. Therefore, to reduce waste and the need for further personnel reductions, any effort to improve project management and reduce cost and schedule overruns should be considered, beginning with an examination of project success factors.

Much has been written regarding project success, preventing cost and schedule overruns, and more efficiently delivering capabilities, resulting in several definitions of project success. However, one of the factors contributing to project success is the role of the PM (Munn and Bjeirmi, 1996). In addition, there is a growing body of literature focused on skills or attributes exhibited by the successful PM (Posner, 1987; Petterson, 1991; Valencia, 2007). Some authors make a clear distinction between project success and project manager success (Munn and Bjeirmi, 1996) and point out that good project managers can "contribute to project success, but are unlikely to prevent failure" (de Witt, 1988, p. 165).

Therefore, selecting the right PM becomes important to project success, and there is some initial evidence personality might be a predictor of success. Several researchers have linked personality with positive job performance. Often, personality is defined using either the Myers-Briggs Type Indicator (MBTI) or the Big Five personality taxonomy which includes extraversion, agreeableness, conscientiousness, openness, and neuroticism. For example, one study of sales representatives involved in a new medicine product launch found Big Five personality traits of agreeableness and openness to experience best predicted sales success (Thoresen, Bradley, Bliese, and Thoresen, 2004). Certain personality types are not only naturally inclined toward, and perform better, in certain industries, specific personality types may perform better within certain jobs in the same industry. In a study of the construction industry, individuals with a Myers-Briggs Type Indicator (MBTI) characterized by Intuitive data collecting and Perceiving performed better than individuals with Sensing and Judging personality types during the planning and construction phases of a project, while individuals with a Judging personality type outperformed during the design phase (Carr, de La Garza, and Vorster, 2002). Furthermore, the literature is replete with examples of job performance related to the Big Five personality taxonomy (Barrick and Mount, 1991; Mount and Barrick 1998; Barrick, Mount, and Judge, 2001; Salgado, 1997; Tett, Jackson, and Rothstein, 1991; Salgado, 2003).

However, little is known about personality and its impact on project or PM success; in fact, the literature is limited to two exploratory studies. The first study discovered a relationship between PM competencies and personality type measured via the Myers-Briggs Type Indicator (Gehring, 2007). The second study found initial

evidence linking personality type with certain types of projects; specifically, it found that PMs who matched their personality type with project type were more successful (Dvir, Sadeh, and Malach-Pines, 2006; Malach-Pines, Dvir, and Sadeh, 2007). In addition, neither study considered all aspects of a robust personality taxonomy, such as the Big Five. Therefore, although there are studies that have considered personality as a predictor of job performance in general, and studies that have considered PMs specifically, there do not appear to be any studies which have considered all dimensions of personality as a predictor for PM performance.

Purpose

This research seeks to investigate and identify project manager personality traits either contributing to, or detracting from, PM success. The research will examine all personality domains as defined by the Big Five and will consider PMs specifically. In addition, the research will investigate differences in PM personality among the United States military services and between different types of projects.

Research Questions

To address the overall research purpose, the following investigative questions are explored in this thesis:

- Does project manager personality contribute to project success?
- For each DoD Service, are there specific personality types associated with project success, and do the personality types differ by Service?
- Given different types of projects, do different personality types contribute more to project success?

Methodology

This research will begin with a thorough review of the literature focused on project manager (PM) success factors and personality influences on job performance. Based on the literature review, a more specific model and hypotheses will be developed, and a subsequent survey of PMs attending Defense Acquisition University (DAU) 352B and 400 series courses will be conducted. The PMs will be surveyed to determine their personality traits using a Big Five personality assessment. In addition, each PM will be asked to provide a Big Five personality assessment for the Best PM, and the Least Successful PM, they know or have known. Following the survey, the data will be analyzed using statistical techniques and a Hierarchical Linear Model (Bryk and Raudenbush, 1992). The most significant personality factors influencing PM performance will then be analyzed for trends and sensitivity.

Assumptions and Limitations

This research assumes DoD PMs are equivalent to their non-DoD counterparts, a representative sample of DoD PMs can be obtained by surveying students attending the Defense Acquisition University (DAU), and PM success can be discerned by an experienced PM. Although there are some unique environmental factors within DoD acquisition, and although no two projects are the same, the role of the DoD PM in general is assumed to be comparable to the non-DoD PM. The rationale for this assumption is further explored in Chapter III. In addition, to obtain a representative sample of DoD PMs, students attending DAU will be surveyed. It is assumed that the students attending DAU will be representative of DoD PMs in general because all DoD PMs are required to

attend DAU. A more detailed description of the sample methodology and arguments supporting this assumption are included in Chapter III. Finally, the research assumes that an experienced PM can identify a good PM from a poor PM. Chapter II presents a description of some of the various definitions of PM success. Although there is no unifying theory of PM success, someone who has observed many PMs is expected to be able to identify the best PM they have known and the least successful PM they have known.

Significance of Study

The results of this research should identity specific personality traits that are better suited for, and have a better chance of success at, project management. Within the DoD, or the Air Force, the findings may be useful to new accessions, and their counselors, as they determine which Air Force Specialty Code (AFSC) or job series to pursue. The findings may also be useful to career program managers, both inside and outside the DoD, as they map their career path and identify specific jobs which best fit their personality. Finally, although personality alone should not be used in hiring decisions, the results may be useful as an additional consideration when hiring project managers.

Preview

Chapter II summarizes the current literature used as a foundation for this research. Specifically, Chapter II will outline PM roles, personality definitions, project success considerations, and the current understanding of PM personality. Chapter III outlines the

methodology used during the research; it describes the instrument used in the survey and the structured interview approach used during the supervisor interviews. Chapter III also describes the validity and research underpinnings for the survey and interviews. Results and recommendations are summarized in Chapter IV. Finally, Chapter V provides conclusions and recommendations for future research.

II. Literature Review

This chapter summarizes the literature associated with the research topic. The chapter begins with a background to define key terminology, followed by a description of key attributes of successful project managers, and concludes with related personality considerations. Personality is described using the Big Five personality taxonomy, and each of the five domains is described in detail. In addition, the Myers-Briggs personality types are described for comparison. Finally, literature regarding personality as a predictor of job performance is presented, along with the research hypotheses.

Background

A *project* is defined as "a temporary endeavor undertaken to create a unique product, service, or result" (Project Management Institute, 2004, p. 5). Projects are often distinguished from other efforts in that they have a definite start and stop date; have specific objectives to be achieved within the stated timeframe; are usually allocated and consume specific project resources including funding, personnel, and equipment; and progress through a lifecycle (Kernzer, 2006). When more and more endeavors began to fit the definition of a project, the literature considering projects and how best to manage them subsequently increased.

As more organizations transition from classical management to a project management approach, many have determined a unique skill-set is required to manage the project (Kernzer, 2006). "Project management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements" (Project

Management Institute, 2004, p. 8). Ultimately, the Project Manager (PM) is the person responsible to manage the project to a successful completion while balancing project cost, schedule, performance, and risk. To accomplish project goals, the PM performs a variety of functions including classical management functions such as planning, organizing, staffing, controlling, and directing, as well as traditional leadership functions and unique project management functions. Often, a PM serves in a complex, matrixed organization with multiple lines of responsibility to the project, the organization, the client (or product user), the funding source and project sponsors, stakeholders, and project team members (Project Management Institute, 2004; Kerzner, 2006; Meredith and Mantel, 2006). As additional layers of complexity are added, a program is created.

> A program is often distinguished from a project in that a program is a group of related projects managed in a coordinated way to obtain benefits and control not available from managing them individually... In contrast with project management, program management is the centralized coordinated management of a group of projects to achieve the program's strategic objectives and benefits. (Project Management Institute, 2004, p. 16)

However, within the United States military, the term program and project are often used interchangeably (Department of Defense, 2003; Kerzner, 2006) perhaps since many of the military projects are complex, take a long time, and involve a systems of systems approach. Furthermore, Department of Defense (DoD) project managers are often called program managers. Whether adhering to the strict definitions of project and program and project manager or program manager, there is general agreement the role of the PM is multi-faceted and selection of a good PM can be key to the success of the project (Project Management Institute, 2004; Kerzner, 2006; Meredith and Mantel, 2006).

Program Manager Attributes

Since the PM is so important to the project, selection of the right PM -- or the PM with the right skills and attributes -- has garnered much attention in PM literature. Petterson (1991) summarized over 60 articles to determine key attributes valuable to PM selection and identified five areas common across the literature: problem solving, administration, supervision and team management, interpersonal relationships, and other personal qualities. The results of additional research and identified attributes are summarized in Table 1.

Interestingly, the list of PM attributes has remained fairly consistent over the last 20 years. In most of the literature, the same common attributes are represented, as delineated by the eight categories in Table 1. However, the categories of attributes have sub-categories, and there is often overlap and interrelation between the sub-categories. For example, a PM who excels at leadership probably also has high interpersonal relationship skills. One study recognized the inability to succinctly split the attributes and instead clustered the attributes into groups which were most likely to be obtained by a single individual (Hauschildt, Keim, and Medeof, 2000).

Table 1. Summary of PM Attributes Literature (Valencia, 2007)

	Problem Solving	Administration	Supervision and Team Management	Interpersonal Relationships	Other Personal Qualities	Knowledge	Experience	External Factors
Bowenkamp & Kleiner (1987)	✓	✓	✓	✓	✓			
Pitts (1990)				✓				
Pettersen (1991)	✓	✓	✓	✓	✓			
Goodwin (1993)	✓			✓		✓		
Anderson & Tucker (1994)		✓	✓	✓		✓	✓	✓
Pinto & Kharbanda (1995)	✓	✓	✓	✓	✓	✓		
Grant, et al. (1997)						✓	✓	✓
Tagger, et al. (1999)						✓	✓	
Brugger, et al. (2000)	✓	✓	✓	✓	✓			✓
Crawford (2000)	✓	✓	✓	✓		✓		✓
Hauschildt, et al. (2000)	✓		✓	✓	✓	✓		
Odusami (2002)	✓	✓	✓	✓		✓		✓
Hyväri (2006)			✓			✓		✓

Whether investigated individually or in clusters, many studies have tried to determine how the attributes relate to job performance. After identifying an initial set of attributes common to PMs, Petterson (1991) proposed the following equation to relate the attributes to job performance success: **Performance = abilities x motivation x personality**. As presented in Table 2, Valencia (2007) further summarized the attributes in Table 1 into those attributes which can be taught and measured. This table, which provides a good summary list of attributes demonstrated by successful PMs, is useful for additional analysis and comparison.

The terms presented in Table 2 include definitions as coalesced by Valencia (2007). These definitions are generally understood by most professionals in the program management career field; however, a few are not as commonly used within the Department of Defense (DoD) or civilian project management vernacular. In particular, three attributes—*administrative skill*, *decision making skill*, and *technical competence*—require further clarification.

Table 2. Definitions of Selected PM Attributes (Valencia, 2007)

Factor	PM success attribute	Attribute definition
1	Leadership Skill	"Takes control and exercises leadership. Initiates action, gives direction, and takes responsibility."[1] Encourages others to act, perform at higher standards, and think for themselves.[2]
2	Communication Skill	"Communicates and networks effectively."[1] Displays behaviors of coordination, encouragement of communicative participation, and sympathetic expression.[3]
3	Decision Making Skill	Makes decisions based on one of two styles: adaptive ("do things better") or innovative ("do things differently").[4]
4	Administrative Skill	"Plans ahead and works in a systematic and organized way. Follows directions and procedures."[1]
5	Coping Ability	"Adapts and responds well to change. Manages pressure effectively and copes well with setbacks."[1]
6	Analytical Thinking	"Shows evidence of clear ability to analyze and interpret information. Gets to the heart of complex problems and issues."[1]
7	Technical Competence	"The ability to assimilate and use technical information."[5] "The ability to use project management tools and methods to carry out projects"[6]

Note. The following citations are provided: [1] Bartram (2005). [2] Van Dyne et al. (1994). [3] Hatfield & Huseman (1982). [4] Kirton (1976). [5] Miller (1987). [6] Hyväri (2005).

Administrative skill is not aligned with the traditional bureaucratic administration definition. Rather, administrative skill implies the PM's ability to plan and organize (Bartram, 2005; Valencia, 2007). The attribute of decision making skill represents the PM's cognitive ability to weigh options and select a course of action (Valencia, 2007). For example, a PM who makes decisions based on well-known techniques and procedures or previously proven methods is said to have an "adaptive" decision making style (McDonough, 1990). In contrast, a PM who makes decisions by connecting ideas in entirely new ways, or by novel approaches, is said to have an "innovative" cognitive style (McDonough, 1990). Finally, technical competence is addressed in the literature by two different meanings (Valencia, 2007). The first meaning describes a PM's ability to understand the technical aspects of the product being managed, such as the implications of the electromagnetic spectrum on a radar acquisition program. The second meaning of technical competence describes the PM's ability to understand and use project management tools and processes, such as building and analyzing critical paths and schedules with Gant or Pert charts.

With the exception of a few PM "superheroes," most PMs cannot excel at all the attributes listed. Therefore, it is helpful to determine which attributes most contribute to job performance and project success. Table 3 summarizes four studies conducted by surveying program managers to determine the relative priority of the PM attributes defined in Table 2. For each of the four studies, the quantitative research results were summarized in the Table 3, using the definitions from Table 2. Each study is described in additional detail in the following paragraphs.

Table 3. Prioritized PM Attributes

	Leadership Skill	Communication Skill	Decision Making Skill	Administrative Skill	Coping Ability	Analytical Thinking	Technical Competence	Other
Gadeken (2004)	2 Vision / Strategy 3 Delegation / Empowerment	1 Communication					6 Competence / Expertise	4 Integrity 5 People Skills 7 Team Building
Posner (1987)	4 Leadership Skills	1 Communication Skills		2 Organizational Skills [included Analyzing]	5 Coping Skills		6 Technological Skills	3 Team Building Skills [some leadership]
El-Sabaa (2000)	3 Delegating Authority 4 Mobilizing	1 Communication		7 Organizing 8 Planning	2 Coping with Situations	12-14 (Various analytical skills)	14-18 (Various technical skills)	5 Political Sensitivity 6 Enthusiasm 9 High Self-esteem
Odusami (2002)	3 Leadership & Motivation	2 Communication	1 Decision Making	6 Organizing 7 Planning & Goal Setting		4 Problem Solving	8 Technical Knowledge	

In the first study, Gadeken (2004) surveyed nearly 2000 Department of Defense PMs attending the Advanced Program Management Course offered by the Defense Acquisition University (DAU). Students were asked to identify good and bad PM leadership attributes which were then clustered into seven categories and ranked by the number of respondents. Although some terminology was slightly different, four of Gadeken's (2004) categories aligned very well with the seven categories outlined in Table 3. However, three elements -- integrity, people skills, and team building -- did not fit neatly into any of the seven categories (Gadeken, 2004). The study identified communication as the number one priority and leadership a close second.

It is important to note that Gadeken's (2004) survey methodology may have been skewed by current events or training priorities. For example, one would expect United States Air Force PM students to respond with the word integrity more often after the F-22 and Darleen Druyun integrity issues during 2002 and 2003. Shortly after those events, the DoD acquisition leadership tended to emphasize integrity as an important hallmark of a good PM. Consequently, one would expect that DoD PM students might identify the attribute of integrity more often. Perhaps current events or recent training led the respondents in Gadeken's (2004) study to focus on integrity, people skills, and team building.

The second study surveyed 287 PMs attending PM conferences (Posner, 1987). In open-ended interviews, the respondents were asked identify "personal characteristics, traits, or skills" used by "above average" PMs (Posner, 1987, p. 51). After conducting content analysis of nearly 1400 statements, six areas emerged. Again, communication was ranked most important, and 84 percent of the respondents indicated good

communications skill was essential for a good PM. In addition, administrative abilities and leadership skills were highly ranked.

The third study used a two-part survey; the first part utilized inputs from 85 PMs to identify 18 attributes, while the second part asked 126 different PMs to rank the attributes using a 1-7 Likert point scale (El-Sabaa, 2001). The identified attributes were grouped into three categories: Human Skill, Conceptual and Organizational, and Technical Skill. Human skill was ranked most important (El-Sabaa, 2001). Although El-Sabaa (2001) only provided rankings for the three attributes, the detailed skills depicted in Table 3 comprise the three attributes, and their ranking was derived based on the data provided in the study. Once again, communication skill was ranked the most important attribute needed.

Finally, a fourth study surveyed 120 construction clients, consultants, and contracting officials, who were asked to rank 13 attributes on a 4-point scale (Odusami, 2002). The attributes included: decision making, communications, leadership, problem solving, time management, organizing, planning and goal setting, technical knowledge, financial management, quality management, listening, delegating, and negotiating. Although all three groups did not agree on the number one priority, they did agree that decision making, communicating, and leadership skills were the top attributes. Additionally, they agreed that negotiation skill was the least important attribute.

When synthesized, it appears that various surveys of PMs to determine which attributes they think are most important result in similar conclusions. Namely, communication skills consistently rank near the top of the prioritized attributes. Furthermore, leadership skills also rank high across all the lists. Finally, technical

competence ranks near the bottom of all the surveys. This result is intriguing since many PMs attend thorough training targeted at improving specific PM technical skills; however, they typically do not attend training targeted at the higher prioritized communication and leadership skills.

A unique consideration explored by McDonough (1990) was that the type of project may impact which factors contribute most to success. In a survey of 41 United Kingdom new product development teams, McDonough (1990) discovered that project types correlated with cognitive -- or decision making -- style and a PM's age. For projects that were classified as new technology projects, cognitive style (and more specifically an innovative cognitive style) was found to be most important to project success. For projects classified as applications projects, or projects that take existing technology and simply recombine the technologies in new ways, cognitive ability did not seem to influence project success. However, for application projects, a PM's age was found to be statistically significant; specifically, younger PMs with less experience fared better than their older, more experienced counterparts. Therefore, the priorities listed in Table 3 should be taken as an average across most projects, and the PM should remember that the priorities might shift depending on the type of project under consideration.

Ultimately, Table 3 could serve as a tool for PMs to assess their strengths and weaknesses against what other PMs believe to be important skills. Using this self-analysis, PMs could plan corrective actions to improve their weaknesses. Furthermore, if certain personality traits could be shown to predict or facilitate these successful PM attributes, the personality traits could be used by aspiring PMs to determine if the PM occupation is the best fit.

Personality Overview

Personality is defined as "the sum total of ways in which an individual reacts to and interacts with others" (Robbins and Judge, 2007, pg. 106). The Big Five personality dimensions represent a taxonomy of personality. They are not based on one specific personality theory, but rather represent the work of many researchers using a lexical hypothesis (Digman, 1990; John and Srivastava, 1999). The lexical hypothesis suggests the natural language contains all the important attributes humans use to describe each other; therefore, an examination of the lexicon can identify the finite set of those attributes useful as a taxonomy (John and Srivastava, 1999).

As cited by John and Srivastava (1999), one of the earliest Big Five personality taxonomy studies was conducted by Allport and Odbert in their 1936 lexical study of the unabridged English Dictionary. As summarized by John and Srivastava (1999), Allport and Odbert identified 18,000 terms in four major categories: personality traits, temporary states (e.g., afraid, rejoicing), evaluative judgments of personal conduct and reputation (e.g., excellent, worthy), and physical characteristics. Although care was taken to ensure the categories were mutually exclusive, some overlap existed among the categories.

Cattell (1945) used the earlier work by Allport and Odbert to condense the terms into a taxonomy suitable to describe differences in an individual's behavior. Cattell (1945) began with a subset of 4,500 traits from the personality category identified by Allport and Odbert; he then reduced them to 35 variables using semantic and empirical clustering. Using factor analysis with the 35 variables, Cattell (1945) subsequently identified 12 personality factors (John and Srivastava, 1999).

Based on Cattell's (1945) effort, Tupes and Christal (1961) studied eight samples including Air Force Officer Candidate School students, Air Command and Staff College students, and three university student groups, comprising a total of 1,816 students of various ages. Using Cattell's (1945) 35 traits, they conducted factor analysis and found "five relatively strong and recurrent factors and nothing more of any consequence" (Tupes and Christal, 1961, p. 245). Their five factor model has been replicated by numerous researchers and includes the factors: extraversion (originally labeled as Surgency), agreeableness, conscientiousness (or dependability), emotional stability, and intellect or openness to new experience (originally labeled culture). These factors became known as the Big Five because they represent the summation of many sub-factors. The term Big Five is not meant to imply greatness or supremacy, but only to identify these five factors as the highest level of abstraction representing the various sub-factors. In addition, the Big Five does not represent the complete totality of all personality factors; some have argued for the addition of another factor or the splitting of one of the Big Five factors (Hogan and Holland, 2003; Hough, 1992). However, the Big Five represent the aggregate of five main factors that seem to correlate the most in repeated studies (Tupes and Christal, 1961; John and Srivastava, 1999).

Furthermore, Norman (1963) replicated the lexicon analysis with the same results, and the lexicon analysis has since been replicated by several researchers and "seems to generalize reliably across different types of samples, raters, and methodological variations when comprehensive sets of variables are factored" (John and Srivastava, 1999, p. 106). Adding additional validity to the taxonomy is the reliability across different cultures and languages, across different instruments, and across reports made

via self-report, third-party reporting, and professional reporting (Digman, 1990; Barrick and Mount, 1991; John and Srivastava, 1999). However, it should be noted that of all the Big Five factors, one factor, Openness (or Intellect), shows less replication in non-Western cultures. Emergence of the five-factor model "illustrates that personality consists of five relatively independent dimensions which provide a meaningful taxonomy for studying individual differences" (Barrick and Mount, 1991, p. 5). The Big Five, each with six subfactors, are shown in Table 4 and described in more detail in the remainder of this section.

Extraversion

Extraversion "implies an energetic approach to the social and material world and includes traits such as sociability, activity, assertiveness, and positive emotionality" (John and Srivastava, 1999, p. 121). Typically used to refer to someone who likes excitement and stimulation, it is often associated with the words like sociable, assertive, active, talkative, cheerful, upbeat, energetic, and optimistic (John and Srivastava, 1999; Costa and McCrae, 1991). The Extraversion subfactors, or facets for each domain, shown in Table 4 include warmth, gregariousness, assertiveness, activity, excitement seeking, and positive emotions (Tupes and Christal, 1961; Costa and McCrae, 1991).

Table 4. Big Five Subfactors (Derived from Costa and McCrae, 1991)

Big Five	
Domains	**Subfactors**
Extraversion	Warmth Gregariousness Assertiveness Activity Excitement Seeking Positive Emotions
Openness	Fantasy Aesthetics Feelings Actions Ideas Values
Conscientiousness	Competence Order Dutifulness Achievement Striving Self-Discipline Deliberation
Agreeableness	Trust Straightforwardness Altruism Compliance Modesty Tender-Mindedness
Neuroticism	Anxiety Angry Hostility Depression Self-Consciousness Impulsiveness Vulnerability

Openness

Openness "describes the breadth, depth, originality, and complexity of an individual's mental and experiential life" (John and Srivastava, 1999: 121). It is most correctly described by the following terms: active imagination, aesthetic sensitivity, attentiveness to inner feelings, preference for variety, intellectual curiosity, and independence of judgment (Costa and McCrae, 1991). The subfactors of openness include fantasy, aesthetics, feelings, actions, ideas, and values. Often labeled intellect, Openness is associated with education and measured intelligence since people who are more educated tend to be more open to new ideas. However, cognitive ability is not included in the Big Five taxonomy (Costa and McCrae, 1991).

Conscientiousness

Conscientiousness "describes socially prescribed impulse control that facilitates task and goal directed behavior" (John and Srivastava, 1999, p. 121). It consists of self-control in the more active sense of planning, organizing, and carrying out tasks; it is also characterized by terms such as purposeful, strong willed, determined, scrupulous, punctual, reliable, orderliness, and perseverance (Costa and McCrae, 1991; John and Srivastava, 1999; Tupes and Christal, 1961). It implies thinking before acting, delaying gratification, and following norms and rules, as well as planning, organizing, and prioritizing tasks (Costa and McCrae, 1991; John and Srivastava, 1999; Tupes and Christal, 1961). Subfactors of Conscientiousness include competence, order, dutifulness, achievement striving, self-discipline, and deliberation (Costa and McCrae, 1991).

Agreeableness

Agreeableness is primarily a dimension of interpersonal tendencies (John and Srivastava, 1999). It is described by the terms: fundamentally altruistic, sympathetic to others, and eager to help (Costa and McCrae, 1991; John and Srivastava, 1999; Tupes and Christal, 1961). In contrast, respondents who score low on the Agreeableness scale are often described as egocentric, skeptical of others' intentions, competitive rather than cooperative (John and Srivastava, 1999). Agreeableness "contrasts a prosocial and communal orientation toward others" (John and Srivastava, 1999, p. 121); it is characterized by altruism, tender-mindedness, trust, modesty, good-natured, cooperative, attentiveness to people (Costa and McCrae, 1991; John and Srivastava, 1999; Tupes and Christal, 1961). The Agreeableness subfactors include trust, straightforwardness, altruism, compliance, modesty, tender-mindedness (Costa and McCrae, 1991).

Neuroticism

Neuroticism is best described as the "general tendency to experience negative effects such as fear, sadness, embarrassment, anger, guilt, and disgust" (Costa and McCrae, 1991, p. 14). However, Neuroticism is not a measure of psychopathology. The contrast to Neuroticism is emotional stability, which describes a person with poise, usually "calm, even tempered, and relaxed, and they are able to face stressful situations without becoming upset or rattled" (Costa and McCrae, 1991, p. 15). Neuroticism "contrasts emotional stability and even temperedness with negative emotionality" (John and Srivastava, 1999, p. 121); it is characterized by feeling anxious, nervous, sad, and tense (Costa and McCrae, 1991; John and Srivastava, 1999; Tupes and Christal, 1961).

Big Five and Myers-Briggs Type Indicator

Many DoD PMs are familiar with the Myers-Briggs Type Indicator (MBTI) as they are provided with an MBTI assessment during their PM training. Since there is research relating MBTI with PM performance, a basic understanding of MBTI and its relationship with the Big Five is helpful. The MBTI is one of the most popular personality assessment frameworks (Robbins and Judge, 2007). Based on Jung's Psychological Types, Myers and Briggs created an instrument to attempt to measure an individual's personality type (Myers, McCaulley, Quenk, and Hammer, 1998; McCrae and Costa, 1989). The type consists of a four letter designation based on four areas: Extraversion–Introversion (EI), Sensing–Intuition (SI), Thinking–Feeling (TF), and Judgment–Perception (JP). When all possible combinations of the 4 areas are considered, 16 primary "types" emerge as shown in Figure 1. MBTI assumes an individual fits into one of the 16 types (McCrae and Costa, 1989; Robbins and Judge, 2007). A description of each area is shown in Table 5.

ISTJ	**ISFJ**	**INFJ**	**INTJ**
ISTP	**ISFP**	**INFP**	**INTP**
ESTP	**ESFP**	**ENFP**	**ENTP**
ESTJ	**ESFJ**	**ENFJ**	**ENTJ**

Figure 1. Myers-Briggs Personality Types

Table 5. Myers-Briggs Type Indicator Descriptions

Extraversion-Introversion	Extraverted individuals are outgoing, sociable, and assertive. Introverts are quiet and shy. Extraverts tend to draw energy from action, Introverts build energy from reflection.
Sensing-Intuition	Sensing types are practical and prefer routine and order. They focus on details. Intuitives rely on unconscious processes and look at the "big picture." Sensing implies a preference for information gathered from the five senses. Intuition implies a preference for more abstract or theoretical information.
Thinking-Feeling	Thinking types use reason and logic to handle problems. Feeling types rely on their personal values and emotions. Feelers prefer to make decisions by associating or empathizing. Thinkers prefer to make decisions using a more logical approach and a set of rules.
Judgment-Perception	Judging types want control and prefer their world to be ordered and structured. Perceiving types are flexible and spontaneous. Judging types prefer to have matters settled, perceiving types prefer to leave matters open.

(Robbins and Judge, 2007, p. 109; derived from Myers and Myers, 1980; Myers, McCaulley, Quenk, and Hammer, 1998)

Although MBTI is well known, the evidence supporting it is not as strong as that for the Big Five (McCrae and Costa, 1989). McCrae and Costa (1989) compared the MBTI and the Big Five NEO Personality Inventory (NEO-PI); they found that the MBTI did not seem to measure dichotomous preferences of distinct types but did measure some aspects of the Big Five. In particular, MBTI Extraversion seemed to be correlated with Big Five Extraversion, MBTI Intuition correlated with Big Five Openness, MBTI Feeling correlated with Agreeableness, and MBTI Perception correlated with Conscientiousness (McCrae and Costa, 1989). Furthermore, the Big Five dimension of Neuroticism did not seem represented in the MBTI (McCrae and Costa, 1989). Perhaps as McCrae and Costa (1989) posit, MBTI in fact really only measures some aspects of the Big Five.

Big Five and Job Performance

Beginning in the 1990s, interest renewed in using personality traits to predict job performance; researchers consequently began to conclude personality traits could be used in personnel selection (John and Srivastava, 1999). Many studies have examined the Big Five personality taxonomy as it relates to job performance. The following paragraphs attempt to summarize some of the key literature related to the Big Five and job performance. Each domain of the Big Five is explored in detail as a predictor of job performance in the following order: Conscientiousness, Extraversion, Openness, Agreeableness, and Neuroticism.

In an often cited study conducted by Barrick and Mount (1991) in which 117 criterion-related studies encompassing 162 samples were examined through a meta-analysis, conscientiousness was determined to be a valid predictor of job performance. Barrick and Mount (1991) reviewed the literature to determine how the Big Five might predict three types of performance: job proficiency, training proficiency, and personnel data (e.g., salary level, turnover, status change, and tenure). Their study considered five types of occupations: professionals, police, managers, sales, and skilled/semi-skilled. For all three types of performance and all five types of occupations, conscientiousness was considered a valid predictor (Barrick and Mount, 1991).

Across many studies, conscientiousness has been a consistent and strong predictor of job performance (Barrick and Mount, 1991; Mount and Barrick 1998; Barrick, Mount, and Judge, 2001; Salgado, 1997; Tett, Jackson, and Rothstein, 1991; Salgado, 2003). However, there have been some conflicting studies regarding conscientiousness in various job stages. A transitional job stage is characterized by job change where a

worker has to learn new skills or methods to successfully perform, while a maintenance job stage is identified when the worker has learned all the skills and methods necessary to successfully perform and no longer encounters novel situations. When job stage is considered, Stewart (1999) found that conscientiousness exhibited a consistent positive relationship across job stages (transitional and maintenance) for sales personnel, while Thoresen, Bradley, Bliese, and Thorenen (2004) found conscientiousness was associated with mean performance in the maintenance sample but not the transitional sample.

Extraversion is a valid predictor of job performance in some cases, particularly when interaction with other people is key to job success (Barrick and Mount, 1991; Barrick, Mount, and Judge, 2001; Salgado, 1997). Extraversion has been shown to be a valid predictor for managers and those in sales and the police force (Barrick and Mount, 1991; Barrick, Mount, and Judge, 2001; Salgado, 1997). Although Salgado (1997) found the validity for managers to be very low, and lower than for police, he still concluded extraversion positively predicts manager's job performance.

Openness was also shown to be a valid predictor for police and skilled labor but not for managers (Salgado, 1997). Interestingly, openness has been shown to be a valid predictor for training proficiency (Barrick and Mount, 1991). Openness is often associated with intellect which perhaps explains the correlation with training environments. Therefore, for jobs in which a measure of success is frequent training, openness might be a good consideration.

Agreeableness does not seem to be an important predictor of job performance (Barrick and Mount, 1991; Barrick, Mount, and Judge, 2001; Witt, Burke, Barrick, and Mount, 2002). Agreeableness seems to interact with conscientiousness such that

personnel who need interaction with other people to be successful can benefit from increased agreeableness, and low agreeableness may negate positive conscientiousness. Although Salgado (1997) demonstrated a positive correlation between agreeableness and managers, perhaps this was caused by the interaction with conscientiousness (Witt, Burke, Barrick, and Mount, 2002).

Neuroticism sometimes predicts job performance. In general, emotional stability is a valid predictor of work performance, particularly for professionals, police, skilled labor, and managers (Barrick and Mount, 1991; Barrick, Mount, and Judge, 2001; Salgado, 1997). However, there is some evidence professionals were more neurotic, and some speculation that a little neuroticism may cause the professional to think through possible negative outcomes and as a result practice better risk management (Barrick and Mount, 1991).

Based on the research described above, the link between personality and job performance has been well documented in several meta-analytic studies, and one might erroneously conclude research in this area has been exhausted. Indeed, Barrick, Mount, and Judge (2001, p. 23) recommended a moratorium on similar meta-analytic research "because the present study subsumes the results of nearly all the previous research in the area, the incremental validity of new studies over the present one is likely to be small." However, they conceded that there are still several areas worthy of exploration, to include linking lower level Big Five factors to lower level job performance criteria and understanding the mechanisms that underlie personality and job performance. In addition to their recommendations, personality as a predictor of performance in the PM profession specifically seems to be ripe for additional research.

Personality and Program Manager Success

Only a few studies have examined personality as a predictor of PM success, and these studies have only been conducted in the last few years. Two studies in particular merit special attention. The first is a study based on the MBTI (Gehring, 2007), while the second one is based on various facets, including one of the Big Five dimensions (Dvir, Sadeh, and Malach-Pines, 2006; Malach-Pines, Dvir, and Sadeh, 2007).

MBTI and PMs

Gehring (2007) recently conducted a study which compared MBTI personality traits theory with project management competencies. After an extensive literature review to identify competencies displayed by successful PMs, Gehring (2007) compared the 16 MBTI types and hypothesized the seven MBTI types depicted in Figure 2 to have a strong preference for the project leadership competencies. After surveying 49 project managers for their MBTI type and their opinion of the competencies required of an expert PM, Gehring (2007) found most matched one of the seven hypothesized MBTI types. The boxes with vertical stripes in Figure 2 (also in green shading, i.e., ISTJ, INFP, INTJ, ENFJ, and ENTJ) demonstrate those MBTI types that were hypothesized to match PMs and did in fact match the surveyed PMs. Those boxes in orange with cross-hatched stripes, ENFP and ESFJ, were not hypothesized to match PMs, but in fact the survey indicated three PMs matched those MBTI types. Finally, the two types in yellow with horizontal stripes, ENTP and ESTJ, were hypothesized to be PMs, but no PMs participating in the survey matched those MBTI types. Gehring (2007) concluded that "the following MBTI types had preferences that would support project leadership: ISTJ,

INFJ, INTJ, ENTP, ESTJ, ENFJ, and ENTJ, with INTJ, ESTJ, and ENTJ being the types containing the most traits that supported project leadership competencies" (p. 53). Gehring (2007) also concluded that these MBTI types should not be used exclusively in personnel selection, but are useful for individuals to assess their fitness to manage projects and for organizations to develop appropriate training programs.

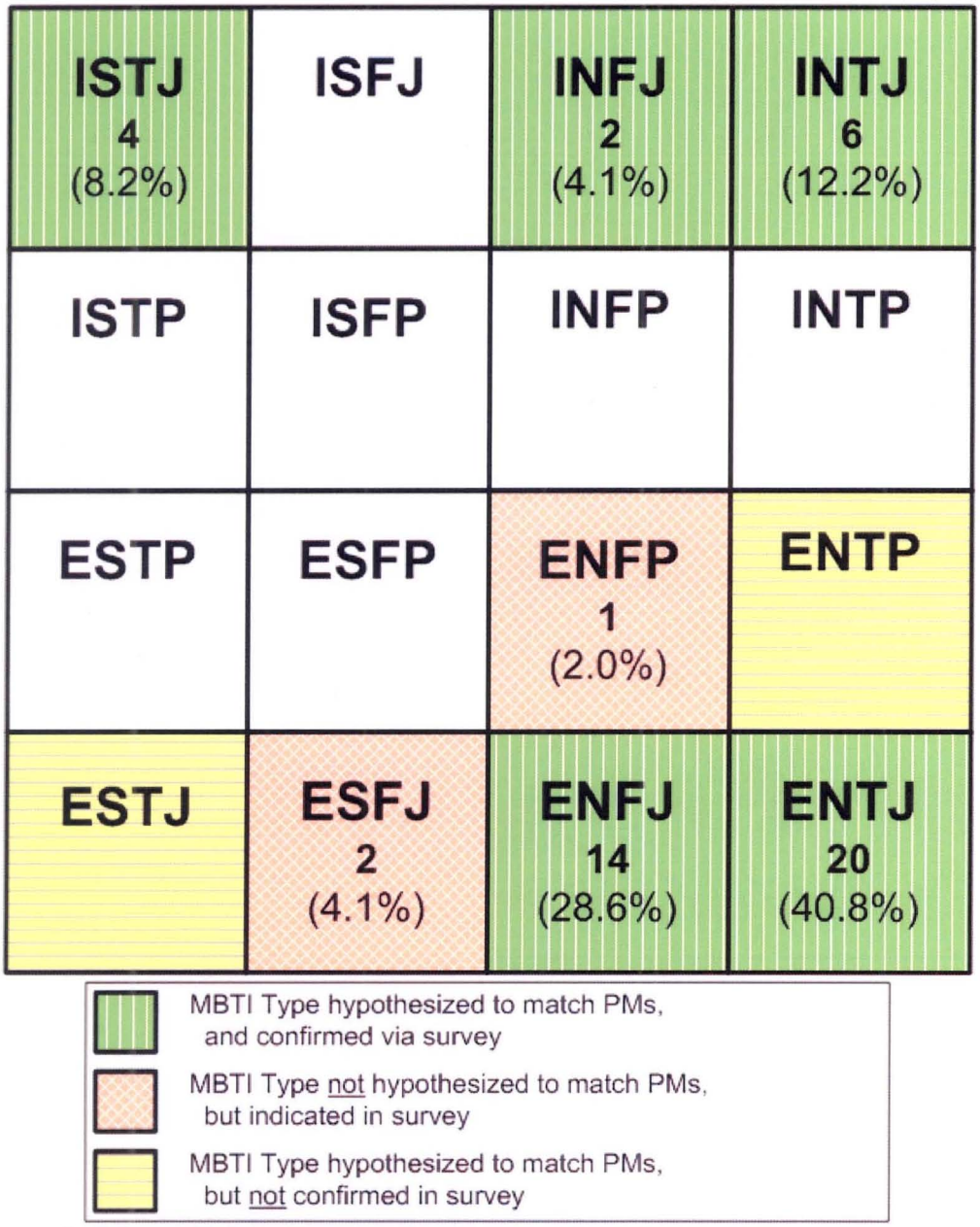


Figure 2. Myers-Briggs Personality Types with Validated Competency Matrix
(Derived from Gehring, 2007)

Gehring's (2007) study also seems to be somewhat corroborated by data collected by the Defense Acquisition University (DAU), which is chartered with training DoD PMs as well as other functional experts who participate in the DoD acquisition process. The DAU premier course for PMs is PMT 401, Program Manager's Course. Students who attend this course have already attained an Acquisition Professional Development Program Level III certification in Program Management, completed prerequisite DAU courses, and spent at least 4 years in the acquisition career field. The PMT 401 course is designed to prepare students for challenging acquisition jobs leading project teams on critical DoD acquisition efforts. During the course, students take the MBTI to facilitate understanding their personality type and how that might influence their leadership approach. Since the course's creation in 2004 until the most recent 2007 class, 640 students have attended PMT 401; the aggregate MBTI results are shown in Figure 3. For each of the 16 MBTI types, the raw number of students reporting that type is shown along with the percentage of all students shown in parentheses. In descending order, the most frequently reported types were ISTJ, ESTJ, ENTJ, INTJ, ENTP, ISTP, and INTP. The three most frequent types represent three of the four most frequent types found in the DAU survey, with the most frequent type also being one of the seven types predicted by Gehring's (2007) survey. While ESTJ and ENTP were predicted in Gehring's (2007) study but not found in the DAU survey, the DAU results did include quite a few ESTJs and ENTPs (Merchant, 2007).

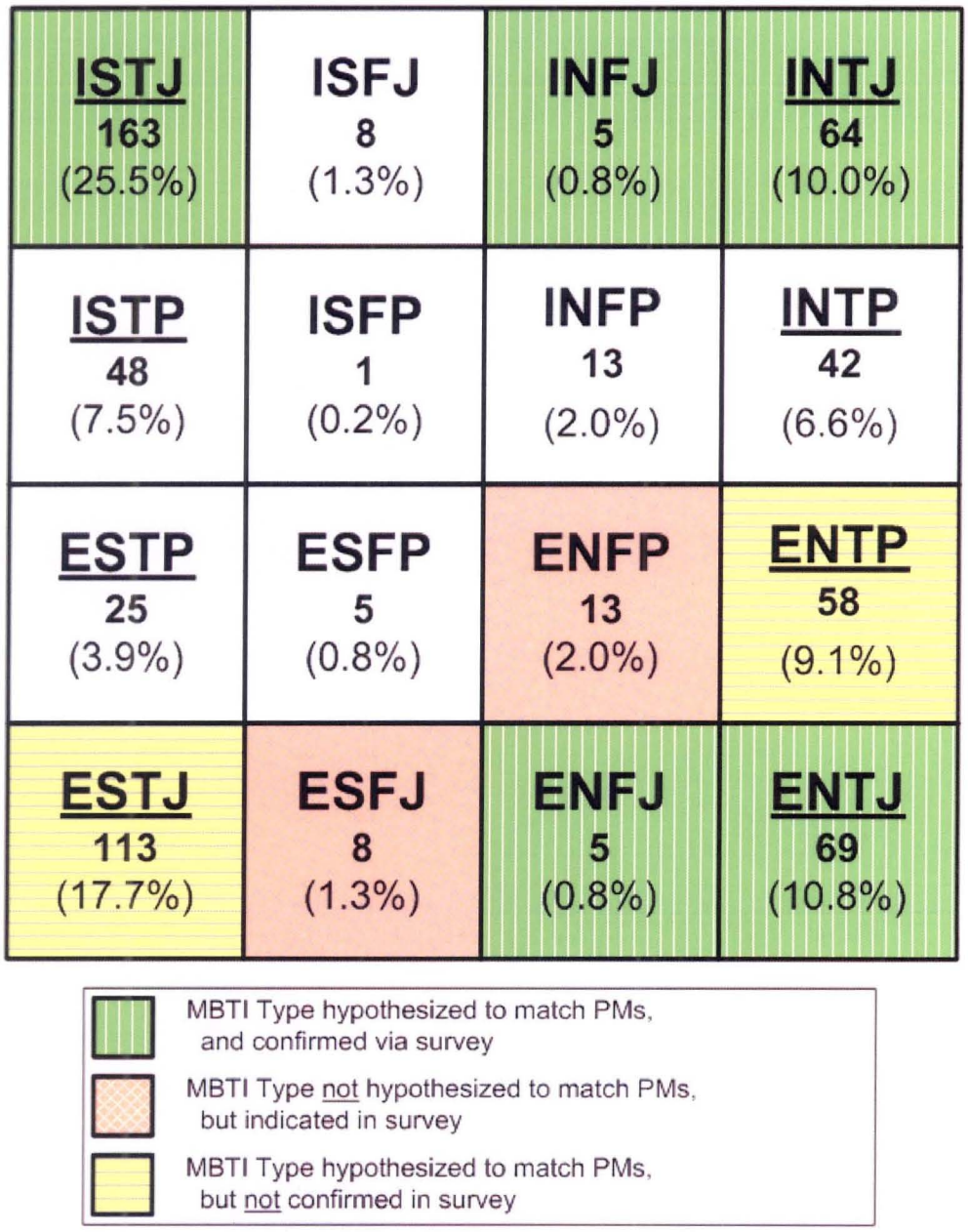


Figure 3. DAU PMT401 Summary MBTI Personality Types
(Derived from Merchant, 2007)

Additionally, the DAU survey reported a high number of ISTPs, INTPs, and ESTPs; these types were not predicted or validated in Gehring's (2007) sample. Although almost 70% of Gehring's (2007) samples were either ENFJ or ENTJ, less than 12% of the DAU respondents reported these MBTI types. In general, the percentages for

each type do not always align. Perhaps some of the disagreement between the two samples could occur naturally in the population. For example, since the DAU data set consists of many military PMs, and if military members tended to identify ISTP (Myers et al., 1998), one might expect ISTPs to be more prevalent in the DAU study than in a study of only non-military PMs. Furthermore, some military PMs did not select the PM profession, but rather were selected by their military departments to become PMs. The lack of self-selection might add PMs to the dataset that otherwise would not have chosen to become PMs; this might skew the data towards MBTI types not found in Gehring's (2007) samples.

Based on Gehring's (2007) conclusions, and considering McCrae and Costa's (1989) findings previously discussed (the MBTI really only measures parts of the Big Five), utilizing Gehring's study alone for personnel selection would be problematic. However, the study does provide some initial key insights into PM personality. Furthermore, using Gehring's study combined with McCrae and Costa's (1989) comparison of MBTI with the Big Five, perhaps some assumptions could be made with respect to Big Five as a predictor for PM success. Combining the three most frequent types from Gehring's study and the most frequent type from the DAU data creates a list of four MBTI types to consider: INTJ, ESTJ, ENTJ, and ISTJ. All of the types consist of the sub-type TJ. From McCrae and Costa (1989), T has a negative correlation with Agreeableness (F a positive correlation with Agreeableness) and J has a positive correlation with Conscientiousness (P a negative correlation with Conscientiousness). Therefore, one might expect Conscientiousness to be a positive predictor, and Agreeableness a negative predictor, of personnel who elect to become PMs.

Big Five, MBTI, and PMs

Dvir, Sadeh, and Malach-Pines (2006) and Malach-Pines, Dvir, and Sadeh (2007), also evaluated the impact of a PM's personality on performance. Both groups of authors report on the same studies and conclude a PM is most successful when their personality is matched to the project type. Based on the P-O fit theory and the assumption that PMs are naturally attracted to and perform better on project types that best fit their personality, Dvir et al. (2006) began by defining project type based on four dimensions. These dimensions included Novelty (N), which measured whether the system being managed represented a derivative of existing systems or a breakthrough, completely new, product; Complexity (C), or whether the system being managed was a complex system, or a more simple sub-assembly; Technology (T), which measured the degree to which the system technology was low or high-tech; and Pace (P), which measured the pace of the project or timeline of the project. Based on this NCTP classification of projects, Dvir et al. (2006) selected personality constructs and instruments they hypothesized would best match each dimension: Big Five Openness measure for Novelty, Jung's "inventor" (ENxP) construct for Complexity, risk-taking tendency for technological uncertainty, and Type A behavior pattern for Pace. Dvir et al. (2006) also identified project success criteria which included meeting design goals, benefit to the end user, benefit to the developing organization, and benefit to the community and national infrastructure.

They then surveyed 89 Israeli PMs in various industries by using a self-report survey which measured their personal characteristics (i.e., answers to the instruments described above), their assessment of their project's characteristics (i.e., the four project

dimensions described above), and their assessment of their project success (using the project success criteria described above). Based on the survey responses, the project characteristics were reduced from the four dimensions to three categories: Derivative, projects with modest improvements relative to previous projects; Platform, projects with low technical uncertainty; and High Tech, projects with high levels of technological uncertainty (Dvir et al., 2006; Malach-Pines et al., 2007).

Dvir et al. (2006) and Malach-Pines et al. (2007) found tentative support to their hypothesis that PMs with personalities matched to their project type are most successful. For example, PMs of "high tech projects (high in Novelty, Complexity, and Technology) were found to be high in perceiving and in intuition (these are two aspects of Jung's Inventor Type" (Malach-Pines et al., 2007, p. 2103). In addition, PMs who best aligned with their hypothesized profile were more successful than those who did not match their profile, and correlations between project type and PM characteristics were discovered. Notably, when project success was measure by customer satisfaction, Dvir et al. (2006) found a negative correlation between Introversion (MBTI definition) and customer satisfaction, leading them to conclude that Introverts may be perceived as less attentive by their customers (Dvir et al., 2006; Malach-Pines et al., 2007).

Although the Dvir et al. (2006), Malach-Pines et al. (2007), and Gehring (2007) studies do not definitively associate certain personality traits with PM success, they all serve as an excellent foundation to a more thorough investigation of the Big Five and PM success. No studies were found that investigated the Big Five in total with project managers specifically. It appears the next logical step is to evaluate each of the Big Five

dimensions to determine if any are predictors of PM success. To support the Big Five evaluation, several hypotheses were constructed based on the literature review.

Research Questions and Hypothesis

After considering the PM attributes previously discussed, aligning those attributes with the Big Five descriptions, and considering the literature available with respect to personality and job performance as well as personality and PMs, several hypothesis were formulated which relate each of the Big Five personality traits with PM performance. A graphical representation of all the hypotheses is shown in Figure 4, followed by a brief discussion of each hypothesis.

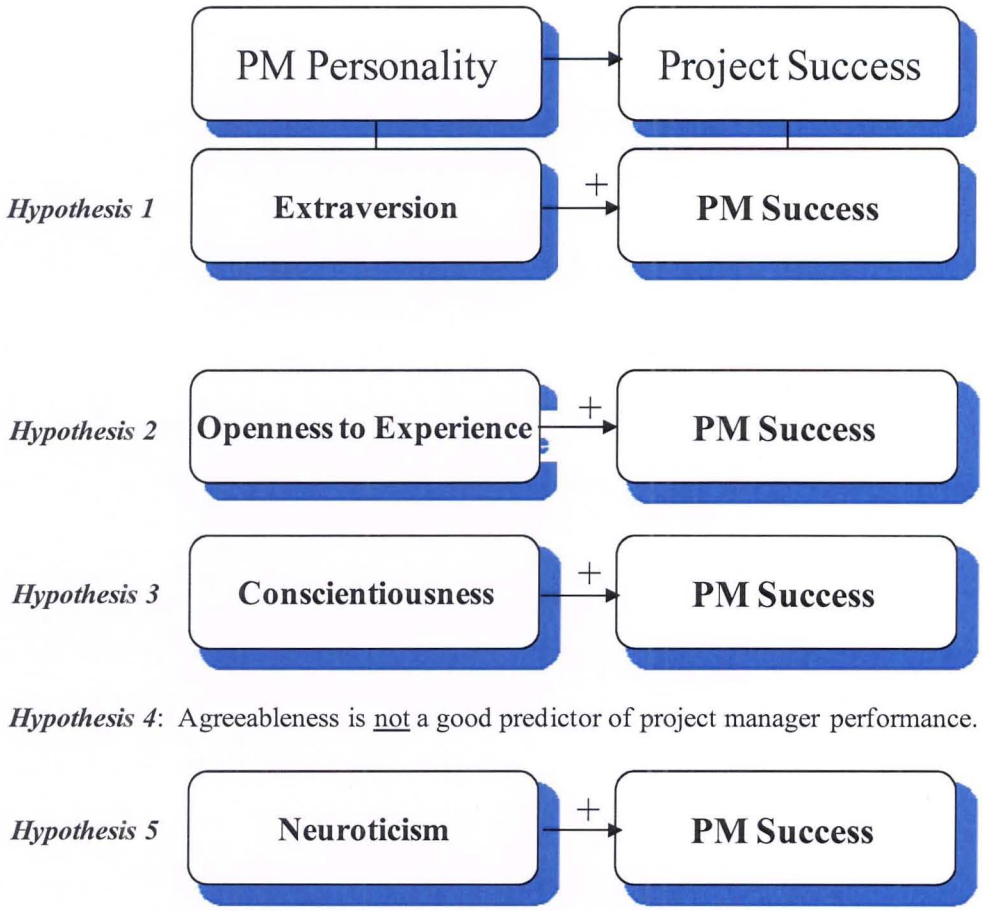


Figure 4. Research Model and Hypothesis

Extraversion Hypothesis

Extraversion would seem to positively correlate with PM success since extraversion has previously predicted performance for managers in general (Barrick and Mount, 1991). Communication is often cited as a key attribute of a good PM (El-Sabaa, 2000; Gadeken, 2004; Odusami, 2002; Posner, 1987), and extraversion includes components necessary for communication including sociability, talkative, warmth, and gregariousness. Furthermore, leadership and motivation have also been determined as critical to PM success (El-Sabaa, 2000; Gadeken, 2004; Odusami, 2002; Posner, 1987), and the warmth, gregariousness, and assertiveness facets of extraversion would seem to

align with leadership. Therefore, *Hypothesis 1* is proposed as: Extraversion positively relates to project manager performance for all types of projects.

Openness Hypothesis

Although in past studies openness has not been positively correlated to manager's performance (Barrick and Mount, 1991; Salgado, 1997), correlation might exist for PMs on certain types of projects. In particular, projects that involve very high levels of technology, or are in the beginning stages of the process where a lot of activity is very fluid, would seem particularly suited to be managed by a PM who is open to new ideas. In addition, an active imagination, preference for variety, intellectual curiosity, and independence of judgment would seem to better enable a PM to navigate a complex project to fruition. Therefore, *Hypothesis 2* is proposed as: Openness positively relates to project manager performance for all types of projects.

Conscientiousness Hypothesis

Conscientiousness has consistently been found to be a predictor of good performance (Barrick and Mount, 1991; Mount and Barrick, 1998; Barrick, Mount, and Judge, 2001; Salgado, 1997; Tett, Jackson, and Rothstein, 1991; Salgado, 2003). For the PM, one would expect nothing different. Orderliness, perseverance, and attention to detail would all seem particularly suited to PM success, especially when planning the project and monitoring project progress. Therefore, *Hypothesis 3* is posited as: Conscientiousness positively relates to project manager performance for all types of projects.

Agreeableness Hypothesis

As described above, agreeableness is not usually a good predictor of job performance (Barrick and Mount, 1991; Barrick, Mount, and Judge, 2001; Witt, Burke, Barrick, and Mount, 2002). However, there is some evidence that agreeableness may amplify the effects of conscientiousness, particularly for work that involves interaction with others (Witt, Burke, Barrick, and Mount, 2002). PMs are constantly interacting with others to accomplish project goals; they are often only able to accomplish those goals via the power of persuasion. However, since there is no previous direct evidence linking agreeableness with performance, *Hypothesis 4* is proposed as: Agreeableness is not a good predictor of project manager performance regardless of the type of project.

Neuroticism Hypothesis

Emotional stability, the antithesis of neuroticism, is generally a good predictor of job performance, even for managers (Barrick and Mount, 1991; Barrick, Mount, and Judge, 2001; Salgado, 1997). However, Barrick and Mount (1991) found that professionals with a little neuroticism fare better; perhaps because they worry about, and more easily identify, risks. The authors speculated that perhaps a little neuroticism causes the PM to think through more worst-case scenarios, which aids in risk management. Therefore, although a positive correlation between neuroticism and performance would seem counterintuitive, *Hypothesis 5* is posited as: Neuroticism is a good predictor of project manager performance for all types of projects.

III. Methodology

This chapter describes the research methodology, including the sample selected, the instrument used, the method used to collect data, and the analysis conducted on the data. After completing the literature review, a specific comparison of project managers against all the Big Five Domains could not be found and does not appear to have been completed. Therefore, an exploratory or descriptive research approach seemed most appropriate. Furthermore, since research regarding the Big Five instrument and applicability to management in general was available for comparison, a quantitative approach was also used.

Participants

The population for this research includes all project managers (PMs) worldwide. However, to focus the research, the population was restricted to PMs who are members of the United States government, and more specifically, the United States military acquisition community. Military acquisition PMs include those personnel participating in the acquisition or procurement of new products for the military. Typically, they manage complex projects in research or development. Additionally, they often provide oversight for contractor PM counterparts who manage the day-to-day activities of a particular project on a specific contract. They also often provide oversight to several activities managed by several PMs on multiple contracts or efforts. In that regard, military PMs may be slightly unique from their non-military counterparts. For example, specific government regulations, Congressional oversight, funding peculiarities, and unique ethics

rules may be different, and may create the illusion that military PMs are significantly different from their non-military counterparts. However, military acquisition PMs provide a good representative population of other PMs for three reasons further described in the following paragraphs: project management began with military acquisition PMs, they have been generally accepted as representative and have been studied and included in past PM research and baselines, and military acquisition PMs seem to exhibit the same attributes of good PMs worldwide.

Military Acquisition PMs are Representative

Military acquisition PMs can be considered representative of the PM field because they initiated the art of project management and created some of the substantive project management tools (Kerzner, 2006; Meredith and Mantel, 2006). Project management began with military acquisition PMs shortly after World War II. On projects like the United States Navy's Polaris program, the Air Force B-52 bomber and Minuteman missile programs, and the National Aeronautics and Space Administration's Apollo program, project management was created and the role of the PM began to take shape (Kerzner, 2006; Meredith and Mantel, 2006). As part of the process, several tools currently used by PMs were developed during this time. In particular, the Program Evaluation and Review Technique (PERT) was developed by the Navy for the Polaris program (Kerzner, 2006; Meredith and Mantel, 2006), along with Earned Value Management (Meredith and Mantel, 2006). After a short history of project management, followed by definitions of project boundaries, Kerzner (2006, p. 33) concludes:

> The Government sector tends to run efforts as programs, headed by a program manager. The majority of the industrial sector, on the other hand, prefers to

> describe efforts as projects, headed by a project manager. Whether we call our undertaking project management or program management is inconsequential because the same policies, procedures, and guidelines tend to regulate both.

While military acquisition PMs helped define project management in the beginning, perhaps over time their roles have diverged and military PMs are no longer representative of their non-military counterparts. If so, an examination of PMs in the literature over time would reveal any disparity.

Military acquisition PMs provide a good representative PM population based on previous PM studies. From Table 1, many studies have explored attributes of PMs by researching United States military acquisition PMs. Gadeken (1989) completed seminal work to define a list of PM competencies. As part of his effort, he surveyed military PMs attending DoD acquisition classes, the forerunner of the classes taught by the Defense Acquisition University today. His work was cited by Crawford (2000) in her effort to define PM competence; it was also mentioned along with other seminal works with no distinction being made between military acquisition PMs and other PMs. Youker (2006) compared both Gadeken's research and non-military research of general managers to make his case for core PM competencies. The work by Gadeken (1989) and Crawford (2000) are also cited in the current PM competency framework published by the Project Management Institute (2002), as well as other important studies (Project Management Institute, 2002; Gehring, 2007). Military and non-military PMs seem so intertwined that one study, which surveyed project management literature from 1969 to 1999, found that 14 percent of the literature used defense or military sources and that the military defense community represented a significant part of the literature from the 1960s to the 1980s (Kloppenborg and Opfer, 2002).

Furthermore, military acquisition PMs provide a good representative population because, as described in the literature review, military acquisition PMs exhibit attributes common across all PMs. For example, Table 3 lists prioritized PM attributes over four studies. Once again, Gadeken's (1989) work represents a survey of United States military acquisition PMs and produced very similar results to the other three studies; which surveyed various PMs attending PM conferences (Posner, 1987), public and private sector PMs (El-Sabaa, 2000), and Nigerian construction clients, consultants, and contracting officials (Odusami, 2002). Although the samples are diverse and unique, canvass military and non-military PMs, and include PMs from different countries, the studies are in virtual agreement on which PM attributes represent the top priority for success: communication and leadership. The studies also agree that technical competence is one of the least needed skills. It is worth noting that integrity is one attribute listed in Gadeken's (1989) findings which was not included in the other studies. However, perhaps as noted in Chapter II, local organizational issues may underlie the respondent's answers. Therefore, it seems that military acquisition and non-military PMs seem to value the same things in successful project management and surveying a military acquisition PM to identify attributes of a good PM yields results similar to non-military PMs.

Therefore, United States military acquisition PMs provide a good representative population of PMs worldwide. Military acquisition PMs initiated the project management field; they have been used as subjects in other previous PM studies and are considered part of the larger PM domain. Furthermore, studies based on military acquisition PMs have identified the same attributes that make non-military PMs

successful. The final challenge is to acquire a representative sample of military acquisition PMs to survey.

Sample Selection

To obtain a good sample of military PMs, students attending Defense Acquisition University (DAU) classes were selected for the study. The DAU is chartered with training Department of Defense (DoD) acquisition PMs as well as other functional experts who participate in the DoD acquisition process. Two DAU classes were selected to sample: PMT 352B and PMT 401.

After military PMs have completed some prerequisite courses and obtained some experience working in the acquisition environment, they attend PMT 352B, Program Management Office Course. Students attending this course typically already have an Acquisition Professional Development Program (APDP) Level II certification in Program Management and have spent at least two years in an acquisition related job. They have already completed an on-line component of the course as well as prerequisite courses which include PMT 250, Program Management Tools; ACQ 201, Intermediate Systems Acquisition; and ACQ 101, Fundamentals of System Acquisition Management. The 352B course is a 5-week in-residence course designed to provide the student with the skills necessary to lead and contribute to effective acquisition teams. Attendees are typically mid-career personnel including military officers in the grades of O-4 and O-5 and DoD civilians in the grades of GM-13 and GM-14 (Defense Acquisition University Press, 2007).

The DAU premier course for PMs is PMT 401, Program Manager's Course. Students who attend this course have already attained an APDP Level III certification in Program Management, the highest level a DoD PM can acquire; they have completed prerequisite DAU courses including PMT 352B, and its prerequisites, and have spent at least four years in the acquisition career field. The PMT 401 course is designed to prepare the student for a challenging acquisition job leading a project team on a critical DoD acquisition effort. Attendees are typically military in the grade of O-5, civilian in the grade of GM-14, and have been nominated for the course based on their potential to lead major programs. PMT 401 is required for project managers of the largest DoD programs, which include projects in Acquisition Category I or II (i.e., projects costing more than $140M in fiscal year 2000 dollars to develop) or projects of special interest (Defense Acquisition University Press, 2007; Department of Defense, 2003).

Data Collection Procedures

To collect the data used in this research, a survey was created and submitted to DAU. The surveys were self-administered, paper based, and were distributed via group administration (Dane, 1990). A total of 116 surveys were initially distributed. As an incentive to the participants, the respondent's Big Five personality trait scores were tabulated, compared with the study results, and provided to the participants at the end of the research. As an additional incentive to PMT401 students, the research team personally introduced the research.

Instrument Review

The instrument constructed for this research, provided at Attachment A, was based on the previous literature review. The instrument was constructed to measure PM personality, as well as collect additional information required to answer the research questions; the personality measure used in the survey instrument was the Big Five. The entire instrument consisted of four parts: Part I – PM, Part II - Best PM, Part III – Least Successful PM, and Part IV - Demographic information.

In the first part, the respondent was asked to provide information to assess their Big Five personality traits. In the second part, the respondent was asked to recall the best PM they have ever known and provide information that measures that PM's Big Five personality traits as well as relevant demographic information. The Big Five instrument included in the Best PM section was the same instrument used to assess the respondent's Big Five personality traits, except the phrases were adjusted to reflect the third person assessment. The third part of the instrument was similar to the second except that the respondent was asked to reflect on the least successful PM they have known. The fourth and final part of the instrument collects demographic information on the respondent.

The second and third sections of the instrument were selected to serve as a proxy for measuring success. By asking the respondent to identify the Best PM they have ever known as well as the Least Successful PM they have known, two ends of the success spectrum are measured without specifically defining success. This method relies on the respondent's experience to correctly define success and adds unique limitations discussed later in this thesis. Finally, the term "Least Successful" was specifically chosen to avoid

the respondent's selection of the 'worst' PM they have known based on other than performance reasons.

Although there are four distinct parts to the instrument, in essence there are really only two instruments repeated for the three sections: the respondent, the best PM the respondent knows, and the least successful PM the respondent knows. Those two instruments are the Big Five personality assessment and relevant demographic data. Each of those sections is described in further detail in the paragraphs below.

Personality Big Five Instrument

The instrument used to collect data relative to the Big Five personality traits was obtained from the International Personality Item Pool (IPIP) (located at http://ipip.ori.org; Goldberg, 1992). The instrument was originally developed as part of a larger effort to provide researchers with an open source set of instruments to measure various facets of personality. The instrument utilizes the following five-point Likert scale: 1 – Very Inaccurate, 2 – Moderately Inaccurate, 3 – Neither Inaccurate nor Accurate, 4 -- Moderately Accurate, and 5 – Very Accurate. Respondents are asked to read each item of the Big Five instrument and provide and their most accurate, honest assessment using the Likert scale. The number of items per Big Five dimension, along with their associated Cronbach Alphas (Coefficient Alpha), are shown in Table 6 and discussed in further detail below.

Table 6. Characteristics of the IPIP Scales (Goldberg, 1992)

Big-Five Domain	Number of Items	Mean Item Intercorrelation Shorter Scales	Coefficient Alpha
I. Extraversion	5 + 5 = 10	.40	.87
II. Agreeableness	6 + 4 = 10	.31	.82
III. Conscientiousness	6 + 4 = 10	.29	.79
IV. Emotional Stability	2 + 8 = 10	.38	.86
V. Intellect	7 + 3 = 10	.34	.84

Extraversion

The Extraversion 10-item scale is shown in Table 7. Five items are keyed positively with Extraversion and five items are keyed negatively. From Table 6, the Cronbach's Alpha for the extraversion 10-item scale is 0.87 (Goldberg, 1992). The extraversion items were distributed with the rest of the Big Five items and their exact location in the overall Big Five instrument is shown in the last column of Table 7 marked "Q#" for Question Number.

Table 7. Extraversion 10-Item Scale

Question	Keyed	Q#
Am the life of the party.	+	**1**
Feel comfortable around people.	+	**11**
Start conversations.	+	**21**
Talk to a lot of different people at parties.	+	**31**
Don't mind being the center of attention.	+	**41**
Don't talk a lot.	-	**6**
Keep in the background.	-	**16**
Have little to say.	-	**26**
Don't like to draw attention to myself.	-	**36**
Am quiet around strangers.	-	**46**

Openness

The Openness 10-item scale is shown in Table 8. It should be noted that in the IPIP instrument, Openness is labeled as Intellect. Seven items are positively keyed with openness and three are negatively keyed. From Table 6, the Cronbach's Alpha for the openness 10-item scale is 0.84 (Goldberg, 1992). Again, the openness items were distributed among the other Big Five items in the instrument and their exact locations are reflected in Table 8.

Table 8. Openness 10-Item Scale

Question	Keyed	Q#
Have a rich vocabulary.	+	**5**
Have a vivid imagination.	+	**15**
Have excellent ideas.	+	**25**
Am quick to understand things.	+	**35**
Use difficult words.	+	**40**
Spend time reflecting on things.	+	**45**
Am full of ideas.	+	**50**
Have difficulty understanding abstract ideas.	-	**10**
Am not interested in abstract ideas.	-	**20**
Do not have a good imagination.	-	**30**

Conscientiousness

The Conscientiousness 10-Item scale is shown in Table 9. Six items are positively keyed with conscientiousness and four are negatively keyed. From Table 6 above, Cronbach's Alpha for the conscientiousness 10-item scale is 0.79 (Goldberg, 1992). Although the conscientiousness Alpha is the lowest of all the Big Five domains, 0.79 is still above the standard 0.70 reliability desired. Once again, the conscientiousness items were distributed among the other Big Five items in the instrument and their exact locations are described in the column marked "Q#".

Table 9. Conscientiousness 10-Item Scale

Question	Keyed	Q#
Am always prepared.	+	**3**
Pay attention to details.	+	**13**
Get chores done right away.	+	**23**
Like order.	+	**33**
Follow a schedule.	+	**43**
Am exacting in my work.	+	**48**
Leave my belongings around.	-	**8**
Make a mess of things.	-	**18**
Often forget to put things back in their proper place.	-	**28**
Shirk my duties.	-	**38**

Agreeableness

The Agreeableness 10-Item scale is shown in Table 10. Six items are positively keyed with agreeableness and four are negatively keyed. From Table 6 above, Cronbach's Alpha for the Agreeableness 10-item scale is 0.82 (Goldberg, 1992). As with all the other domains, the Agreeableness items were distributed in the instrument and their exact locations are described in the column marked "Q#".

Table 10. Agreeableness 10-Item Scale

Question	Keyed	Q#
Am interested in people.	+	**7**
Sympathize with others' feelings.	+	**17**
Have a soft heart.	+	**27**
Take time out for others.	+	**37**
Feel others' emotions.	+	**42**
Make people feel at ease.	+	**47**
Feel little concern for others.	-	**2**
Insult people.	-	**12**
Am not interested in other people's problems.	-	**22**
Am not really interested in others.	-	**32**

Neuroticism

The Neuroticism 10-Item scale is shown in Table 11. It should be noted that in the IPIP instrument, Neuroticism is labeled by its reverse, Emotional Stability. Therefore, two items are positively keyed with emotional stability, negatively keyed with neuroticism, and eight are positively keyed with neuroticism. From Table 6 above, Cronbach's Alpha for the neuroticism 10-item scale is 0.86 (Goldberg, 1992). The exact location of the neuroticism items within the instrument are depicted in the column labeled "Q#".

Table 11. Emotional Stability 10-Item Scale

Question	Keyed	Q#
Am relaxed most of the time.	+	**9**
Seldom feel blue.	+	**19**
Get stressed out easily.	-	**4**
Worry about things.	-	**14**
Am easily disturbed.	-	**24**
Get upset easily.	-	**29**
Change my mood a lot.	-	**34**
Have frequent mood swings.	-	**39**
Get irritated easily.	-	**44**
Often feel blue.	-	**49**

Selection of Control Questions

The control questions were selected primarily based upon the literature review. In addition, the research questions were used as guidelines to ensure the data collected best addressed the research questions. Beyond the standard demographic information, the control questions attempted to determine three things: Service affiliation, project type, and each respondent's definition of project manager success.

First, the control questions attempted to determine Service affiliation. Service affiliation is useful to answer the second research question: "For each DoD Service, are there specific personality types associated with project success, and do the personality types differ by Service?" Therefore, in Sections II and III (best and least successful PM), Questions 55 and 56 asked about Service affiliation for the program and program manager, respectively. Furthermore, Questions 2 and 3 in Section IV of the survey ask the respondent which Service they are associated with as well as their rank. All of these questions collect data that will enable the research team to match the respondent, their best PM, and their worst PM with specific Services.

Second, Questions 51 through 54 were developed to characterize project type. Project type is important to answer the third research question: "Given different types of projects, do different personality types contribute more to project success?" In general, project type was determined by the cost of the project, the phase of the project, the technological uncertainty of the project, and the location of the project being managed. Cost and technological uncertainty are often measures of project type. Within the Department of Defense, the phases of acquisition projects are fairly regimented, with each phase fairly well defined. Project phase is often used to describe the project (i.e., a

development project versus a sustainment project). Likewise, the DoD organizational structure allows similar types of projects to be managed at similar locations. For example, aircraft acquisition projects are typically managed at a Product Center; these types of projects are different from projects that may be exploring aerodynamic research, which are generally managed at a laboratory.

II-51 Total Program Cost Size (mark all that apply)	(1) < $100,000 (2) at least $100,000 but less than $1,000,000 (3) at least $1M but less than $100M (4) at least $100M but less then $1B (5) $1B or greater
II-52 Program Phase (mark all that apply)	(1) Lab activity, Concept Refinement, or Pre-Milestone A (2) Technology Development, or pre-Milestone B (3) System Development and Demonstration, or pre-Milestone C (4) Production and Deployment (5) Operations and Support (6) Other:_____
II-53 Please describe the Technological Uncertainty of the program	(1) Low tech: mostly existing technologies (2) Med tech: some new technologies, or old technologies combined in new ways (3) High tech: mostly new technologies
II-54 Where was the program managed?	(1) At a Product Center (2) At a Logistics Center or Depot (3) At a laboratory (4) At a Defense Agency (DLA, NRO, NSA, MDA, DISA) (5) At a Test Center (6) Other:_____

Figure 5. Questions to Measure Project Type

Third, the control questions attempted to determine the respondent's definition of PM success. Since the instrument is based on the respondent's definition of PM success, it is helpful to try to understand what underlies the respondent's assumptions regarding success. Therefore, Question 8 in Section IV, as depicted in Figure 6, requests a rank

ordering of several factors which might lead to PM success. The list of items was derived from the literature review previously discussed.

IV-8 Please rank order the following attributes of a successful PM from 1 to 10, with 1 as the most important to success and 10 as the least important. Please mark each item, and use each number only once (no ties).	☐ Leadership ☐ Communication ☐ Decision Making ☐ Planning & Organizing ☐ Coping ☐ Technical undertanding of the product ☐ Technical understanding of PM tools & techniques ☐ Analytical Thinking ☐ Team Building ☐ Networking ☐ Other_____

Figure 6. Question to Measure PM Success Definition

Method Bias

The instrument was constructed to alleviate several types of method bias including same-source bias and leniency bias. Same-source bias is a risk anytime the respondent provides data on both the criterion and the predictor variable (Podsakoff, MacKenzie, Lee, and Podsakoff, 2003). For this research, the criterion variable is PM success, which is a subjective assessment by the respondent, while the predictor variable is personality provided by the Big Five assessment. Since the respondent was asked to provide information on the best PM and the least successful PM, any same-source bias should be balanced. For example, if the respondent tends to view all things positively, then both the best PM and the least successful PM will be slanted in the same direction, which should balance out any same-source bias.

Another type of method bias is characterized by leniency bias, which "was named from the very obvious fact that raters tend to rate those whom they know well, or in

whom they are ego-involved, higher than they should" (Guilford, 1954, p. 278). The instrument is subject to leniency bias since the respondent personally knows the PMs and may tend to view them in a more favorable light (Podsakoff et al., 2003). Once again, since the respondent reports on both the best PM and least successful PM, some of the effects of leniency bias should be mitigated.

Data Analysis

The data collected by the instrument was analyzed using standard statistical procedures. First the individual, Best PM, and Least Successful PM Big Five personality scores were computed. The Best PM and Least Successful PM scores were then compared using a difference of the means test, correlation matrix, and Hierarchical Linear Model (Bryk and Raudenbush, 1992) in order to address the research questions and hypotheses. Each of these tools will be discussed in the following paragraphs.

The difference of the means Student's t-Test was used to determine if there were any statistically significant difference in the means between the Best and Least Successful PMs. The difference of the means was compared for each Big Five domain. The test assumes the sample was randomly selected, independent, and approximately normal (McClave, Benson, and Sincich, 2005). In addition, there are different equations to address large and small samples (McClave et al., 2005). Microsoft Excel and the Statistical Package for the Social Sciences (SPSS) for Windows version 15.0 were used to conduct the t-Tests.

Furthermore, a correlation matrix was developed to analyze correlations between the Big Five domains and Service, project type, and other control variables. In particular, the correlation matrix was used to determine correlation between the respondent's Big

Five scores, the Best PM scores, and Least Successful PM scores. The matrix provides a correlation coefficient that identifies the direction and type of correlation present. The larger the number the stronger the correlation with a value of 1.0 indicating perfect correlation and 0.0 indicating no correlation. A positive number indicates positive correlation, a negative number negative correlation. The Statistical Package for the Social Sciences (SPSS) for Windows version 15.0 was used to create the correlation matrixes (George and Mallery, 2006).

Finally, a Hierarchical Linear Model was developed and analyzed to further describe the relationship between the predictor and criterion variables. Hierarchical Linear Models provide additional insight into group-level effects and are the most appropriate model for use with grouped or nested data (Bryk and Raudenbush, 1992). In this case, each respondent becomes their own group with two sub-groups: Good PM and Least Successful (L.S.) PM. Therefore, the data can be characterized with 34 groups, each with two cases per group. This hierarchical construct enables an analysis utilizing a Hierarchical Linear Model (HLM); however, since the DV is dichotomous for this research effort, a non-linear model is required (Raudenbush, Bryk, Cheong, and Congdon, 2000). Since the criterion variable can only assume two values, a zero for a Least Successful PM and a one for a Good PM, a Bernoulli model was used. The Hierarchical Linear Model was created and analyzed using HLM version 6.0, Student Edition (available at http://www.ssicentral.com).

The next chapter further explains the analysis conducted, as well as the results of the analysis.

IV. Data Analysis and Results

This chapter describes the data analysis conducted as part of the research effort. Microsoft Excel, the Statistical Package for the Social Sciences (SPSS) for Windows version 15.0, and HLM version 6.0, Student Edition, were all used to conduct the analysis. After data collection, the data was initially evaluated to determine participant demographics, instrument reliability and normality, and descriptive statistics. Finally, the research questions were evaluated using a correlation matrix, difference of the means test, and a Hierarchical Model. The chapter describes each of the tests and their relevance to the research questions and hypotheses.

Initial Data Evaluation

To being the data evaluation, the data was compiled in Excel and SPSS. The data was examined for missing or incomplete entries, demographics, instrument reliability, data normality, and descriptive statistics. The following paragraphs describe the initial data evaluation. The resolution of missing data is described in the demographics section.

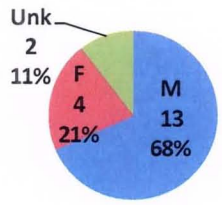
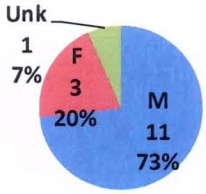
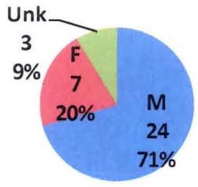
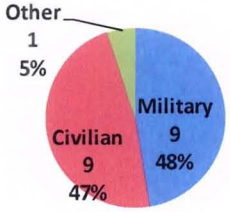
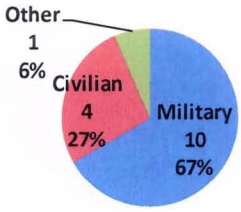
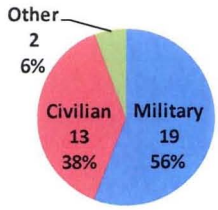
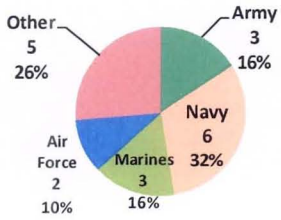
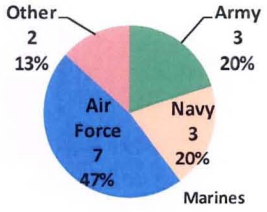
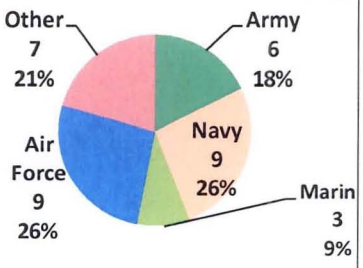
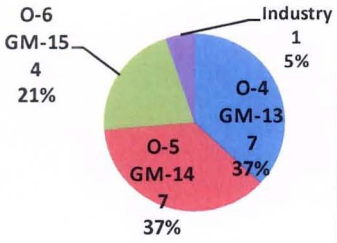
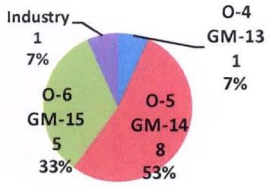
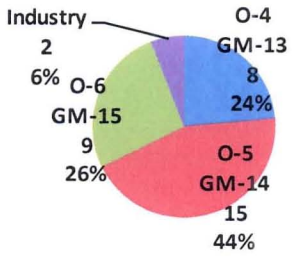
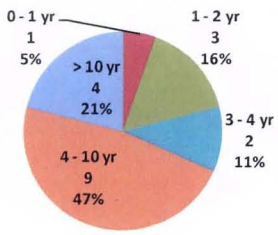
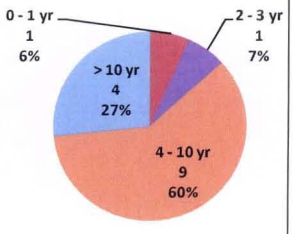
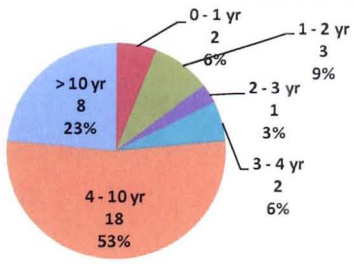
Demographics

As described in the previous chapter, students in both PMT352B and PMT401 January 2008 courses were provided the opportunity to participate in the survey. A total of 60 students attended PMT352B and 56 students attended PMT401 for a total pool of 116 possible participants. Only 21 of the 60 PMT352B students participated, for a response rate of 35 percent. Only 16 of the 56 PMT401 students participated, which

equates to a response rate of 29 percent. Furthermore, two PMT352B surveys and one PMT401 survey were deemed unusable since they were incomplete and were list wise deleted from the sample. The result was a PMT352 response rate of 32 percent (19 usable surveys) and a PMT401 response rate of 27 percent (15 usable surveys), for an overall response rate of 29 percent (34 usable surveys).

The demographics for the entire sample are show in Table 12. The sample was predominantly male (71 percent male versus 20 percent female); the gender of three respondents was not provided. The military and civilian mix of the respondents was weighted slightly more towards the military. All four Services were represented in the sample; however, seven respondents reported an indiscernible Service affiliation. As expected, all of the respondents were considered a Field Grade Officer or civilian equivalent. Additionally, the grade of the PMT401 students was slightly higher than the PMT352B students, which was expected. Since 70 percent of the respondents hold the grade of O-5 (Lieutenant Colonel), or civilian equivalent, or higher, the respondents represent a wealth of experience; in fact, each respondent had at least 13 years of DoD experience. Furthermore, when program management experience was considered, over 75 percent of the respondents had at least four years of PM experience and 23 percent had over 10 years of experience. Therefore, the sample seemed to represent an appropriate cross section of the courses, and respondents represented the appropriate level of experience to discern good PMs from less successful PMs.

Table 12. Respondent Demographics

	PMT352B n=19 (56%)	PMT401 n=15 (44%)	Total n=34
Gender			
Military/ Civilian Mixture			
Branch of Service			
Rank			
PM Experience			

Instrument Reliability

The overall reliability for the survey instrument was considered very good, as shown in Table 13. The measured Cronbach Alpha for each section of the survey was calculated using SPSS. In all three sections (i.e., Respondent, Best PM, and Least Successful PM), the alpha values were 0.94 or better. Therefore, the reliability of the instrument was better than expected and meets acceptable standards.

Table 13. Instrument Measured Reliability

			Measured		
Big-Five Domain	**# of Items**	**Reported[1] Alpha**	**Respondent Alpha**	**Best PM Alpha**	**L.S. PM Alpha**
I. Extraversion	5 + 5 = 10	0.87	0.94	0.94	0.95
II. Agreableness	6 + 4 = 10	0.82	0.94	0.95	0.95
III. Conscientiousness	6 + 4 = 10	0.79	0.95	0.95	0.96
IV. Emotional Stability	2 + 8 = 10	0.86	0.95	0.96	0.95
V. Openness	7 + 3 = 10	0.84	0.96	0.96	0.96
Total / Mean	26 + 24 = 50	0.84	0.95	0.95	0.95

1. Goldberg, 1992

Data Normality

Data normality was tested using SPSS with both visual (histograms, stem and leaf plots, and a Q-Q plots) and quantitative (Shapiro-Wilk test) tools. An example of each test, generated by SPSS, conducted for Extraversion, is shown in Figure 7, Figure 8, Table 14, and Table 15. Tests for the remaining Big Five dimensions are included at Appendix B. Each of the Big Five dimensions (e.g. extraversion, agreeableness, conscientiousness, emotional stability, and openness) were examined and found to have an approximately normal distribution. None of the control variables were considered normal; this was not unexpected as most of the control variables were categorical.

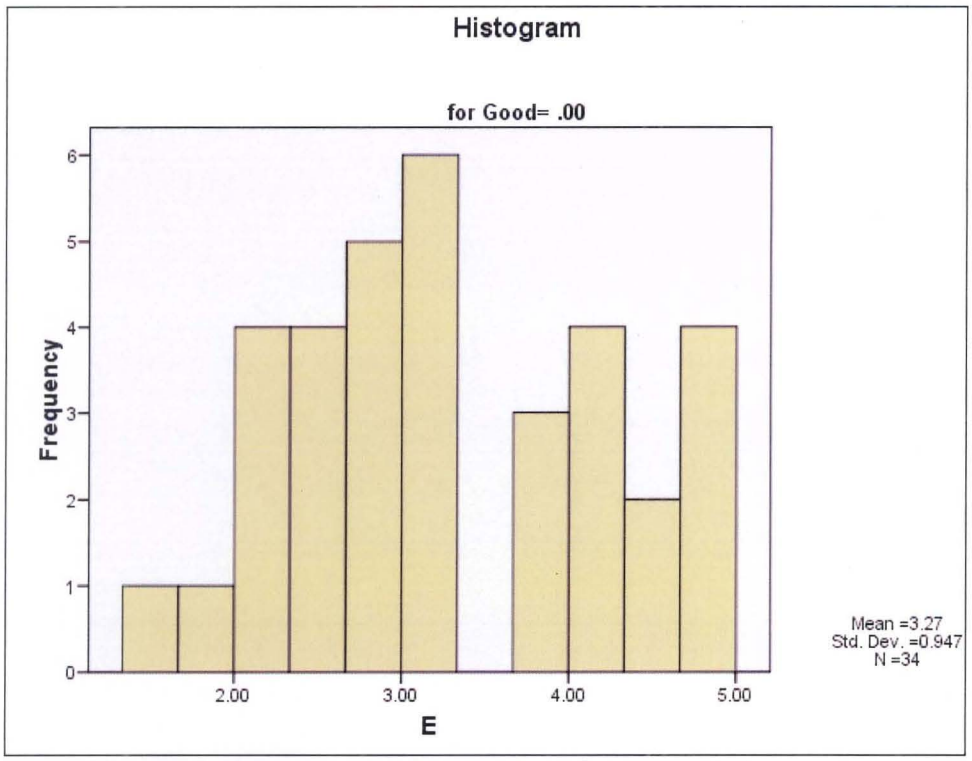


Figure 7. Histogram, Least Successful PM's Extraversion

Table 14. Stem and Leaf Plot, Least Successful PM's Extraversion

Frequency	Stem & Leaf
2.00	1 . 69
5.00	2 . 11234
8.00	2 . 66677788
6.00	3 . 011223
3.00	3 . 788
5.00	4 . 11334
5.00	4 . 57799

Stem width: 1.00
Each leaf: 1 case(s)

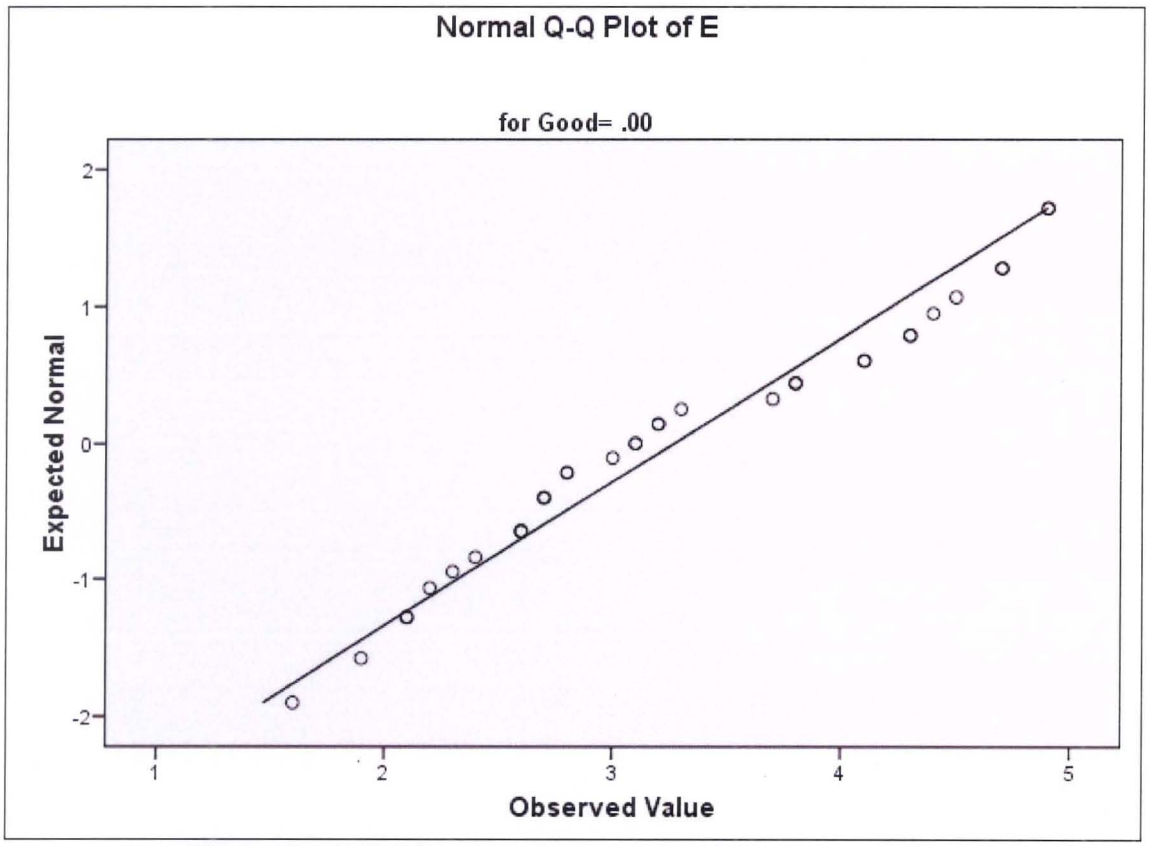


Figure 8. Q-Q Plot, Least Successful PM's Extraversion

Table 15. Shapiro-Wilk Test, Least Successful PM's Extraversion

	Good	Shapiro-Wilk		
		Statistic	df	Sig.
E	.00	.947	34	.100

Descriptive Statistics

An example of the descriptive statistics for Extraversion is shown in Table 16; descriptive statistics for the other Big Five domains are included in Appendix B. For each Big Five domain, the same statistics are provided for both the Least Successful (L.S.) PMs and Good PMs. The descriptive statistics demonstrate that the range of the data provided for each domain was acceptable, and in most cases span the entire spectrum from close to 1.0, the lowest score possible, to close to 5.0, the highest score possible. A sample with data that did not include the entire scale might indicate a limitation of the research, and the applicability might be limited only to the range provided in the data. However, since the ranges for each domain encompass most of the scale, the findings should be applicable to Big Five scales from 1.0 to 5.0.

Table 16. Extraversion Descriptive Statistics

			Statistic
L.S. PM		Mean	3.2706
	95% C.I.	Lower Bound	2.9402
		Upper Bound	3.6010
		Median	3.10
		Std Dev	0.9469
		Minimum	1.6
		Maximum	4.9
Good PM		Mean	3.8088
	95% C.I.	Lower Bound	3.5244
		Upper Bound	4.0932
		Median	3.95
		Std Dev	0.8152
		Minimum	1.3
		Maximum	5.0

Research Questions Revisited

From Chapter I, three research questions were included as part of this research effort. The three research questions include:

- Question 1: Does project manager personality contribute to project success?
- Question 2: For each DoD Service, are there specific personality types associated with project success, and do the personality types differ by Service?
- Question 3: Given different types of projects, do different personality types contribute more to project success?

Unfortunately, no statistically significant findings could be extracted from the data for Research Question 2 or Question 3, due to the small sample size. Both were exploratory questions aimed at determining if there were any personality differences based on

organizational cultures or project type. As the sample was further subdivided to assess specific Service or project type affiliation, the subdivided samples were quite small. For example, the largest Service representation was the Navy, and it only included nine respondents. Likewise, project type was measured by several categorical variables including project cost, project phase, project location, and project technical uncertainty. Most variables had at least five categories except technical uncertainty which had only three categories. However, even considering technical uncertainty alone, the most populated categories had no more than eight Good PMs and eight Least Successful PMs. Therefore, from this sample no conclusions can be determined regarding differences in personality predictors due to Service affiliation or project type.

Consequently, the remainder of this chapter will focus on the first research question. To answer Research Question 1, and the subsequent hypotheses associated with this question, three types of analysis were conducted. First, a difference of the means t-test was conducted, second a correlation analysis was completed, finally, a hierarchical linear model was created to better characterize the relationships present in the data. In the subsequent paragraphs each type of analysis is described in more detail along with the underlying assumptions, findings, and relationship to the research question and hypotheses. Following the discussion of the tests, each hypothesis will be examined in detail.

Difference of the Means Test

To examine the difference of the means, a Student's t-test was conducted. To begin the analysis, the assumptions underlying an appropriate use of the test were

examined and satisfied. The assumptions include random selection, approximately normal distribution of the data, equality of variance, and independence. Although the sample was not random, the sample was considered random subject to the limitations described in Chapter V. Normal distribution was examined via visual methods as well as a quantitative Shapiro-Wilk test. Equality of variances was explored using the Levene's test available in SPSS. Levene's test posits a hypothesis that the variances are not equal, with a null hypothesis that the variances are in fact equal. Consequently, a *p*-value of less than 0.05 is considered significant and evidence that the variances are not equal. As shown in Table 17, the significance level is greater than 0.05 for each of the Big Five dimensions; therefore, the null hypothesis is not rejected, and the variances are assumed to be equal. Once the underlying assumptions of normality and equality of variances were validated, the appropriate formula for the statistical test could be selected.

Table 17. Levene's Test Results

		Levene's Test for Equality of Variances	
		F	Sig.
		Lower	Upper
E	Equal variances assumed	2.951	0.095
	Equal variances not assumed		
A	Equal variances assumed	0.981	0.329
	Equal variances not assumed		
C	Equal variances assumed	1.534	0.224
	Equal variances not assumed		
ES	Equal variances assumed	0.191	0.665
	Equal variances not assumed		
O	Equal variances assumed	0.001	0.972
	Equal variances not assumed		

To select the appropriate type of test, two other considerations include the independence of cases and the sample size. In this research, the same respondent provided both the Best PM data and the Least Successful PM data; therefore, the cases may not be considered completely independent. A depiction of the data dependency is provided in Figure 9 with the cases being dependent in two ways. In the first, the respondent's assessment of the attributes of both the Good and Least Successful PM (labeled L.S. PM in Figure 9) tie the two cases together. In the second way, any bias the respondent may have when evaluating another PM's Big Five would also be attributed to both the Good PM and the Least Successful PM.

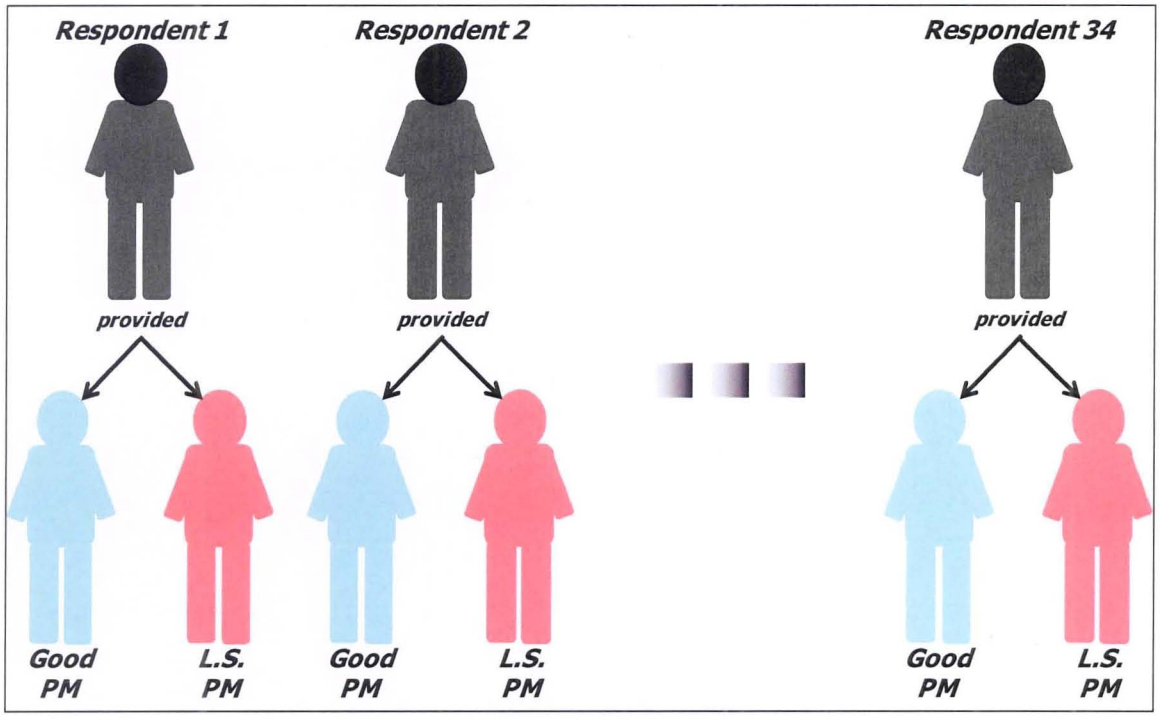


Figure 9. Respondent Dependency

To rule out the effect of case dependency, the data was split into smaller sub-samples. To ensure the selection of the sub-samples was random, a random number was generated in Excel for each respondent. If the random number was greater than 0.5, then the Good PM data was used for the respondent. Likewise, if the random number was less than 0.5, then the Least Successful PM data was used for the respondent. A total of 35 sub-samples were created using this method. An example of the PM distribution for Sub-sample 1 is included in Table 18. The first column represents the number of the respondent, the second column is the random number, and the third column demonstrates whether the Good PM or the Least Successful PM data was selected for that respondent.

Table 18. Sub-Sample 1, an Example Sub-Sample Selection

Respondent #	Rand #	Pick
1	0.082314962	Least Successful PM
2	0.1856121	Least Successful PM
3	0.495878718	Least Successful PM
4	0.315267072	Least Successful PM
5	0.351354305	Least Successful PM
6	0.058048121	Least Successful PM
7	0.343123631	Least Successful PM
8	0.347581422	Least Successful PM
9	0.03783512	Least Successful PM
10	0.261188565	Least Successful PM
11	0.351275963	Least Successful PM
12	0.817993614	Good PM
13	0.594764135	Good PM
14	0.454131766	Least Successful PM
15	0.001844344	Least Successful PM
16	0.281826718	Least Successful PM
17	0.284544226	Least Successful PM
18	0.010921577	Least Successful PM
19	0.157648668	Least Successful PM
20	0.400535551	Least Successful PM
21	0.747560796	Good PM
22	0.023036067	Least Successful PM
23	0.34306531	Least Successful PM
24	0.607248796	Good PM
25	0.699783097	Good PM
26	0.740387375	Good PM
27	0.657379932	Good PM
28	0.007599194	Least Successful PM
29	0.211007945	Least Successful PM
30	0.579034977	Good PM
31	0.758353578	Good PM
32	0.543176976	Good PM
33	0.252427439	Least Successful PM
34	0.024804165	Least Successful PM

The method of creating sub-samples from the original sample ensured that Best PM Big Five data and Least Successful PM Big Five data came from different respondents and were in fact independent. Although, as described in Chapter III, the instrument was designed to reduce same-source and leniency bias, the respondent still creates some data dependency in the Best PM and Least Successful PM data because the respondent selects and evaluates both PMs. Splitting the sample into sub-samples eliminates those dependencies. In addition, the method provided samples which could be analyzed using an independent t-test. Although the sample sizes were technically large (n = 34) for each sub-sample, the t-test was still selected since it provided a slightly more conservative result that a standard z-test. For Sub-Sample 1, 10 Good PMs were selected and 24 Least Successful PMs were selected for a total of 34 PMs. For sub-samples 1 through 35 the number of Best and Least Successful PMs varied, as described in Table 19.

Table 19. Sub-Sample PM Distribution

Sub-Sample	# of Good PMs Selected	# of Least Sucessful PMs Selected	Total
1	10	24	34
2	11	23	34
3	18	16	34
4	15	19	34
5	15	19	34
6	21	13	34
7	19	15	34
8	14	20	34
9	19	15	34
10	22	12	34
11	19	15	34
12	15	19	34
13	21	13	34
14	16	18	34
15	18	16	34
16	20	14	34
17	17	17	34
18	8	26	34
19	16	18	34
20	19	15	34
21	18	16	34
22	20	14	34
23	17	17	34
24	14	20	34
25	18	16	34
26	14	20	34
27	16	18	34
28	16	18	34
29	22	12	34
30	23	11	34
31	18	16	34
32	19	15	34
33	18	16	34
34	23	11	34
35	19	15	34

The SPSS results of the independent t-test for Sub-Sample 1 are shown in Table 20. Although results for each hypothesis will be discussed in further detail below, it appears that Conscientiousness and Openness exhibited significant findings, with *p*-values of 0.001 and 0.002, respectively. Extraversion, Agreeableness, and Emotional Stability did not exhibit a statistically significant difference in the means for this sub-sample; their *p*-values were all greater than 0.05. Therefore, there appears to be a difference between Good PM and Least Successful PMs in the domains of Conscientiousness and Openness, with the other Big Five domains do not appear to be good predictors of PM success.

Table 20. Sub-Sample 1 Independent Samples t-Test Results

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
E	Equal variances assumed	2.951	0.095	-1.323	32	0.195	-0.44667	0.33763	-1.13440	0.24106
	Equal variances not assumed			-1.548	24.716	0.134	-0.44667	0.28853	-1.04125	0.14792
A	Equal variances assumed	0.981	0.329	-0.150	32	0.882	-0.05417	0.36224	-0.79202	0.68369
	Equal variances not assumed			-0.144	15.590	0.887	-0.05417	0.37664	-0.85431	0.74598
C	Equal variances assumed	1.534	0.224	-3.719	32	**0.001**	-1.11833	0.30068	-1.73081	-0.50586
	Equal variances not assumed			-2.930	11.263	0.013	-1.11833	0.38164	-1.95594	-0.28073
ES	Equal variances assumed	0.191	0.665	-0.846	32	0.404	-0.26417	0.31218	-0.90006	0.37172
	Equal variances not assumed			-0.828	16.169	0.419	-0.26417	0.31885	-0.93952	0.41119
O	Equal variances assumed	0.001	0.972	-3.438	32	**0.002**	-0.86667	0.25208	-1.38013	-0.35320
	Equal variances not assumed			-3.521	17.828	0.002	-0.86667	0.24616	-1.38419	-0.34914

Results for Sub-Sample 1 are also presented graphically in Figure 10. The figure depicts the Big Five dimensions and each of the Big Five sub-factors previously discussed. In addition, the Best PM Big Five and Least Successful PM mean scores are depicted above and below the scale, respectively. Mean scores are denoted with an "x" in both cases, in addition, the 95 percent confidence intervals are shown. The brackets represent the maximum and minimum data values. The associated *p*-values for each Big Five dimension are also provided. For example, on the Extraversion scale in Figure 10, the Best PM mean score was 3.9 with the 95 percent confidence interval ranging from 3.4 to 4.4. The Least Successful PM mean score was 3.4, with a lower bound of 3.0 and an upper bound of 3.8 for the 95 percent confidence interval. Furthermore, the data ranged from a minimum of 1.6 to a maximum of 4.9, and the *t* test *p*-value was 0.195. In this case, there is not a statistically significant difference in the means between the Extraversion scores of the Good PMs and the Least Successful PMs.

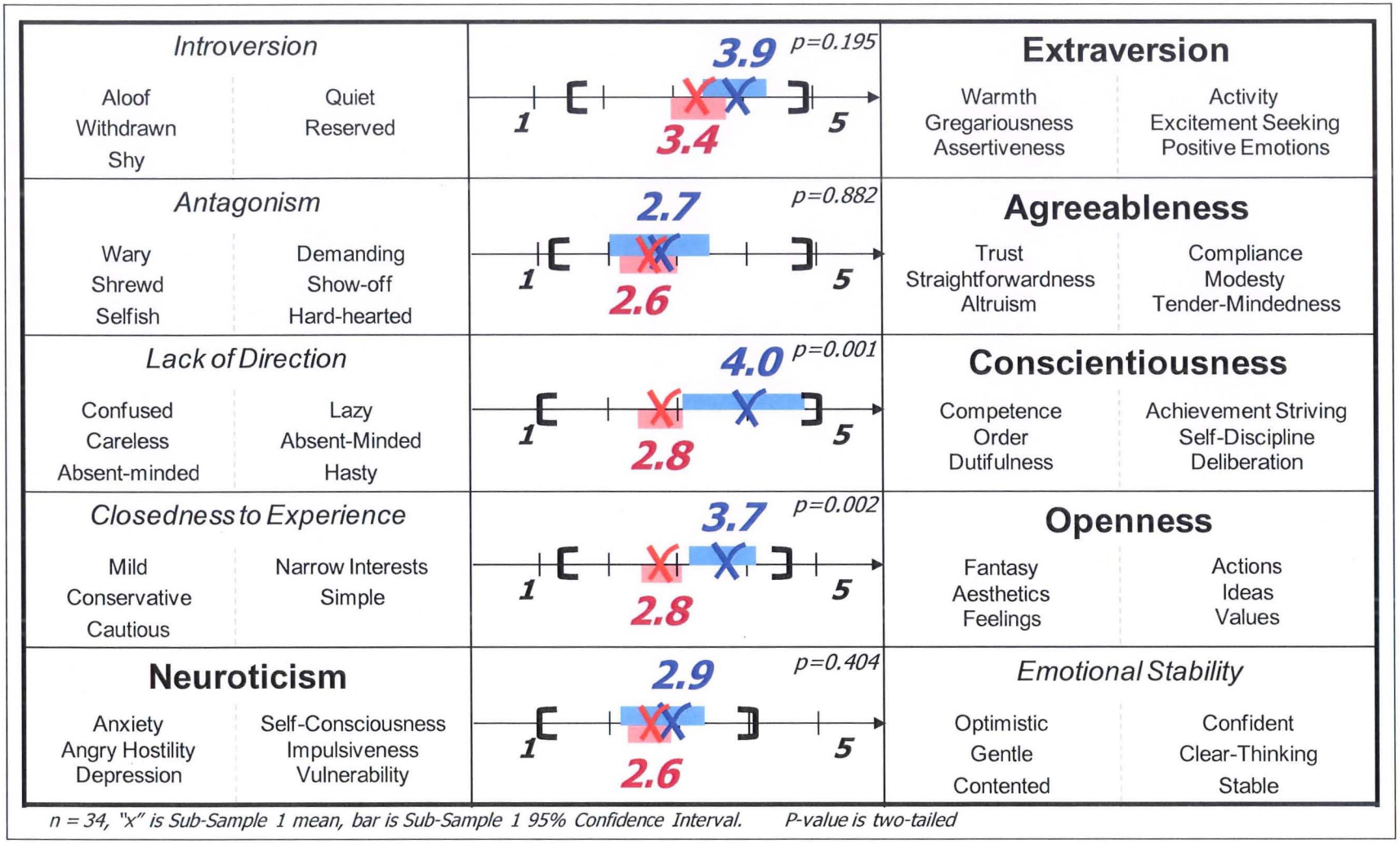


Figure 10. Graphical Depiction of Sub-Sample 1 t-Test Results

Considering all of the sub-samples, the results are mixed and the *p*-values for each sub-sample are presented numerically in Table 21. The *p*-values for each Big Five domain are presented graphically in Figure 11 through Figure 15. From the table and the figures, Conscientiousness and Openness demonstrated statistical significance in the difference between Good PM and Least Successful PM means for all sub-samples. Emotional Stability was statistically significant in all but two sub-samples (sub-sample 1 and 27). Agreeableness was only statistically significant in about half of the sub-samples. Extraversion was only statistically significant in approximately one third of the sub-samples. Therefore, it appears Conscientiousness and Openness and Emotional Stability are good predictors of PM success. Extraversion and Agreeableness do not appear to predict PM success.

Table 21. t-Test *p*-value Results for all Sub-samples

Sub-Sample	E	A	C	O	ES
1	0.195	0.882	0.001	0.002	0.404
2	0.300	0.084	0.000	0.000	0.002
3	0.096	0.246	0.001	0.001	0.013
4	0.305	0.009	0.000	0.000	0.001
5	0.177	0.014	0.000	0.000	0.000
6	0.046	0.157	0.000	0.000	0.017
7	0.013	0.041	0.000	0.000	0.003
8	0.000	0.045	0.000	0.000	0.005
9	0.295	0.010	0.000	0.000	0.002
10	0.199	0.017	0.000	0.000	0.006
11	0.278	0.302	0.000	0.000	0.010
12	0.083	0.011	0.000	0.000	0.002
13	0.041	0.291	0.000	0.000	0.026
14	0.977	0.010	0.000	0.000	0.001
15	0.019	0.339	0.000	0.000	0.009
16	0.031	0.303	0.000	0.000	0.010
17	0.038	0.381	0.000	0.000	0.007
18	0.013	0.000	0.000	0.000	0.000
19	0.197	0.004	0.000	0.000	0.006
20	0.304	0.120	0.000	0.002	0.005
21	0.251	0.352	0.000	0.000	0.019
22	0.128	0.120	0.000	0.000	0.002
23	0.141	0.026	0.000	0.000	0.000
24	0.154	0.005	0.000	0.000	0.008
25	0.037	0.171	0.000	0.000	0.022
26	0.141	0.633	0.001	0.000	0.022
27	0.117	0.212	0.000	0.000	0.068
28	0.037	0.001	0.000	0.000	0.000
29	0.107	0.171	0.000	0.000	0.009
30	0.092	0.035	0.000	0.001	0.008
31	0.011	0.001	0.000	0.000	0.006
32	0.173	0.007	0.000	0.000	0.001
33	0.332	0.012	0.000	0.001	0.009
34	0.187	0.000	0.000	0.000	0.000
35	0.026	0.044	0.000	0.000	0.001
Mean	0.158	0.144	0.000	0.000	0.020

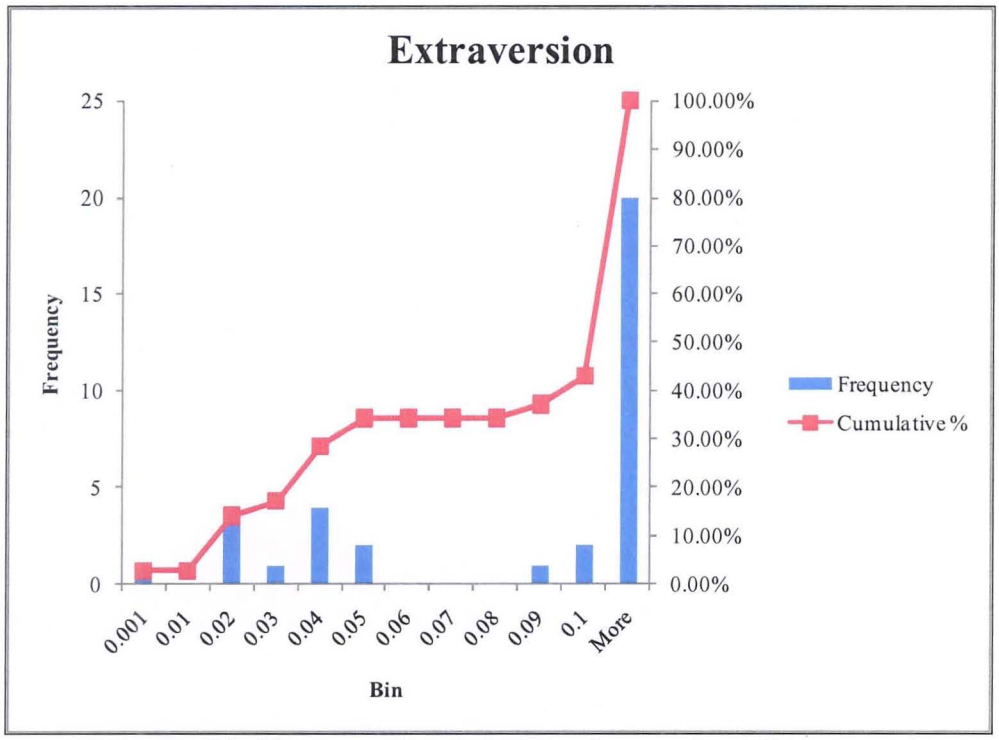


Figure 11. Extraversion Sub-Samples *p*-value Histogram

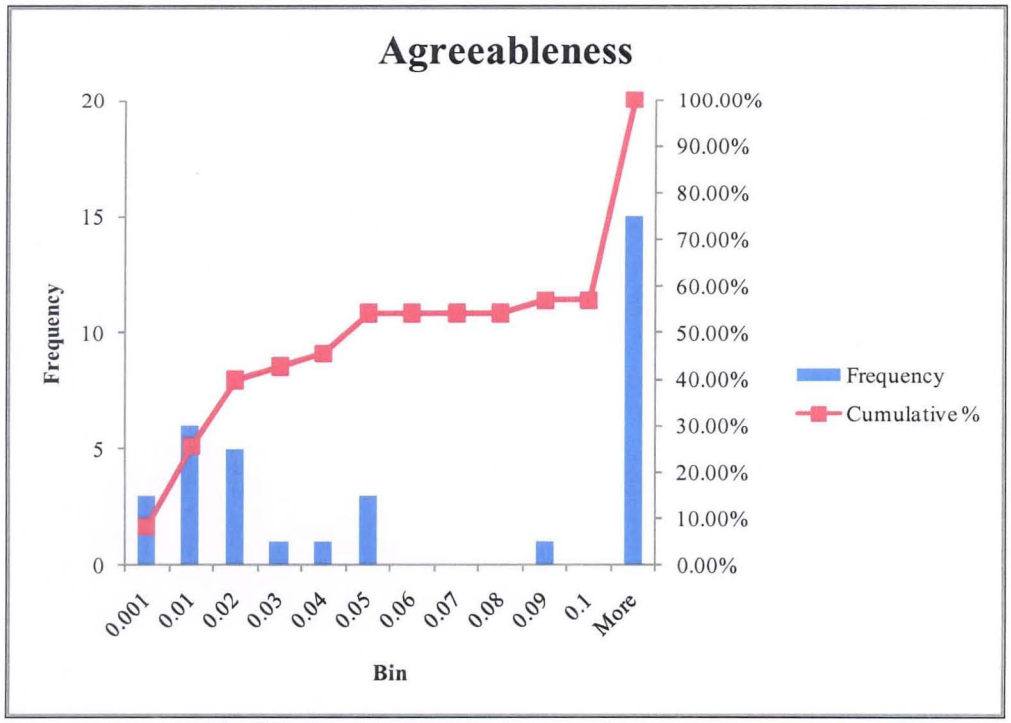


Figure 12. Agreeableness Sub-Samples *p*-value Histogram

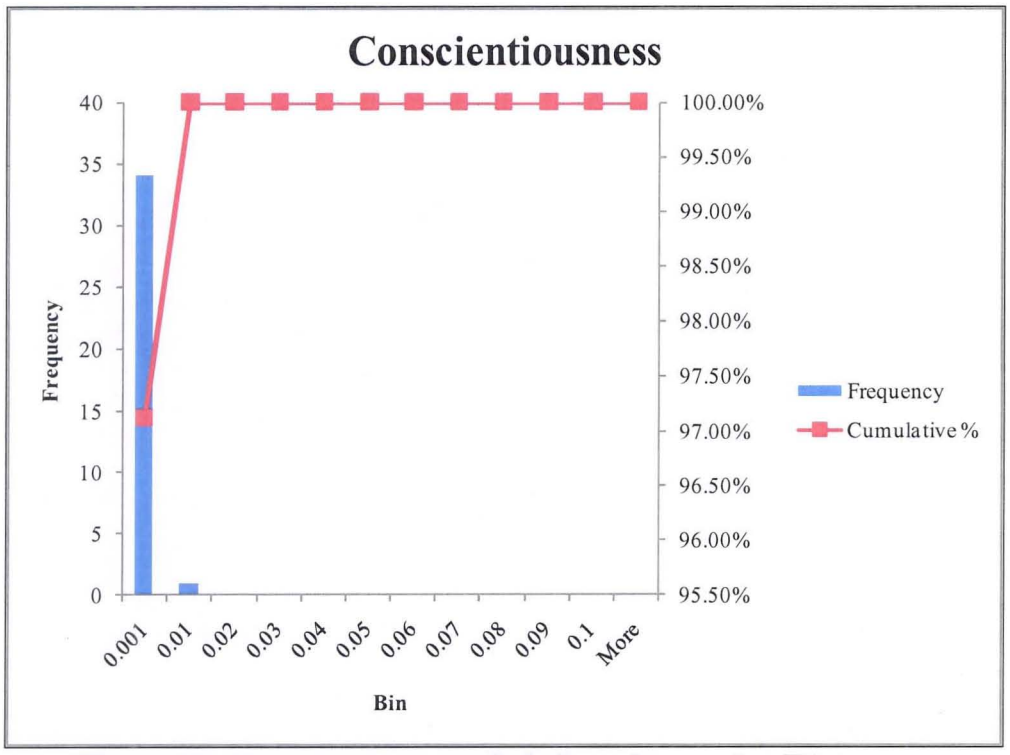


Figure 13. Conscientiousness Sub-Samples *p*-value Histogram

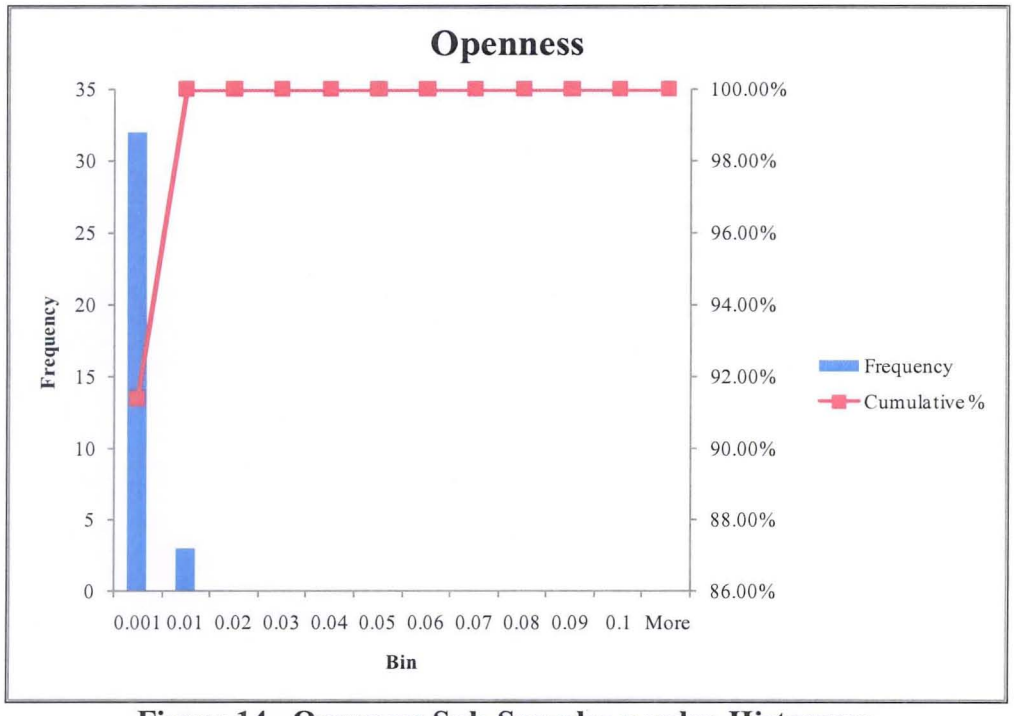


Figure 14. Openness Sub-Samples *p*-value Histogram

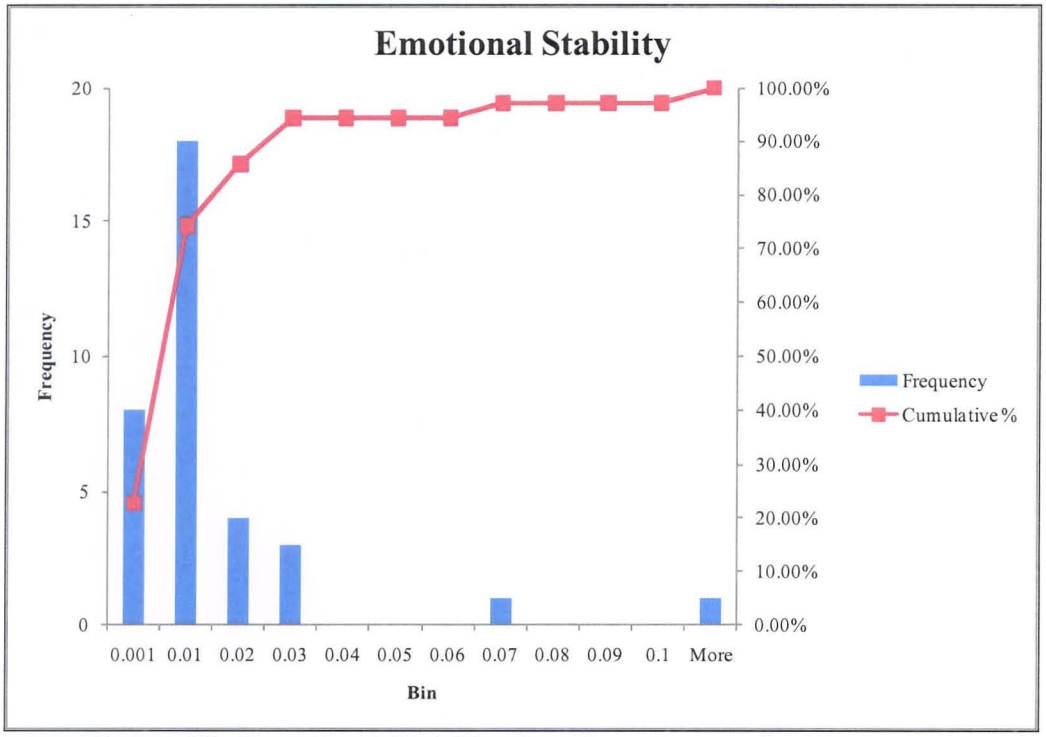


Figure 15. Emotional Stability Sub-Samples *p*-value Histogram

Although, as described in Chapter III, the survey instrument was designed to reduce same-source bias, an additional step was taken to quantify the effect of the bias and attempt to determine if the instrument sufficiently reduced the bias. Same-source bias may be present when the same respondent reports on the Independent Variable (IV), in this case the Big Five, and the Dependent Variable (DV), in this case the categorization of the "goodness" of the PM. One result of same-source bias may manifest as a respondent who is optimistic about the DV is also optimistic about the IV and inflates the scores accordingly. From Chapter III, one of the reasons the methodology was selected was to reduce, or balance, same-source bias. In particular, the instrument design attempted to gather information regarding the Best PM and the Least Successful PM from the same source, so if the source was optimistic, both the Best PM and Least Successful PM scores would be inflated, but the relative difference in the means would remain unchanged. Although the sample was split into two halves to reduce the effect of this bias, a correlation was also conducted to determine if the bias was indeed influencing the results.

Correlation Matrix

If a same-source bias was adversely influencing the results, a correlation matrix might identify the influence. In particular, if same-source bias was present, one might expect a strong positive correlation between the respondent's Big Five scores and the Best PM Big Five scores, and a strong negative correlation between the respondent's Big Five scores and the Least Successful PM Big Five scores. For example, if the respondent scores high on the Extraversion scale, they might identify the Best PM as also high on the

Extraversion scale while they might rate the Least Successful PM as low on the Extraversion scale. A correlation matrix between the respondent's Big Five scores, the Best PM scores, and Least Successful PM scores is provided in Table 22.

Table 22. Respondent, Best PM, and Least Successful PM Correlation Matrix

		"Best" PM					"Least Successful" PM				
Respondent		E	A	C	ES	O	E	A	C	ES	O
E	Pearson Corr	-.171	.123	.124	-.049	-.092	.025	-.062	-.225	-.071	.086
	Sig (2-tail)	.313	.469	.465	.772	.589	.881	.714	.181	.678	.612
A	Pearson Corr	.062	**.343**	**.438**	.070	.322	.238	-.074	.054	.050	.130
	Sig (2-tail)	.715	.038	.007	.682	.052	.156	.663	.750	.768	.443
C	Pearson Corr	.101	**.405**	**.515**	.140	**.359**	-.049	.107	-.184	.170	.079
	Sig (2-tail)	.553	.013	.001	.409	.029	.775	.530	.275	.315	.643
ES	Pearson Corr	.109	**.348**	**.346**	**.327**	**.355**	.158	-.082	-.110	-.076	.060
	Sig (2-tail)	.520	.035	.036	.048	.031	.349	.631	.516	.654	.726
O	Pearson Corr	-.040	**.412**	.200	.183	**.354**	.115	-.129	-.010	-.098	.070
	Sig (2-tail)	.816	.011	.235	.278	.032	.498	.447	.951	.562	.681

Bold items are statistically significant

The results of the correlation matrix do not support the concept that the difference of the means is due solely to same-source bias. However, the correlation indicates a strong positive correlation between some of the Respondent's Big Five scores and the Best PM scores. Particularly, the Best PM Conscientiousness score is strongly positively correlated with the Respondent's scores on Agreeableness and Conscientiousness; it is modestly positively correlated with the Respondent's Emotional Stability score. There are also positive correlations between the Best PM Agreeableness score and the respondent's scores of Agreeableness, Conscientiousness, Emotional Stability, and Openness. Similarly, the respondent's Emotional Stability score is positively correlated with the Best PM scores on Agreeableness, Conscientiousness, Emotional Stability, and

Openness. However, there are no statistically significant correlations between the respondent and the Least Successful PM scores. This finding does not align with the expected correlations present in a sample with significant same-source bias previously described. Therefore, the correlation matrix does not support the idea that the difference in mean scores is solely based on some type of same-source bias.

Furthermore, an alternative concept may explain the correlations between the respondent's and Best PM's Big Five scores: the sample may have included many successful PMs. Therefore, one would expect their Big Five assessments to strongly correlate with the "Best" PM assessments and further bolster the findings of this thesis. Although the PMT352 respondents may or may not be successful PMs, one would expect many of the PMT401 respondents to have displayed some competence as PMs. The PMT401 respondents have experience, previous PM training and certification, and will most likely continue to become the PM of a DoD Acquisition Category (ACAT) I or II program, which are some of the biggest and most challenging programs in the DoD. In addition, from the sample demographics, over 75 percent of the total respondents have more than four years experience as a PM. Although experience does not guarantee competence, all of the factors taken together might indicate the sample includes many successful PMs. To further understand and quantify the relationship between the Big Five factors and PM success, a Hierarchical Linear Model was created and analyzed.

Hierarchical Linear Model

Upon further consideration of Figure 9, the data dependency might be better described by data grouping using Hierarchical Linear Models. A hierarchical model

provides additional insight into group-level effects and is the most appropriate model for use with grouped data (Bryk and Raudenbush, 1992). In this case, each respondent becomes their own group with two sub-groups: Good PM and Least Successful (L.S.) PM, as depicted in Figure 16. Therefore, the data can be characterized with 34 groups, each with two cases per group. This hierarchical construct enables an analysis utilizing a Hierarchical Linear Model (HLM); however, since the DV is dichotomous for this research effort, a non-linear model is required (Raudenbush, Bryk, Cheong, and Congdon, 2000). Since the criterion variable can only assume two values, a zero for a Least Successful PM and a one for a Good PM, a Bernoulli model was used in HLM version 6.0, Student Edition.

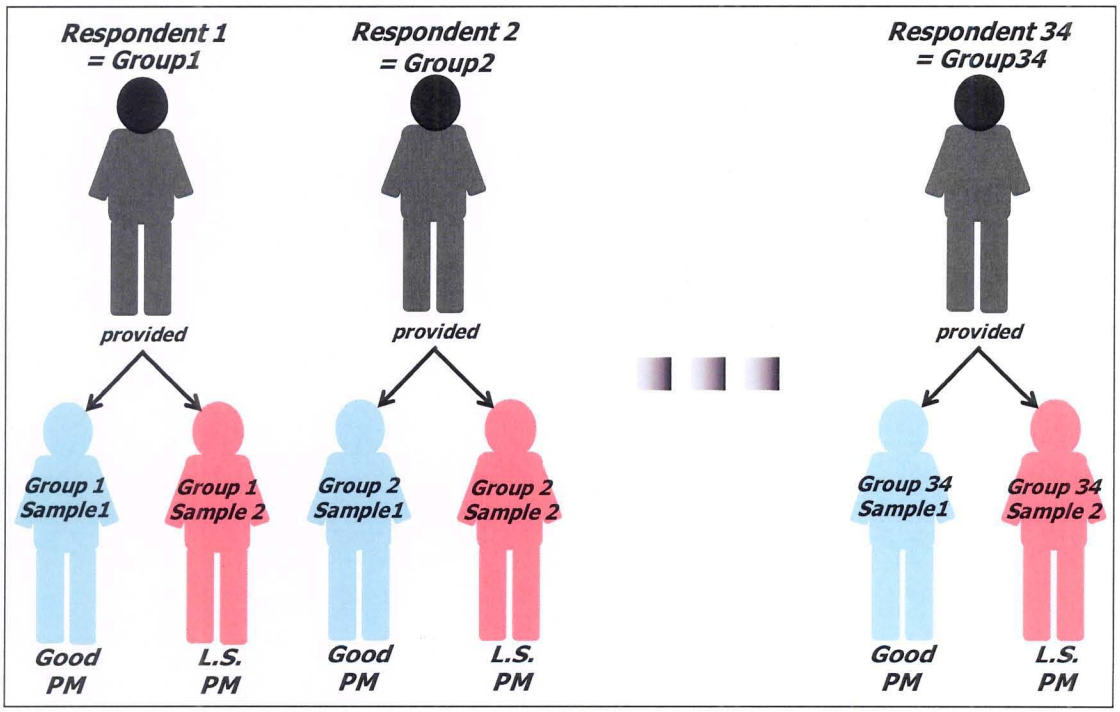


Figure 16. Hierarchical Grouping Depicted

In a HLM, a model is created for each level of the hierarchy. In this case, the Level 1 model describes the individual effects and is described by the following equations:

$$P(Good) = \varphi \tag{1}$$

$$Log\left[\frac{\varphi}{1-\varphi}\right] = \eta \tag{2}$$

$$\eta = \beta_0 + \beta_1(C) + \beta_2(O) \tag{3}$$

where P(Good) is the probability of a Good PM, η is the log odds (or logit) of a Good PM versus a Least Successful PM, β_0 is the y-intercept, β_1 is the coefficient for the individual level effect of Conscientiousness, and β_2 is the coefficient for the individual level effect of Openness. Since the respondents reported on the perceived success of PMs, the criterion variable is considered to be the "goodness" of the PM; this is expressed as the probability of a Good PM in Equation 1. This probability is then converted into a log odds in Equation 2, similar to a standard logistical regression. Finally, the specific predictor variables are added into the model in Equation 3. Several Big Five dimensions either prevented the model from converging or were not statistically significant; in either case, they were subsequently removed. Only Conscientiousness and Openness allowed the model to converge with an appropriate level of statistical significance.

Similarly, Level 2 models were created to describe the group effects for each of the coefficients in the Level 1 model. The three Level 2 equations are shown in Equations 4, 5, and 6.

$$\beta_0 = \gamma_{00} \tag{4}$$

$$\beta_1 = \gamma_{10} + \gamma_{11}(IC) + u1 \tag{5}$$

$$\beta_2 = \gamma_{20} + \gamma_{21}(IO) + u2 \tag{6}$$

where β_0 is the group level effect on the y-intercept, β_1 is the group level effect on Conscientiousness, and β_2 is the group level effect on Openness. The variables for each Equation 4, 5, and 6, along with their meanings, are described in the following paragraphs.

In Equation 4, β_0 is allowed to vary by only the fixed effect, γ_{00}. No random effects are included since the y-intercept has no meaning (i.e., there are no zero scores on the Big Five personality assessment). The remaining Level 2 equations are allowed to vary by both fixed effects and random effects. Equation 5 describes the group effects on the Level 1 predictor for Conscientiousness, β_1. The variable γ_{10} the y-intercept of the group. The variable γ_{11} describes the coefficient of the group effect of the Respondent's Conscientiousness score (IC) on the Level 1 Conscientiousness score. The random effect is included as the term $u1$. Similarly, Equation 6 describes the group level effects on Openness, where γ_{20} is the y-intercept, γ_{21} is the group effect of the respondent's Openness score, and $u2$ is the random effect.

In Equations 5 and 6, the Respondent's Conscientiousness and Openness scores, along with random effects, are used as predictors at the group level. Similar to the development of Equation 3, all of the Big Five variables were initially included in the Level 2 equations; however, only the Respondent's Conscientiousness and Openness were deemed to be valid predictors. Consequently, substituting the Level 2 equations (Equations 4, 5, and 6) into the Equation 3 (from Level 1) yields Equation 7. After model convergence, a subset of the HLM output is shown in Table 23. When the coefficients

from Table 23 are inserted into Equation 7, Equation 8 is the result. Substituting Equation 8 back into Equation 2, and then into Equation 1, yields a more familiar looking logistic regression Equation 9.

$$\eta = \gamma_{00} + \gamma_{10}(C) + \gamma_{11}(IC)(C) + \gamma_{20}(O) + \gamma_{21}(IO)(O) + u1(C) + u2(O) \tag{7}$$

$$\eta = -15.95 + 2.49(C) - 0.23(IC)(C) + 6.01(O) - 0.73(IO)(O) \tag{8}$$

$$P(Good) = \frac{1}{1 + e^{-[-15.95 + 2.49(C) - 0.23(IC)(C) + 6.01(O) - 0.73(IO)(O)]}} \tag{9}$$

Table 23. HLM Results

Fixed Effect	**Coefficient**	**Standard Error**	**T-ratio**	**Approx d.f.**	***p*-value**
γ_{00}	-15.952664	4.758413	-3.353	63	0.002
γ_{10}	-2.487966	1.086917	2.289	32	0.029
γ_{11}	-0.230416	0.1.4624	-2.202	32	0.035
γ_{20}	6.012708	2.154241	2.791	32	0.009
γ_{21}	-0.731378	0.283777	-2.577	32	0.015
Random Effect	**Standard Deviation**	**Variance Component**	**d.f.**	**Chi-square**	***p*-value**
$u1$	1.81273	3.28598	30	36.11686	0.204
$u2$	1.91228	3.65683	30	41.60876	0.077

Although Equations 8 and 9 are slightly less intuitive than a regular linear regression, they both describe the positive predictive influence of both Conscientiousness and Openness on the probability of a Good PM. The results of the analysis indicate that Conscientiousness and Openness positively predict Good PMs, controlling for group

level effects. Equations 8 and 9 also describe the effect of the group level interaction between the Respondent's Conscientiousness and the PM's Conscientiousness, as well as between the Respondent's Openness and the PM's Openness.

Review

The results of the difference of the means analysis and the Hierarchical model both confirm that personality is a factor in predicting PM success. However, not all of the hypotheses associated with the first research question were supported. A more detailed explanation of the findings for each hypothesis is presented below.

Hypothesis 1

The first hypothesis was: *Extraversion positively relates to project manager performance for all types of projects*. This hypothesis was not supported. In the difference of the means test, none of the random sub-samples indicated any significant findings. In addition, there were no positive correlations between the respondent's Extraversion score and either the Best PM Extraversion score or the Least Successful PM Extraversion score. Finally, Extraversion was not found to be statistically significant during the HLM analysis. Therefore, Extraversion does not appear to be a significant predictor of PM success.

Hypothesis 2

The second hypothesis regarded Openness as a predictor of PM success and stated: *Openness positively relates to project manager performance for all types of*

projects. This hypothesis was supported. For all of the difference of means sub-samples, the mean Openness scores were shown to be statistically different between the Good PMs and the Least Successful PMs. Furthermore, the Openness factor was statistically significant in the HLM model. Therefore, Openness does seem to be a good predictor of PM success.

Hypothesis 3

Hypothesis three stated: *Conscientiousness positively relates to project manager performance for all types of projects*. Hypothesis three was supported. All of the sub-sample difference of mean tests found that the difference between Good PM and Least Successful mean Conscientiousness scores were statistically significant. Conscientiousness was also a significant predictor in the HLM model. Therefore, Hypothesis three was supported and Conscientiousness is considered a good predictor of PM success.

Hypothesis 4

Hypothesis four posited: *Agreeableness is not a good predictor of project manager performance regardless of the type of project*. Hypothesis four was supported. Agreeableness was not statistically significant in the difference of means test or the HLM analysis. Although one sub-sample reported a statistically significant finding and there was a moderate correlation between the respondent's Agreeableness score and the Best PM Agreeableness score, these findings alone are not enough to support the hypothesis,

especially when neither of the other analysis found any significant findings. Therefore, Agreeableness does not appear to be a significant factor in predicting PM success.

Hypothesis 5

The fifth and final hypothesis stated: *Neuroticism is a good predictor of project manager performance for all types of projects*. This hypothesis was not supported; in fact, the findings appear to contradict this hypothesis. Emotional Stability, rather than Neuroticism, was statistically significant for the difference of means test on four of the five sub-samples. However, Emotional Stability did not seem significant in the HLM analysis. Therefore, it appears Emotional Stability may be a good predictor of PM success, while Neuroticism is not a good predictor of PM success.

Summary

The summation of all the research results is provided in Table 24. For each research question or hypothesis, the table provides the methods used to analyze the data and the results of each analysis. Data collected by surveying students attending DAU PMT352B and PMT401 courses was principally analyzed using the difference of means tests and HLM. Based on the results, personality does seem to be a predictor of PM success. Particularly, Conscientiousness and Openness are both good predictors of project success. Extraversion and Agreeableness do not seem to be predictors of success. Emotional Stability might be a good predictor of success. Finally, no significant results were obtained to determine whether Service affiliation or project type had any bearing on personality attributes that might be useful to predict project success. The next chapter

discusses the findings in more detail, as well as practical application of the findings, some limitations of the research, and recommendations for future research.

Table 24. Research Results Summary

Research Question 1: Does PM personality contribute to success?	Method	Results	
Hypothesis 1: Extraversion is a predictor for all project types	a. t-test b. HLM	a. No significant difference in the means b. Initial model identified – E excluded	**Not Supported**
Hypothesis 2: Openness is a predictor for all project types	a. t-test b. HLM	a. Significant difference in the means b. Initial model identified – O included	**Supported**
Hypothesis 3: Conscientiousness is a predictor for all project types	a. t-test b. HLM	a. Significant difference in the means b. Initial model identified – C included	**Supported**
Hypothesis 4: Agreeableness is not a predictor	a. t-test b. HLM	a. No significant difference in the means b. Initial model identified – A excluded	**Supported**
Hypothesis 5: Neuroticism is a predictor for all project types	a. t-test b. HLM	a. Significant difference in the means b. Initial model identified – ES excluded (ES rather than N is a predictor)	**Not Supported (perhaps ES)**
Research Question 2: Does Service affiliation matter?	t-test	Small sample size No significant findings	
Research Question 3: Does Project Type matter?	t-test	Small sample size No significant findings	

V. Conclusions and Recommendations

The last chapter described the data analysis and presented preliminary findings. This chapter discusses the findings in more detail and provides practical applications of those findings. In addition, this chapter discusses limitations of the research, policy recommendations based on the findings, and recommendations for future research. The chapter concludes with a summary of the thesis.

Results

The research findings indicate personality is a predictor of Project Manager (PM) success. A survey of 34 students attending the Department of Defense (DoD) Defense Acquisition University (DAU) collected Big Five personality information on the best PM and least successful PM they have known. The results of a difference of the means test between Good and Least Successful PMs indicates both Conscientiousness (n=34, t=3.719, p=0.001) and Openness (n=34, t=3.438, p=0.002) are consistent positive predictors. Emotional Stability was demonstrated to predict PM success in some cases. Furthermore, Conscientiousness and Openness were positive predictors in a Hierarchical Linear Model analysis as described in Equation 9 from the last chapter, and reprinted below.

$$P(Good) = \frac{1}{1+e^{-[-15.95+2.49(C)-0.23(IC)(C)+6.01(O)-0.73(IO)(O)]}} \tag{9}$$

Limitations

Several research limitations require elucidation to properly explain the extent of the research applicability, as well as underlying assumptions and bias present in this research. Principally four limitations require further comment: small sample size, restriction to DoD PMs, research methodology limitations, and unproven causality. The findings are based on a relatively small sample size, n = 34 respondents, which restricted more detailed analysis. Especially in cases where the data was further subdivided to explore distinctions between categories of data, small samples within each category made finding statistically significant differences nearly impossible. Not only were there few respondents, but they were exclusively from DoD PMs. As argued in Chapter III, DoD PMs are predicted to be representative of PMs worldwide. However, the sample did not include any non-DoD PMs, and an argument could be made the conclusions should be restricted accordingly.

The data collection methodology also presents limitations including respondent bias, same-source bias, redundant reporting, and self-selection bias. Since the instrument collected the respondent's perceptions of other PMs, there may be some bias in their reporting, or their perceptions might not exactly match reality. The respondents may have used different criterion to identify their Best and Least Successful PMs, and once identified, their personal bias may have impacted their assessment. In addition, the differences between the Good PMs and the Least Successful PMs may contain more same-source bias than is reported and quantified. Furthermore, several PMs may have reported on the same Good PM, or the same Least Successful PM. While this is unlikely due to the dispersion of PMs across Services and locations, any "double reporting" of

Good PMs and Least Successful PMs would slightly skew the data. Finally, the respondents self-selected to participate in the survey which might lead to self-selection bias. All of these data collection limitations might limit the applicability of the results to PMs worldwide.

The final research limitation is unproven causality. Causality requires three items: temporal precedence, correlation, and the exclusion of all other alternative explanations (Schwab, 2005). It is the last item, the exclusion of all other causes that proves the most difficult. While personality would appear to precede the efforts of the PM, and while correlation between personality and PM "goodness" was discovered during this research, there are many other factors that were not excluded as part of the this research. Some of those other factors may be masking the results reported in this research. Therefore, the small sample size, restriction of the sample to DoD PMs, data collection limitations, and unproven causality are all research limitations, and may impact application of the research findings. Perhaps future research can more fully address and overcome these limitations.

Recommendations for future research

Since this effort was intended to complete only an exploratory analysis, much work regarding personality and PM success is still incomplete. To aid future researchers, the following recommendations are offered. The recommendations are in no particular order. A short description is offered with each recommendation to clarify the intent.

- Validate the model: Several models were proposed based on the data collected. However, due to the small sample sizes, some factors may not have

been included that might otherwise demonstrate statistical significance. Therefore, collecting additional data, perhaps a larger sample size, would be useful to validate the model.

- Validate results with non-DoD PMs: As discussed in the limitations, the data collected was restricted to DoD PMs. While an argument was made in Chapter III that DoD PMs are good representatives for PMs worldwide, it would be helpful to validate the results with non-DoD PMs to quantitatively prove the point.
- Investigate Big Five sub-factors: Since the instrument used to collect the data was limited to measurement at the domain level, no inferences could be made at the sub-factor level. Because the research effort was exploratory and only sought to determine if personality could be used to predict PM success, a sub-factor investigation was not initially desired. However, it might be useful to investigate specifically which sub-factors contributed to the findings. In particular, the Conscientiousness and Openness sub-factors should be explored. Another interesting effort would be to investigate the sub-factors of Emotional Stability since that domain did exhibit some statistically significant findings through the difference in means test (but not in the hierarchical model). Perhaps an exploration of the Emotional Stability sub-factors would help explain this phenomenon.
- Investigate influence of project type: A stated goal of the research which could not be realized doe to the small sample size, it would be important to understand whether project type influences the type of personality that is most

successful as a PM. This would assist PMs as they try to determine which project type might best fit their personality. Perhaps a larger sample size might identify any influences of project type.

- Validate findings via 360 degree feedback method: As noted earlier, this research was based largely on perceptions of PMs. It might be important to validate these findings by measuring good PMs and poor PMs as determined by their supervisors, peers, subordinates, and organizations. The methodology might include both the self-reported information from the PMs as well as 360 degree feed-back from their supervisors, peers, and subordinates. This 360 degree feedback method might provide a fuller explanation of personality influence and interaction in the workplace.
- Investigate effective personality-based training: For an organization such as the DoD, it will be very difficult, and undesired, to eliminate PMs that do not fit a particular personality profile. However, it might be important to provide PMs in the current workforce with specific training to assist them in understanding their personality, the personality of ideal PMs, and tools they might use to compensate for any differences. An investigation of personality-based training might identify those differences and tools, and it might be useful to determine if PMs can be trained to adapt.
- Investigate personality differences among other career fields: Perhaps personality can be used to predict success in other DoD career fields. A complete catalog of career fields, along with their associated personality predictors, would be useful during career counseling. If the applicant's

personality was not strong in Conscientiousness and Openness, perhaps one of the other career fields would be a better match than project management.

Policy Recommendations

In addition to recommendations for future research, the results of this research lend themselves to some initial policy recommendations. The policy recommendations are delineated into two categories. The first category includes those recommendations associated with using personality information for personnel selection. The second category includes a recommendation for utilizing personality information during PM training. The two categories of policy recommendations are discussed in further detail in the following paragraphs.

Recommendations for personnel selection

The research findings could be most useful for PM personnel selections. There are two aspects of personnel selection using personality: employee self-selection and employer selection. Employee self-selection means the employee uses the personality and best fit information to determine if project management is a good fit. Employer selection is the reverse, where the employer measures the employee's personality and then determines whether the employee should be selected based on the personality results. Although the former is recommended, the latter requires more careful study.

With respect to employee self-selection, the findings could be useful to three types of employees: new accessions who are considering entering the DoD as a PM; personnel who are currently in another specialty and thinking of transferring, or cross-

training, into project management; or those outside the DoD who are considering a career in project management. In those cases, the results from this research would be useful as the individual considers whether project management is a good fit. To support the employee's decision, information regarding PM and personality should be made available, as well as the results of the employee's Big Five personality assessment. The individual could then take the results of their Big Five assessment, along with the findings of this research and future research, to determine if a career in project management is indeed the best fit. Furthermore, results of this study would be useful to currently practicing PMs who often counsel others considering whether or not to enter the PM profession. Any additional information available to those who counsel prospective PMs might increase the chance that the most promising PMs pursue careers in project management.

In situations where the employers make the decision, it would be difficult to justify making a personnel selection based on personality alone. At first blush, given two otherwise equal candidates applying for a particular PM position, perhaps an employer could select the candidate with higher Conscientiousness and Openness scores. In a setting like the DoD, where a Service often assigns employees to positions regardless of the desire of the employee, and based on sometimes murky rationale, perhaps personality could have a more important contribution. Furthermore, perhaps the personnel selection systems in each DoD Service could use these findings, in conjunction with their current selection processes, to determine which individuals should be assigned to the PM career fields. However, many other factors should be considered when trying to determine

whether a PM will be successful. Therefore, no specific policy recommendations should be made regarding employer PM selection based on this research alone.

Recommendations for training

Another interesting possibility is the development and application of personality-based training. This concept involves capturing each student's Big Five assessment and then pursuing two courses of action. The first step would be to identify the teaching styles and methods that best match the student's personality. The next step would be to identify gaps between the student's personality and the personalities of the ideal PM and then create specific training to deal with those gaps. For example, if the student scores low on the Openness scale, perhaps that student could receive specialized training that would teach them how to compensate, to be more open, or to employ tools that allow the impact of their lack of openness to be reduced. This recommendation might be easier to implement in the DoD environment, where all PMs are required to attend Defense Acquisition University (DAU) training, or other organizations with very structured training "pipelines." However, perhaps other PM training institutions might also consider personality-based training to give their students a competitive advantage.

Summary

Some aspects of personality do indeed seem to predict PM success. After a careful review of the literature, several research questions and hypotheses were developed to explore the predictive relationship of personality on PM success. After surveying students in DAU courses by collecting Big Five personality data on the Best

and Least Successful PMs they have known, analysis was conducted by using difference of the means tests and building a hierarchical model. From the results, only Conscientious and Openness seem to consistently predict PM success. While Emotional Stability was not significant in the hierarchical model, it did demonstrate significance in the difference of the means test. As a result, the relationship between personality and PM success was more clearly described. Although much more research remains in this area, hopefully the results of this thesis effort will be useful as part of the overall effort to improve project manager selection, subsequent PM training, and PM success.

Vita

Major John Bedingfield has 14 years of Department of Defense acquisition program management experience. In 1993 he received his undergraduate degree from Auburn University in Aerospace Engineering, and was commissioned through Detachment 005, Air Force Reserve Officers Training Corps. Since entering Active Duty, his assignments have included managing various types of acquisitions in areas such as aircraft communication and navigation modification, black-box airborne Signals Intelligence, logistics information technology, Air Force Portal, and command and control systems. He has served in System Program Offices at Aeronautical Systems Center, Electronic Systems Center, and the Missile Defense Agency. He also served on Air Force / Secretary of the Air Force Headquarters (AF/SAF AQ) in the Air Force Program Executive Office for Command and Control and Combat Support Systems. He is an Acquisition Professional Development Program Level-III certified program manager. In August 2006, he entered the Graduate School of Engineering and Management, Air Force Institute of Technology. Upon graduation, he will be assigned to Headquarters, Defense Information Systems Agency.

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Appendix A

Survey Instrument



BIG FIVE PERSONALITY TRAITS PROGRAM MANAGER SURVEY

Survey Introduction and Reassurance of Confidentiality

You have been asked to participate in a survey designed to determine if personality traits have any bearing on project management success. Participation in this survey is completely voluntary, and no adverse action will be taken should you choose not to participate. The results of this research will further our understanding of successful project managers.

The survey consists of four parts and will take approximately 30 minutes to complete. The first section will ask questions regarding your personality. The second and third sections ask questions regarding the personalities of the best and worst program managers you have known. The final section asks a few demographic questions. There are no right or wrong answers.

If you desire, the results of your personality profile will be provided along with the research results in aggregate. The results of your profile may be useful to you in your personal development. The results of your profile will only be provided to you. Neither the research team or anyone at the Defense Acquisition University will be able to match your name to the results. If you desire to receive the results of your profile, you will be prompted to provide a code at the end of the survey.

All answers will be kept completely confidential. No one other than the research team will see your completed survey. Demographic information was requested in order to interpret the results more accurately. Findings of this study will be reported as an aggregate group, and no personally identifying information will be used or reported.

If you have any questions or concerns, please contact Major John Bedingfield at (334) 538-0885 or john.bedingfield@afit.edu

INSTRUCTIONS FOR MARKING THE SURVEY

Please mark your answers clearly on the sheets provided.

For survey items marked with a circle, filling in the complete circle is not necessary. Please mark your answer clearly and avoid accidently mismarking a neighboring answer. Any of the following methods of marking the circles is appropriate:



For survey items with a fill-in the blank, please mark your answer as legibly as possible.

SECTION I:

In this Section, there are phrases describing people's behaviors. Please use the rating scale below to describe how accurately each statement describes you. Describe yourself as you generally are now, not as you wish to be in the future. Describe yourself as you honestly see yourself, in relation to other people you know of the same sex as you are, and roughly your same age. So that you can describe yourself in an honest manner, your responses will be kept in absolute confidence. Please read each statement carefully, and then fill in the bubble that corresponds to the number on the scale.

Response Options

1: Very Inaccurate
2: Moderately Inaccurate
3: Neither Inaccurate nor Accurate
4: Moderately Accurate
5: Very Accurate

	Very Inaccurate					**Very Accurate**
1	Am the life of the party.	①	②	③	④	⑤
2	Feel little concern for others.	①	②	③	④	⑤
3	Am always prepared.	①	②	③	④	⑤
4	Get stressed out easily.	①	②	③	④	⑤
5	Have a rich vocabulary.	①	②	③	④	⑤
6	Don't talk a lot.	①	②	③	④	⑤
7	Am interested in people.	①	②	③	④	⑤
8	Leave my belongings around.	①	②	③	④	⑤
9	Am relaxed most of the time.	①	②	③	④	⑤
10	Have difficulty understanding abstract ideas.	①	②	③	④	⑤
11	Feel comfortable around people.	①	②	③	④	⑤
12	Insult people.	①	②	③	④	⑤
13	Pay attention to details.	①	②	③	④	⑤
14	Worry about things.	①	②	③	④	⑤
15	Have a vivid imagination.	①	②	③	④	⑤
16	Keep in the background.	①	②	③	④	⑤
17	Sympathize with others' feelings.	①	②	③	④	⑤
18	Make a mess of things.	①	②	③	④	⑤
19	Seldom feel blue.	①	②	③	④	⑤

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20 Am not interested in abstract ideas.	(1)	(2)	(3)	(4)	(5)
21 Start conversations.	(1)	(2)	(3)	(4)	(5)
22 Am not interested in other people's problems.	(1)	(2)	(3)	(4)	(5)
23 Get chores done right away.	(1)	(2)	(3)	(4)	(5)
24 Am easily disturbed.	(1)	(2)	(3)	(4)	(5)
25 Have excellent ideas.	(1)	(2)	(3)	(4)	(5)
26 Have little to say.	(1)	(2)	(3)	(4)	(5)
27 Have a soft heart.	(1)	(2)	(3)	(4)	(5)
28 Often forget to put things back in their proper place.	(1)	(2)	(3)	(4)	(5)
29 Get upset easily.	(1)	(2)	(3)	(4)	(5)
30 Do not have a good imagination.	(1)	(2)	(3)	(4)	(5)
31 Talk to a lot of different people at parties.	(1)	(2)	(3)	(4)	(5)
32 Am not really interested in others.	(1)	(2)	(3)	(4)	(5)
33 Like order.	(1)	(2)	(3)	(4)	(5)
34 Change my mood a lot.	(1)	(2)	(3)	(4)	(5)
35 Am quick to understand things.	(1)	(2)	(3)	(4)	(5)
36 Don't like to draw attention to myself.	(1)	(2)	(3)	(4)	(5)
37 Take time out for others.	(1)	(2)	(3)	(4)	(5)
38 Shirk my duties.	(1)	(2)	(3)	(4)	(5)
39 Have frequent mood swings.	(1)	(2)	(3)	(4)	(5)
40 Use difficult words.	(1)	(2)	(3)	(4)	(5)
41 Don't mind being the center of attention.	(1)	(2)	(3)	(4)	(5)
42 Feel others' emotions.	(1)	(2)	(3)	(4)	(5)
43 Follow a schedule.	(1)	(2)	(3)	(4)	(5)
44 Get irritated easily.	(1)	(2)	(3)	(4)	(5)
45 Spend time reflecting on things.	(1)	(2)	(3)	(4)	(5)
46 Am quiet around strangers.	(1)	(2)	(3)	(4)	(5)
47 Make people feel at ease.	(1)	(2)	(3)	(4)	(5)
48 Am exacting in my work.	(1)	(2)	(3)	(4)	(5)
49 Often feel blue.	(1)	(2)	(3)	(4)	(5)
50 Am full of ideas.	(1)	(2)	(3)	(4)	(5)

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SECTION II: Best Program Manager

Please think of the best Program Manager you know, or have known.
On the following pages, there are phrases describing people's behaviors. Please use the rating scale below to describe how accurately each statement describes the best PM you know. Your responses will be kept in absolute confidence. Please read each statement carefully, and then fill in the bubble that corresponds to the number on the scale.

Response Options

1: Very Inaccurate
2: Moderately Inaccurate
3: Neither Inaccurate nor Accurate
4: Moderately Accurate
5: Very Accurate

	Very Inaccurate	1	2	3	4	5	Very Accurate
	The best Program Manager I know:						
II-1	Is the life of the party.	1	2	3	4	5	
II-2	Feels little concern for others.	1	2	3	4	5	
II-3	Is always prepared.	1	2	3	4	5	
II-4	Gets stressed out easily.	1	2	3	4	5	
II-5	Has a rich vocabulary.	1	2	3	4	5	
II-6	Doesn't talk a lot.	1	2	3	4	5	
II-7	Is interested in people.	1	2	3	4	5	
II-8	Leaves their belongings around.	1	2	3	4	5	
II-9	Is relaxed most of the time.	1	2	3	4	5	
II-10	Has difficulty understanding abstract ideas.	1	2	3	4	5	
II-11	Feels comfortable around people.	1	2	3	4	5	
II-12	Insults people.	1	2	3	4	5	
II-13	Pays attention to details.	1	2	3	4	5	
II-14	Worries about things.	1	2	3	4	5	
II-15	Has a vivid imagination.	1	2	3	4	5	
II-16	Keeps in the background.	1	2	3	4	5	
II-17	Sympathizes with others' feelings.	1	2	3	4	5	
II-18	Makes a mess of things.	1	2	3	4	5	
II-19	Seldom feels blue.	1	2	3	4	5	
II-20	Is not interested in abstract ideas.	1	2	3	4	5	
II-21	Starts conversations.	1	2	3	4	5	
II-22	Is not interested in other people's problems.	1	2	3	4	5	
II-23	Gets chores done right away.	1	2	3	4	5	
II-24	Is easily disturbed.	1	2	3	4	5	
II-25	Has excellent ideas.	1	2	3	4	5	
II-26	Has little to say.	1	2	3	4	5	
II-27	Has a soft heart.	1	2	3	4	5	
II-28	Often forgets to put things back in their proper place.	1	2	3	4	5	
II-29	Gets upset easily.	1	2	3	4	5	
II-30	Does not have a good imagination.	1	2	3	4	5	
II-31	Talks to a lot of different people at parties.	1	2	3	4	5	
II-32	Is not really interested in others.	1	2	3	4	5	
II-33	Likes order.	1	2	3	4	5	
II-34	Changes their mood a lot.	1	2	3	4	5	
II-35	Is quick to understand things.	1	2	3	4	5	
II-36	Doesn't like to draw attention to themselves	1	2	3	4	5	
II-37	Takes time out for others.	1	2	3	4	5	
II-38	Shirks their duties.	1	2	3	4	5	
II-39	Has frequent mood swings.	1	2	3	4	5	
II-40	Uses difficult words.	1	2	3	4	5	
II-41	Doesn't mind being the center of attention.	1	2	3	4	5	
II-42	Feels others' emotions.	1	2	3	4	5	

II-43	Follows a schedule.	(1)	(2)	(3)	(4)	(5)
II-44	Gets irritated easily.	(1)	(2)	(3)	(4)	(5)
II-45	Spends time reflecting on things.	(1)	(2)	(3)	(4)	(5)
II-46	Is quiet around strangers.	(1)	(2)	(3)	(4)	(5)
II-47	Makes people feel at ease.	(1)	(2)	(3)	(4)	(5)
II-48	Is exacting in their work.	(1)	(2)	(3)	(4)	(5)
II-49	Often feels blue.	(1)	(2)	(3)	(4)	(5)
II-50	Is full of ideas.	(1)	(2)	(3)	(4)	(5)

Please describe the type of program they successfully managed. If they successfully managed more than one program, mark all that apply

II-51	Total Program Cost Size (mark all that apply)	(1) < $100,000 (2) at least $100,000 but less than $1,000,000 (3) at least $1M but less than $100M (4) at least $100M but less then $1B (5) $1B or greater
II-52	Program Phase (mark all that apply)	(1) Lab activity, Concept Refinement, or Pre-Milestone A (2) Technology Development, or pre-Milestone B (3) System Development and Demonstration, or pre-Milestone C (4) Production and Deployment (5) Operations and Support (6) Other:_____
II-53	Please describe the Technological Uncertainty of the program	(1) Low tech: mostly existing technologies (2) Med tech: some new technologies, or old technologies combined in new ways (3) High tech: mostly new technologies
II-54	Where was the program managed?	(1) At a Product Center (2) At a Logistics Center or Deport (3) At a laboratory (4) At a Defense Agency (DLA, NRO, NSA, MDA, DISA) (5) At a Test Center (6) Other:_____
II-55	Please indicate which Service the program was primarily associated with:	(1) Army (2) Navy (3) Marines (4) Air Force (5) Joint (6) Other:_____
II-56	To which Service was the Program Manager assigned?	(1) Army (2) Navy (3) Marines (4) Air Force (5) Other:_____
II-57	Approximately how long has this person been a program manager?	(1) < 1 year (2) At least 1 year, but less than 3 years (3) At least 3 years, but less than 5 years (4) At least 5 years, but less than 10 years (5) At least 10 years
II-58	Approximately how long have you known this person?	(1) < 1 year (2) At least 1 year, but less than 3 years (3) At least 3 years, but less than 5 years (4) At least 5 years, but less than 10 years (5) At least 10 years

SECTION III: Least Successful Program Manager

Please think of the Least Successful Program Manager you know, or have known.
On the following pages, there are phrases describing people's behaviors. Please use the rating scale below to describe how accurately each statement describes the Least Successful PM you know. Your responses will be kept in absolute confidence. Please read each statement carefully, and then fill in the bubble that corresponds to the number on the scale.

Response Options

1: Very Inaccurate
2: Moderately Inaccurate
3: Neither Inaccurate nor Accurate
4: Moderately Accurate
5: Very Accurate

	Very Inaccurate	1	2	3	4	5	Very Accurate
	The Least Successful Program Manager I know:						
III-1	Is the life of the party.	1	2	3	4	5	
III-2	Feels little concern for others.	1	2	3	4	5	
III-3	Is always prepared.	1	2	3	4	5	
III-4	Gets stressed out easily.	1	2	3	4	5	
III-5	Has a rich vocabulary.	1	2	3	4	5	
III-6	Doesn't talk a lot.	1	2	3	4	5	
III-7	Is interested in people.	1	2	3	4	5	
III-8	Leaves their belongings around.	1	2	3	4	5	
III-9	Is relaxed most of the time.	1	2	3	4	5	
III-10	Has difficulty understanding abstract ideas.	1	2	3	4	5	
III-11	Feels comfortable around people.	1	2	3	4	5	
III-12	Insults people.	1	2	3	4	5	
III-13	Pays attention to details.	1	2	3	4	5	
III-14	Worries about things.	1	2	3	4	5	
III-15	Has a vivid imagination.	1	2	3	4	5	
III-16	Keeps in the background.	1	2	3	4	5	
III-17	Sympathizes with others' feelings.	1	2	3	4	5	
III-18	Makes a mess of things.	1	2	3	4	5	
III-19	Seldom feels blue.	1	2	3	4	5	
III-20	Is not interested in abstract ideas.	1	2	3	4	5	
III-21	Starts conversations.	1	2	3	4	5	
III-22	Is not interested in other people's problems.	1	2	3	4	5	
III-23	Gets chores done right away.	1	2	3	4	5	
III-24	Is easily disturbed.	1	2	3	4	5	
III-25	Has excellent ideas.	1	2	3	4	5	
III-26	Has little to say.	1	2	3	4	5	
III-27	Has a soft heart.	1	2	3	4	5	
III-28	Often forgets to put things back in their proper place.	1	2	3	4	5	
III-29	Gets upset easily.	1	2	3	4	5	
III-30	Does not have a good imagination.	1	2	3	4	5	
III-31	Talks to a lot of different people at parties.	1	2	3	4	5	
III-32	Is not really interested in others.	1	2	3	4	5	
III-33	Likes order.	1	2	3	4	5	
III-34	Changes their mood a lot.	1	2	3	4	5	
III-35	Is quick to understand things.	1	2	3	4	5	
III-36	Doesn't like to draw attention to themselves	1	2	3	4	5	
III-37	Takes time out for others.	1	2	3	4	5	
III-38	Shirks their duties.	1	2	3	4	5	
III-39	Has frequent mood swings.	1	2	3	4	5	
III-40	Uses difficult words.	1	2	3	4	5	

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III-41	Doesn't mind being the center of attention.	1	2	3	4	5
III-42	Feels others' emotions.	1	2	3	4	5
III-43	Follows a schedule.	1	2	3	4	5
III-44	Gets irritated easily.	1	2	3	4	5
III-45	Spends time reflecting on things.	1	2	3	4	5
III-46	Is quiet around strangers.	1	2	3	4	5
III-47	Makes people feel at ease.	1	2	3	4	5
III-48	Is exacting in their work.	1	2	3	4	5
III-49	Often feels blue.	1	2	3	4	5
III-50	Is full of ideas.	1	2	3	4	5

Please describe the type of program they successfully managed. If they successfully managed more

III-51	Total Program Cost Size (mark all that apply)	(1) < $100,000 (2) at least $100,000 but less than $1,000,000 (3) at least $1M but less than $100M (4) at least $100M but less then $1B (5) $1B or greater
III-52	Program Phase (mark all that apply)	(1) Lab activity, Concept Refinement, or Pre-Milestone A (2) Technology Development, or pre-Milestone B (3) System Development and Demonstration, or pre-Milestone C (4) Production and Deployment (5) Operations and Support (6) Other:_____
III-53	Please describe the Technological Uncertainty of the program	(1) Low tech: mostly existing technologies (2) Med tech: some new technologies, or old technologies combined in new ways (3) High tech: mostly new technologies
III-54	Where was the program managed?	(1) At a Product Center (2) At a Logistics Center or Depot (3) At a laboratory (4) At a Defense Agency (DLA, NRO, NSA, MDA, DISA) (5) At a Test Center (6) Other:_____
III-55	Please indicate which Service the program was primarily associated with:	(1) Army (2) Navy (3) Marines (4) Air Force (5) Joint (6) Other:_____
III-56	To which Service was the Program Manager assigned?	(1) Army (2) Navy (3) Marines (4) Air Force (5) Other:_____
III-57	Approximately how long has this person been a program manager?	(1) < 1 year (2) At least 1 year, but less than 3 years (3) At least 3 years, but less than 5 years (4) At least 5 years, but less than 10 years (5) At least 10 years
III-58	Approximately how long have you known this person?	(1) < 1 year (2) At least 1 year, but less than 3 years (3) At least 3 years, but less than 5 years (4) At least 5 years, but less than 10 years (5) At least 10 years

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SECTION IV: Demographics

The following section contains several items regarding demographic information. This information is important for statistical analysis purposes

IV-1 Please pick the best description for your current occupation:

(1) Program Manager
(2) Engineer
(3) Finance
(4) Contracting
(5) Other_____

IV-2 What is your grade/rank?

Military: Rank_____
Civilian: Rank_____
Contractor / Industry

IV-3 To which Service are you assigned?

(1) Army
(2) Navy
(3) Marines
(4) Air Force
(5) Other_____

IV-4 What is your gender?

Male (M) **Female** (F)

IV-5 What is your age? [ ]

IV-6 Please indicate your highest level of education:

High School (1)
Some College (2)
Associates Degree (3)
Bachelor Degree (4)
Some Graduate studies (5)
Graduate Degree (6)
Doctorate (7)
Post Doctorate (8)

IV-7 How many years have you worked as a project manager?

(1) no experience
(2) some experience, but 1 year or less
(3) more than 1, but 2 years or less
(4) more than 2, but 3 years or less
(5) more then 3, but 4 years or less
(6) more then 4, but 10 years or less
(7) more than 10 years

IV-8 Please rank order the following attributes of a successful PM from 1 to 10, with 1 as the most important to success and 10 as the least important. Please mark each item, and use each number only once (no ties).

[ ] Leadership
[ ] Communication
[ ] Decision Making
[ ] Planning & Organizing
[ ] Coping
[ ] Technical understanding of the product
[ ] Technical understanding of PM tools & techniques
[ ] Analytical Thinking
[ ] Team Building
[ ] Networking
[ ] Other_____

IV-9 Please describe your personal success in the field of program management using the following scale

0: None, not a program manager
1: Very Unsuccessful
2: Moderately Unsuccessful
3: Neither Unsuccessful nor Successful
4: Moderately Successful
5: Very Successful

(0) (1) (2) (3) (4) (5)

IV-10 Please rank order your personal competency for the following attributes from 1 to 10. Mark the item you are most competent at with a "1", mark "10" next to the item you are least competent, or the one which you feel needs the most improvement. Please mark each item, and please use each number only once (no ties).

- [ ] Leadership
- [ ] Communication
- [ ] Decision Making
- [ ] Planning & Organizing
- [ ] Coping
- [ ] Technical understanding of the product
- [ ] Technical understanding of PM tools & techniques
- [ ] Analytical Thinking
- [ ] Team Building
- [ ] Networking
- [ ] Other_____

IV-11 Please select the type of project you feel most comfortable managing

(1) Low tech: mostly existing technologies
(2) Med tech: some new technologies, or old technologies combined in new ways
(3) High tech: mostly new technologies
(4) None, not a program manager

IV-12 Which course are you currently attending?

(1) PMT 352B at Ft Belvoir
(2) PMT 352B at this location: _____
(3) PMT 401
(4) Other _____

If you are interested in your results on the Big Five Personality Inventory, please complete the section below:
I. Create your code.

I understand the sensitivity of maintaining your privacy, and for this reason, I want you to create a code that you will be able to generate without having to remember it. I do not need your name on the survey for any purpose. The code will only be known by you and will be used to return your Big Five Personality Assessment results.

Your code consists of the first 2 letters of your mother and father's first names, and the numerical month and day of your birthday. An example is below:

Mothers name: Mary Smith
Father's name: John Smith
Birthday: June 1st

Your Code would be: majo0601

II. After developing your unique code, please enter it in the boxes below.

First two letters of Mother's first name First two letters of Father's first name Birth Month and Day
(do not include the year)

Please place your 8 digit code here:

10

Appendix B

Descriptive statistics & Data Tests for Normality

Descriptives

	Good			Statistic	Std. Error
E	.00	Mean		3.2706	.16240
		95% Confidence Interval for Mean	Lower Bound	2.9402	
			Upper Bound	3.6010	
		5% Trimmed Mean		3.2660	
		Median		3.1000	
		Variance		.897	
		Std. Deviation		.94693	
		Minimum		1.60	
		Maximum		4.90	
		Range		3.30	
		Interquartile Range		1.55	
		Skewness		.248	.403
		Kurtosis		-1.095	.788
	1.00	Mean		3.8088	.13980
		95% Confidence Interval for Mean	Lower Bound	3.5244	
			Upper Bound	4.0932	
		5% Trimmed Mean		3.8592	
		Median		3.9500	
		Variance		.664	
		Std. Deviation		.81515	
		Minimum		1.30	
		Maximum		5.00	
		Range		3.70	
		Interquartile Range		1.03	
		Skewness		-1.007	.403
		Kurtosis		1.283	.788
A	.00	Mean		2.7118	.15756
		95% Confidence Interval for Mean	Lower Bound	2.3912	
			Upper Bound	3.0323	
		5% Trimmed Mean		2.6807	

		Median		2.5500	
		Variance		.844	
		Std. Deviation		.91875	
		Minimum		1.00	
		Maximum		4.90	
		Range		3.90	
		Interquartile Range		1.05	
		Skewness		.524	.403
		Kurtosis		.156	.788
	1.00	**Mean**		3.3676	.15903
		95% Confidence Interval for Mean	**Lower Bound**	3.0441	
			Upper Bound	3.6912	
		5% Trimmed Mean		3.4196	
		Median		3.6000	
		Variance		.860	
		Std. Deviation		.92727	
		Minimum		1.20	
		Maximum		4.60	
		Range		3.40	
		Interquartile Range		1.08	
		Skewness		-.914	.403
		Kurtosis		-.026	.788
C	**.00**	**Mean**		2.8235	.10863
		95% Confidence Interval for Mean	**Lower Bound**	2.6025	
			Upper Bound	3.0445	
		5% Trimmed Mean		2.8281	
		Median		2.8500	
		Variance		.401	
		Std. Deviation		.63344	
		Minimum		1.20	
		Maximum		4.20	
		Range		3.00	
		Interquartile Range		.93	
		Skewness		-.134	.403
		Kurtosis		.325	.788
	1.00	**Mean**		4.0088	.13735
		95% Confidence Interval for Mean	**Lower Bound**	3.7294	
			Upper Bound	4.2883	

		5% Trimmed Mean		4.1003	
		Median		4.1500	
		Variance		.641	
		Std. Deviation		.80090	
		Minimum		1.00	
		Maximum		5.00	
		Range		4.00	
		Interquartile Range		.93	
		Skewness		-2.019	.403
		Kurtosis		5.742	.788
ES	**.00**	**Mean**		2.5529	.14055
		95% Confidence Interval for Mean	**Lower Bound**	2.2670	
			Upper Bound	2.8389	
		5% Trimmed Mean		2.5399	
		Median		2.4000	
		Variance		.672	
		Std. Deviation		.81955	
		Minimum		1.00	
		Maximum		4.30	
		Range		3.30	
		Interquartile Range		.95	
		Skewness		.332	.403
		Kurtosis		-.339	.788
	1.00	**Mean**		3.4735	.14923
		95% Confidence Interval for Mean	**Lower Bound**	3.1699	
			Upper Bound	3.7771	
		5% Trimmed Mean		3.5092	
		Median		3.5500	
		Variance		.757	
		Std. Deviation		.87015	
		Minimum		1.40	
		Maximum		4.70	
		Range		3.30	
		Interquartile Range		1.33	
		Skewness		-.584	.403
		Kurtosis		-.368	.788
O	**.00**	**Mean**		2.6941	.11570
		95% Confidence Interval for Mean	**Lower Bound**	2.4587	

			Upper Bound	2.9295	
		5% Trimmed Mean		2.6817	
		Median		2.7000	
		Variance		.455	
		Std. Deviation		.67462	
		Minimum		1.30	
		Maximum		4.60	
		Range		3.30	
		Interquartile Range		.93	
		Skewness		.316	.403
		Kurtosis		.978	.788
	1.00	Mean		3.9029	.10668
		95% Confidence Interval for Mean	Lower Bound	3.6859	
			Upper Bound	4.1200	
		5% Trimmed Mean		3.9510	
		Median		4.0500	
		Variance		.387	
		Std. Deviation		.62206	
		Minimum		2.20	
		Maximum		4.70	
		Range		2.50	
		Interquartile Range		.80	
		Skewness		-.983	.403
		Kurtosis		1.108	.788

Extreme Values

	Good			Case Number	Value
E	.00	Highest	1	57	4.90
			2	63	4.90
			3	52	4.70
			4	68	4.70
			5	35	4.50
		Lowest	1	36	1.60
			2	61	1.90
			3	47	2.10
			4	37	2.10

			5	54	2.20
	1.00	Highest	1	11	5.00
			2	7	4.90
			3	12	4.80
			4	30	4.70
			5	9	4.50(a)
		Lowest	1	29	1.30
			2	34	2.40
			3	6	2.50
			4	33	2.80
			5	26	2.80
A	.00	Highest	1	63	4.90
			2	51	4.70
			3	47	4.20
			4	48	3.90
			5	55	3.90
		Lowest	1	36	1.00
			2	59	1.40
			3	53	1.40
			4	68	1.60
			5	60	1.70
	1.00	Highest	1	19	4.60
			2	15	4.40
			3	17	4.40
			4	34	4.40
			5	11	4.30
		Lowest	1	25	1.20
			2	27	1.40
			3	12	1.60
			4	8	1.90
			5	33	2.00
C	.00	Highest	1	59	4.20
			2	51	3.90
			3	68	3.80
			4	48	3.60
			5	42	3.40(b)
		Lowest	1	36	1.20
			2	55	1.90

			3	64	2.00
			4	60	2.00
			5	57	2.00
	1.00	Highest	1	13	5.00
			2	22	4.90
			3	3	4.80
			4	27	4.80
			5	18	4.70(c)
		Lowest	1	25	1.00
			2	33	2.00
			3	34	3.30
			4	28	3.40
			5	10	3.40
ES	.00	Highest	1	47	4.30
			2	63	4.10
			3	48	3.90
			4	51	3.80
			5	45	3.60
		Lowest	1	36	1.00
			2	59	1.30
			3	57	1.30
			4	46	1.50
			5	35	1.70
	1.00	Highest	1	2	4.70
			2	15	4.70
			3	1	4.60
			4	4	4.60
			5	17	4.60
		Lowest	1	13	1.40
			2	12	1.90
			3	26	2.10
			4	29	2.20
			5	27	2.40(d)
O	.00	Highest	1	52	4.60
			2	43	3.80
			3	49	3.50
			4	51	3.50
			5	63	3.40

		Lowest	1	36	1.30
			2	46	1.40
			3	55	1.80
			4	59	1.90
			5	41	2.00(e)
	1.00	Highest	1	7	4.70
			2	15	4.70
			3	19	4.70
			4	34	4.70
			5	2	4.60
		Lowest	1	33	2.20
			2	25	2.30
			3	26	3.10
			4	29	3.30
			5	12	3.30

a Only a partial list of cases with the value 4.50 are shown in the table of upper extremes.

b Only a partial list of cases with the value 3.40 are shown in the table of upper extremes.

c Only a partial list of cases with the value 4.70 are shown in the table of upper extremes.

d Only a partial list of cases with the value 2.40 are shown in the table of lower extremes.

e Only a partial list of cases with the value 2.00 are shown in the table of lower extremes.

Tests of Normality

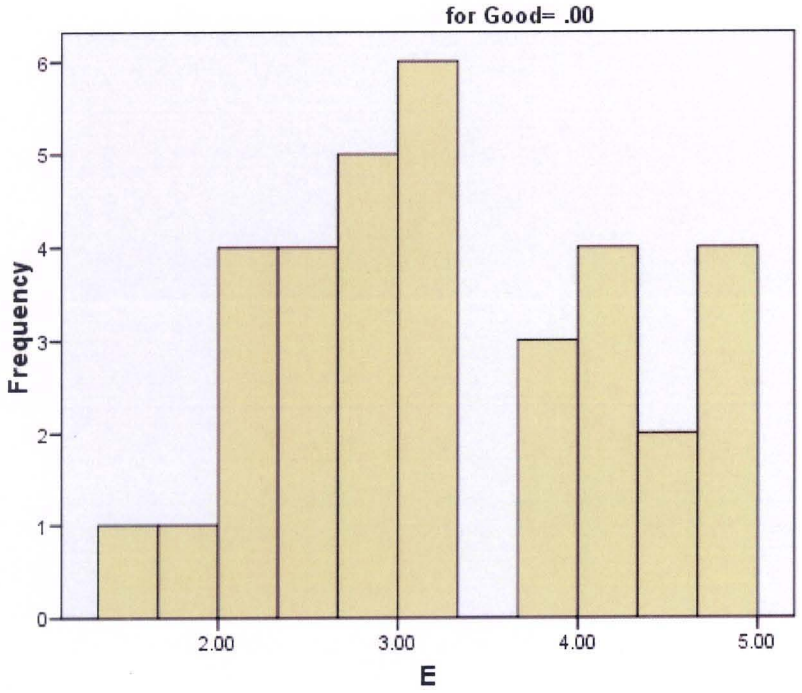
	Good	Kolmogorov-Smirnov(a)			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
E	.00	.132	34	.145	.947	34	.100
	1.00	.126	34	.193	.933	34	.039
A	.00	.112	34	.200(*)	.970	34	.461
	1.00	.151	34	.047	.903	34	.006
C	.00	.070	34	.200(*)	.988	34	.971
	1.00	.143	34	.077	.824	34	.000
ES	.00	.103	34	.200(*)	.975	34	.605
	1.00	.143	34	.076	.944	34	.082
O	.00	.085	34	.200(*)	.980	34	.788
	1.00	.124	34	.200(*)	.917	34	.014

* This is a lower bound of the true significance.

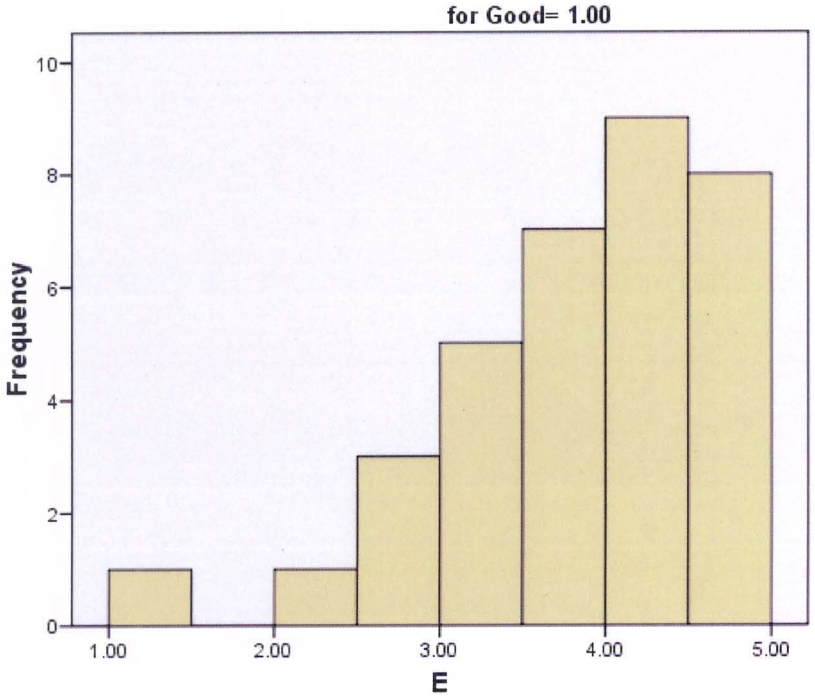
a Lilliefors Significance Correction

Extraversion (E)

Histograms



Mean =3.27
Std. Dev. =0.947
N =34



Mean =3.81
Std. Dev. =0.815
N =34

Stem-and-Leaf Plots

E Stem-and-Leaf Plot for
Good= .00

Frequency	Stem &	Leaf
2.00	1 .	69
5.00	2 .	11234
8.00	2 .	66677788
6.00	3 .	011223
3.00	3 .	788
5.00	4 .	11334
5.00	4 .	57799

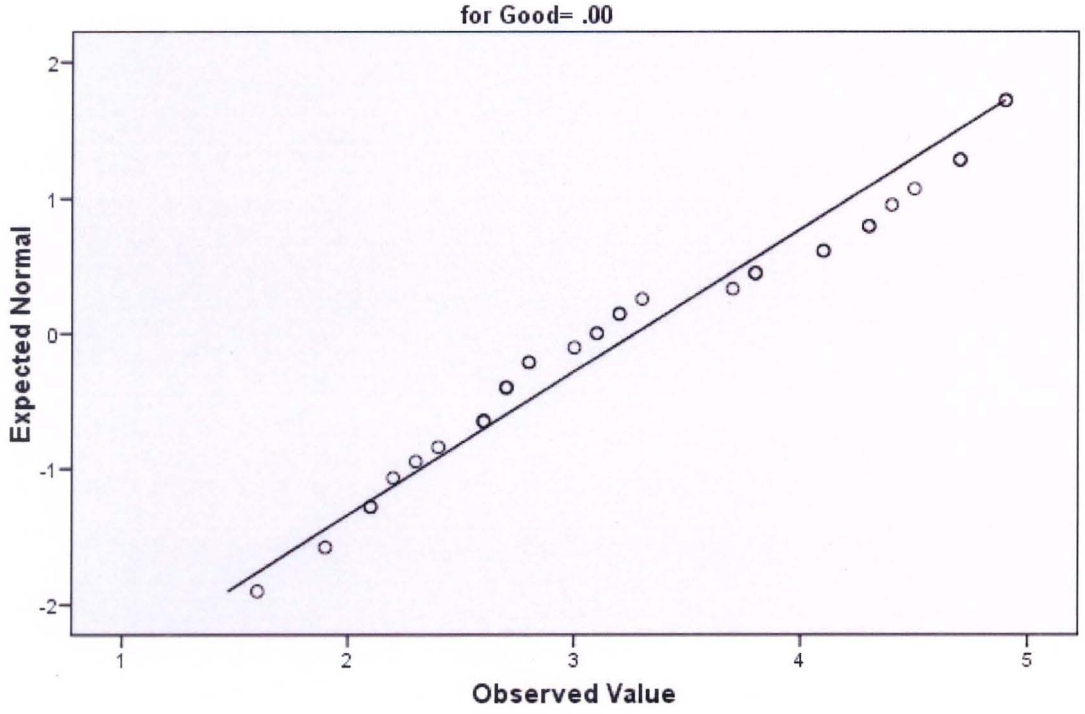
Stem width: 1.00
Each leaf: 1 case(s)

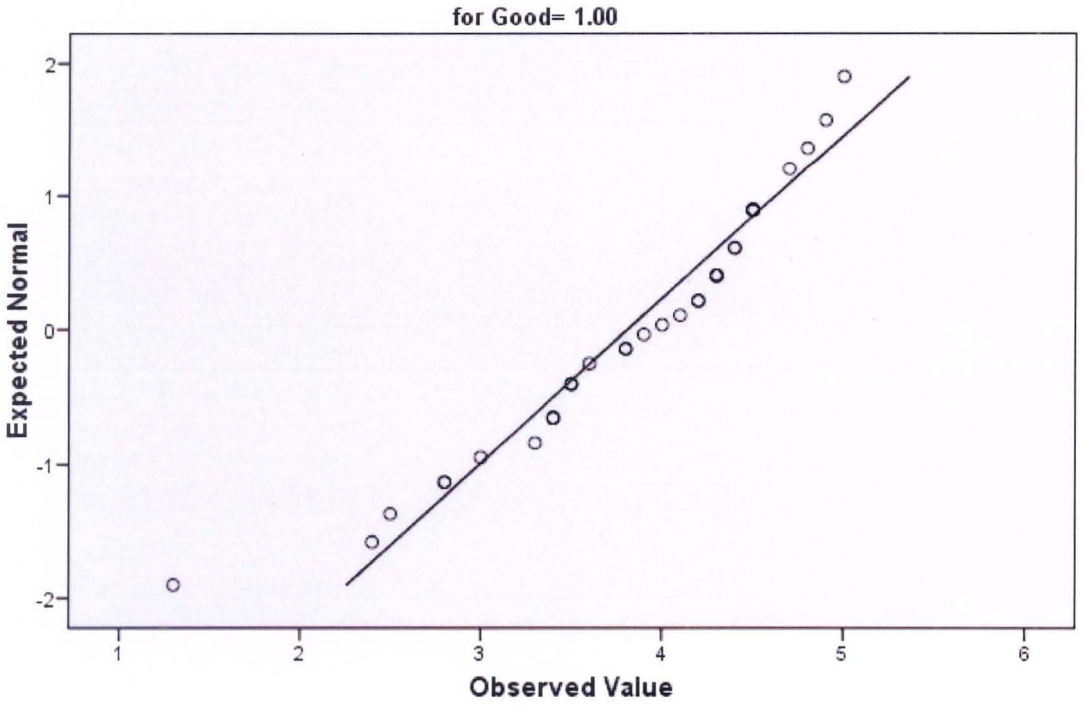
E Stem-and-Leaf Plot for
Good= 1.00

Frequency	Stem &	Leaf
1.00 Extremes		(=<1.3)
1.00	2 .	4
3.00	2 .	588
5.00	3 .	03444
7.00	3 .	5556889
9.00	4 .	012233344
7.00	4 .	5555789
1.00	5 .	0

Stem width: 1.00
Each leaf: 1 case(s)

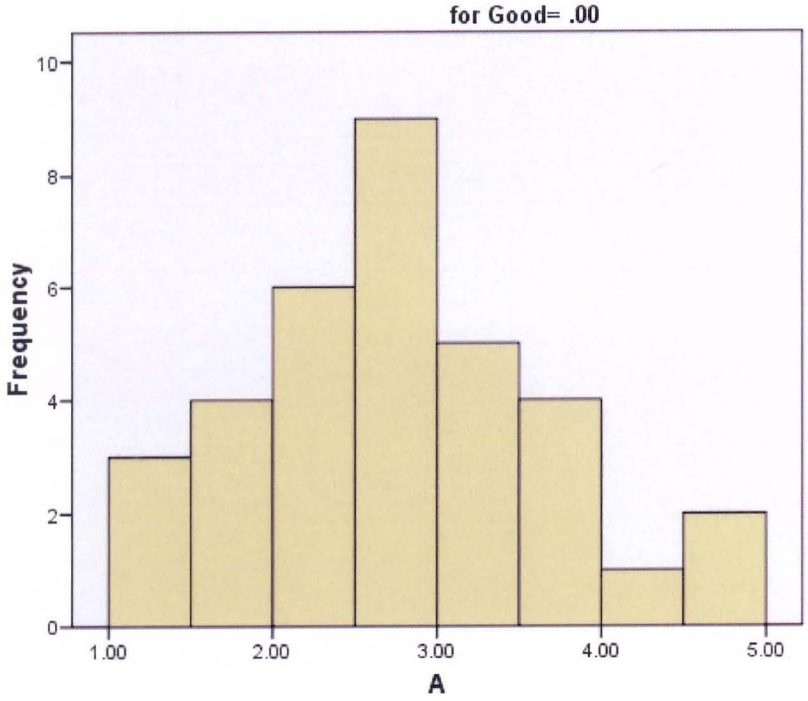
Normal Q-Q Plots

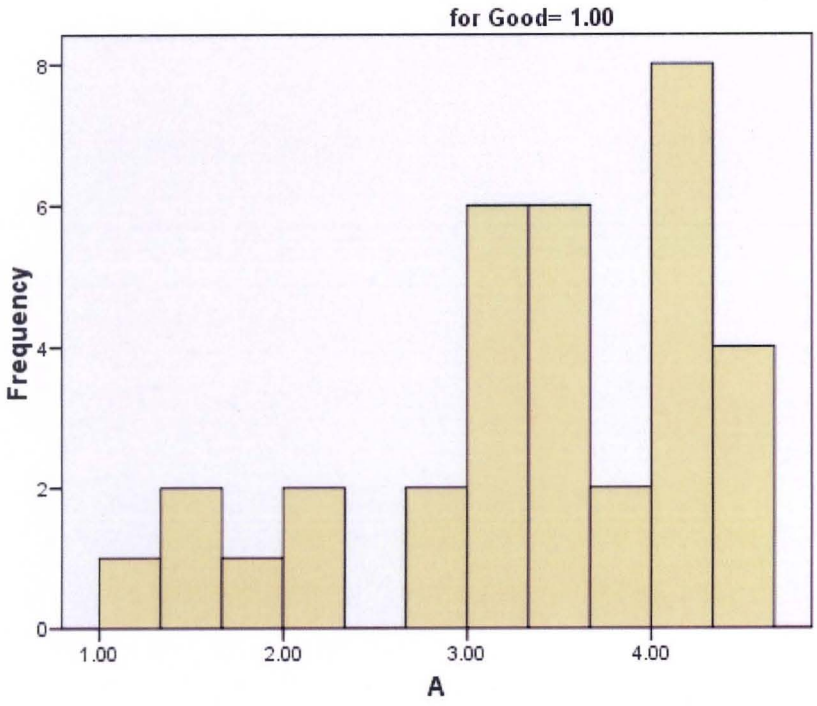

for Good= .00
Expected Normal
Observed Value
2
1
0
-1
-2
1
2
3
4
5


for Good= 1.00
Expected Normal
Observed Value
2
1
0
-1
-2
1
2
3
4
5
6

Agreeableness (A)

Histograms





Stem-and-Leaf Plots

```
A Stem-and-Leaf Plot for
Good= .00

 Frequency    Stem &  Leaf

     3.00        1 .  044
     4.00        1 .  6789
     6.00        2 .  012444
     9.00        2 .  555566899
     5.00        3 .  00012
     4.00        3 .  5799
     1.00        4 .  2
     2.00 Extremes    (>=4.7)

 Stem width:      1.00
 Each leaf:       1 case(s)
```

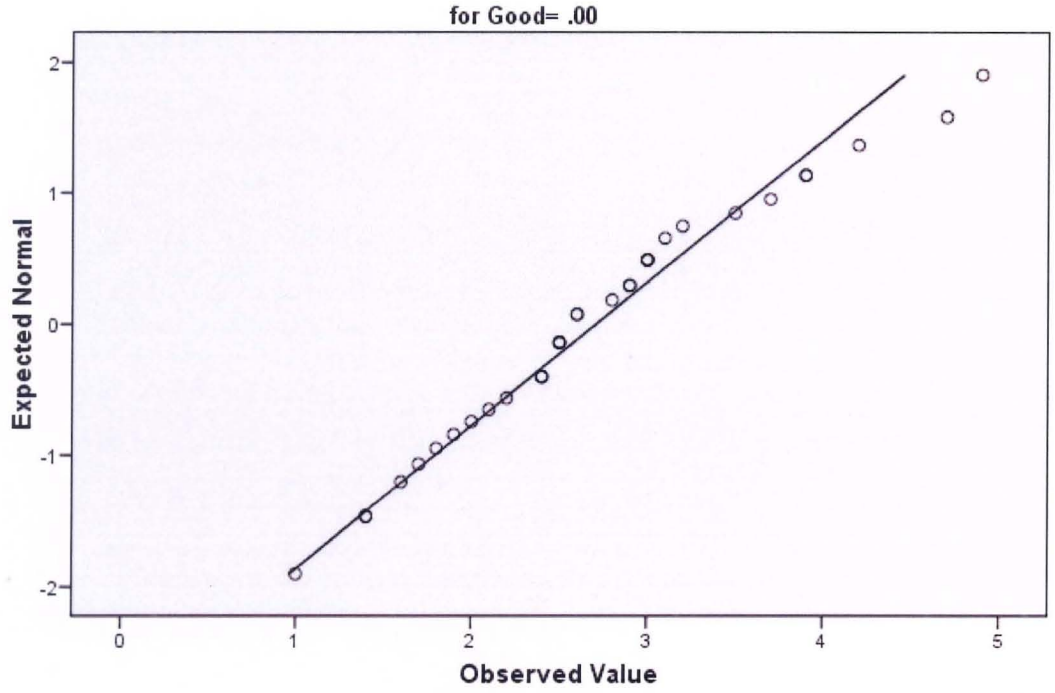
```
A Stem-and-Leaf Plot for
Good= 1.00

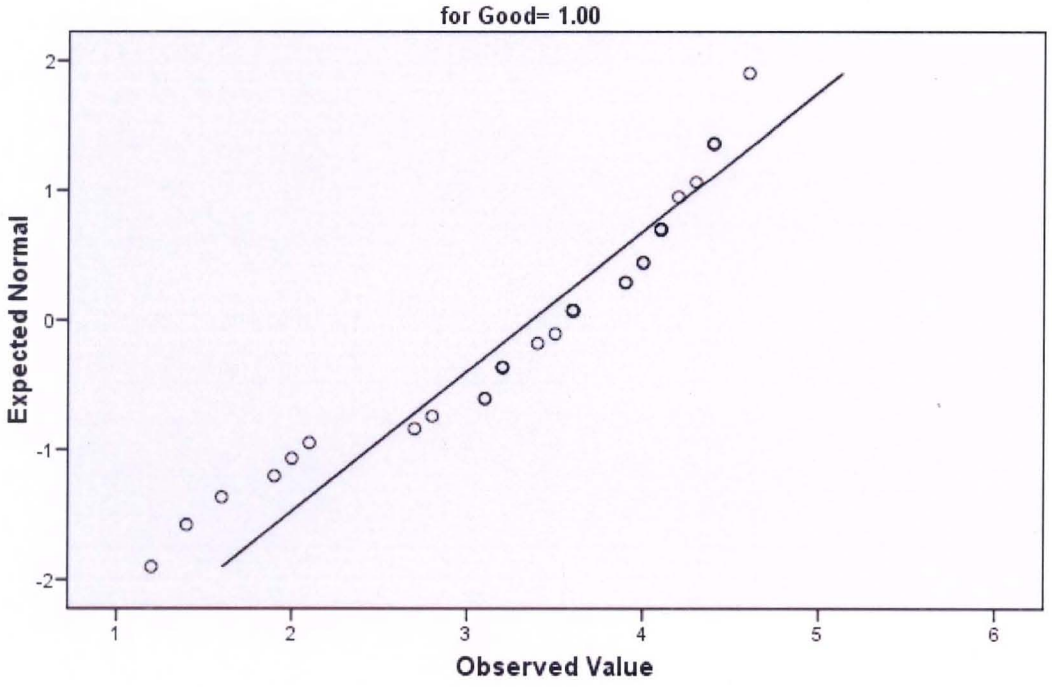
 Frequency    Stem &  Leaf

     3.00 Extremes    (=<1.6)
     1.00        1 .  9
     2.00        2 .  01
     2.00        2 .  78
     7.00        3 .  1122224
     7.00        3 .  5666699
    11.00        4 .  00111123444
     1.00        4 .  6

 Stem width:      1.00
 Each leaf:       1 case(s)
```

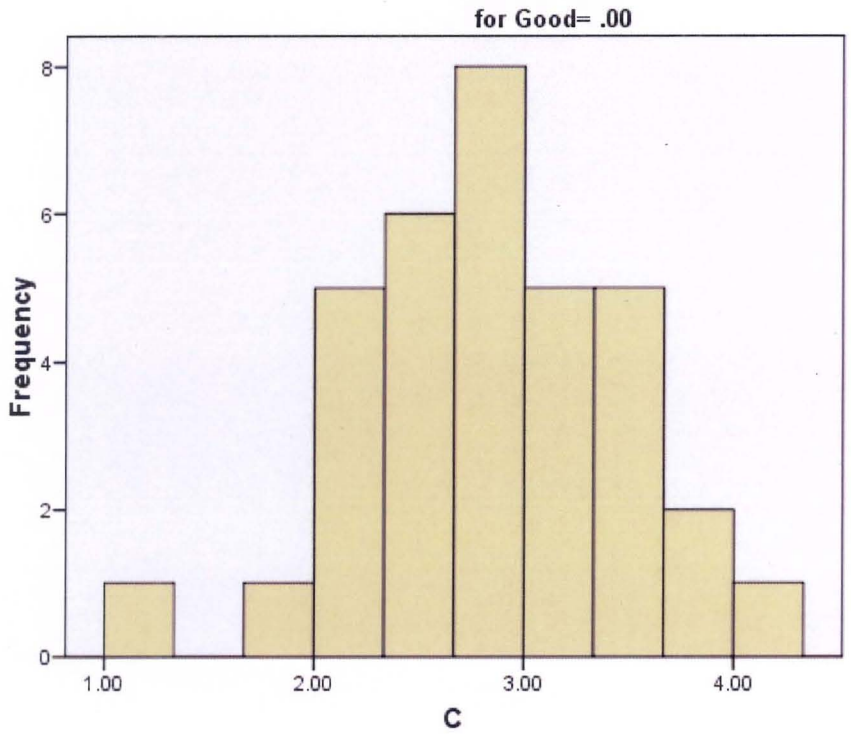
Normal Q-Q Plots

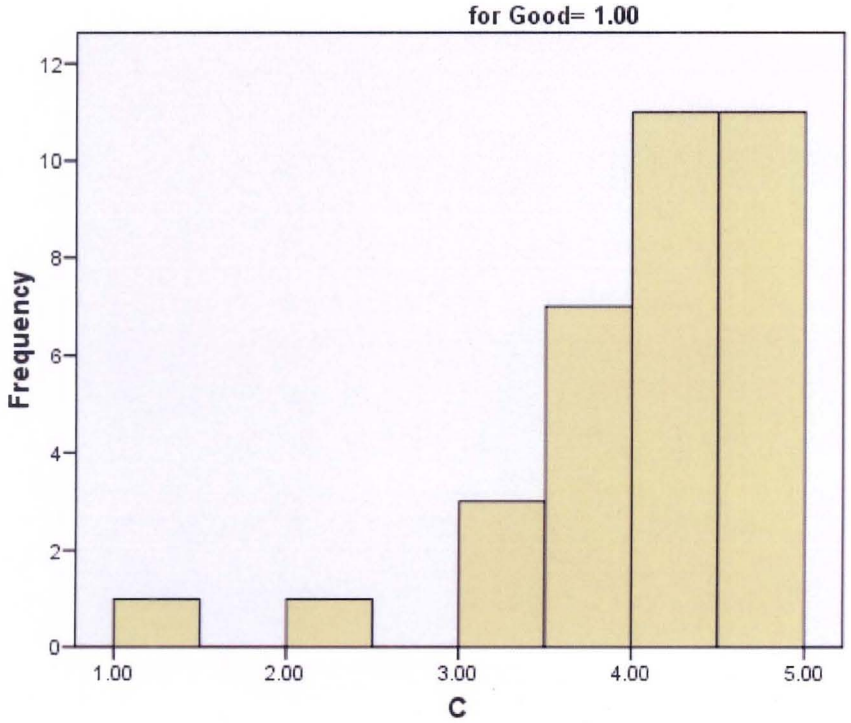

for Good= .00
Expected Normal
Observed Value
2
1
0
-1
-2
0
1
2
3
4
5


for Good= 1.00
Expected Normal
Observed Value
2
1
0
-1
-2
1
2
3
4
5
6

Conscientiousness (C)

Histograms





Stem-and-Leaf Plots

```
C Stem-and-Leaf Plot for
Good= .00

 Frequency    Stem &  Leaf

     1.00        1 .  2
     1.00        1 .  9
     7.00        2 .  0003344
    12.00        2 .  556677889999
     9.00        3 .  001234444
     3.00        3 .  689
     1.00        4 .  2

 Stem width:      1.00
 Each leaf:       1 case(s)
```

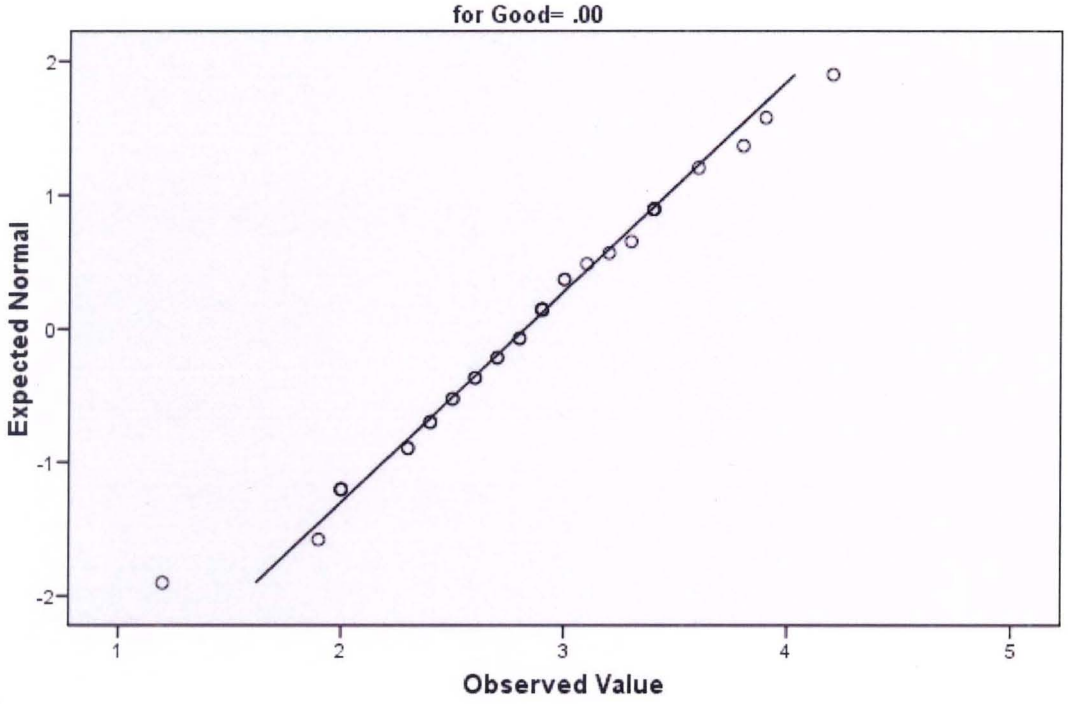
```
C Stem-and-Leaf Plot for
Good= 1.00

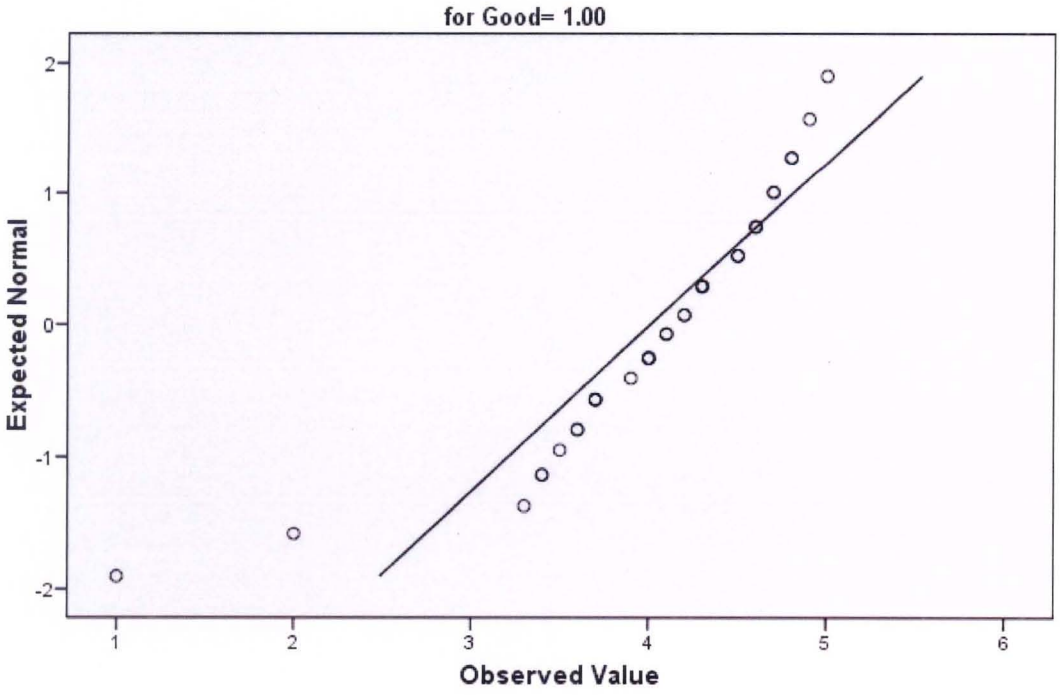
 Frequency    Stem &  Leaf

     2.00 Extremes    (=<2.0)
     3.00        3 .  344
     7.00        3 .  5667779
    11.00        4 .  00011223333
    10.00        4 .  5566677889
     1.00        5 .  0

 Stem width:      1.00
 Each leaf:       1 case(s)
```

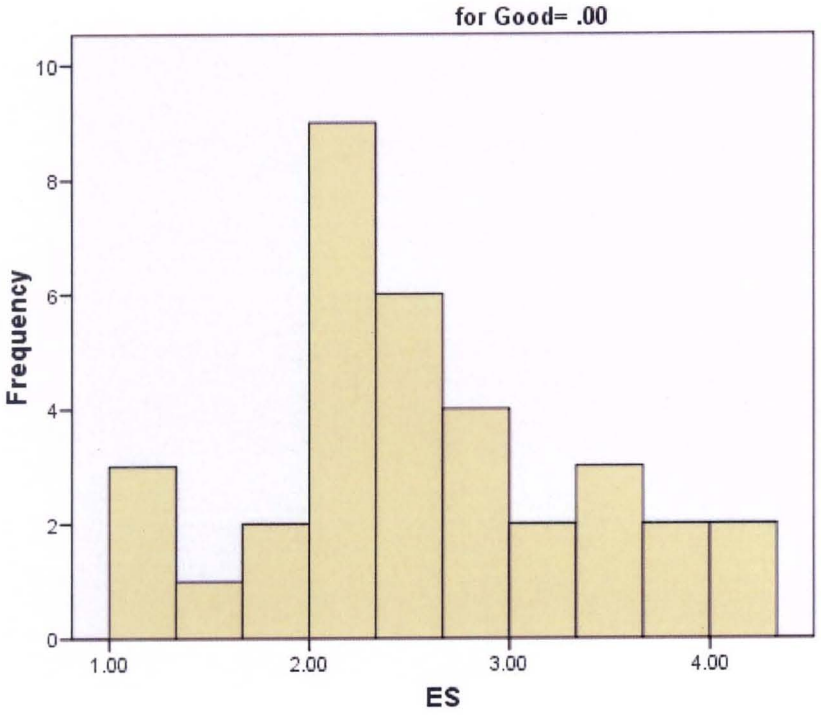
Normal Q-Q Plots

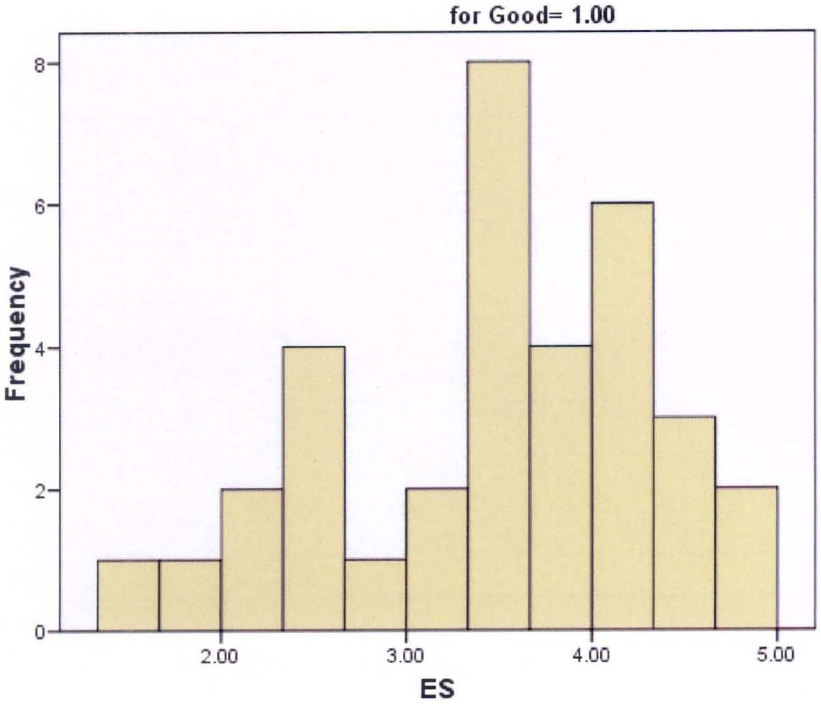

for Good= .00
Expected Normal
Observed Value
2
1
0
-1
-2
1
2
3
4
5


for Good= 1.00
Expected Normal
Observed Value
2
1
0
-1
-2
1
2
3
4
5
6

Emotional Stability (ES)

Histograms





Stem-and-Leaf Plots

ES Stem-and-Leaf Plot for
Good= .00

Frequency	Stem &	Leaf
3.00	1 .	033
3.00	1 .	578
12.00	2 .	001111223444
7.00	2 .	6668899
3.00	3 .	014
4.00	3 .	5689
2.00	4 .	13

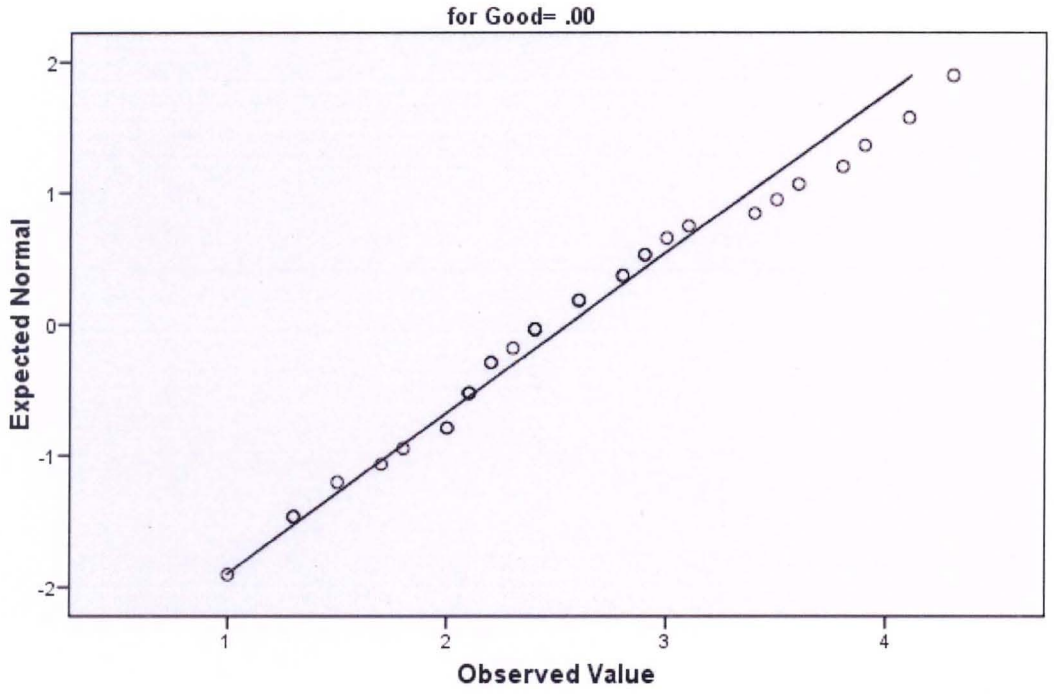
Stem width: 1.00
Each leaf: 1 case(s)

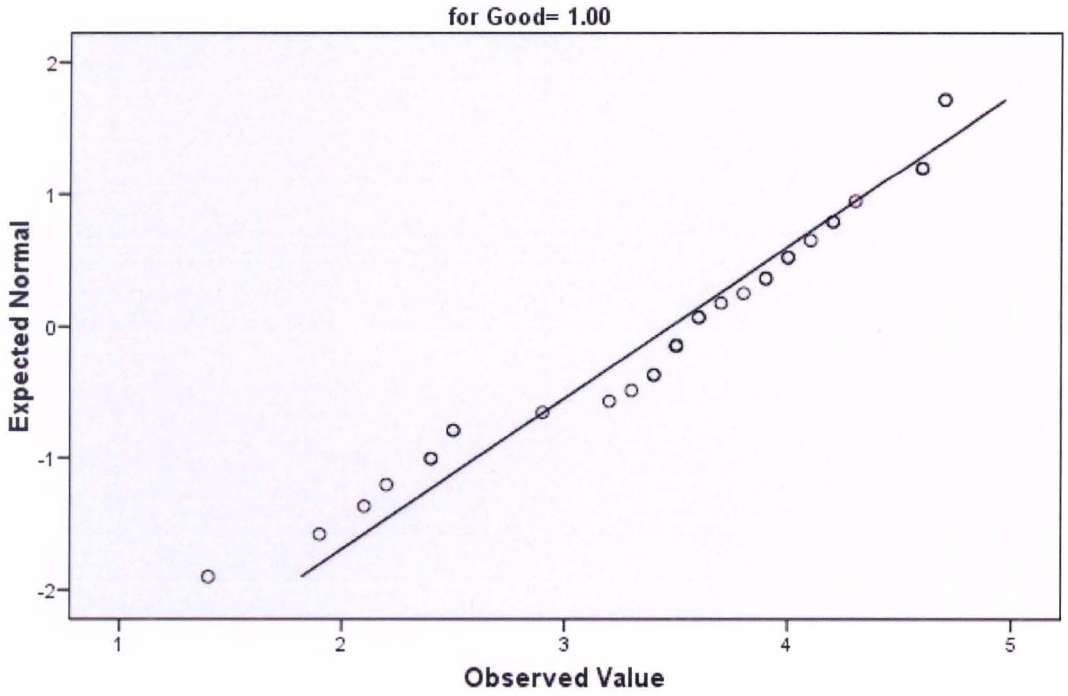
ES Stem-and-Leaf Plot for
Good= 1.00

Frequency	Stem &	Leaf
1.00	1 .	4
1.00	1 .	9
4.00	2 .	1244
3.00	2 .	559
4.00	3 .	2344
10.00	3 .	5555667899
6.00	4 .	001223
5.00	4 .	66677

Stem width: 1.00
Each leaf: 1 case(s)

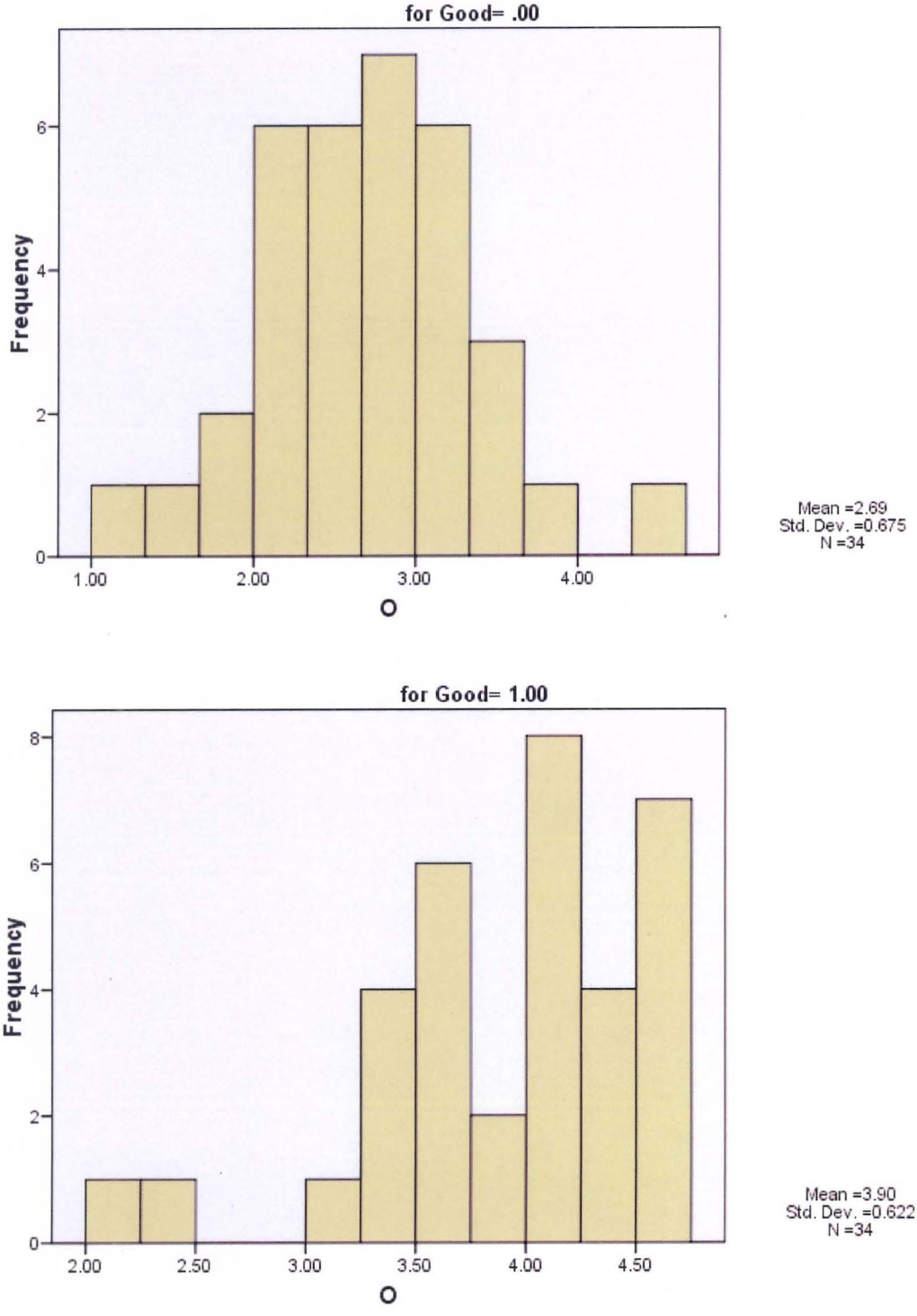
Normal Q-Q Plots


for Good= .00
Expected Normal
Observed Value
2
1
0
-1
-2
1
2
3
4


for Good= 1.00
Expected Normal
Observed Value
2
1
0
-1
-2
1
2
3
4
5

Openness (O)

Histograms



Stem-and-Leaf Plots

```
O Stem-and-Leaf Plot for
Good= .00

 Frequency    Stem &  Leaf

     2.00        1 .  34
     2.00        1 .  89
     7.00        2 .  0022234
    12.00        2 .  556667788889
     7.00        3 .  0112224
     3.00        3 .  558
     1.00 Extremes    (>=4.6)

 Stem width:      1.00
 Each leaf:       1 case(s)
```

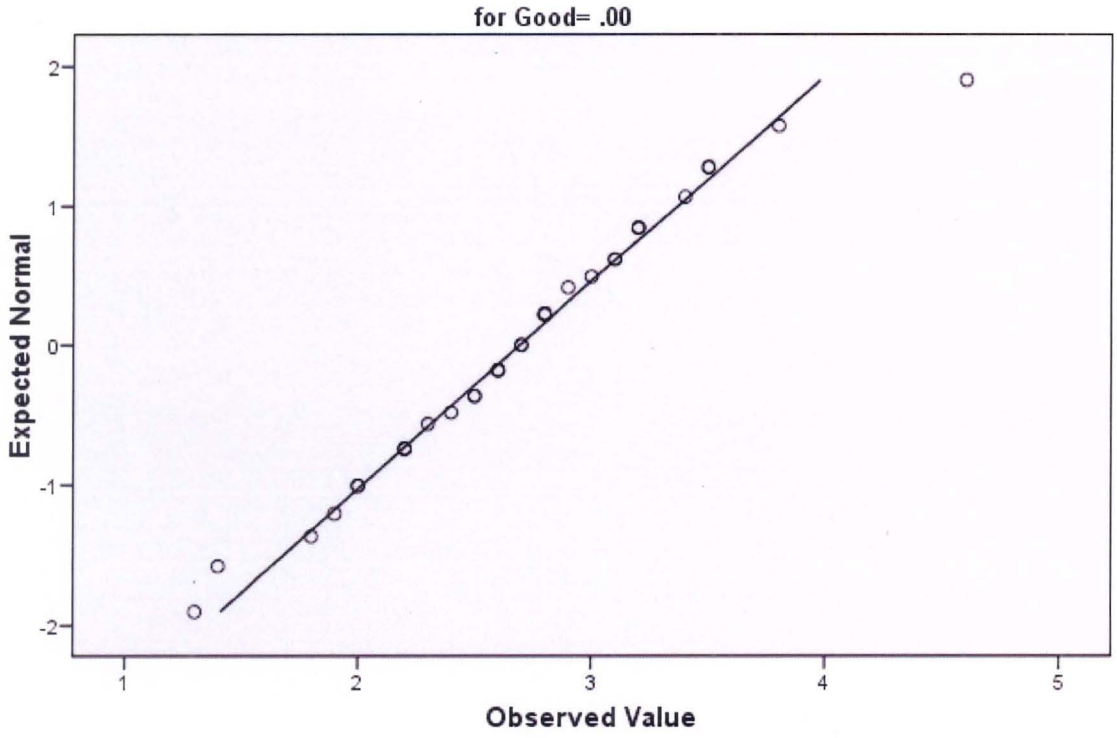
```
O Stem-and-Leaf Plot for
Good= 1.00

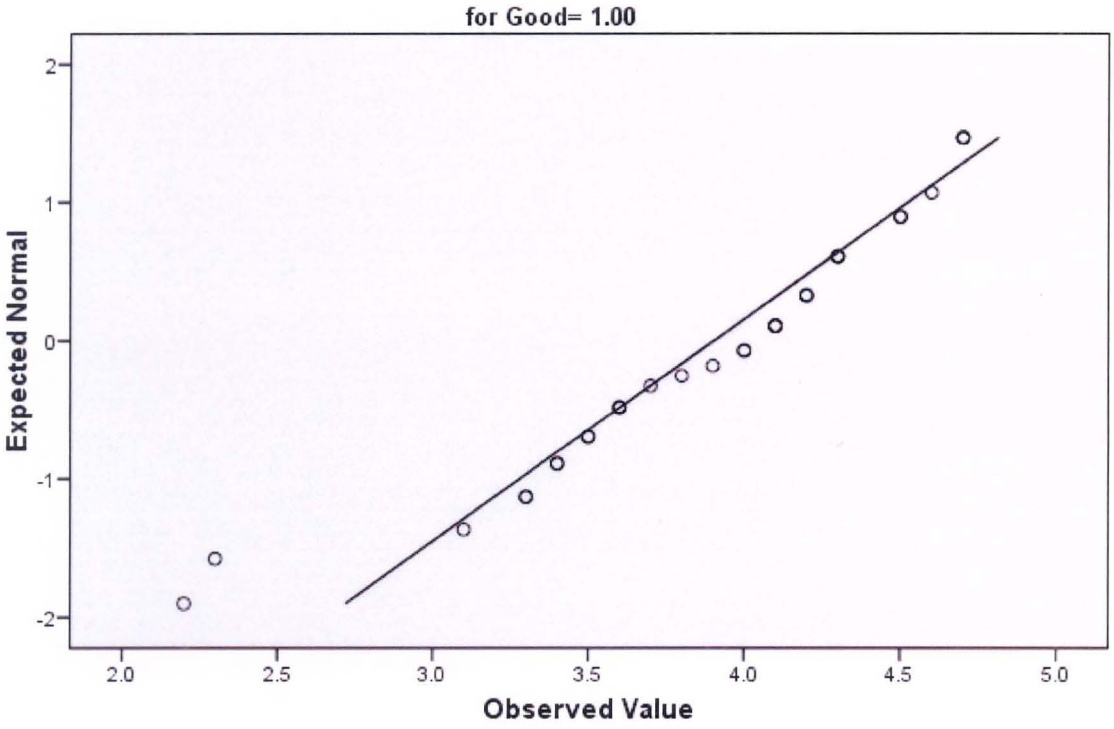
 Frequency    Stem &  Leaf

     2.00 Extremes    (=<2.3)
     1.00        3 .  1
     2.00        3 .  33
     4.00        3 .  4455
     4.00        3 .  6667
     2.00        3 .  89
     5.00        4 .  00111
     7.00        4 .  2223333
     2.00        4 .  55
     5.00        4 .  67777

 Stem width:      1.00
 Each leaf:       1 case(s)
```

Normal Q-Q Plots


for Good= .00
Expected Normal
Observed Value
2
1
0
-1
-2
1
2
3
4
5


for Good= 1.00
Expected Normal
Observed Value
2
1
0
-1
-2
2.0
2.5
3.0
3.5
4.0
4.5
5.0

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14. ABSTRACT

Much has been written regarding project success, and one of the factors contributing to project success is the role of the project manager. Furthermore, project success can be enhanced by selecting the best project manager, and by assigning project managers whose attributes best align with project type. We investigated the role of project manager's personality on project success using the "Big Five" personality model. We surveyed United States Department of Defense project managers to determine specific "Big Five" personality traits which were more likely to positively predict project manager success. The findings indicate conscientiousness and openness to experience were both good predictors of successful project managers. The results may be useful as one consideration when hiring project managers, and when selecting project managers to best match certain project types.

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