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Project Management Professional Training Needs for Defense Industry Projects

Cole Jerome Kupec II
Old Dominion University

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PROJECT MANAGEMENT PROFESSIONAL TRAINING

NEEDS FOR DEFENSE INDUSTRY PROJECTS

by

Cole Jerome Kupec II

B.S. May 2008, University of Wyoming
M.B.A. December 2009, Auburn University

A Dissertation Submitted to the Faculty of
Old Dominion University in Partial Fulfillment of the
Requirements for the Degree of

DOCTOR OF PHILOSOPHY

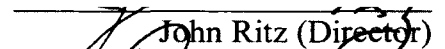
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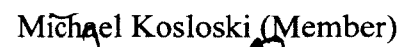
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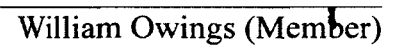
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Approved by:

 John Ritz (Director)

 Michael Kosloski (Member)

 William Owings (Member)

ABSTRACT

PROJECT MANAGEMENT PROFESSIONAL TRAINING NEEDS FOR DEFENSE INDUSTRY PROJECTS

Cole Jerome Kupec II
Old Dominion University, 2013
Director: Dr. John M. Ritz

The purpose of this study was to determine if the Project Management Professional credential requirements encompass the knowledge for project managers required to effectively manage defense industry projects. This study used a four-round Delphi methodology to solicit opinions of defense industry project management professionals about current project management credential curriculum and if that curriculum reflects the realities of the current project management environment.

Two research questions guided this study: 1) Do government contractors working on defense projects use project management knowledge and abilities that are different from what the Project Management Professional credential requires? and 2) Are there additional skill sets needed for project managers to successfully work in the defense industry?

Participants in this study were selected from a project management training company based in the southeastern United States. Project management training professionals were selected due to the unique credentials required of participants in this study. From a population of sixteen defense industry project management training professionals, fourteen agreed to serve on the Delphi panel. The first round asked an open-ended question about knowledge and abilities required by defense industry project

management professionals. The panel identified thirteen knowledge and abilities as additions to the Project Management Professional credential for project managers to effectively manage defense industry projects. In the second round, participants evaluated the knowledge and abilities identified in the first round, assigning varying ratings from limited relevance to significant relevance. In the third round, the participants compared their evaluations with the evaluations of the other participants in aggregate. Consensus was built on the identified knowledge and abilities which ranged from limited relevance to significant relevance. In the fourth round, the participants were given a final opportunity to decide if the knowledge and abilities are either necessary, supplemental, or neither. Five knowledge and abilities were found to be necessary, six were found to be supplemental, one was identified as neither, and one was identified equally as necessary and supplemental by the panel.

The findings of the study identified competencies unique to the defense industry project management field, including Management of Contracts, Developing Positive Relationships with Stakeholders, Knowledge of Customer Organization, Leading a Team of People with Diverse Backgrounds, Knowledge of Communication with Government Customers, and Knowledge of DoD 5000 Series Regulations. Thus it is recommended that the defense industry needs an appropriate project management certification to fit its unique operational requirements. These findings provide knowledge for the project management field that should be included in training programs provided by colleges, companies, and consultants.

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This thesis is dedicated to my brother.

Cole Jerome Kupec II

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Cole Jerome Kupec II

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CHAPTER I

INTRODUCTION

“A project is a temporary endeavor undertaken to create a unique product, service, or result” (*PMBok Guide*, 2008, p. 5). “Project Management is the application of knowledge, skills, tools, and techniques to project activities in order to meet the project requirements” (*PMBok Guide*, 2008, p. 6). Projects are subject to change and project management is recognized as the most efficient way of managing that change (Association for Project Management, 2006). Project management has existed since the time of the early Egyptian civilizations and their building of the great pyramids (Smith, 1999). However, modern project management was first put into practice following World War II (Abba, 2000). The principles of project management were initially developed by the U.S. Navy. Many of the principles of project management have proven effective and logical for the management of modern projects (Abba, 2000).

Formal project management training is offered by colleges, government agencies, professional organizations, private training firms, and private consultants. These training courses often offer certifications that are used as project management credentials for practitioners. The first organization to offer these credentials specifically for project managers was the Project Management Institute (PMI) (Project, 2012). PMI offers several project management credentials, but the most notable credential of these is their Project Management Professional (PMP)[®] credential (Starkweather & Stevenson, 2011). The PMP[®] credential has become a strongly preferred credential and even a requirement by some companies to apply for positions in the project management field (Remer & Martin, 2009). The defense industry operates in a unique environment and is subject to

challenges not found in other industries (Rogerson, 1994). The Department of Defense reserves a number of rights, as a government department, by which all contracting participants must comply (Templin, 1994). Some of these rights include the ability to unilaterally change the contract, terminate a contract at its pleasure, and force sellers to disclose what might usually be considered proprietary information (Templin, 1994). The defense of the U.S. relies upon its military industrial base; the industry has to work closely with government agencies to support the mission of the war fighter while maximizing the tax-payer dollars and maintaining its own profitability (Dittmer, 2003; Mills, Fouse, & Green, 2011). It is important to recognize these challenges and determine if they impact the industry significantly enough to reconsider whether or not the PMP® curriculum should continue to be the standard for defense industry project management principles.

Statement of the Problem

The purpose of this study was to determine if the Project Management Professional credential requirements encompass the knowledge for project managers required to effectively manage defense industry projects. This study is important to the development of the project management credential curriculum and ensuring that it reflects the realities of the current project management environment. Results of this study could aid in making changes to training programs in the project management field provided by colleges, companies, and consultants.

Research Questions

The researcher investigated the knowledge needed by project management professionals on defense industry projects. The researcher wanted to determine if the

Project Management Professional credential does not necessarily conform to all the project management realities specific to the defense industry. The intent of this study was to identify the individual qualifications including knowledge and abilities that are used to understand project management realities and to ascertain if there is a need to present the practiced alternatives in order to better prepare employees for real world project management in the defense industry.

This study was guided by the following research questions to determine:

RQ₁: Do government contractors working on defense projects use project management knowledge and abilities that are different from what the Project Management Professional credential requires?

RQ₂: Are there additional skill sets needed for project managers to successfully work in the defense industry?

Background and Significance

In 1969, the Project Management Institute (PMI) was founded under the philosophy and principal idea that project management fundamentals are similar across industries and could be standardized. PMI created the first edition of the *Project Management Body of Knowledge (PMBOK)* (1987) which laid out the guidelines and standards for project management (Abyad, 2012). The purpose of the *PMBOK* was to be an inclusive body of knowledge for the project management profession (Abyad, 2012). PMI offers a credential called the Project Management Professional (PMP)[®] to demonstrate an individual's knowledge of project management principles and a foundation of experience, discipline, education in project management, and knowledge of the *PMBOK* (PMI, 2012).

Project management practices, as used today, rest on narrow theory such as that found in the *PMBok*. The narrow theory explains problems in project management that result in frequent project failures (Kharbanda & Pinto, 1996). Starkweather and Stevenson (2011) found that the PMP® credential tests necessary core competencies, but it is not sufficient for project management needs to industry specific issues.

Project management knowledge has become a critical qualification for the Department of Defense (DoD), which manages billions of dollars of acquisitions each year (Abba, 2000). However, the U.S. Department of Defense (DoD) project management is a unique and complicated process (Sutterfield, Friday-Stroud, & Shivers-Blackwell, 2006). The complexities of project management in the defense industry include behavioral complexities, structural complexities, and abundance of various stakeholders in the management process (Sutterfield et al., 2006). Other industries have industry specific certifications such as the construction industry's Certified Construction Manager (CCM) certificate. The CCM is offered by the Construction Management Association of America and is comprised of knowledge, education, and experience elements (Remer & Martin, 2009).

Many employers across all industries that use project management have started to require project management certifications for project managers (Remer & Martin, 2009). A cursory review of project management positions found that the PMP® credential is a credential for personal advancement in the project management field for many defense companies, and some companies require the PMP® credential for initial employment.

Department of Defense projects have to deal with significant changes such as organizational restructuring, which can divert the control of the project. Projects have to

deal with changes in leadership that could mean losing vitally important project sponsorship. Sponsors of a project may be critical in civil organizations, but they are absolutely essential to success in the military project environment (Sutterfield et al., 2006). This is in part due to the need to meet full compliance with DoD regulations, an abundance of stakeholders, and the end-user (Sutterfield et al., 2006).

PMI planned a DoD-specific extended version of the *PMBok* to address defense program management needs. The long term goal of the DoD-specific *PMBok* was to develop commercially available credentials to the defense industry (U.S. DoD Extension, 2003). The goal of the commercially available credentials was not realized. The government-funded Defense Acquisitions University that supported the development of the DoD-specific *PMBok* experienced budget cuts in 2005 and 2006. Updates to the extension were not funded (DAU: Ask, 2006). Neither DAU nor PMI ever used the U.S. DoD *PMBok* extension as a textbook and was therefore never put into general use (DAU: Ask, 2006). The defense industry specific bodies of knowledge from the extended version of the *PMBok* would apply to the knowledge base that is hoped to be determined through this study.

This study examines what individual qualifications, including knowledge and abilities, are being used by individuals who work in the defense environment and to determine if these skills are supported by what is taught through project management courses, specifically the industry-standard PMP® credential. The purpose of this study is not to determine if one methodology is more useful than another, but rather to compare what is being required for the credential to what is practiced in the defense industry. If there is a substantial difference between what is being taught and what is being practiced,

then there may be grounds to review and possibly modify the training curricula for project management courses specifically for the defense industry.

As defense projects continue to grow larger and more complex, they require management systems that can meet their needs. Project management is like many fields of study; it faces challenges as technology and new processes develop or evolve. Making an effort to understand the needs of the workforce and adjusting training to help in that effort are important for the field of project management.

Limitations

The following limitations existed for this study:

1. People selected for the study worked for a project management training company as project management training professionals and are known experts in the field. They were selected based on experience with the defense industry and the Project Management Professional credential. This study's approach is called purposeful sampling. There was no measure of their level of expertise, such as educational background.
2. The focus of the study is limited to the U.S.-led western defense industry. The study may not apply to non-western defense industry project management practices.
3. Project management is largely conceptual and there is room for different interpretations of what is considered variation. In this study project management has been defined as follows: "Project Management is the application of knowledge, skills, tools, and techniques to project activities in order to meet the project requirements" (*PMBok Guide*, 2008, p. 6).

4. The study did not field test the findings. It only reported project management variations that can be used for future development of training programs.

5. The Delphi methodology relies on the opinions and conjecture of the panel of experts in the study. Thus this study is limited to one group of individuals selected as experts. This group was a purposive sample taken from a nationally recognized project management training firm. Although the panel has expertise in managing defense industry projects this is a limitation since it does not represent all segments of this industry.

Assumptions

Through the entirety of this research process, the following assumptions were made and considered true:

1. All Delphi panel members are experts in project management and are familiar with the terminology and processes involved in project management in the defense industry.

2. Participants did not communicate with one another and therefore did not bias the opinions of other panelists. This is important because the study is designed for consensus building based on individual reflection rather than persuasive argument.

3. Participants' qualifications were accurately represented and therefore have expertise and competency in the field of project management, particularly in working with defense industry projects.

Procedures

The overall purpose of this study was to determine if the Project Management Professional credential accurately reflected the necessary knowledge and abilities required by defense industry project managers. This study focused on Department of Defense (DoD) contractors and the individual qualifications required to manage projects. The research population was composed of fourteen DoD project management experts that are employed as project management training professionals for a project management training company.

The Delphi method was used to collect data and build consensus on the additional qualifications needed by defense industry project managers beyond what the PMP® credential required. Email was used as the communications medium for the four rounds of the study. The first round of the study asked the panelists to respond to this research question: Are there additional qualifications including knowledge and abilities that are needed for project managers to successfully work in the defense industry? An external panel of three defense industry PMP® experts was used to collate the responses from the first round. Responses to the first round were used to design a questionnaire for building consensus on the knowledge and abilities in the second round. Then responses to the second round were used to provide feedback and begin to draw consensus in the third round. The panelists then classified the qualifications as necessary knowledge and abilities, supplemental knowledge and abilities, or neither in the fourth round. The fourth round was the culmination of the Delphi method which should result in a list of necessary knowledge and abilities and a list of supplemental knowledge and abilities for project

management in the defense industry, built on consensus of the panel of experts. The other research question for this study is answered by the results after all four rounds.

Definition of Terms

The following definition of terms will assist the reader in understanding this research:

Credential - Certificate of added qualifications (Chodosh et al., 2004).

Defense Industry - Companies that operate on Department of Defense contracts that conform to defense contracting requirements and operate in an environment where the government regulates returns and owns the intellectual property that the company produces for the Department of Defense (Harned & Lundquist, 2003).

Project - A temporary endeavor undertaken to create a unique product, service, or result (*PMBok Guide*, 2008).

Project Management - Application of knowledge, skills, tools, and techniques to project activities in order to meet the project requirements (*PMBok Guide*, 2008).

Project Stakeholder - Any individual or group of individuals that is directly or indirectly impacted by a project (Sutterfield et al., 2006).

Summary and Overview

Project management is critical to project success. Education and certification programs can show that individuals have a sufficient knowledge of principles of project management. This research focuses on the opinions of experts regarding the Project Management Professional knowledge base and making sure that it reflects the realities of the current defense industry project management environment. The research will

determine the additional knowledge and abilities needed for project managers to successfully work in the defense industry.

Chapter II is the Review of the Literature written to assist in answering the research questions. There are eight parts to the Review of Literature which cover a description of project management, history of modern project management, major project management organizations, Project Management Professional (PMP)[®] credential, *Project Management Body of Knowledge (PMBok)*, project management methodologies, project management in the defense industry, and government defense project management credentials.

Chapter III details the methods that were used to collect data. Chapter III describes the population, selection criteria, survey development, methods of data collection, analysis of the data collected, and summary. Chapter IV reports the findings of the research.

Chapter V contains the summary, conclusions, and recommendations from the research. This chapter summarizes the research, answers the research questions, and ends with recommendations made by the researcher for implementing the findings and for future research.

CHAPTER II

REVIEW OF LITERATURE

The goal of this research was to determine if the Project Management Professional credential requirements encompass the knowledge for project managers required to effectively manage defense industry projects. All research in this field must have a foundation in the existing relevant literature in order to develop a research design, draw conclusions, or make recommendations. The goal of this chapter is to provide the necessary theoretical foundations found in the existing literature.

This review of literature is divided into eight parts to cover relevant topics to this study. The first part defines and describes project management. Part two covers the history of modern project management. The third part covers major project management organizations. In the fourth part the Project Management Professional (PMP)[®] credential is discussed. Part five covers the *Project Management Body of Knowledge (PMBOK)*. In part six, project management methodologies are discussed. Part seven describes project management in the defense industry. The eighth and final part reviews the government defense project management credentials.

Project Management

Project management “is the application of knowledge, skills, tools, and techniques to project activities in order to meet the project requirements” (*PMBOK Guide*, 2008, p. 6). Project management is a balance of managerial and technical practices and knowledge which form a framework of core component processes. During the management of a project the component processes are envisioned as interacting in a progressive, overlapping fashion. These practices and knowledge move the project closer

to its goal of completion. In order for project managers to be successful in completing a project, they need to know all knowledge areas of project management and how those areas interact (Du, Johnson, & Keil, 2004). These interactions can change throughout the different project phases, and the project manager must anticipate and plan for these events so that they can move the project toward the goal of completion. Project management is essential for coordinating complex multidimensional tasks such as those found in large-scale projects. Project management is necessary in order for most large-scale projects to reach their goal of completion (Du et al., 2004). Given the importance of project management, one might assume an established theory of practice; however, no one unified theory on projects is currently available (Blomquist, Hällgren, Nilsson, & Söderholm, 2010). Blomquist, Hällgren, Nilsson, and Söderholm (2010) believe that one theory on projects will never exist because projects at their most basic level are open-system organizations. Projects vary with contextual dependencies and possess individual variations. Most of the research on the topic is on best practice models which look at the overall models and concepts from which project management action is derived. In the field of project management, there is an assumption that the process dictates the project's success (LaMarsh, 2009). Often the models and processes are very defined and rigid because of this assumption (LaMarsh, 2009). This rigorous process provides project execution certainty to meet the strategic business, construction, and/or operations' objectives (Smith, 1999).

Although some research states that project management has existed since the time of the early Egyptian civilization and their construction of the great pyramids (Smith, 1999), modern project management was founded following World War II and has

evolved significantly during the last 70 years (Abba, 2000). The principles and practices of project management, which have developed over time, have been universally adopted by industry, and many of the principles of project management have survived largely because of their proven effectiveness, applied discipline, and logical concepts (Abba, 2000). Many of the early developments in project management adopted by industry were developed by the U.S. Navy (Kwak, 2003). New areas are being combined with project management to support its growing role and further standardization in modern times (Kwak & Anabari, 2009).

History of Modern Project Management

Some suggest that Fayol's (1916) five functions of a manager are at the origin of modern project management. Fayol indicated that there are five discrete functions that must occur while managing any projects successfully. These five functions include planning, organizing, coordinating, controlling, and directing or commanding (Aman et al., 2012).

Planning is one of the most critical aspects of a manager's job. It shapes the strategic landscape of future operations to achieve future goals of the organization (Beach & Lindahl, 2007). Organizing is structuring and aligning the workforce in an efficient manner with the primary purpose of a project or organization. This allows for efficiency and maximization of performance (Graham, 1968). Coordinating is the objective of harmonizing procedures and activities within an organization (Graham, 1968). This involves two or more persons working in unity of action to express the principles of the organization. Coordination is critical in all functions of an organization's management system (Graham, 1968). Controlling is the decisional role that a manager must take on to

make the strategic system of his organization effective (Mintzberg, 1971). Control is verifying the events of a project to make sure that they conform to the plan adopted (Graham, 1968). Directing or commanding is communicating company goals to lead the implementation of the management process (Beach & Lindahl, 2007).

The development and evolution of modern project management is largely categorized by four periods. The first period includes adapting and implementing Fayol's five functions and other project management procedures employed prior to the 1950s. During this period resource allocation and mobility began to play a larger role as technologies such as the automobile and telecommunication became more advanced and wide spread. It was also during this period that Henry Gantt invented the Gantt chart, which is a tool that illustrates a project schedule and is still widely used today (Kwak, 2003).

Also during this period the United States' government established the Office of Scientific Research and Development (1941) to coordinate government-sponsored projects, including coordination with universities (Keefer, 1969). One of the most renowned of these projects was the Manhattan Project, which oversaw the creation of the atomic bomb (Kwak, 2003).

The second period spanned from 1958-1979 and saw the application of management science and new technology to project management (Kwak, 2003). Technology had developed and the advent of copiers and early computers with silicon chips changed how businesses could operate (Kwak, 2003). Project management as a field of study was developed from a number of different industries, including the defense

industry (Kwak, 2003). The 1950s saw the birth of modern industry project management principles and tools (Lock, 2007; Kwak, 2003).

One of the earliest formalized project management tools was created in a joint venture between Booz-Allen & Hamilton, Lockheed Corporation, and the U.S. Navy and was named Program Evaluation and Review Technique (PERT). PERT is a planning tool designed to analyze and represent the tasks involved in completing a given project. As a formal program management process, PERT was used successfully on the Polaris missile submarine program (Malcom et al., 1959). Also during this period the U.S. government funded the Advanced Research Projects Agency (ARPA) to coordinate projects for several government organizations (Kwak, 2003). ARPA was an initiative by the U.S. government to recoup scientific and technological leadership. ARPA was designed to energize space and military innovation (Blaustein, 2012).

Other formalized quantitatively based program management practices started to form during the 1950s including the critical path method (CPM), which is an algorithm for scheduling a set of project activities, cost estimating, material requirement planning (MRP), inventory control, and cost management (Galloway, 2006). PERT and CPM were used together in early project management approaches. The impact of their applicability was not holistic and complete to the needs of project management, but their theoretical and practical implications led to the identification of areas of improvements for the future (Stelth & Le Roy, 2009).

In 1956 one of the first program management process-oriented organizations was created. It was called the American Association of Cost Engineers (AACE), and this organization's focus was on cost-estimating processes only (Amos, 2005).

The third period was from 1980-1994. This period saw the transition to personal computers as a computational and tracking tool with higher efficiency than ever before (Kwak, 2003). Technology in computing enabled complex project software to become more widely available to companies. This ultimately led to a shift away from mainframe software, which was not as easily accessible for many companies. The shift in technology led to the creation of project management techniques such as matrix organizations, which became widespread (Kwak, 2003). Matrix organizations are a type of organizational management in which people with similar skills are pooled for work assignments (Cleland, 1981).

The fourth period began in 1995, and since then, the Internet has changed how many businesses function. Business has become more customer-oriented as the ease of communication, data storage, and interactivity has continued to grow and evolve (Kwak, 2003). The project management community has begun to grow and mature around internet technology as businesses have begun to use it for controlling project management. Examples of this include virtual project, web-based project offices, and the widespread use of project management software such as Microsoft Project® (Lock, 2007; Kwak, 2003). A virtual project team is when more than 50% of the team members do not reside in the same physical location. The team relies on technology to communicate and only rarely if ever interacts face-to-face. In order for virtual teams to be successful, training on communication skills and communication technology must be a major factor (Curlee, 2008). Most software suppliers have come to recognize the need to make their products and services compatible with Microsoft's Windows operating system. Microsoft Project® has become the most widely used project software on the market (Lock, 2007).

Some project management professionals prefer higher end software with greater adaptability for specific applications. These project management software programs allow project management professionals to predict risks and plan ahead for risk mitigation strategies (Lock, 2007). The modern information systems and technology require project managers that are business-oriented as well as technically trained in addition to having traditional skills such as leadership and communications skills (Tesch, Kloppenborg, & Stemmer, 2003).

Project Management Organizations

In 1969 the Project Management Institute was founded as a not-for-profit organization “that advances the project management profession through globally recognized standards and certifications, collaborative communities, an extensive research program, and professional development opportunities” (PMI, 2012, para. 1). This mission relies on the idea that project management fundamentals are similar across countries’ industries. It was not until 1987 that PMI created the *Project Management Body of Knowledge (PMBok)* which laid out their guidelines and standards for project management (Abyad, 2012). The *PMBok* was adopted as a standard (ANSI/PMI 99-001-2008) by the American National Standards Institute (ANSI) (Abyad, 2012; *PMBok Guide*, 2008).

PMI’s most well-known credential, and the basis of this study, is the Project Management Professional (PMP)[®] credential (Remer & Martin, 2009). According to the 2011 PMI annual report their organization had more than 600,000 members and credential holders in more than 184 countries. This makes PMI the largest project management member association in the world. Being a member of PMI does not require

completing the PMP[®] credential, nor does completing the PMP[®] certification require membership to PMI. There are currently about 400,000 PMP[®] certified individuals around the world (PMI, 2012). The PMP[®] was the first project management credential issued by PMI, but it is only one of six different project management related credentials offered by PMI. The other credentials include Certified Associate in Project Management (CAPM)[®], Program Management Professional (PgMP)[®], PMI Agile Certified Practitioner (PMI-ACP)[®], PMI Risk Management Professional (PMI-RMP)[®], and PMI Scheduling Professional (PMI-SP)[®] (PMI, 2012; Remer & Martin, 2009). The Certified Associate in Project Management (CAPM)[®] is a certification designed for entry-level project practitioners with little or no experience. It demonstrates that the practitioner understands the fundamental knowledge and terminology of effective project management. The Program Management Professional (PgMP)[®] is a credential that recognizes practitioners with an advanced level of experience in overseeing multiple projects and achieving strategic business goals (PMI, 2012; Remer & Martin, 2009). The PMI Agile Certified Practitioner (PMI-ACP)[®] recognizes knowledge of the agile principles, tools, and practices. The agile development process is often associated with software development projects. The PMI Risk Management Professional (PMI-RMP)[®] credential fills the need for project risk specialists. It recognizes the practitioner's ability to identify and mitigate project risks. The PMI Scheduling Professional (PMI-SP)[®] credential fills the need for project scheduling specialists. It recognizes the expertise needed to develop and maintain project schedules in a complex project management environment (PMI, 2012).

The PMI Certified Organizational Project Management Maturity Model (OPM3) Assessor and PMI Certified OPM3 Consultant are certifications offered by Det Norske Veritas (DNV) with approval from PMI since 2006. The OPM3 certifications are for assessors and consultants that want to improve on their project management maturity and capability (Remer & Martin, 2009).

There are a number of project management organizations besides PMI operating in the U.S. and globally. Two of the most renowned organizations in the field besides the Project Management Institute (PMI) are the International Project Management Association (IPMA) and the Association for Project Management (APM) (Bența, Podean, & Mircean, 2011; Gao, Feng, & Wang, 2007). These organizations allow participants the opportunity to share and exchange their experiences in the project management field (Bența et al., 2011). All three organizations have credential programs in project management to verify their existing and newly acquired knowledge. These organizations derive credibility from requiring that their standards are in line with relevant international standards and can be accredited by the international standard's accrediting body. The credentials from these organizations acknowledge that the participants receiving the credential have obtained a skill to perform their job in accordance with the standards and the ethics of the given profession (Landoni & Corti, 2011; Crawford, Pollack, & England, 2007; Ali & Rahmat, 2010). Credential programs such as those offered by the Project Management Institute, the International Project Management Association, and the Association for Project Management can vary in the amount of time for which they stay valid. Once the credential expires, there is often an opportunity to recertify and extend the validity of the credential (Toljaga-Nikolić, Obradović, & Mihić, 2011).

The IPMA's mission statement is to support the member associations by developing products and services that enhance performance throughout the global program and portfolio management community. The IPMA currently has 120,000 members in 55 member associations around the world (IPMA, 2012). The organization is based in Zurich, Switzerland (Toljaga-Nikolić et al., 2011). As of the end of 2011, the IPMA had certified more than 150,000 people globally with over 97,000 of the credential holders receiving the IPMA's Level D[®] Certified Project Management Associate credential. The Level D[®] credential is an exam-oriented, knowledge-based credential similar to that of PMI's PMP[®] credential (IPMA, 2012). The main difference is that the IPMA certification is comprised of knowledge, experience, and behavior, while PMI's PMP[®] is comprised of knowledge and experience (Remer & Martin, 2009). IPMA states that their certifications do not focus on just one business sector, but instead are representatives of business practices across a variety of business sectors. IPMA does not offer a certificate or body of knowledge specific to the defense industry (IPMA, 2012).

The Association for Project Management is based in the United Kingdom and has 19,500 members and 500 corporate members. Their mission statement is "to develop and promote the professional disciplines of project and programme management for the public benefit" (APM, 2012, para. 3). They offer a variety of credentials and have signed a Memorandum of Understanding with IPMA which will allow greater reciprocity between the two organizations. Currently the APM will offer their Practitioner Qualification credential, which will be equivalent to the IPMA Level C[®] credential (Press Centre, 2009). The APM Practitioner Qualification is for "relatively experienced" project management practitioners that demonstrate an understanding of the APM Body of

Knowledge. APM offers public and private institutions the ability to become an APM Accredited Training Provider, which allows those institutions the ability to deliver professional qualifications in a holistic, integrated approach (Proudfoot, 2011). The United Kingdom's Royal School of Military Engineering (RSME) was awarded its APM Accredited Training Provider certificate in 2011. The RSME has developed a new "through-career" training program aligned with APM Body of Knowledge and APM Competence Framework based courses. It is the first defense-related organization to qualify for the APM Accredited Training Provider certificate (Proudfoot, 2011).

Project Management Professional (PMP)[®] Credential

There is a trend for professionals in the project management environment to place greater emphasis on official credentials such as industry certifications (Hernandez, Aderton, & Eidem, 2011; Remer & Martin, 2009). These certifications ensure that project management professionals understand at least the fundamentals of project management practices and often require some experience in project management (Remer & Martin, 2009). Some of the more current project management credentials, such as PMI's Agile Certified Practitioner (PMI-ACP)[®] and Scheduling Professional (PMI-SP)[®] credentials, focus on more specific areas of project management (Remer & Martin, 2009). The PMP[®] credential is a credential for personal advancement in the project management field. The PMP[®] credential is supposed to demonstrate that an individual possesses the knowledge of project management principles and a foundation of experience and education in project management. Table 1 shows the outline of the PMP[®] exam content that PMI offers prospective exam participants.

Table 1

<i>PMP Exam Content Outline</i>	
Domain	Percentages of Items
I. Initiating the Project	13%
II. Planning the Project	24%
III. Executing the Project	30%
IV. Monitoring and Controlling the Project	25%
V. Closing the Project	8%
Total	100%

Note. Adapted from “Project Management Professional (PMP)[®] Handbook Examination Content Outline,” by Project Management Institute. Copyrighted 2010 by Project Management Institute, Inc. Retrieved from http://www.pmi.org/Certification/~media/PDF/Certifications/pdc_pmhandbook.ashx

Many employers have started to require project management certifications (Remer & Martin, 2009). A cursory review of job postings indicates that positions open in project management at defense firms view the PMP[®] as a preferred credential. Some job postings state that the project management position requires that applicants have a PMP[®] credential or the ability to obtain it.

Some studies indicate that the PMP[®] credential can aid certified personnel in commanding a higher salary. According to the fourth edition of the PMI Project Management Salary Survey, people with a PMP[®] credential had an average salary that was 17.2% higher than their counterparts who did not have the PMP[®] credential (LaBrosse, 2007). Another study done on IT professionals found that PMP[®] was the highest paying IT credential when compared to other industry relevant credentials such as the Certified IS Security Professional credential and Oracle Certified Professional credential (AbuAli & Abu Arja, 2010).

Starkweather and Stevenson (2011) assessed the PMP[®] credential from the perspective of the IT industry. They investigated the relationship between the PMP[®]

credential and the established core competencies of project management. Their study concluded with a variety of results from a national sample of IT recruiters which found that only a slight majority of recruiters, 52%, viewed the PMP® credential as an important prerequisite. IT executives put less value on the PMP® credential relative to other attributes and qualifications. The sampling of IT executives found no significant difference in success rates of PMP® credential holders when compared to their non-credentialed counterparts. Both IT recruiters and executives placed emphasis on soft skills including a project manager's communication skills and tacit knowledge of knowing when to lead and how to use leadership skills to achieve project success. Both IT executives and recruiters acknowledged the *PMBOK* as being useful for understanding overall project management methodology. They also stated that there was a definitive gap between the explicit textbook knowledge offered by the *PMBOK* and the tacit knowledge of experience.

Furthermore, the study mentioned the need in the IT hiring process to assess the extent to which PMP® certified individuals are given the opportunity to demonstrate their ability to apply the *PMBOK* methodologies in a real-world context. Understanding the basics of project management methodology is a necessary part of project success, but the current body of knowledge needs to be developed to incorporate an experiential knowledge base (Starkweather & Stevenson, 2011). Otherwise the PMP® credential, according to Starkweather and Stevenson, could be viewed as a "paper chase" or getting credentials for the sake of showing individual distinction when in fact the credentials provide the individual with no real merit.

The PMP® and other project management credentials have a growing base of international project managers on a worldwide scale. China is experiencing a demand for project management education. In 2000 there were 316 PMP® credential holders in China. By 2010 there were 14,720 PMP® credential holders, and the number of individuals expected to sit for the PMP® exam in the near future is expected to grow (Xiaojin & Jianrong, 2012). In all there are about 44,000 PMP® and IPMA certificate holders in China as of 2008 (Xiaojin & Jianrong, 2012). The project management credentials being introduced to China are playing an important role in the development of the project management profession in that country (Xiaojin & Jianrong, 2012). The Asia-Pacific region is already seeing a growing trend of PMP® certified project management professionals. In 2007, almost 28 percent of those getting certified were from the Asia-Pacific-rim area. This region of the world continues to experience impressive growth in project management. It would only make sense that a growth in project management would naturally see the higher demand for established project management credentials like the PMP® (LaBrosse, 2007).

In order to take the PMP® examination, project managers must complete certain prerequisites. The participant must have a four-year bachelor's degree (or global equivalent) and at least three years' project management experience. Participants with a secondary diploma (or global equivalent) can still qualify to take the exam, but they must have at least five years of project management experience. Participants must also have 35 contact hours of formal project management education in order to qualify to take the examination (PMP Handbook, 2012). Once participants have qualified and passed the PMP® examination, they are required to participate in continuing education and

professional development in order to retain their credential and expand their relevant skill set. The continuing credential requirements progress in a three year cycle from the time of the participant's successful completion of the PMP® examination (PMP Handbook, 2012).

PMI conducts a Role Delineation study every five to seven years for each of its credentials, including the PMP®. The Role Delineation study is a job analysis that discusses the tasks and responsibilities that each credential is supposed to perform (PMP Handbook, 2012). The PMP Handbook (2012) reports that the PMP® Role Delineation for candidates for the PMP® credential must:

- Perform their duties under general supervision and are responsible for all aspects of the project for the life the project.
- Lead and direct cross-functional teams to deliver projects within the constraints of schedule, budget, and scope.
- Demonstrate sufficient knowledge and experience to appropriately apply a methodology to projects that have reasonably well-defined requirements and deliverables.

Current PMP® Role Delineation studies are not made available to the public. Therefore, the researcher was not able to obtain relevant information from a PMP® Role Delineation study to add to this Review of Literature.

Project Management Body of Knowledge

Project management standards can be taken from external sources or developed internally to a specific industry. It has become increasingly popular in recent times to adopt external practices. Such external standards include the Project IN Controlled

Environments, also known as PRINCE2, which was developed by the United Kingdom's Office of Government Commerce (Karamitsos, Apostolopoulos, & Bugami, 2010).

Another example is the United Kingdom's Association for Project Management's (APM) Body of Knowledge, currently in its fifth edition (Ghosh et al., 2012). In the United States the Project Management Institute's Project Management Body of Knowledge, also known as *PMBok*, has become the standard for project management methodologies (Ghosh et al., 2012). *A Guide to the Project Management Body of Knowledge (PMBok Guide)* was originally written by Duncan in 1996 to supersede the PMI's *Project Management Body of Knowledge (PMBok)*, originally released in 1987 (Duncan, 1996). The *PMBok Guide*, third edition, printed in 2004, provided major improvements to the structure of the document and additions to processes (Abyad, 2012). The fourth edition of the *PMBok Guide* was released in 2008 (Abyad, 2012). The fifth edition of the *PMBok Guide* was released in January of 2012 (PMI, 2012). The purpose of the *PMBok* was to be an inclusive body of knowledge for the project management profession (Gao et al., 2007). The *PMBok* includes both traditional and advanced innovative practices found in project management. The *PMBok* describes what project management is, a project management framework, project management areas of knowledge, project management's relationship to other disciplines, and the project life cycle and processes (Duncan, 1996). *The Project Management Body of Knowledge* is an internationally recognized standard for project management (Abyad, 2012). The *PMBok* defines five management process groups and nine areas of knowledge. The management process groups are initiating, planning, executing, monitoring/controlling, and closing (Abyad, 2012). The *PMBok Guide* states the initiating process is performed to define a new

project or phase of a project based on authorization to start the project or phase. The planning process is devising and maintaining a workable scheme to accomplish the business needs that the project was developed to address (Zwikael, 2009). This process includes establishing scope, refining the objectives, and defining a course of action (Abyad, 2012; *PMBok Guide*, 2008). The executing process involves completing the work to project specifications based on the project management plan. The monitoring and controlling processes track, review, and regulate a project's performance and progress. Controlling processes take corrective action when it is necessary. The closing process brings the project to an end by formally closing all processes (Abyad, 2012; *PMBok Guide*, 2008).

The *PMBok* areas of knowledge include project integration management, project scope management, project time management, project cost management, project quality management, project human resources management, project communications management, project risk management, and project procurement management (*PMBok Guide*, 2008). The *PMBok* areas of knowledge and project management process groups can be mapped out in a matrix as seen in Table 2.

The *PMBok Guide* (2008) states that project integration management includes processes needed to identify, define, combine, unify, and coordinate various processes. Project integration management includes developing a project's charter and project management plan. It also includes integrated change control, which includes approving and managing changes. Then project integration management finalizes all activities across all the project management processes groups to complete the project (*PMBok Guide*, 2008).

Table 2

PMBok Matrix

Knowledge Areas	Project Management Process Groups				
	Initiation Process	Planning Process	Executing Process	Monitoring & Controlling Process	Closing Process
Project Management Integration	<ul style="list-style-type: none"> Develop Project Charter 	<ul style="list-style-type: none"> Develop Project Management Plan 	<ul style="list-style-type: none"> Direct and Manage Project Execution 	<ul style="list-style-type: none"> Monitor and Control Project Work Perform Integrated Change Control 	<ul style="list-style-type: none"> Close Project or Phase
Project Scope Management		<ul style="list-style-type: none"> Collect Requirements Define Scope Create WBS 		<ul style="list-style-type: none"> Verify Scope Control Scope 	
Project Time Management		<ul style="list-style-type: none"> Define Activities Sequence Activities Estimate Resources Estimate Durations Develop Schedule 		<ul style="list-style-type: none"> Schedule Control 	
Project Cost Management		<ul style="list-style-type: none"> Estimate Costs Determine Budget 		<ul style="list-style-type: none"> Control Costs 	
Project Quality Management		<ul style="list-style-type: none"> Plan Quality 	<ul style="list-style-type: none"> Perform Quality Assurance 	<ul style="list-style-type: none"> Perform Quality Control 	
Project Human Resource Management		<ul style="list-style-type: none"> Develop Human Resource Plan 	<ul style="list-style-type: none"> Acquire Project Team Develop Project Team Manage Project Team 		
Project Communications Management	<ul style="list-style-type: none"> Identify Stakeholders 	<ul style="list-style-type: none"> Plan Communications 	<ul style="list-style-type: none"> Distribute Information Manage Stakeholder Expectations 	<ul style="list-style-type: none"> Report Performance 	
Project Risk Management		<ul style="list-style-type: none"> Plan Risk Management Identify Risks Perform Qualitative Risk Analysis Perform Quantitative Risk Analysis Plan Risk Responses 		<ul style="list-style-type: none"> Risk Monitoring and Control 	
Project Procurement Management		<ul style="list-style-type: none"> Plan Procurements 	<ul style="list-style-type: none"> Conduct Procurements 	<ul style="list-style-type: none"> Administrate Procurements 	<ul style="list-style-type: none"> Close Procurements

Note. Adapted from “A Guide to the Project Management Body of Knowledge (4th Ed.)” by Project Management Institute. Copyrighted 2008 by Project Management Institute, Inc.

Project scope management ensures that the project includes all the work required and is composed of five processes: collect requirements, define scope, create the work breakdown structure (WBS), verify scope, and control the scope (Abyad, 2012; *PMBok Guide*, 2008). Collect requirements are the processes by which the stakeholders' needs and project objectives are defined and documented. Defining the scope is the process by which the project and product are defined. Creating a work breakdown structure includes subdividing project work and deliverables into small, manageable components. Verifying the scope formalizes the completed project deliverables. The control scope process monitors the status of the project and product scope and when needed, manages the changes to the scope baseline (*PMBok Guide*, 2008).

Project time management includes all processes that are required to manage the completion of the project on time. In order to do that, project time management must define the activities of the project's deliverables and sequences the activities (Abyad, 2012; *PMBok Guide*, 2008). It must estimate activity resources including quantity of materials, people, equipment, and other supplies and then estimate the activity durations. Project time management includes developing schedules based on sequences, durations, and resource requirements and then controls the schedule by management changes to the schedule baseline and monitoring the status of project updates.

Project cost management includes estimating, budgeting, and controlling costs to ensure that the project comes in within the project's approved budget. Controlling for costs requires actively managing changes to the cost baseline (*PMBok Guide*, 2008; Wazed & Ahmed, 2009).

Project quality management includes all processes and activities involved in determining quality policies, objectives, and responsibilities to ensure that the project fulfills the need for which it was undertaken. The processes involved include planning quality by identifying quality requirements, performing quality assurance, and performing quality control (*PMBok Guide*, 2008; Tsung-Hsien & Yen-Lin, 2010).

Project human resources management includes organizing, managing, and leading a project team. The required processes in this body of knowledge include development of a human resource plan, acquiring a project team, developing a project team, and managing the project team (*PMBok Guide*, 2008).

Project communications management ensures the timely and appropriate disposition of project information. This requires the processes of identifying stakeholders, planning communications, distributing information, managing stakeholder expectations, and reporting performance (Abyad, 2012; *PMBok Guide*, 2008).

Stakeholders are all parties that are impacted by the project. Managing their expectations can include distributing information such as status reports, progress measurements, and forecasts (*PMBok Guide*, 2008).

Project risk management includes all processes that involve risk. The objective of project risk management is to increase the probability of a positive outcome and decrease the possibility of a negative outcome on the project. The processes involved in maximizing that objective include defining activities involved in planned risk management and identifying risks. Performing qualitative and quantitative risk analysis and a plan risk response can also be useful in completing the objective of project risk

management. Also monitoring and controlling risks are important throughout the project (*PMBok Guide*, 2008; Zizhi, Jinpeng, & Xin, 2012).

Project procurement management includes all the processes necessary to acquire products or services outside of the project team. These processes include plan procurement, conduct procurement, administer procurement, and close procurement. Planning procurement includes documenting purchasing decisions, specifying the procurement approach, and identifying potential sellers. Conducting procurement includes selecting a seller and awarding a contract. Administering procurement includes managing contract performance and relationships. Closing procurements is done by completing each project procurement (*PMBok Guide*, 2008). Knowledge of the nine bodies of knowledge in the *PMBok* is necessary for the PMP® credential examination (Starkweather & Stevenson, 2011).

Koskela and Howell (2002) say the *PMBok Guide* provides for a useful summary of project management doctrine, and they formulate the primary characteristics of project management. They use the *PMBok* in their research as the theoretical foundation of project management. However, project management as it is currently practiced rests on narrow theory like that found in the *PMBok*. The current narrow theory explains problems in project management that result in frequent project failures (Kharbanda & Pinto, 1996). According to Morris (1994) this may also explain the slow rate of methodological renewal in project management. Because of this narrow theory, Koskela and Howell (2002) argue that an explicit theory for project management is the single most important issue that the project management profession faces.

The *PMBok Guide* (2008) defines executing process group as:

Those processes performed to complete the work defined in the project management plan to satisfy the project specifications. The Process Group involves coordinating people and resources, as well as integrating and performing the activities of the project in accordance with the project management plan.

(p. 55)

Koskela and Howell (2002) have two criticisms of the theory of execution such as those found in the *PMBok*. Their first criticism is that current theory of project management assumes that resources are ready to execute at the time of authorization. It is very hard, however, to maintain an up-to-date plan that accurately reflects reality. This will lead to tasks inevitably being pushed back on plans (Koskela & Howell, 2002). Johnston and Brennan (1996) claim that improvisation must occur at the operational level when this approach is used. Improvisation diverts from a rigid project management model to fit the needs of the organization in the context of their specific operations to complete the project. The second criticism that Koskela and Howell describe is the flow of authorization of tasks on a project. The flow of authorization is the control element of project management. The current model assumes a mechanized approach to project management in which the people in the chain of project operations commit to commands from a central control. The commitment is in turn a promise to follow through with the order handed down. This model denies two-way communication between the central command issuing orders and the executor of the order. In addition, the task will only be executed if the executor is committed to the task in which there was a shortcoming in two-way communication. These criticisms, like others in the field, come from a

perceived lack of flow conceptualization found in narrow project management theory. In addition, they argue that there is an abundance of a lack of value generation conceptualization found in the current theory of project management (Koskela & Howell, 2002).

Snider and Nissen (2003) address limitations of body of knowledge taxonomies found in project management. They write that project management is dynamic in nature and can be captured only in a knowledge flow approach. This approach consists of the knowledge in project management as a commodity and knowledge in project management as a social construct. Knowledge as a commodity can be seen in the digital archives of communication between project group members to use as an information resource of important experiences (Snider & Nissen, 2003). The social construct found in the project management experience comes from social interaction based around a common problem. Events like negotiating and social interaction in the problem-solving process make up this knowledge. Snider and Nissen argue that though bodies of knowledge are easily conceptualized and are easily disseminated, they are not fitting to the dynamic nature of knowledge as it flows through a project's organization. They argue that the knowledge flow approach addresses tacit knowledge and provides better insight into relationships between project knowledge and an organization's managers.

Project Management Methodologies

Some researchers such as Kerzner (2001), make the case that an organization has a better chance of streamlining project management practices using in-house methodologies. Kerzner believed project management is developed with organizational specifics in mind that can be a more flexible option for supporting a wide variety of

projects. Implementing a standardized methodology serves to create a common reference for developing infrastructure around a common standard. These standards can include controlling resources and budgets and presenting a common planning structure (Zdanytė & Neverauskas, 2011).

Despite having a good project management standard, either from internal or external sources, a project can still suffer. Poor leadership or a misalignment of unrealistic goals directed from the senior management levels can lead to poor performance despite a proven project management methodology. Inefficient monitoring of project performance and action implementation can also be to blame when a project does not perform to expectations (Zdanytė & Neverauskas, 2011).

It is also important to remember that no matter where a project management methodology comes from, there are important socio-cultural aspects to take into consideration. No project is done in a vacuum and it is important that the project management process conform to the context of the project. Contextual variables such as contact with clients, working with teams, and perception of leadership play critical roles in project success (Zdanytė & Neverauskas, 2011).

A 2005 study of superior performers in project management found that job-task competencies are highly specific to the industry in which the project manager works. The study focused on the construction industry, which faces a unique project-based environment. The construction industry relies on a multi-disciplinary team-oriented industry environment with a transient workforce. In addition, many projects in the industry tend to be awarded on short notice. The study delineated average managers from their “superior” counterparts based on evidence in their activities. The competency

of “superior” managers in activities was attributed to their occupationally specific competency and behavioral competency (Cheng, Dainty, & Moore, 2005).

Understanding project management practices like those found in this study is important for understanding project management success.

It is a fact that more organizations are embracing project management practices and methodologies. Often the methodologies are combined with allied disciplines such as human resources, quality assurance, research and development efforts, innovation efforts, and organizational behavior ideals. Organizations hope that by incorporating these disciplines they will be able to better address the organization’s complex management problems. Implementing these allied disciplines into the project management arena occurs because of the proven effectiveness of each of these disciplines (Kwak & Anabari, 2009).

Over the past 25 years, human resources and organizational behavior have grown into a critical element in project management. This is because so much of business today is about people management more so than about task orientation systems. Kwak and Anabari (2009) believe that the integration of human resources and organizational behavior may have reached its peak. The future of project management may focus on other allied disciplines such as performance measurement methodologies, information technology, information systems, and quality control. Earned Value Management (EVM) is a performance measurement methodology that can aid managers in determining technical and schedule performances as well as the cost of a project by comparing planned work with work that has been accomplished (Damaré & Peterson, 2005). The projected growth regarding performance measurement methodologies such as Earned

Value Management (EVM) is because of two forces. The first is the need for performance measurement of activities on a global scale. Globalization requires greater standardization of performance evaluation systems in order to provide a standardized and comparable analysis of project performance measures around the world (Kwak & Anbari, 2009). The second is government regulation, which continues to drive cost and schedule evaluation on large government projects (Visitacion, 2007).

It is believed that information technology will continue to enhance the tools used in project management well into the future. The idea is that these tools will make it easier to implement and use project management techniques. Quality management methodologies such as Lean Manufacturing and Six Sigma (statistical modeling of manufacturing processes) are expected to continue to be more integrated into project management practices as companies see the value in these practices (Burton, 2012; Kwak & Anbari, 2009). Often quality management is seen as a key piece of an organization's business strategy (Kwak & Anbari, 2009).

The success or failure of implementing allied disciplines into the project management arena will depend on what kind of value the discipline can bring to an organization's process (Burton, 2012; Kwak & Anbari, 2009). It will largely rely on managers from the executive levels down to successfully install the concepts and practices into an organization (Kwak & Anbari, 2009).

It is the belief of some in the project management community that project management may move in a more philosophical direction (Cicmil, 2006; Kwak & Anbari, 2009). Project management may move in a direction to include ideas found in sociological and ethical realms. As of now the literature reports that project managers

must work in those contexts, but those contexts are not a regular part of project management methodologies (Kwak & Anbari, 2009).

Project Management in the Defense Industry

“Project management within the United States Department of Defense (DoD) has been described as one of the world’s most complicated processes” (Sutterfield et al., 2006, p. 218). Project completion in the DoD requires years for which the same project strategies have to be used to complete the project successfully. The complexities of project management in the DoD stems from behavioral complexities, structural complexities, and abundance of various stakeholders in the management process. Stakeholders on DoD projects can range from senior financial staff responsible for the allocation of funds to functional managers trying to maintain their independence from senior DoD management in order to ensure full compliance with regulation, as well as the end-user and other stakeholders in the process. Achieving compliance in the DoD structure can be time consuming to the point of extending a project’s time to field by years. The lengthened time to completion can increase project costs and push back project timelines (Sutterfield et al., 2006). Special interest groups also influence military projects in a number of commands. The ultimate stakeholder is the end-user, who is the soldier or sailor on the front lines that uses the equipment to complete his or her mission. Defense industry contractors work hand in hand with their government counterparts and often have to coordinate with this diverse group of stakeholders, which can prove to be very challenging (Sutterfield et al., 2006).

In the early stages of a DoD project there can be a diversity of opinion surrounding the project including the acquisition strategy, the source of funding for the

project, and the projected cost of the project. Requirements analysis of a project performed by independent systems analysis organizations within the DoD can help to end speculation on some of these issues such as the per unit cost of a weapons system (Sutterfield et al., 2006). Even after the requirements analysis is complete, an acquisition strategy must be formed to support the technical requirements of the project to see if the project is viable. Once a project is established, it may have to deal with significant changes such as organizational restructuring, which can divert the control of the project. Projects may also have to deal with a change in leadership in the project office or at the senior executive level during the course of the project. A change in leadership could mean that a project loses vitally important project sponsorship. Sponsors that support a project may be critical in civil and industry organizations, but they are absolutely essential to success in the military project environment (Sutterfield et al., 2006).

Due to the issues that arise from so many stakeholders, it is important that project managers in the DoD structure educate the project stakeholders on the project to reduce resistance and help overcome conflicting agendas. One current theoretical framework to accomplish this is the Project Stakeholder Management (PSM) Strategy Framework (2006). The framework includes nine steps performed in a repeated cycle. Step one requires the project manager to identify and inform the stakeholders of the project's mission and vision. Step two asks for a project Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis that the project manager and his or her team can control. In step three, the project manager identifies all of the project's stakeholders and their stake in the project. For step four, the project manager selects criteria for managing each stakeholder and develops a strategy to manage each. In step five, the project manager

chooses the stakeholder management strategies for the project manager's goals. For step six, the project manager allocates resources to the strategies that he or she has selected. Step seven is the implementation of the strategies. In step eight, the project manager evaluates the results of the strategies and makes corrective actions as necessary (Sutterfield et al., 2006).

The government does not set aside its sovereignty when dealing with the defense industry. The Department of Defense reserves a number of rights by which all contracting participants must comply. Some of these rights include the ability to unilaterally change the contract with an industry partner and force continued performance. The government can also terminate a contract at its pleasure and force sellers to disclose what might usually be considered proprietary information. These abilities make the government a unique customer with powers far beyond the economic power of market forces alone. These powers violate many of the assumptions found in a free market system (Templin, 1994).

Unique requirements found in the defense industry include the fact that pricing on acquisitions is largely based on anticipated or incurred costs rather than market forces such as competition. The Department of Defense, the buyer, is the specifier of the weapons system as opposed to the seller. Other challenges include political considerations, changing national threats, and large capital requirements from non-private financing, which make doing business with the Department of Defense a unique endeavor. Political considerations stem from congressional authorization of programs. The appropriation of congressional funds generates political overtones. The defense industry must engage in politically oriented activities such as engaging lobbyists, trade

associations, and committing to political action committees to influence the political process to their benefit (Templin, 1994).

Government Defense Project Management Credentials

The DoD maintains their own credentials process independent of that used by their defense contracting industry partners. The Defense Acquisition Workforce Improvement Act (DAWIA) was established in 1991. It requires the Department of Defense to establish education and training standards, requirements, and courses for the civilian and military workforce (Richard, 2007). The Defense Acquisition University (DAU) was authorized by Congress under DAWIA in 1990 and established by DoD Directive 5000.57 on October 22, 1991 (DAU, 2006). DAU's vision statement is "Enabling the Defense Acquisition Workforce to achieve the right acquisition outcomes" (DAU, 2006, para. 2). The idea for training the government acquisition workforce in program management skill sets emerged after World War II. At that time the U.S. government was facing more complex weapons systems and needed a skilled government workforce that could manage complex government acquisitions being built by defense contractors.

The inception of the university began in the form of the Defense Systems Management School in 1971. It became the Defense Systems Management College in 1976 and consolidated with other service schools in 2000 to become DAU. The DAU offers formal courses, continuous learning modules, and knowledge-sharing opportunities (History: DAU, 2012).

DAU offers a number of credentials designed for a variety of career paths, including program management. There are three levels of program management

certification that a Department of Defense acquisition member can pursue at DAU. The certifications at DAU are only available to Department of Defense employees, military personnel, and civilians assigned to acquisition coded positions. The certifications in program management and other fields in acquisitions are not a qualification factor for positions in the Department of Defense. They are seen as quality ranking factors, not requirements. DAU certifications maintain reciprocity with all other Department of Defense organizations and are accepted by all Department of Defense organizations. The DAU encourages acquisition professionals to get certified in multiple career fields (DAU: iCatalog, 2010). Though DAU encourages students to make their first priority their current position certification, they are encouraged to get certified in other fields afterwards. DAU maintains a Fulfillment Program. This program enables Department of Defense acquisition workforce members to apply experience and demonstrated competencies toward acquisition career field certification. In addition, DAU maintains an Equivalency Program that allows applicants to receive credit for courses that have been previously approved by DAU at the request of the provider (DAU, 2006). The PMP® is a credential that the DAU will accept in its equivalency program as a replacement for Project Management Tools 250 (PMT 250) (DAU: iCatalog, 2010).

In 2003, DAU and PMI signed a memorandum of understanding and developed the U.S. DoD *PMBok* extension, funded by DAU. The extension was originally developed to complement the second edition of the *PMBok Guide*. The U.S. DoD *PMBok* extension was developed to “fill in the gaps” on defense program management for the *PMBok Guide* with the long term goal being to develop commercially available credentials to the defense industry and a government DoD certification (U.S. DoD

Extension, 2003). Neither DAU nor PMI ever used the U.S. DoD *PMBok* extension as a textbook. In 2005 and 2006, DAU experienced budget cuts and the U.S. DoD *PMBok* extension updates were not funded (DAU: Ask, 2006). The extension was adjusted to the needs of the DoD and included five additional defense acquisition knowledge areas: project systems engineering management, project software acquisition management, project logistics management, project test and evaluation management, and project manufacturing management (U.S. DoD Extension, 2003).

Project systems engineering management involves the technical aspects from which a program is evaluated, managed, and controlled. It includes the functional disciplines within the defense environment including the design, development, test, and support of programs. The processes of project systems engineering management include systems engineering planning, which guides engineering efforts; systems engineering activities, which make up the fundamentals of the systems engineering process; and analysis and control, which includes the tools and techniques used in the systems engineering process (U.S. DoD Extension, 2003).

Project software acquisition management includes the acquisition and development of DoD acquisitions that are software-intensive. Project software acquisition management takes the acquisition organization's point of view. It focuses on software acquisition inputs, tools, techniques, and outputs (U.S. DoD Extension, 2003).

Project logistics management deals with all concerns with the material support of a DoD system throughout the entire life cycle of a project. Project logistics management includes acquisition logistics such as technical and management activities to ensure that resources are provided through completion and sustainment logistics, which maintains a

system once it is provided to the DoD user. The need for sustainment logistics came from a need to field DoD systems beyond their planned life expectancy as well as to meet the needs of upgrades and modifications (U.S. DoD Extension, 2003).

Project test and evaluation management is involved in the systems engineering process and assesses levels of system performance in order to analyze risks and assist in correcting issues. The processes involved include test and evaluation planning as well as reporting the results (U.S. DoD Extension, 2003).

Project manufacturing management ensures that projects integrate manufacturing resources in the most economical fashion. It includes processes that influence the design, plan for production, and the actual production of the project (U.S. DoD Extension, 2003).

The U.S. DoD *PMBok* extension is not currently available on the PMI's website. A commercially available credential on the material in the U.S. DoD *PMBok* extension to the *PMBok* could not be found by the researcher after an extensive search.

Summary

In the last 100 years, project management has evolved exponentially as a result of technology and innovation. The first glimpse of modern project management theory was found in Fayol's five functions of a manager in 1916 and established the first period of project management history. The three periods that followed saw the rise of project management methodologies that have been made more widely available by technology and innovation.

Project management organizations have been formed to standardize processes and create a forum for sharing ideas and innovations. Project management in the defense industry, and on the whole, continues to change and improve as more technology

becomes available and implementation of the methodologies spillover into other, non-manufacturing or process-driven fields. Over the last twenty years human resources and organizational behavior have played a much larger role in the field of project management. Moving into the future, other project management related tools such as performance evaluation and quality management could play a larger role in project management once these tools can be usefully applied.

The *PMBok* describes the important aspects of project management and includes innovative practices found in project management. The Department of Defense developed their own extension to the *PMBok* to address their needs, which included five additional defense acquisition knowledge areas: project systems engineering management, project software acquisition management, project logistics management, project test and evaluation management, and project manufacturing management. The extension was never used to develop a course by either the PMI or DAU. The field of project management has progressed from its roots and will likely continue to grow and adapt to the needs of business, innovation, and technology.

Chapter III details the methods and procedures that were used to collect data to answer the study's research questions. The chapter describes the population, research methodology employed, instrument design, data collection, and summary.

CHAPTER III

METHODS AND PROCEDURES

This chapter describes the study's methodology used to answer the research questions of this study. The purpose of this study was to determine if the PMP® credential requirements encompass qualifications including bodies of knowledge and abilities for project managers to engage in defense industry projects as perceived by a panel of experts. This study was designed to ascertain consensus regarding the PMP® credential as an appropriate reflection of situational performance and core competencies for project managers in the defense industry. This study used the Delphi method to address the problem of this study. This chapter has five major sections: population, research methodologies employed, instrument design, data collection, and summary.

Population

Using subject-matter experts to form consensus and create knowledge is a common practice. The defense industry project management experts used in this study are project management training professionals from a project management training company. The company provided sixteen experts for the study. All experts used in the study have provided training for the PMP® credential as well as have experience in the defense industry project management environment. The training company was contacted and after a teleconference with the company's president, the researcher was allowed access to the company's project management credential trainers. The company president provided the names of individuals that qualified as subject-matter experts on the topic of defense industry project management and the PMP® credential. Experts were recruited for this study from a training company because of the unique needs of the study. The

experts needed a thorough knowledge of project management in the defense industry and a thorough knowledge of the PMP[®] credential. Professional project management trainers possess a comprehensive knowledge of the *PMBOK*. Their knowledge of the information is comprehensive to the point where they can assist others in putting PMP[®] bodies of knowledge and methodologies into the context of their own job's framework. All of the subject-matter experts had experience as practitioners in the field of project management in the defense industry prior to becoming trainers. Many of them hold full-time or part-time positions in the defense industry project management field and work as industry trainers on a part-time basis. As a part of the PMP[®] credential, an individual must have at least three years of experience in project management (PMI, 2012). Since all the participants were PMP[®] certified, they all had at least that amount of experience.

Selecting qualified experts is one of the most important steps in the Delphi method process. The quality of the results of the study relies directly on the qualifications of the experts used in the study (Klee, 1972). Delbecq, Van de Ven, and Gustafson (1975) state there are three types of individuals that are qualified to be a part of a panel in a Delphi study. They include “(1) the top management decision makers who will utilize the outcomes of the Delphi study; (2) the professional staff members together with their support team; and (3) the respondents to the Delphi questionnaire whose judgments are being sought” (p. 85). The subject-matter experts from this study are at least one of these types of qualified groups of people.

Adler and Ziglio (1996) suggest that 10-15 individuals is a small sample size for a Delphi study, but it can still get reasonable results. Other research suggests that the Delphi method gets the best results with 15-20 experts on the panel. This is because

categorizing the volume of items that respondents generate can be difficult with larger groups (Delbecq et al., 1975). Taking this previous research into consideration, a panel of sixteen experts was determined to be a reasonably sized group for the purposes of this study.

After data are gathered from Round 1 of the Delphi process a review panel is convened. The review panel's responsibility is to create categories and to integrate similar responses to the survey question. This will aid the researcher in the development of additional rounds of the study. Three review panel experts were used. The review panel experts were selected to ensure that the review panel accurately reflected the group of experts (Hsu & Sandford, 2007; Weidenbaum, 1959). The review panel is made up of active Department of Defense affiliated project managers. These review panel experts were chosen by the researcher and deemed qualified to serve on the review panel because they are exceptional project managers with many years of experience in project management and are active participants in the defense industry project management training mission.

Research Methodology Employed

The Delphi method was selected to ascertain and organize the perceptions of defense industry project management professionals on the appropriateness of the PMP[®] credential. A Delphi study is a multi-round surveying process to build consensus (Hsu & Sandford, 2007). The Delphi method was developed by Dalkey of the RAND Corporation. The method was originally developed in the 1950s to obtain the consensus of a group of experts on the viewpoint of a Soviet strategic planner (Dalkey & Helmer, 1963). The RAND Corporation is a federally funded research and development company

that was born out of the defense industry after World War II. It dealt directly with the defense-related agenda in the Cold War competition with the Soviet Union (RAND: History, 2011).

Delbecq et al. (1975) state the Delphi method can be used for these objectives:

1. To determine or develop a range of possible program alternatives;
2. To explore or expose underlying assumptions or information leading to different judgments;
3. To seek out information which may generate a consensus on the part of the respondent group;
4. To correlate informed judgments on a topic spanning a wide range of disciplines; and
5. To educate the respondent group as to the diverse and interrelated aspects of the topic. (p. 11)

All of these objectives are related to the research being conducted. In addition, literature on the Delphi method indicates that the method can be used in a number of program management related activities such as program planning, needs assessment, and policy determination (Hsu & Sandford, 2007).

Instrument Design

Four features are necessary for a procedure to be defined as a “Delphi”: anonymity, iteration, controlled feedback, and the statistical aggregation of group response. There are a number of ways that these procedures can be applied (Rowe & Wright, 1999).

The Delphi method is used to systematically explore the judgment of experts and form an opinion in a gradual process. The process is more conducive to independent thought by the experts and minimizes direct confrontation. Direct confrontation can lead to closed-minded attitudes to novel thought and a tendency to defend a stance once it is

taken. The Delphi methodology also eliminates any predisposing of participants and their ability to be swayed by persuasive arguments of others (Dalkey & Helmer, 1963). The Delphi method is exploratory in nature and useful when addressing interdisciplinary fields such as project management (Choudaha, 2008). The Delphi method is also appropriate for a study when opinions of experts that are geographically spread out are required for the study (Murry & Hammons, 1995).

Some perceive the Delphi method as inferior to statistical or model-based procedures which require human judgment. The Delphi method is intended for use in judgment and forecasting situations when model-based forecasting situations are not practical because of a lack of appropriate data, where human judgment input is necessary (Rowe & Wright, 1999). This is the case in this research study, as the field of project management is a highly complex field encompassing multiple disciplines.

For this study, all the participants were project management training professionals recruited through a project management training company. All of the experts used in this study were contacted by email and asked to volunteer in this study. Participation was strictly voluntary. The letter inviting the experts to be a part of the study explained the purpose of the study, the time commitment involved with the study, how the study would be conducted using the Delphi methodology, and emphasized the importance of the study to the understanding of the body of knowledge. See Appendix A for the invitation.

All communications between the researcher and the participants were completed electronically. In order to control for researcher survey bias, the researcher used a web-based survey tool within Survey MonkeyTM in Round 1. All additional survey rounds were issued as a Microsoft Word[®] document in an email attachment. Survey MonkeyTM

allows the user to create a custom survey tool that can be administered and collected online. A username and password is required to access Survey Monkey™, providing for anonymity of the subject-matter experts in the research process (Survey Monkey™, 2012). The link for the survey of each round was emailed to the review panel with instructions on how to complete the round. See Appendix B and C. In this way the researcher did not know the specific responses to the questions and did not know the specific names for each of the respondent's responses.

Data Collection

The data collection consisted of four rounds. Each round was an important step in building consensus of the panel of experts.

Round 1

In Round 1, the Delphi process began with an open-ended question. This served to solicit information about a specific content area and served as the foundation for the rest of the study (Custer, Scarcella, & Stewart, 1999). The researcher posed an open-ended question for the participants to consider:

Are there additional qualifications including knowledge and abilities that are needed for project managers to successfully work in the defense industry? Please list a minimum of two skill sets needed. For the purpose of this study, skill sets included additional bodies of knowledge, methodologies, or qualifications such as knowledge on product systems engineering management, project logistics management such as sustainment logistics, project test/evaluation management, and security functions. Please describe your responses with a few sentences for clarification.

The subject-matter experts in the study were instructed to identify at least two knowledge and abilities that need to be addressed by the question and provide a brief description of the key points of each, so other expert panelists would be able to properly reflect on all the knowledge and abilities presented in Round 2. In addition to the examples given in the question in Round 1, participants might bring up defense industry bodies of knowledge such as project software acquisition management or project manufacturing management. Some participants may go as far as suggesting training in specific DoD project control mandated software. The subject-matter experts were provided with the definitions of key terms to aid them in completing the purpose of Round 1. The participants were also provided with a purpose statement of the study, directions on how to complete it, and a timeline of when the survey was due back to the researcher. The survey was due back to the researcher two weeks from the day the survey was sent out. A follow-up email was sent to each participant one week after the initial survey.

After the responses to Round 1 were collected, the external panel of subject-matter experts reviewed the responses of the participants to the research question. The external panel created categories to the responses to the survey question. They placed similar responses into similar categories when appropriate and rewrote into one similar statement as needed. The names given to the categories were not disclosed to the panel of experts so that it did not influence the panelists in future rounds. The end result was identification and description of further knowledge and abilities for project managers in the defense industry. The researcher made further edits to the recommendations of the external panel to place the knowledge and abilities into a similar format for Round 2.

Round 2

The Round 2 survey was developed to begin to draw consensus on the responses to the question posed in Round 1. The content from Round 1 was used to generate a 5-point Likert-type scale survey for Round 2. The Likert-type scale gave the following options of levels of importance to each knowledge and abilities for the participants to choose: *most relevant* = 5 points, *significantly relevant* = 4 points, *moderately relevant* = 3 points, *limited relevant* = 2 points, *not relevant* = 1 point. The subject-matter experts were given instructions to rate the importance of each knowledge or ability. See Appendix C for the Round 2 survey.

The ratings received for each of the knowledge and abilities from the research question were recorded. From these data the mean score, median, standard deviation, and interquartile range for each question was computed. Round 2 is where agreements and disagreements between the panelists begin to be identified (Ludwig, 1994). Any knowledge or ability with an interquartile range greater than 2.0 would indicate a disagreement between panelists on their rating of the knowledge or ability. The panelists were given ten days to complete Round 2.

Round 3

In Round 3, the knowledge and abilities from Round 2 were presented in the same order with the mean score, median, standard deviation, and interquartile range for each of the knowledge and abilities from the panel of subject-matter experts as a group in the previous round. In addition, the panel members were provided with their response from the previous round and instructed to reaffirm their response or change their response from the previous round based on the panel's overall responses. If the panelist's response

remained outside of the group consensus, the panelist was asked to justify why he or she believed that the response should be higher or lower than the consensus. Once the respondents submitted their Round 3 surveys, the mean score, median, standard deviation, and interquartile range for each question were computed again. The coefficient of variation was also calculated. If the coefficient of variation is between 0.00 and 0.50, there is a strong consensus for each of the knowledge and abilities in the research question (English & Kernan, 1976). The rationales for answers lying outside the interquartile range were compiled as well. The panelists were given two weeks to complete Round 3. If consensus was reached, then the researcher does not need to send another round like Round 3 (Hsu & Sandford, 2007). See Appendix D for the Round 3 survey.

Round 4

Delbecq et al. (1975) state that a Delphi study should consist of three to five rounds, depending on the consensus sought by the researcher. Round 4 was used to determine which knowledge and abilities from the previous rounds were necessary to be added to the PMP[®] credential and which were desirable supplemental knowledge and abilities. Whereas previous rounds insisted that participants choose a level of relevancy of each knowledge and ability, this round provided an opportunity for the participants to truly decide whether knowledge and abilities generated in the study are necessary additions to the PMP[®] credential as it relates specifically to the defense industry or possibly beneficial supplemental material. Participants were asked to reflect on the Delphi method and to consider if the knowledge and abilities addressed would be better described as a Necessary Knowledge and Ability or a Supplemental Knowledge and Ability to the PMP[®] as it relates to the defense industry. Sometimes what is initially

thought to be a necessary knowledge and ability is, in fact, not as necessary as the participants believed at the start of the study. It is important for the panel of experts to consider the relevance of the knowledge and ability, and consider if a knowledge and ability should be pursued in formal training.

A **Necessary** knowledge and ability is a core skill set that is needed for a person to be considered adequate. Individuals that possess the necessary knowledge and abilities are considered capable in the foundations and principles in a field, which in this study is defense industry project management. Necessary knowledge and abilities make up the body of knowledge of a subject.

A **Supplemental** knowledge and ability can sometimes be considered necessary when, in fact, it is not at all. Supplemental knowledge and abilities are not critical to the body of knowledge. They fall under the “nice to have” category or supply greater efficiency, but they are not essential to the completion of a project management task and comprehension of the body of knowledge.

Individual experts on the panel may have initially thought that certain knowledge and abilities that they or others had brought up were necessary in the defense industry. Those experts may change their minds after reflection on the responses of their peers in the panel. They may determine that the knowledge and abilities they thought to be necessary could better be described as supplemental. The panel may also decide that the knowledge and abilities are neither necessary nor supplement. They could determine that a topic, previously thought knowledge and abilities, is actually a current policy issue relating to the defense industry. See Appendix E for the Round 4 survey.

Summary

The four-round Delphi method used in this study was outlined in this chapter. Round 1 asked the panel of experts to identify knowledge and abilities needed in the project management defense industry beyond what was required in the Project Management Professional credential. An external panel categorized the responses of the panel. The categories identified were distributed in Round 2. The panelists were asked to rate each knowledge and ability in a Likert-scale survey. The mean score, median, standard deviation, and interquartile range were calculated for each response in Round 2. For Round 3 the Likert-scale survey was redistributed with the mean score, median, standard deviation, and interquartile range data associated with each question. The panelists were also given their responses to the survey from Round 2. The panelists were asked to reflect on their responses and the data collected from their fellow panelists. They were asked to reconsider their answers if they differed significantly from the rest of the panel. The data from Round 3 were collected to determine if a consensus on the knowledge and abilities had been reached. The researcher calculated the mean score, median, interquartile range, and standard deviation for each question again, as well as the coefficient of variation. If the coefficient of variation is between 0.00 and 0.50, there is a strong consensus for the knowledge or ability from the responses to the research question. If consensus had been reached then another round similar to Round 3 would not be necessary. Round 4 asks if the knowledge and abilities brought up in the previous rounds were necessary or supplemental knowledge and abilities for the defense industry. The technique provided each panelist the opportunity to provide his or her view of the

research question and to consider and respond to the views of others. The Delphi methodology eliminated many of the issues that arise in consensus building situations.

In Chapter IV, the findings of the Delphi study are presented. These findings include the responses to the research question in Round 1, the statistics from the five point Likert-style scales, and the rationale for divergent responses given by the panelists.

CHAPTER IV

FINDINGS

This chapter describes the study's findings. The Delphi methodology was used to generate and rate knowledge and abilities to answer the study's research questions. The first research question of this study was: Do government contractors working on defense projects use project management knowledge and abilities that are different from what the Project Management Professional credential requires? The second research question of this study was: Are there additional skill sets needed for project managers to successfully work in the defense industry?

Four Delphi rounds were used to build consensus among a panel of experts in defense industry project management. This chapter presents the findings of each round of the study.

Panel Participants

The panel of experts in this study are project management training professionals from a nationally recognized project management training company. The training company was very cooperative and provided a significant list of potential panel experts. Of those on the list, sixteen were invited to participate in this study because of their expertise and experience in project management specific to the defense industry and because all of them were certified Project Management Professionals (PMP)[®]. Of the sixteen who were invited to participate, fourteen agreed to participate in the study and became the population of Round 1. Of the fourteen, eleven completed Round 2, twelve completed Round 3, and twelve completed Round 4. The study occurred over a seven-week period.

The participants were asked to provide their number of years of experience with the PMP® credential, with the defense industry, and with defense industry in project management positions. These data were used to determine the characteristics of the panel. The average number of years of experience of the panel within the defense industry was 24.9. The average number of years of defense industry project management experience was 16.3, and the average number of years of experience with the PMP® credential was 6.25. The panel's average number of years of experience with the PMP® credential is significant considering the number of those with the PMP® credential has more than doubled since 2006 (LaBrosse, 2007). The age of the participants ranged from the mid-thirties through the mid-sixties with a mean age of 52.7. The study's panel consisted of an ethnically homogeneous sample, with 92.8% of the panel identifying themselves as Caucasian males.

Round 1 Results

The purpose of Round 1 of this study was to enable the participants to contribute ideas for knowledge and abilities that are needed by certified project managers to work in the defense industry. An email was sent to participants with a link to a SurveyMonkey.com™ link on January 14, 2013. All the participants followed the link to participate in Round 1. The round consisted of posing the following open-ended question for the participants to consider:

What additional qualifications including knowledge and abilities are needed for project managers to successfully work in the defense industry? Please list a minimum of two skill sets needed. For the purpose of this study, skill sets included additional bodies of knowledge, methodologies, or qualifications such as

knowledge on product systems engineering management, project logistics management such as sustainment logistics, project test/evaluation management, and security functions. Please describe your responses with a few sentences for clarification.

Each of the fourteen panelists in the study identified at least two additional knowledge and abilities and provided brief descriptions of each, so other panelists would be able to properly reflect on all the knowledge and abilities presented in Round 2. Responses from the fourteen participants totaled 28, and all participants completed Round 1 prior to the deadline on January 28, 2013.

An external panel of three subject-matter experts reviewed the responses of the fourteen participants to the open-ended question in Round 1. The external panel created categories of the responses to the question and through this process, identified the specific knowledge and abilities by screening for duplicates. The duplicate knowledge and abilities were removed or combined where applicable to make them appear as one single unique factor. The end result of this process produced thirteen additional knowledge and abilities as well as descriptions for project managers in the defense industry. These included:

Management of Contracts -- The project manager is expected to be able to participate in the contracting process from proposal through closure of the contract. In order to ensure that all contractual requirements are being met, the project manager must not just understand the Statement of Work (SOW), but also the rules and regulations behind the requirements. This includes knowledge of the Federal Acquisition Regulation (FAR) which will enhance a defense industry project manager's experience with their DoD

counterpart. An understanding of the FAR is important to project managers in the defense industry because the underlying laws and regulations directly impact requirement, cost, and schedule implications that may not be encountered in other commercial sectors.

Developing Positive Relationships with Stakeholders -- Earning stakeholders' confidence and trust is a critical qualification for any project manager in the defense industry. Stakeholders include senior DoD oversight management, the Government Accounting Office, and Congressional Staffers, for example. This often requires the need to have great interpersonal skills in human relations, leading, and consensus building.

Knowledge of Fiscal Law -- Knowledge of fiscal law specific to the defense industry that is not encountered in other commercial sectors is important to a defense industry project manager. An understanding of this area is important because the underlying laws and regulations directly impact requirement, cost, and schedule implications.

Knowledge of DoD 5000 Series Regulations -- The DoD 5000 series regulations is a critical body of knowledge to the success of the vast majority of project managers in the defense industry as it guides all DoD acquisitions. In order to meet the contract requirements within the DoD Acquisition Community, a basic knowledge of the DoD 5000 series regulations that outline the acquisition cycles and all of the standard requirements (concept development, engineering development, test and evaluation, and the rest) along with the standard timelines within the DoD and Congress is a necessity. Defense acquisition methods are unique and often complex compared to the procurement processes in other industries.

Knowledge of Logistics Management -- Defense acquisition methods are unique and often complex compared to the procurement processes in other industries. Understanding the logistics process of integrating DoD-acquired products and contractor-provided products is critical to defense industry project managers. An understanding of logistics and the associated constraints with military methods are required to successfully complete many of today's defense industry projects. As an example, the critical factor on military transport aircraft is the pallet footprint. As fuel costs continue to rise, designing smaller and lighter systems will be crucial.

Knowledge of Customer Organization -- A successful project manager in the defense industry understands how the military is comprised. This will enable the project manager to have a greater understanding of how to access stakeholder value. Project managers in the defense industry need a working knowledge of their customer's organization as well as their own. All too often we limit organizational process assets to one's own organization. It is very important to understand the processes and procedures of the customer's organization. This is especially true if the customer is the Government. One example is the budgeting process.

Knowledge of FEMA Incident Command Systems -- FEMA Incident Command Systems contain incident best practices born from the 9/11 commission report. These practices are widely used within the Department of Defense.

Program Protection -- A security clearance is normally needed to work in the DoD and a lack of one will severely limit your information access. Security protocol are common practices that are well supported in the *Project Management Body of Knowledge*

(*PMBok*), however, the defense industry applies a level of scrutiny well beyond that practiced in non-DoD commercial projects.

Knowledge of Software Development -- Testing and verification may be conducted in cyclical and redundant parallel processes not anticipated by any project management discipline.

Knowledge of Technology Management -- Project managers in the defense industry need to have a working knowledge of the technology involved with their project.

Technology management is a disciplined approach to vetting the near future from the far future, and the realistic cost objectives from the prohibitive. Although common project management practices apply and are very useful, understanding the importance and impact of technologies that have not been implemented into tangible products pushes all into the realm of "imagineering." This is counter intuitive to a disciplined process, but it must be allowed for.

Knowledge of the DoD Customer Motivations -- Generally speaking, the DoD customer is motivated by their mission and the accomplishment of that mission, not profit. This makes all the difference in the world in terms of how DoD customers define and then prioritize their requirements for a particular project. The DoD customer is focused on "spending money" as opposed to "making money." This is not to say that the DoD customer is not interested in being efficient and effective. They probably are concerned with efficiency and effectiveness to a degree (so that they can ultimately get more for their money), but this is not necessarily a driving factor like it is in a commercial for-profit company that has shareholders to answer to.

Leading a Team of People with Diverse Backgrounds -- For example, members of the team will be from different disciplines (engineering, budget & finance, test, logistics, etc.) and may also be members of the Armed Forces (Army, Navy, Air Force, Marines, and Coast Guard), federal employees (government civilians), other contractors (both Materiel Developer Contractors as well as Support Engineering & Technical Assistance (SETA) Contractors), National Laboratories (Lincoln Labs, Sandia Labs, etc.), Other Government Agencies and Organizations, Federally Funded Research & Development Centers (FFRDCs), Historically Black Colleges & Universities (HBCUs), and University Affiliated Research Centers (UARCs), just to name a few. It is very important for the leader to know and understand that each member of the team has a different perspective and motivation based on what organization they belong to and that those perspectives and motivations influence how they act and behave. It is imperative that the project manager, operating in such an environment, has the skill and the ability to bring all of the different team members together as a cohesive team focused on the cost, schedule, and performance goals of the project from the start of the project on through to the successful completion of the project.

Knowledge of Communication with Government Customers -- Communicating with the government customer is critical to the successful project. While this is not exclusive to the DoD project manager, it is important to note that the government operates very differently from domestic customers. Project managers must be able to communicate customer requirements to internal resources and communicate procurement processes to the customer.

The knowledge and abilities identified became the basis of the Likert-type scale survey in Round 2 of the study. The Likert-scale allowed panelists to reflect on the responses of other participants from Round 1 of the study.

Round 2 Results

The purpose of Round 2 was to begin to identify and build consensus on the Round 1 responses among the panelists. A 5-point Likert-scale survey was designed for Round 2 that included the knowledge and abilities and their descriptions from the Round 1 survey responses. The survey was distributed to panelists by email. The Likert-scale gave the following options of levels of importance to each knowledge and ability for the participants to choose: *most relevant* = 5 points, *significantly relevant* = 4 points, *moderately relevant* = 3 points, *limited relevant* = 2 points, *not relevant* = 1 point. The panelists were to rate the importance of each knowledge and ability.

The Round 2 survey was delivered to the panelists on January 31, 2013, and was to be completed and returned no later than February 9, 2013. Of the fourteen panelists in Round 1, eleven (78.5%) responded to the Round 2 survey. The panelists' responses were entered into a spreadsheet. From these data, the mean score, median, standard deviation, and interquartile range for each knowledge and ability were compiled and computed. In all, the survey from Round 2 consisted of thirteen knowledge and abilities that were to be considered.

Survey Item 1 focused on Management of Contracts. Two panel members replied most relevant (18.18%), six panelists replied significant relevance (54.54%), three panelists replied moderate relevance (27.27%), zero panelists replied limited relevance, and zero panelists replied not relevant. The mean response for this item was 3.91 with a

median of 4, SD was 0.67, and the IQR was 0.50. The mean of 3.91 indicated the panelists found Management of Contracts to be significantly relevant to defense industry project management.

Survey Item 2 focused on Developing Positive Relationships with Stakeholders. Four panel members replied most relevant (36.36%), three panelists replied significant relevance (27.27%), two panelists replied moderate relevance (18.18%), two panelists replied limited relevance (18.18%), and zero panelists replied not relevant. The mean response for this item was 3.82 with a median of 4, SD was 1.11, and the IQR was 2.0. The mean of 3.82 indicated the panelists found Developing Positive Relationships with Stakeholders to be significantly relevant to defense industry project management.

Survey Item 3 focused on Knowledge of Fiscal Law. Zero panel members replied most relevant, four panelists replied significant relevance (36.36%), five panelists replied moderate relevance (45.45%), two panelists replied limited relevance (18.18%), and zero panelists replied not relevant. The mean response for this item was 3.18 with a median of 3, SD was 0.72, and the IQR was 1.0. The mean of 3.18 indicated the panelists found Knowledge of Fiscal Law to be moderately relevant to defense industry project management.

Survey Item 4 focused on Knowledge of DoD 5000 Series Regulations. Three panel members replied most relevant (27.27%), four panelists replied significant relevance (36.36%), three panelists replied moderate relevance (27.27%), one panelist replied limited relevance (9.09%), and zero panelists replied not relevant. The mean response for this item was 3.82 with a median of 4, SD was 0.94, and the IQR was 1.50.

The mean of 3.82 indicated the panelists found Knowledge of DoD 5000 Series Regulations to be significantly relevant to defense industry project management.

Survey Item 5 focused on Knowledge of Logistics Management. Zero panel members replied most relevant, three panelists replied significant relevance (27.27%), six panelists replied moderate relevance (54.54%), two panelists replied limited relevance (18.18%), and zero panelists replied not relevant. The mean response for this item was 3.09 with a median of 3, SD was 0.67, and the IQR was 0.50. The mean of 3.09 indicated the panelists found Knowledge of Logistics Management to be moderately relevant to defense industry project management.

Survey Item 6 focused on Knowledge of Customer Organization. Three panel members replied most relevant (27.27%), three panelists replied significant relevance (27.27%), four panelists replied moderate relevance (36.36%), one panelist replied limited relevance (9.09%), and zero panelists replied not relevant. The mean response for this item was 3.73 with a median of 4, SD was 0.96, and the IQR was 1.50. The mean of 3.73 indicated the panelists found Knowledge of Customer Organization to be significantly relevant to defense industry project management.

Survey Item 7 focused on Knowledge of FEMA Incident Command Systems. Zero panel members replied most relevant, one panelist replied significant relevance (9.09%), two panelists replied moderate relevance (18.18%), five panelists replied limited relevance (45.45%), and three panelists replied not relevant (27.27%). The mean response for this item was 2.09 with a median of 2, SD was 0.90, and the IQR was 1.0. The mean of 2.09 indicated the panelists found Knowledge of FEMA Incident Command Systems to be of limited relevance to defense industry project management.

Survey Item 8 focused on Program Protection. Zero panel members replied most relevant, four panelists replied significant relevance (36.36%), three panelists replied moderate relevance (27.27%), four panelists replied limited relevance (36.36%), and zero panelists replied not relevant. The mean response for this item was 3.00 with a median of 3, SD was 0.85, and the IQR was 2.0. The mean of 3.00 indicated the panelists found Program Protection to be moderately relevant to defense industry project management.

Survey Item 9 focused on Knowledge of Software Development. Zero panel members replied most relevant, two panelists replied significant relevance (18.18%), five panelists replied moderate relevance (45.45%), three panelists replied limited relevance (27.27%), and one panelist replied not relevant (9.09%). The mean response for this item was 2.73 with a median of 3, SD was 0.86, and the IQR was 1.0. The mean of 2.73 indicated the panelists found Knowledge of Software Development to be moderately relevant to defense industry project management.

Survey Item 10 focused on Knowledge of Technology Management. One panel member replied most relevant (9.09%), one panelist replied significant relevance (9.09%), seven panelists replied moderate relevance (63.63%), two panelists replied limited relevance (18.18%), and zero panelists replied not relevant. The mean response for this item was 3.09 with a median of 3, SD was 0.79, and the IQR was 0.0. The mean of 3.09 indicated the panelists found Knowledge of Technology Management to be moderately relevant to defense industry project management.

Survey Item 11 focused on Knowledge of the DoD Customer Motivations. One panel member replied most relevant (9.09%), three panelists replied significant relevance (27.27%), five panelists replied moderate relevance (45.45%), two panelists replied

limited relevance (18.18%), and zero panelists replied not relevant. The mean response for this item was 3.27 with a median of 3, SD was 0.86, and the IQR was 1.0. The mean of 3.27 indicated the panelists found Knowledge of the DoD Customer Motivations to be moderately relevant to defense industry project management.

Survey Item 12 focused on Leading a Team of People with Diverse Backgrounds. Four panel members replied most relevant (36.36%), three panelists replied significant relevance (27.27%), two panelists replied moderate relevance (18.18%), two panelists replied limited relevance (18.18%), and zero panelists replied not relevant. The mean response for this item was 3.82 with a median of 4, SD was 1.11, and the IQR was 2.0. The mean of 3.82 indicated the panelists found Leading a Team of People with Diverse Backgrounds to be significantly relevant to defense industry project management.

Survey Item 13 focused on Knowledge of Communication with Government Customers. Four panel members replied most relevant (36.36%), four panelists replied significant relevance (36.36%), three panelists replied moderate relevance (27.27%), zero panelists replied limited relevance, and zero panelists replied not relevant. The mean response for this item was 4.09 with a median of 4, SD was 0.79, and the IQR was 1.50. The mean of 4.09 indicated the panelists found Knowledge of Communication with Government Customers to be significantly relevant to defense industry project management.

Round 2 is where agreements and disagreements between the panelists begin to be identified (Ludwig, 1994). No knowledge or ability had an interquartile range (IQR) greater than 2.0, which indicates no substantial disagreement between panelists on their rating of each knowledge or ability (Table 3). In Round 2, Knowledge of Technology

Management was the only knowledge and ability that had an IQR of 0, which implies substantial agreement.

Table 3

Round 2 Data

Survey Number	Knowledge and Abilities	Mean	Median	Standard Deviation	IQR
1	Management of Contracts	3.91	4	0.67	0.50
2	Developing Positive Relationships with Stakeholders	3.82	4	1.11	2.00
3	Knowledge of Fiscal Law	3.18	3	0.72	1.00
4	Knowledge of DoD 5000 Series Regulations	3.82	4	0.94	1.50
5	Knowledge of Logistics Management	3.09	3	0.67	0.50
6	Knowledge of Customer Organization	3.73	4	0.96	1.50
7	Knowledge of FEMA Incident Command Systems	2.09	2	0.90	1.00
8	Program Protection	3.00	3	0.85	2.00
9	Knowledge of Software Development	2.73	3	0.86	1.00
10	Knowledge of Technology Management	3.09	3	0.79	0.00
11	Knowledge of the DoD Customer Motivations	3.27	3	0.86	1.00
12	Leading a Team of People with Diverse Backgrounds	3.82	4	1.11	2.00
13	Knowledge of Communication with Government Customers	4.09	4	0.79	1.50

The panelists were asked to submit any knowledge or abilities they believed should be added to the survey. No panelist submitted additional knowledge or abilities in Round 2. In all, the panelists rated six (42.8%) of the thirteen knowledge and abilities a median group rating of three, or moderately relevant, including Knowledge of Fiscal

Law, Knowledge of Logistics Management, Program Protection, Knowledge of Software Development, Knowledge of Technology Management, and Knowledge of the DoD Customer Motivations. Six (42.8%) of the thirteen knowledge and abilities had a median score of four, or significantly relevant, including Management of Contracts, Developing Positive Relationships with Stakeholders, Knowledge of DoD 5000 Series Regulations, Knowledge of Customer Organization, Leading a Team of People with Diverse Backgrounds, and Knowledge of Communication with Government Customers. Only one knowledge or ability (7.6%), Knowledge of FEMA Incident Command Systems, had a median of two, or limited relevance in Round 2.

Round 3 Results

The purpose of Round 3 was to continue to build consensus among the panelists. Of the fourteen participants, twelve (85.7%) participated in Round 3, which was sent to participants on February 11, 2013. Participants were asked to complete Round 3 by February 21, 2013. All individual and aggregate results from Round 2 were presented to each panelist in the same order to include mean score, median, standard deviation, and interquartile range for each of the knowledge and abilities. In addition, the panel members were provided with their own response from the previous round. The panelists were then asked to reevaluate their responses from Round 2 after being given the aggregate response data of all the panelists. If the panelist's response remained outside of the group consensus, the panelist was asked to justify why he or she believed that the response should be higher or lower than the consensus. At the conclusion of Round 3, the mean score, median, standard deviation, and interquartile range for each question were computed again. This time the coefficient of variation was also computed, and a

majority (53.85%) of the knowledge and abilities ranged from 0.2 to 0.249 (Table 4). The coefficients of variation for all the knowledge and abilities are between 0.00 and 0.50. This means there is a strong consensus for each of the knowledge and abilities in the research question (English & Kernan, 1976).

Table 4

Distribution of Coefficients of Variation

Range	n	%
0.010 to 0.049	0	0
0.050 to 0.099	0	0
0.100 to 0.149	3	23.08
0.150 to 0.199	1	7.69
0.200 to 0.249	7	53.85
0.250 to 0.299	1	7.69
0.300 to 0.349	0	0
0.350 to 0.399	1	7.69

Survey Item 1 focused on Management of Contracts. One panel members replied most relevant (8.33%), nine panelists replied significant relevance (75%), one panelist replied moderate relevance (8.33%), one panelist replied limited relevance (8.33%), and zero panelists replied not relevant. The mean response for this item was 3.83 with a median of 4, SD was 0.69, CV was 0.18, and the IQR was 0.0. The mean of 3.83 indicated the panelists found Management of Contracts to be significantly relevant to defense industry project management. Participants that chose to respond outside of the group's consensus provided the following justifications for their responses:

- “The successful PM [project manager] needs to have a good general knowledge and understanding of his/her contracts but will leave the details to their Contract

Specialists, e.g., Contracting Officer Representative (COR), the Contracting Officer's Technical Representative (COTR), and Subcontract Program Managers (SCPMs).”

- “The PMBoK and the PMI PMP Certification exam prep training do not adequately address the particulars of the FAR/DFARs requirements to be meaningful to a DoD Industry project manager.”

Survey Item 2 focused on Developing Positive Relationships with Stakeholders.

Two panel members replied most relevant (16.66%), nine panelists replied significant relevance (75%), one panelist replied moderate relevance (8.33%), zero panelists replied limited relevance, and zero panelists replied not relevant. The mean response for this item was 4.08 with a median of 4, SD was 0.49, CV was 0.12, and the IQR was 0.0. The mean of 4.08 indicated the panelists found Developing Positive Relationships with Stakeholders to be significantly relevant to defense industry project management. Participants that chose to respond outside of the group's consensus provided the following justifications for their responses:

- “Unless a PM [project manager] has the ability to develop positive relationships with all stakeholders then they will not be successful.”
- “In my experience this was critical.”

Survey Item 3 focused on Knowledge of Fiscal Law. Zero panel members replied most relevant, three panelists replied significant relevance (25%), six panelists replied moderate relevance (50%), three panelists replied limited relevance (25%), and zero panelists replied not relevant. The mean response for this item was 3.00 with a median of 3, SD was 0.71, CV was 0.24, and the IQR was 0.50. The mean of 3.00 indicated the

panelists found Developing Positive Relationships with Stakeholders to be moderately relevant to defense industry project management. Participants that chose to respond outside of the group's consensus provided the following justifications for their responses:

- “In my experience this was critical.”
- “The PMBoK and the PMI PMP Certification exam prep training do not adequately address the particulars of fiscal law to be meaningful to a DoD Industry project manager.”

Survey Item 4 focused on Knowledge of DoD 5000 Series Regulations. One panel member replied most relevant (8.33%), six panelists replied significant relevance (50%), four panelists replied moderate relevance (33.33%), one panelist replied limited relevance (8.33%), and zero panelists replied not relevant. The mean response for this item was 3.58 with a median of 4, SD was 0.76, CV was 0.21, and the IQR was 1.0. The mean of 3.58 indicated the panelists found Knowledge of DoD 5000 Series Regulations to be significantly relevant to defense industry project management. Participants that chose to respond outside of the group's consensus provided the following justifications for their responses:

- “Granted most DoD Projects fall under the purview and jurisdiction of DoD5000.2 and thus are not exempt from it. But some DoD Projects are indeed exempt from 5000.2 for any number of reasons. A great example of this is the National Missile Defense (NMD) Program back in the early 2000s. The NMD Program was exempted from DoD 5000.2, we threw away the Operational Requirements Document (ORD), established a set of Key Performance Parameters (KPPs) and drastically accelerated the development and deployment

of the system in less than 2 years time. I just wanted to make the point that not ALL DoD Programs fall under DoD 5000.2.”

- “My DoD experience has always allowed me to focus on my level of Project Management. While I don’t believe the 5000 series would have helped me I will freely admit there was always someone above me who understood it. It’s possible I simply didn’t place emphasis on it because someone else already had.”
- “The PMBOK and the PMI PMP Certification exam prep training do not adequately address the particulars of DoD 5000 series to be meaningful to a DoD Industry project manager.”

Survey Item 5 focused on Knowledge of Logistics Management. Zero panel members replied most relevant, zero panelists replied significant relevance, ten panelists replied moderate relevance (83.33%), two panelists replied limited relevance (16.66%), and zero panelists replied not relevant. The mean response for this item was 2.83 with a median of 3, SD was 0.37, CV was 0.13, and the IQR was 0.0. The mean of 2.83 indicated the panelists found Knowledge of Logistics Management to be moderately relevant to defense industry project management. Participants that chose to respond outside of the group’s consensus provided the following justification for their response:

- “The PMBoK and the PMI PMP Certification exam prep training do not adequately address DoD ILS functions to be meaningful to a DoD Industry project manager.”

Survey Item 6 focused on Knowledge of Customer Organization. Two panel members replied most relevant (16.16%), five panelists replied significant relevance (41.66%), four panelists replied moderate relevance (33.33%), one panelist replied

limited relevance (8.33%), and zero panelists replied not relevant. The mean response for this item was 3.67 with a median of 4, SD was 0.85, CV was 0.23, and the IQR was 1.0. The mean of 3.67 indicated the panelists found Knowledge of Customer Organization to be significantly relevant to defense industry project management. Participants that chose to respond outside of the group's consensus provided the following justifications for their responses:

- “This requirement is in no way unique to the defense industry.”
- “This question may be worded incorrectly. You give an example of the budgeting process at the end while referencing how the military is comprised. One is work flow and the other is an org [organizational] chart. When I read I was referencing how the military is compromised and knowing how a Captain is lower than a General would not help me with my work.”
- “Everybody thinks they are unique; DoD has some peculiarities, but is a Government organization and functions like the others.”
- “The Customer Org [organization] is the environment in which we work. I do not see how this could possibly be less than a 5.”

Survey Item 7 focused on Knowledge of FEMA Incident Command Systems. Zero panel members replied most relevant, one panelist replied significant relevance (8.33%), zero panelists replied moderate relevance, eight panelists replied limited relevance (66.66%), and three panelists replied not relevant (25%). The mean response for this item was 1.92 with a median of 2, SD was 0.76, CV was 0.40, and the IQR was 0.25. The mean of 1.92 indicated the panelists found Knowledge of FEMA Incident Command Systems to be of limited relevance to defense industry project management.

Participants that chose to respond outside of the group's consensus provided the following justifications for their responses:

- “I still believe that ICS [Incident Command System] plays a vital part of DoD operations. In a response situation with many agencies from DHS, DoD and DoJ come together they must use a common language and ICS supports this. I've also responded to many Federal and State emergencies and they all used ICS.”
- “This is a bit of a random question, but FEMA has not once been relevant in my experience on IT efforts.”
- “The PMBoK and the PMI PMP Certification exam prep training do not adequately address FEMA best practices nor is it relevant to a DoD Industry project manager as a general rule.”

Survey Item 8 focused on Program Protection. Zero panel members replied most relevant, four panelists replied significant relevance (33.33%), six panelists replied moderate relevance (50%), two panelists replied limited relevance (16.66%), and zero panelists replied not relevant. The mean response for this item was 2.67 with a median of 3, SD was 0.62, CV was 0.23, and the IQR was 1.0. The mean of 2.67 indicated the panelists found Program Protection to be moderately relevant to defense industry project management. Participants that chose to respond outside of the group's consensus provided the justifications for their responses, one of which is on the wrong knowledge and ability:

- “A security clearance is not optional and I do not see what it has to do with project management curriculum.”

- “I took this question to mean the relevance of a clearance and in the DoD space in DC it’s a must.”
- “Clearance is binary, so I think it is very important.”
- “The PMBOK and the PMI PMP Certification exam prep training do not adequately address the particulars of FEMA best practices to be meaningful to a DoD Industry project manager.”

Survey Item 9 focused on Knowledge of Software Development. Zero panel members replied most relevant, one panelist replied significant relevance (8.33%), six panelists replied moderate relevance (50%), five panelists replied limited relevance (41.66%), and zero panelists replied not relevant. The mean response for this item was 3.17 with a median of 3, SD was 0.69, CV was 0.22, and the IQR was 1.0. The mean of 3.17 indicated the panelists found Knowledge of Software Development to be moderately relevant to defense industry project management. Participants that chose to respond outside of the group’s consensus provided the following justifications for their responses:

- “I don’t believe that specific knowledge of software development is that relevant. It’s simply a nature of Agile development and can be applied to many areas, not just software.”
- “The PMBoK and the PMI PMP Certification exam prep training do not adequately address the particulars of SW [software] development to be meaningful to a DoD Industry project manager.”

Survey Item 10 focused on Knowledge of Technology Management. One panel member replied most relevant (8.33%), two panelists replied significant relevance (16.66%), seven panelists replied moderate relevance (58.33%), two panelists replied

limited relevance (16.66%), and zero panelists replied not relevant. The mean response for this item was 3.17 with a median of 3, SD was 0.80, CV was 0.25, and the IQR was 0.25. The mean of 3.17 indicated the panelists found Knowledge of Technology Management to be moderately relevant to defense industry project management. Participants that chose to respond outside of the group's consensus provided the following justifications for their responses:

- “Cost prohibitive is not a phrase you hear very often. The DoD has a budget greater than the GDP of most countries! They will purchase something just because they want it, not because it's useful in the long term.”
- “I may be biased here due to being in IT, but technology is what we manage.”
- “Since technology is driving everything within DoD, this factor needs a higher rating.”

Survey Item 11 focused on Knowledge of the DoD Customer Motivations. One panel member replied most relevant (8.33%), two panelists replied significant relevance (16.66%), eight panelists replied moderate relevance (66.66%), one panelist replied limited relevance (8.33%), and zero panelists replied not relevant. The mean response for this item was 3.25 with a median of 3, SD was 0.72, CV was 0.22, and the IQR was 0.25. The mean of 3.25 indicated the panelists found Knowledge of the DoD Customer Motivations to be moderately relevant to defense industry project management. Participants that chose to respond outside of the group's consensus provided the following justifications for their responses:

- “Again, it is very important for the DoD PM to have knowledge of and understand the DoD customer's motivation since it greatly influences what

actions that customer can and cannot and will and will not take. This knowledge and understanding is imperative.”

- “I think the group makes a good point”
- “I may be biased here by being at the Executive Level (above the PM [project manager]). From my vantage point, Customer Motivations drive how we scope our product.”

Survey Item 12 focused on Leading a Team of People with Diverse Backgrounds.

Three panel members replied most relevant (25%), five panelists replied significant relevance (41.66%), three panelists replied moderate relevance (25%), one panelist replied limited relevance (8.33%), and zero panelists replied not relevant. The mean response for this item was 3.83 with a median of 4, SD was 0.90, CV was 0.23, and the IQR was 1.25. The mean of 3.83 indicated the panelists found Leading a Team of People with Diverse Backgrounds to be significantly relevant to defense industry project management. Participants that chose to respond outside of the group’s consensus provided the following justifications for their responses:

- “If the PM [project manager] cannot lead a diverse group of people then he/she will not be successful. All other knowledge and understanding are secondary to this. This is Management 101 stuff.”
- “Also not unique to the defense industry or working with the government.”
- “The DoD has a very structured militaristic approach to leadership, and it’s quite often, ‘do as I say.’ I still believe that building relationships is better than wielding power that I might have through legitimate authority.”

- “I will up it to a 3, but the commonality is the mission and the commercial sense of diversity is less important here.”

Survey Item 13 focused on Knowledge of Communication with Government Customers. Three panel members replied most relevant (25%), nine panelists replied significant relevance (75%), zero panelists replied moderate relevance, zero panelists replied limited relevance, and zero panelists replied not relevant. The mean response for this item was 4.25 with a median of 4, SD was 0.43, CV was 0.10, and the IQR was 1.50. The mean of 4.25 indicated the panelists found Knowledge of Communication with Government Customers to be significantly relevant to defense industry project management. Participants that chose to respond outside of the group’s consensus provided the following justifications for their responses:

- “Good communications is more important than I originally rated it, but I believe the PMBOK does a very good job on that.”
- “Communications are my deliverable until the product, service or result is finished. It is critically important.”

The coefficient of variation ranged from 0.102 to 0.396 among the thirteen knowledge and abilities. All of the coefficients of variation were between 0.0 and 0.50 (Table 5), indicating there is a strong consensus for each of the knowledge and abilities in the research question (English & Kernan, 1976). Consensus was reached, so the researcher did not need to send another round like Round 3 (Hsu & Sandford, 2007). Justifications for responses higher or lower than the group consensus are contained in Appendix F.

Table 5

Round 3 Data

Survey Number	Knowledge and Abilities	Mean	Median	Standard Deviation	IQR	CV
1	Management of Contracts	3.83	4	0.69	0.00	0.18
2	Developing Positive Relationships with Stakeholders	4.08	4	0.49	0.00	0.12
3	Knowledge of Fiscal Law	3.00	3	0.71	0.50	0.24
4	Knowledge of DoD 5000 Series Regulations	3.58	4	0.76	1.00	0.21
5	Knowledge of Logistics Management	2.83	3	0.37	0.00	0.13
6	Knowledge of Customer Organization	3.67	4	0.85	1.00	0.23
7	Knowledge of FEMA Incident Command Systems	1.92	2	0.76	0.25	0.40
8	Program Protection	3.17	3	0.69	1.00	0.22
9	Knowledge of Software Development	2.67	3	0.62	1.00	0.23
10	Knowledge of Technology Management	3.17	3	0.80	0.25	0.25
11	Knowledge of the DoD Customer Motivations	3.25	3	0.72	0.25	0.22
12	Leading a Team of People with Diverse Backgrounds	3.83	4	0.90	1.25	0.23
13	Knowledge of Communication with Government Customers	4.25	4	0.43	0.25	0.10

Table 6

Delta Between Rounds 2 and 3

Survey Number	Knowledge and Abilities	Mean	Median	Standard Deviation
1	Management of Contracts	-0.08	0	0.02
2	Developing Positive Relationships with Stakeholders	0.27	0	-0.62
3	Knowledge of Fiscal Law	-0.18	0	-0.01
4	Knowledge of DoD 5000 Series Regulations	-0.23	0	-0.18
5	Knowledge of Logistics Management	-0.26	0	-0.30
6	Knowledge of Customer Organization	-0.06	0	-0.11
7	Knowledge of FEMA Incident Command Systems	-0.17	0	-0.14
8	Program Protection	0.17	0	-0.17
9	Knowledge of Software Development	-0.06	0	-0.24
10	Knowledge of Technology Management	0.08	0	0.01
11	Knowledge of the DoD Customer Motivations	-0.02	0	-0.14
12	Leading a Team of People with Diverse Backgrounds	0.02	0	-0.22
13	Knowledge of Communication with Government Customers	0.16	0	-0.36

Round 4 Results

The purpose of Round 4 was for participants to assess the level of necessity of each knowledge and ability identified through the previous Delphi rounds. Round 4 was sent to participants on February 22, 2013, and they were asked to complete the round by March 3, 2013. This round provided an opportunity for the participants to decide whether knowledge and abilities generated in the study were necessary additions to the PMP® credential for defense industry project managers. Participants were asked to reflect on

the Delphi method and consider if knowledge and abilities would be better described as necessary, supplemental, or neither. While previous rounds mandated that panelists choose a level of relevancy, this round gave a final opportunity to verify panelists' views on the knowledge and abilities as additions to the PMP® credential. At least 50% of the panelists who responded marked Management of Contracts (66%), Developing Positive Relationships with Stakeholders (83%), Knowledge of Customer Organization (50%), Leading a Team of People with Diverse Backgrounds (66%), and Knowledge of Communication with Government Customers (83%) as necessary additions to the PMP® credential (Table 7).

Table 7

Round 4 Data

Survey Number	Knowledge and Abilities	Necessary	Supplemental	Neither
1	Management of Contracts	8	4	0
2	Developing Positive Relationships with Stakeholders	10	2	0
3	Knowledge of Fiscal Law	2	9	1
4	Knowledge of DoD 5000 Series Regulations	6	6	0
5	Knowledge of Logistics Management	2	9	1
6	Knowledge of Customer Organization	6	5	1
7	Knowledge of FEMA Incident Command Systems	1	2	9
8	Program Protection	4	8	0
9	Knowledge of Software Development	2	6	4
10	Knowledge of Technology Management	2	9	1
11	Knowledge of the DoD Customer Motivations	3	8	1
12	Leading a Team of People with Diverse Backgrounds	8	3	1
13	Knowledge of Communication with Government Customers	10	2	0

At least 50% of the participants that responded to Round 4 marked the following knowledge and abilities as supplemental: Knowledge of Fiscal Law (75%), Knowledge of Logistics Management (75%), Program Protection (66%), Knowledge of Software Development (50%), Knowledge of Technology Management (75%), and Knowledge of the DoD Customer Motivations (66%). Knowledge of FEMA Incident Command Systems was described by 75% of the panelists as neither a necessary nor a supplemental addition to the PMP credential and was the only knowledge and ability that had at least 50% of participants describe it as such.

Knowledge of DoD 5000 Series Regulations was marked by an equal number (50%) of panelists as necessary and as supplemental. Knowledge of DoD 5000 Series Regulations was the only knowledge and abilities that had at least half of the participants describe it as supplemental that also had a median score of 4 or greater in Round 3.

Summary

The purpose of this study was to determine if the Project Management Professional credential requirements encompass the depth and breadth of knowledge for project managers required to effectively manage defense industry projects. A panel of project management training professionals from a national- recognized project management training company formed the panel of this Delphi study. The study solicited the opinions of the panel about current project management credential curriculum and if that curriculum reflects the realities of the current project management environment within the defense industry.

In Round 1, the panel identified 28 knowledge and abilities needed in the project management defense industry beyond what was required in the PMP[®] credential. An

external panel organized the responses of the panel into thirteen knowledge and abilities with definitions.

In Round 2, panelists rated each knowledge and ability in a Likert-scale survey. The mean score, median, standard deviation, and interquartile range were calculated for each response.

In Round 3, the Likert-scale survey aggregate results were redistributed with the mean score, median, standard deviation, and interquartile range data associated with each question for the individual panelist in the group. The panelists were asked to reconsider their answers if they differed from the group consensus. The researcher calculated the mean score, median, interquartile range, standard deviation, and coefficient of variation for each question. A strong consensus was reached for each of the knowledge and abilities in Round 3.

In Round 4, panelists marked each knowledge and ability as necessary, supplemental, or neither. This provided them with a final opportunity to decide if a knowledge or ability should be added to the PMP® credential as it pertains to the defense industry. Five of the knowledge and abilities were identified as necessary additions by the participants in the round.

This chapter described the results of the Delphi study. This included the results of each of the rounds as well as the panel's level of experience with the PMP® credential and the defense industry. The next chapter contains the summary, conclusions, and recommendations from the research. Chapter V summarizes the research, answers the research questions, and ends with recommendations made by the researcher for implementing the findings and for future research.

CHAPTER V

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

The purpose of this study was to determine if the Project Management Professional credential requirements include the knowledge for project managers required to effectively manage defense industry projects. This study is important to the development and evolution of the project management credential curriculum and to ensuring that this curriculum reflects the realities of the current project management environment with respect to meeting the needs of the defense industry. A four-round Delphi study was used to build consensus among defense industry project management training professionals. The Delphi method was an appropriate method to ascertain and organize the perceptions of the participants while allowing them to offer opinions anonymously. Included in this chapter is a summary of the Delphi study, conclusions based on the findings, and recommendations for implementing the findings and for further research.

Summary

The Project Management Professional (PMP)[®] credential has become a preferred credential and even a requirement by some companies for applicants for many positions in the project management field. However, the defense industry operates in a unique environment. Project managers are often subjected to challenges not found in other industries. A U.S. Department of Defense (DoD) *Project Management Book of Knowledge (PMBok)* extension was developed in the past to fill in the gaps on defense program management issues (DoD DAU, 2003). A goal of the extension was to develop a commercially available project management defense industry credential, which never

materialized. Research has suggested that the PMP[®] credential includes the necessary components of project management in general, but it is not sufficient. The purpose of this study was to determine if the Project Management Professional credential requirements encompass the knowledge for project managers required to effectively manage defense industry projects. This purpose is directly reflected in the two research questions of this study: 1) Do government contractors working on defense projects use project management knowledge and abilities that are different from what the Project Management Professional credential requires? and 2) Are there additional skill sets needed for project managers to successfully work in the defense industry?

A number of limitations existed for this study. This study used purposeful sampling. There was no measure of the level of expertise of the participants, such as educational background, experience outside the defense industry, or other relevant training each may have received. Additionally, the focus of the study is limited to the U.S.-led western defense industry, and the findings may not apply to non-western defense industry project management practices. It is also important to understand that project management is largely conceptual, and there is room for different interpretations of the field. The Delphi methodology used in this study relies on the opinions and conjecture of the panel of experts in the study. Consequently, this study is limited to one group of individuals selected as experts. The study's panel consisted of an ethnically homogeneous sample, with 92.8% of the panel identifying themselves as Caucasian males. Finally, the study did not field-test the findings. It only reported project management variations that could be used for future development of training programs.

The Delphi method is used to systematically explore the judgment of a panel of experts and form a consensus opinion in a four-round process. The population for this study was fourteen panelists, who are project management training professionals from a project management training company and also have extensive experience in defense industry project management.

Round 1 began the Delphi process with an invitation to participate and with a request for demographic information followed by an open-ended question. The question asked the panel to identify at least two knowledge and abilities needed in the project management defense industry beyond what was required in the PMP® credential and to provide a brief description of the key points of each. As a result, thirteen knowledge and abilities were compiled from the participants' responses by an external panel of three subject-matter experts.

The Round 2 survey was developed to begin to draw consensus on the knowledge and abilities found in the responses to the question posed in Round 1. The content from Round 1 was used to generate a 5-point Likert-scale survey of relevancy of knowledge and abilities sent to participants in Round 2. Of the fourteen panelists, eleven (78.5%) panelists responded to the Round 2 survey. The data collected from this round included the mean score, median, standard deviation, and interquartile range for each knowledge and ability. The mean scores ranged from 2.73 to 4.09, and the median scores ranged from 2 to 4. The interquartile range was from 0.00 to 2.00.

In Round 3, the knowledge and abilities from Round 2 were presented in the same order with the group's aggregate mean score, median, standard deviation, and interquartile range for each of the knowledge and abilities. The panel members were also

provided with their responses from the previous round. They were instructed to reaffirm their response or change their response from Round 2. If the panelist's response remained outside of the panel's consensus, the panelist was asked to justify why he or she believed that the response fell outside the consensus. Of the fourteen participants, twelve (85.7%) participated in Round 3. The mean scores ranged from 1.92 to 4.25, and the median scores ranged from 2 to 4. The interquartile range was from 0.0 to 1.25. The coefficient of variation ranged from 0.10 to 0.40 among the thirteen knowledge and abilities, meaning consensus was reached on all knowledge and abilities. No further rounds like Round 3 were needed to reach consensus.

Round 4 asked the experts to reflect on the Delphi method and to consider if knowledge and abilities addressed in the study would be better described as necessary, supplemental, or neither to the PMP® credential as it relates to the defense industry. Of the fourteen participants, twelve (85.7%) responded to the Round 4 survey. There were six knowledge sets and abilities which at least half of the participants marked as necessary, seven marked as supplemental, and one marked as neither necessary nor supplemental. One knowledge set and ability received an equal number of participants that thought it was both necessary and supplemental. However, its mean score was 3.58 and its median score was four, indicating a moderate to significantly high relevancy score on the Likert-scale used in the study.

Conclusions

This study was designed to gain insight into the knowledge and abilities requirements for project managers to effectively manage defense industry projects. A panel of sixteen project management training professionals was solicited for their

opinions of the current project management credential curriculum and whether that curriculum reflects the realities of the current project management environment. Fourteen of the sixteen project management training professionals participated in the study.

This study was guided by two research questions. The research questions and their findings are as follows:

Research Question 1: Do government contractors working on defense projects use project management knowledge and abilities that are different from what the Project Management Professional credential requires?

The knowledge and abilities that were found to be necessary in this study support Zdanytė and Neverauskas's (2011) claim that no project occurs in a vacuum. The project management process must conform to the context of the project, as is clearly evident in the opinions of this study's participants. The participants have indicated that defense related projects use knowledge and abilities that are different from what the Project Management Professional credential requires. The participants have indicated that defense-related projects use knowledge and abilities that are more wide-ranging and in-depth than what the Project Management Professional credential requires.

Knowledge of Communication with Government Customers ($M= 4.25$) and Developing Positive Relationships with Stakeholders ($M= 4.08$) had the first- and second-highest mean scores respectively, which implies that the project management process must conform to the context of the project, a critical requirement for the defense industry. These two knowledge and abilities also tied for the greatest percentage of panelists, who stipulated these criteria as necessary additions for a defense industry specific project management credential. This is not surprising considering that contextual

variables such as contact with clients, working with teams, and perception of leadership play critical roles in project success (Zdanytė & Neverauskas, 2011). The consensus opinion of this study's participants is in clear agreement with Sutterfield et al. (2006) in their understanding of sponsors as essential to success in the military project management environment.

Templin (1994) points out that project management requirements of the defense industry include unique acquisition pricing, which is not as concerned with market forces such as competition, but rather with anticipated or incurred costs. The PMP® credential is known as a "gold standard" and has become a strongly preferred credential by some companies for applicants for positions in the project management field. However, given that the defense industry operates in a unique environment, these realities require knowledge and abilities beyond the scope of what the PMP® credential currently requires (Remer & Martin, 2009; Starkweather & Stevenson, 2011). Understanding unique differences in DoD acquisition falls under two other knowledge and abilities described as necessary: Management of Contracts ($M= 3.83$) and Knowledge of DoD 5000 Series Regulations ($M= 3.58$). The result of this study was the identification and description of those knowledge and abilities.

This study reaffirms the findings of earlier work by Starkweather and Stevenson (2011), which stated that while the PMP® credential contains necessary project management knowledge, it is insufficient as an all-encompassing project management credential. The results of Research Question 1 provide insight into additional project management knowledge and abilities needed specifically for project management in the defense industry.

Research Question 2: Are there additional skill sets needed for project managers to successfully work in the defense industry?

At least half of the participants identified six additional necessary knowledge and abilities and seven additional supplemental knowledge and abilities for defense industry project managers that are not currently included in the Project Management Professional (PMP)[®] credential. These knowledge and abilities represented the additional skill sets needed for project managers to work in the defense industry as indicated by participants of this study. The consensus-building process in Rounds 2 and 3, as well as the current literature, support the findings that the additional knowledge and abilities identified as necessary in this study are required to better support the defense industry.

The Knowledge of DoD 5000 Series Regulations had an equal number of participants describe it as necessary and supplemental. Its mean score was 3.58 and its median score was four. These scores on the Likert-scale indicate a significant relevancy for defense industry project managers. Knowledge of DoD 5000 Series Regulations was the only knowledge or ability to have a median score of four or greater and to have at least half the participants describe it as supplemental. These data lead the researcher to believe that Knowledge of DoD 5000 Series Regulations should be considered a necessary addition to a PMP[®] curriculum tailored to defense industry project managers.

Additional necessary knowledge and abilities included Management of Contracts, which had a third-round mean score of 3.83 and a coefficient of variation of 0.18, indicating a significant relevancy and strong consensus among the participants. Eight of the twelve (66%) participants in Round 4 thought that the Management of Contracts is a

necessary addition. Three participants provided justifications for their responses outside of the group's consensus in Round 3. The first participant stated:

Granted most DoD Projects fall under the purview and jurisdiction of DoD 5000.2 and thus are not exempt from it. But some DoD Projects are indeed exempt from 5000.2 for any number of reasons. A great example of this is the National Missile Defense (NMD) Program back in the early 2000's. The NMD [National Missile Defense] Program was exempted from DoD 5000.2, we threw away the Operational Requirements Document (ORD), established a set of Key Performance Parameters (KPPs) and drastically accelerated the development and deployment of the system in less than 2 years' time. I just wanted to make the point that not ALL DoD Programs fall under DoD 5000.2.

The DoD 5000 Defense Acquisition System is the management process that guides all DoD acquisition programs. This participant's justification addresses only the DoD 5000.2 Instruction which is only one piece of the DoD 5000 series of instructions and regulations (Operation of the Defense Acquisition System). The participant does not address National Missile Defense's (NMD) exemption to all of the DoD 5000 directives, regulations, and instructions and was therefore not sufficiently meaningful to provide to the other participants. The second participant stated:

My DoD experience has always allowed me to focus on my level of Project Management. While I don't believe the 5000 series would have helped me I will freely admit there was always someone above me who understood it. It's possible I simply didn't place emphasis on it because someone else already had.

This participant's Likert-scale response was close to the group's consensus as he implied that although he did not emphasize Knowledge DoD 5000 Series Regulations, his superiors do. The participant's justification does clarify why the participant chose to respond the way he did but suggested his own bias toward the topic was driven by his perception being a project manager at a lower level than he feels the DoD 5000 Series Regulations are directed. The third participant stated, "The PMBoK and the PMI PMP Certification exam preparation training do not adequately address the particulars of DoD 5000 series to be meaningful to a DoD Industry project manager." The participant's justification implies that he agrees with the group's consensus in Round 2, yet the participant changed his answer from Round 2 to differ from the consensus in Round 3. The participant only states that the PMP® does not address the particulars of DoD 5000 series. The participant does not address why he changed his answer.

Developing Positive Relationships with Stakeholders had the second highest mean score with 4.08 and a coefficient of variation of 0.12 indicating a significant relevancy and strong consensus among the participants. Ten of the twelve (83%) participants in Round 4 believed that this ability was a necessary addition. One participant provided a justification for his response outside of the group's consensus in Round 3 and stated, "Unless a PM [project manager] has the ability to develop positive relationships with all stakeholders, then they will not be successful." This justification is a very general statement that suggests that developing positive relationships with stakeholders is a foregone implication, and as such is already deemed in consensus. Knowledge of Customer Organization had a mean score of 3.67 and a median score of 4. Its coefficient of variation in Round 3 was 0.23, indicating a significant relevancy and

strong consensus among the participants. Half (50%) of the participants believed that this knowledge set was necessary. Four participants provided justifications for their response outside of the group's consensus in Round 3 for Knowledge of Customer Organization. The first participant stated that "This requirement is in no way unique to the defense industry." This ability may not be unique to the defense industry, but the research question asks if it is important to the success of defense industry project management. The participant's response does not address the research question as it relates to the defense industry specifically in his justification and suggests that Knowledge of the Customer Organization is still necessary for any successful project manager. The second participant stated:

This question may be worded incorrectly. You give an example of the budgeting process at the end while referencing how the military is comprised. One is work flow and the other is an org [organizational] chart. When I read I was referencing how the military is compromised and knowing how a Captain is lower than a General would not help me with my work.

This participant appears to have misinterpreted the knowledge as it was presented or was confused by the definition given to the knowledge. This was the only response that indicated any confusion about the Knowledge of Customer Organization. The third participant stated, "Everybody thinks they are unique; DoD has some peculiarities, but is a Government organization and functions like the others". This ability may not be unique to the defense industry, but the question asks if it is important to the success of defense industry project management. The participant's response does not address the research question as it relates to the defense industry specifically in his justification but still

suggests that Knowledge of the Customer Organization is necessary for any successful project manager. The fourth participant stated, “The Customer Org [organization] is the environment in which we work. I do not see how this could possibly be less than a 5.” This justification seems to present the most extreme interpretation of the description provided for Knowledge of Customer Organization, which is of little value in making a case for other participants to reflect upon.

Leading a Team of People with Diverse Backgrounds tied for the third largest mean with a score of 3.83, indicating a significant relevancy. Its median score was 4 with a coefficient of variation of 0.23 indicating a consensus; however, this ability had the highest coefficient of variation of all the knowledge and abilities described as necessary. Four participants provided justifications for their response outside of the group’s consensus in Round 3 for Leading a Team of People with Diverse Backgrounds. The first participant stated, “If the PM [project manager] cannot lead a diverse group of people then he/she will not be successful. All other knowledge and understanding are secondary to this. This is Management 101 stuff.” This justification shows that the participant has taken the extreme interpretation of the ability. The group data as a whole clearly showed that it was less important than this participant thought. The second participant stated, “Also not unique to the defense industry or working with the government.” This ability may not be unique to the defense industry, but the question asks if it is important to the success of defense industry project management. The participant does not justify the response within the bounds of the research question asked. The third participant stated, “The DoD has a very structured militaristic approach to leadership, and it’s quite often, ‘do as I say.’ I still believe that building relationships is better than wielding power that I

might have through legitimate authority.” This participant takes a comparative approach in his justification. He admits that the culture of the DoD is one way but suggests something else from his experience. The fourth participant stated, “I will up it to a 3, but the commonality is the mission and the commercial sense of diversity is less important here.” The participant did change his response to bring it closer to the consensus, therefore a justification was not needed.

Knowledge of Communication with Government Customers had the highest mean score of any knowledge or ability in the study at 4.25 indicating a significant relevancy, and a median score of 4. This knowledge set also had the lowest coefficient of variation in the study at 0.10 indicating a strong consensus. Two participants provided justifications for their response outside of the group’s consensus in Round 3. The first participant stated, “Good communications is more important than I originally rated it, but I believe the PMBoK does a very good job on that.” No justification was needed because the participant changed that answer to agree with the group consensus. The second participant stated, “Communications are my deliverable until the product, service or result is finished. It is critically important.” The participant offers a credible justification, but his response was so close to the consensus of the group as to not warrant a justification.

The project management training community may consider strategically evaluating the needs of their defense industry customers. The defense industry needs a unique project management credential appropriately tailored to its requirements. A commercially available credential was a goal of the DoD *PMBoK* (2003) developed by the Project Management Institute (PMI) and the Defense Acquisition University (DAU),

however this goal was never achieved. The findings of this study confirm that the defense industry still needs this revised credential. A commercially available credential should carefully consider the results of this study in evaluating the needs of the defense industry. This study provides the evaluation and opinions of defense industry project management trainers, whose opinions are ideally suited for the baseline development of a commercially available credential. This study confirmed the need for a commercially available, defense-industry specific, project management credential patterned after the government sponsored U.S. DoD *PMBok*. The commercial defense industry has its own similar but unique project management needs that differ from what a government-focused credential provided, including key components and topics such as Knowledge of Communication with Government Customers, Knowledge of Customer Organization, Leading a Team of People with Diverse Backgrounds, Developing Positive Relationships with Stakeholders, and Management of Contracts. Knowledge of DoD 5000 Series Regulations is an example of a project management need that both government-focused and commercial industry credentials should include.

Recommendations

The following recommendations for further research by the project management community are based upon the findings of this Delphi study and the literature:

The development of a commercially available, defense industry specific, project management credential and its associated training materials should be a priority for project management organizations, so they can oversee the standards and train personnel to support the needs of the defense industry more effectively. The need for such a defense industry specific credential was originally recognized in the U.S. DoD *PMBok* in

2003 and further confirmed by this study. As it stands, the Project Management Professional (PMP)[®] credential can be described as a necessary foundation for project management in general; however, it remains insufficient for the specific needs of defense industry customers. Furthermore, the Project Management Institute (PMI) should consider the unique needs of the defense industry, as this study suggests, by incorporating the six necessary additions found in this study to the U.S. DoD *PMBok* for the express purpose of catering to the commercial defense industry. This implies that participants receiving the defense industry specific project management credential would then be able to obtain the knowledge and abilities that are consistent with the unique standards of the defense industry. Moreover, it would be beneficial to the defense community if the U.S. DoD *PMBok* could be updated to current DoD standards and practices since it is nearly a decade old at the time this study was published.

The International Project Management Association (IPMA) and the Association for Project Management (APM) should also consider the findings of this study within the context of their own organization's credential offerings. IPMA and APM cater largely to non-U.S. customers and should evaluate the needs of their own unique defense industry project management customers prior to developing a defense industry specific credential.

This study provides a foundation and direction for future research on the relevancy of necessary and supplemental knowledge and abilities in the field of defense industry project management. Further research should consider delving deeper into knowledge and abilities identified as necessary or supplemental, with high relevancy scores from the Likert-scale surveys.

While this study focused on the body of knowledge of project managers, an element not considered was the requirement of experience for the project management credential. Currently the PMP® credential requires three years of experience. Research should consider the amount and type of experience required by defense industry specific project management credentials. A qualitative study including trainers, managers, and executives could provide more insight into that project management credential variable. The credential's experience requirements should be explored to ensure a sufficient amount of experience given the unique environment of defense industry.

This study drew participants from one project management training company. Future studies should include a greater number of participants, and the participants should be drawn from multiple project management training companies. A broader panel will increase the validity and reliability of the identified knowledge and abilities for defense industry project managers. Then these knowledge and abilities maybe integrated into a project management certification directed to defense industry project managers.

The number of individuals awarded the PMP® credential has grown in recent years. Future research should explore the impact that such significant growth has had on the quality, accountability, and impact of the PMP® credential. This is especially true in regions such as East Asia, where the demand for credentialed project managers is rapidly increasing. Future research may also be warranted in exploring details and purpose of individuals who are pursuing the PMP® credential, and whether or not the credential is having an appropriate impact on their customers. It would also be helpful to understand the number of individuals who are pursuing the PMP® credential but are not in positions related to project management and why they are pursuing the credential.

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APPENDIX A**INTRODUCTORY E-MAIL REQUESTING PARTICIPATION IN THE DELPHI****EXPERT PANEL**

To:
From: Cole Kupec <ckupe001@odu.edu>
Subject: PMP® Defense Industry Research
Date:

Dear _____,

The Project Management Professional (PMP)® credential is widely accepted as the gold standard in project management credentials. It has become a strongly preferred credential and even a requirement by some companies to apply for positions in the project management field. The defense industry operates in a unique environment and is subject to challenges not found in other industries. Attempts in the past, including the U.S. DoD PMBoK extension, have been developed to fill in the gaps on defense program management issues. The long term goal of the extension was to develop a commercially available credential, which was never realized. Some research has suggested that the PMP® credential includes the necessary components of project management but is not sufficient. The goal of this research is to ascertain and organize the perceptions of defense industry project management professionals on the appropriateness of the PMP® credential as an encompassing credential for use by the defense industry.

I am a doctoral candidate at Old Dominion University working on my dissertation to assess the PMP® credential qualifications including knowledge and abilities for project managers on defense industry projects. This study will complete a requirement for my dissertation for a degree in Occupational and Technical Studies with a concentration in Human Resources Training.

This study will use the Delphi method of research. The Delphi method is used to systematically explore the judgment of a panel of experts and form a consensus opinion in a multiple round process. I have solicited experts in the defense industry project management field for individuals that possess expertise in the domain of this study. You have been identified as a subject-matter expert, and you have been purposefully selected based on your knowledge of the PMP® and the defense industry.

This study will continue be conducted across an eight week period. It begins the first week in January and will continue through the last week in February. Each of the study's rounds will take two weeks to distribute and collect.

As an individual with experience with both the PMP® credential and the defense industry, I am inviting you to participate in this study to aid in a better understanding of the current

defense industry project management skill set needs. This Delphi study will include four rounds of questions. The question for Round 1 will be found on a link, sent by email. The participant's link will take them to an online survey software website called SurveyMonkey.comTM to participate in the study. All additional rounds will be sent as a Microsoft Word[®] document attached in an email. Your participation in this survey is voluntary. The responses given to Round 1 are anonymous and all the following rounds are kept confidential. The results of the study will be reported in aggregate to further minimize risk to the participant. Your identifying information will be destroyed upon completion of the study. Your participation will aid in developing the field of project management in the defense industry by bring forward skill sets that merit further attention. There are no benefits to you for your participation in this study. By guarding your response there should be little risk of harm to you. Participants may withdraw from the study at any time and for any reason.

Your participation in this study could help to contribute to the advancement and understanding of defense industry project management. If you are willing to join me in this endeavor, please complete the contact information below and reply to this e-mail. Please feel free to contact me with any questions at (703) 338-8306 or by email at ckuce001@odu.edu.

I appreciate your time and assistance in this research. Upon completion of the study, an electronic copy of the findings of this study will be sent to you upon request.

Very Respectfully,

Cole J. Kupec II
Ph.D. Candidate
Old Dominion University
ckuce001@odu.edu

Dr. John M. Ritz
Professor
Department of STEM Education
and Professional Studies
Old Dominion University

Contact Information

Name:
Preferred E-mail address:
Phone Number:
Title/Position:
Organization:

Gender: _____

Age: _____

Race/Ethnicity: _____

Years of defense industry experience? _____

Years of defense industry project management experience? _____

Years of experience/familiarity with the PMP® credential? _____

APPENDIX B
ROUND 1 INSTRUCTIONS

To:
From: Cole Kupec <ckupe001@odu.edu>
Subject: Round 1 Instrument
Date: January 14, 2013

This email is Round 1 of the Delphi study to assess the PMP® credential and additional knowledge and abilities that may be needed in the project management defense industry. This round is prudent to the effectiveness of the study. Your responses are needed no later than January 28, 2013.

You can access the Round 1 survey through the following link:

<http://www.surveymonkey.com/s/X6DC56J>

Please allow me in advance to thank you for your assistance in the completion of this study. I appreciate your time, and I will do all I can to ensure that this process moves along as efficiently and effectively as possible.

Please feel free to contact me anytime with questions or concerns by phone at (703) 338-8306 or by e-mail at ckupe001@odu.edu.

Very Respectfully,

Cole J. Kupec II
Ph.D. Candidate
Old Dominion University
ckupe001@odu.edu

Dr. John M. Ritz
Professor
Department of STEM Education
and Professional Studies
Old Dominion University

APPENDIX C

ROUND 1

Purpose: The purpose of this study is to determine individual qualifications including knowledge and abilities in project management beyond what is required knowledge on the Project Management Professional (PMP)[®] credential in the defense industry.

Directions: Please answer the question with at least two concise responses at any length you require.

Timetable: It is important to move the process along as efficiently as possible to minimize the inconvenience to each of the participants. I will do my utmost to achieve that efficiency. The e-mail with this link was sent on January 14th. Please respond within two weeks.

Definition of Terms: Below are the definitions of common terms for the purposes of your response and the reported results of this study.

Credential - Certificate of added qualifications (Chodosh et al., 2004).

Defense Industry - Companies that operate on Department of Defense contracts that conform to defense contracting requirements and operate in an environment where the government regulates returns and owns the intellectual property that the company produces for the Department of Defense (Harned & Lundquist, 2003).

Project - A temporary endeavor undertaken to create a unique product, service, or result (*PMBok Guide*, 2008).

Project Management - The application of knowledge, skills, tools, and techniques to project activities in order to meet the project requirements (*PMBok Guide*, 2008).

Project Stakeholder - Any individual or group of individuals that is directly or indirectly impacted by a project (Sutterfield, Friday-Stroud, & Shivers-Blackwell, 2006).

Question: Are there additional qualifications including knowledge and abilities that are needed for project managers to successfully work in the defense industry? Please list a minimum of two skill sets needed. For the purpose of this study, skill sets include additional bodies of knowledge, methodologies, or qualifications such as knowledge on product systems engineering management, project logistics management such as sustainment logistics, project test/evaluation management, and security functions. Please describe your responses with a few sentences for clarification.

Example Response from Another Field: Infrastructure management is a critical body of knowledge to the success of an overwhelming number of project managers in the urban construction industry. Infrastructure management is a branch of Civil Engineering that designs, monitors, regulates, and plans for infrastructure projects. Infrastructure management can address problems in disaster management, disaster mitigation, and

urban management. Infrastructure management is critical to the participation of private sectors in infrastructure supply.

Thank you for your time and assistance.

APPENDIX D**ROUND 1 FOLLOW-UP E-MAIL**

To:
From: Cole Kupec <ckupe001@odu.edu>
Subject: Round 1 Instrument Follow-up
Date: January 21, 2013

On January 14, 2013 I sent Round 1 of the Delphi study. This is a gentle reminder to see if you submitted your response to Round 1 of the study. The purpose of this study is to determine individual qualifications including knowledge and abilities in project management beyond what is required knowledge on the Project Management Professional (PMP)[®] credential in the defense industry.

Your expertise and assistance are critical to the study. Please answer and return the Round 1 questions as soon as possible if you have not yet done so already. The link for the Round 1 survey is here for your convenience:

<http://www.surveymonkey.com/s/X6DC56J>

Please feel free to contact me anytime with questions or concerns by phone at (703) 338-8306 or by e-mail at ckupe001@odu.edu.

Thank you for your time and assistance in this study.

Very Respectfully,

Cole J. Kupec II
Ph.D. Candidate
Old Dominion University
ckupe001@odu.edu

Dr. John M. Ritz
Professor
Department of STEM Education
and Professional Studies
Old Dominion University

APPENDIX E
ROUND 2 INSTRUCTIONS

To:
From: Cole Kupec <ckupe001@odu.edu>
Subject: PMP Delphi Study Round 2
Date: January 31, 2013

Dear _____,

Thank you for your input into the Round 1 questionnaire regarding additional qualifications including knowledge and abilities that are needed for project managers to successfully work in the defense industry. The qualifications including knowledge and abilities have been compiled for further input from all panelists. Round 2 consists of a Likert scale survey found in the Microsoft Word attachment to this email. This round provides the opportunity to respond to the group's results from Round 1.

The Round 2 survey is important to begin drawing consensus on the responses to the Round 1 question. As you read and respond to the Likert scale survey it is important to keep in mind that the descriptions of knowledge and abilities are responses from participants in Round 1. In cases where multiple participants submitted similar responses in Round 1, the descriptions have been combined to encapsulate the essence of what the participants submitted.

Please answer and return the Round 2 survey by February 9, 2013. Your expertise and assistance are critical to the study. Feel free to contact me with any questions by phone at (703) 338-8306 or by email at ckupe001@odu.edu.

Thank you for your time and assistance in this study.

Very Respectfully,

Cole J. Kupec II
Ph.D. Candidate
Old Dominion University
ckupe001@odu.edu

Dr. John M. Ritz
Professor
Department of STEM Education
and Professional Studies
Old Dominion University

APPENDIX F

ROUND 2

Round 2- Project Management Professional Training Needs for Defense Industry Projects

Purpose: The purpose of this study is to determine if the Project Management Professional (PMP®) credential requirements encompass the knowledge for project managers required to effectively manage defense industry projects. The purpose of this round is for participants to rank the relevance of knowledge and abilities, to be used as a means of building consensus between participants in future rounds.

Directions: For each knowledge and ability please mark an “X” on the appropriate relevance as an addition to the PMP® credential as it pertains to defense industry project management. Mark only one answer for each.

Timetable: It is important to move the process along as efficiently as possible to minimize the inconvenience to each of the participants. I will do my utmost to achieve that efficiency. The e-mail with this attachment was sent on January 31, 2013. Please respond within 10 days.

	Not Relevant	Limited Relevant	Moderately Relevant	Significantly Relevant	Most Relevant
1) Management of Contracts Description: The project manager is expected to be able to participate in the contracting process from proposal through closure of the contract. In order to ensure that all contractual requirements are being met, the project manager must not just understand the Statement of Work (SOW), but also the rules and regulations behind the requirements. This includes knowledge of the Federal Acquisition Regulation (FAR) which will enhance a defense industry project manager’s experience with their DoD counterpart. An understanding of the FAR is important to project managers in the defense industry because the underlying laws and regulations directly impact requirement, cost, and schedule implications that may not be encountered in other commercial sectors.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Not Relevant	Limited Relevant	Moderately Relevant	Significantly Relevant	Most Relevant

<p>2) Developing Positive Relationships with Stakeholders Description: Earning stakeholder’s confidence and trust is a critical qualification for any project manager in the defense industry. Stakeholders include senior DoD oversight management, relationships with the Government Accounting Office, and Congressional Staffers, for examples. This often requires the need to have great interpersonal skills in human relations, leading, and consensus building.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Not Relevant	Limited Relevant	Moderately Relevant	Significantly Relevant	Most Relevant
<p>3) Knowledge of Fiscal Law Description: Knowledge of fiscal law specific to the defense industry that is not encountered in other commercial sectors is important to a defense industry project manager. An understanding of this area is important because the underlying laws and regulations directly impact requirement, cost, and schedule implications.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Not Relevant	Limited Relevant	Moderately Relevant	Significantly Relevant	Most Relevant
<p>4) Knowledge of DoD 5000 Series Regulations Description: The DoD 5000 series regulations is a critical body of knowledge to the success of the vast majority of project managers in the defense industry as it guides all DoD acquisitions. In order to meet the contract requirements within the DoD Acquisition Community, a basic knowledge of the DOD 5000 series regulations that outline the acquisition cycles and all of the standard requirements (concept development, engineering development, test and evaluation and the rest) along with the standard timelines within the DoD and Congress is a necessity. Defense acquisition methods are unique and often complex compared to the procurement processes in other industries.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Not Relevant	Limited Relevant	Moderately Relevant	Significantly Relevant	Most Relevant

<p>5) Knowledge of Logistics Management Description: Defense acquisition methods are unique and often complex compared to the procurement processes in other industries. Understanding the logistics process of integrating DoD acquired products and contractor provided products is critical to defense industry project managers. An understanding of logistics and the associated constraints with military methods are required to successfully complete many of today's defense industry projects. As an example, the critical factor on military transport aircraft is the pallet foot print. As fuel costs continue to rise designing smaller and lighter systems will be crucial.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Not Relevant	Limited Relevant	Moderately Relevant	Significantly Relevant	Most Relevant
<p>6) Knowledge of Customer Organization Description: A successful project manager in the defense industry understands how the military is comprised. This will enable the project manager to have a greater understanding of how to access stakeholder value. Project managers in the defense industry need a working knowledge of their customer's organization as well as their own. All too often we limit organizational process assets to one's own organization. It is very important to understand the processes and procedures of the customer's organization. This is especially true if the customer is the Government. One example is the budgeting process.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Not Relevant	Limited Relevant	Moderately Relevant	Significantly Relevant	Most Relevant
<p>7) Knowledge of FEMA Incident Command Systems Description: FEMA Incident Command Systems contain incident best practices born from the 9/11 commission report. These practices are widely used within the Department of Defense.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Not Relevant	Limited Relevant	Moderately Relevant	Significantly Relevant	Most Relevant
<p>8) Program Protection Description: A security clearance is normally needed to work in the DoD and a lack of one will severely limit your information access. Security protocol are common practices that are well supported in the Project Management Body of Knowledge (PMBOK), however, the defense industry applies a level of scrutiny well beyond that practiced in non-DoD commercial projects.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Not Relevant	Limited Relevant	Moderately Relevant	Significantly Relevant	Most Relevant
9) Knowledge of Software Development Description: Testing and verification may be conducted in cyclical and redundant parallel processes not anticipated by any project management discipline.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Not Relevant	Limited Relevant	Moderately Relevant	Significantly Relevant	Most Relevant
10) Knowledge of Technology Management Description: Project managers in the defense industry need to have a working knowledge of the technology involved with their project. Technology management is a disciplined approach to vetting the near future from the far future, and the realistic cost objectives from the prohibitive. Although common project management practices apply and are very useful, understanding the import and impact of technologies that have not been implemented into tangible products pushes all one into the realm of "imagineering". This is counter-intuitive to a disciplined process, but must be allowed for.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Not Relevant	Limited Relevant	Moderately Relevant	Significantly Relevant	Most Relevant
11) Knowledge of the DoD Customer Motivations Description: Generally speaking, the DoD customer is motivated by their mission and the accomplishment of that mission; not profit. This makes all the difference in the world in terms of how the DoD customer defines and then prioritizes their requirements for a particular project. The DoD customer is focused on "spending money" as opposed to "making money." Now, that is not to say that the DoD customer isn't interested in being efficient and effective. They probably are concerned with efficiency and effectiveness to a degree (so that they can ultimately get more for their money) but that is not necessarily a "driving factor" like it is in a commercial enterprise like a for-profit company that has shareholders to answer to.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Not Relevant	Limited Relevant	Moderately Relevant	Significantly Relevant	Most Relevant

<p>12) Leading a Team of People with Diverse Backgrounds Description: For example, members of the team will be from different disciplines (Engineering, Budget & Finance, Test, Logistics, etc) and may also be members Armed Forces (Army, Navy, Air Force, Marines, and Coast Guard), Federal Employees (Government Civilians), Other Contractors (both Materiel Developer Contractors as well as Support Engineering & Technical Assistance (SETA) Contractors), National Laboratories (Lincoln Labs, Sandia Labs, etc), Other Government Agencies and organizations, Federally Funded Research & Development Centers (FFRDCs), Historically Black Colleges & Universities (HBCUs), and University Affiliated Research Centers (UARCs), just to name a few. It is very important for the leader to know and understand that each member of "The Team" has a different perspective and motivation based on what organization they belong to and that those perspectives and motivations influence how they act and behave. It is imperative that the project manager, operating in such an environment, has the skill and the ability to bring all of the different team members together as a cohesive team focused on the cost, schedule, and performance goals of the project from the start of the project on through to the successful completion of the project.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Not Relevant	Limited Relevant	Moderately Relevant	Significantly Relevant	Most Relevant
<p>13) Knowledge of Communication with Government Customers Description: Communicating with the government customer is critical to the successful project. While this is not exclusive to the DoD project manager, it is important to note that the government operates very differently from domestic customers. Project managers must be able to communicate customer requirements to internal resources and communicate procurement processes to the customer.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If any knowledge or abilities are not in the survey that you believe should be added, please submit them with a description below:

APPENDIX G
ROUND 3 INSTRUCTIONS

To:
From: Cole Kupec <ckupe001@odu.edu>
Subject: PMP Delphi Study Round 3
Date: February 11, 2013

Dear _____,

Thank you again for volunteering to participate in this Delphi study. This study addresses the additional qualifications including knowledge and abilities that are needed for project managers to successfully work in the defense industry.

This round of the Delphi study provides you the opportunity to respond to the group's results from Round 2. Round 3 consists of a Likert-scale survey with the same knowledge and abilities found in the survey from Round 2. Your responses to the last round, as well as the group's aggregate data, is provided with each question. In this round you are asked to reflect on your responses in light of the other panel members collected responses. You still need to select a response for each question in Round 3. If you choose to respond outside of the group responses, you should provide a justification as to why you believe that the response should be higher or lower than the group consensus. The survey can be found in the Microsoft Word attachment to this email.

Please answer and return the Round 3 survey by February 21, 2013. Your expertise and assistance are critical to the completion of the study. Feel free to contact me with any questions by phone at (703) 338-8306 or by email at ckupe001@odu.edu.

Thank you for your time and assistance in this study.

Very Respectfully,

Cole J. Kupec II
Ph.D. Candidate
Old Dominion University
ckupe001@odu.edu

Dr. John M. Ritz
Professor
Department of STEM Education
and Professional Studies
Old Dominion University

APPENDIX H

ROUND 3

Round 3- Project Management Professional Training Needs for Defense Industry Projects

Purpose: The purpose of this study is to determine if the Project Management Professional (PMP®) credential requirements encompass the knowledge for project managers required to effectively manage defense industry projects. The purpose of this round is for participants to indicate the relevance of knowledge and abilities after reflecting on the group's aggregate responses in the previous round.

Directions: Below you will see a similar Likert-scale survey with the same knowledge and abilities found in the survey from Round 2. Your responses to the last round, as well as the group's aggregate data, is provided with each question. In this round you are asked to reflect and reaffirm your responses to Round 2 or change your response from the previous round based on the panel's overall aggregate responses. You should respond to each question even if your opinion is the same. If you choose to respond outside of the of the group's consensus, please provide a justification for your response. Please mark an "X" on the appropriate relevance as an addition to the PMP® credential as it pertains to defense industry project management. Mark only one answer for each.

Timetable: It is important to move the process along as efficiently as possible to minimize the inconvenience to each of the participants. I will do my utmost to achieve that efficiency. The e-mail with this attachment was sent on February 11, 2013. Please respond within 10 days.

	Not Relevant (1)	Limited Relevant (2)	Moderately Relevant (3)	Significantly Relevant (4)	Most Relevant (5)
<p>1) Management of Contracts</p> <p>Description: The project manager is expected to be able to participate in the contracting process from proposal through closure of the contract. In order to ensure that all contractual requirements are being met, the project manager must not just understand the Statement of Work (SOW), but also the rules and regulations behind the requirements. This includes knowledge of the Federal Acquisition Regulation (FAR) which will enhance a defense industry project manager's experience with their DoD counterpart. An understanding of the FAR is important to project managers in the defense industry because the underlying laws and regulations directly impact requirement, cost, and schedule implications that may not be encountered in other commercial sectors.</p> <p>Your Round 2 Response: Group Round 2 Mean Response: 3.9 Median: 4 Standard Deviation: 0.668 IQR: 3.5-4</p> <p>Justification, if needed:</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Not Relevant (1)	Limited Relevant (2)	Moderately Relevant (3)	Significantly Relevant (4)	Most Relevant (5)
<p>2) Developing Positive Relationships with Stakeholders</p> <p>Description: Earning stakeholder's confidence and trust is a critical qualification for any project manager in the defense industry. Stakeholders include senior DoD oversight management, relationships with the Government Accounting Office, and Congressional Staffers, for examples. This often requires the need to have great interpersonal skills in human relations, leading, and consensus building.</p> <p>Your Round 2 Response: Group Round 2 Mean Response: 3.8 Median: 4 Standard Deviation: 1.113 IQR: 3-5</p> <p>Justification, if needed:</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Not Relevant (1)	Limited Relevant (2)	Moderately Relevant (3)	Significantly Relevant (4)	Most Relevant (5)

<p>3) Knowledge of Fiscal Law Description: Knowledge of fiscal law specific to the defense industry that is not encountered in other commercial sectors is important to a defense industry project manager. An understanding of this area is important because the underlying laws and regulations directly impact requirement, cost, and schedule implications. Your Round 2 Response: Group Round 2 Mean Response: 3.2 Median: 3 Standard Deviation: 0.716 IQR: 3-4 Justification, if needed:</p>	☐	☐	☐	☐	☐
	Not Relevant (1)	Limited Relevant (2)	Moderately Relevant (3)	Significantly Relevant (4)	Most Relevant (5)
<p>4) Knowledge of DoD 5000 Series Regulations Description: The DoD 5000 series regulations is a critical body of knowledge to the success of the vast majority of project managers in the defense industry as it guides all DoD acquisitions. In order to meet the contract requirements within the DoD Acquisition Community, a basic knowledge of the DOD 5000 series regulations that outline the acquisition cycles and all of the standard requirements (concept development, engineering development, test and evaluation, and the rest) along with the standard timelines within the DoD and Congress is a necessity. Defense acquisition methods are unique and often complex compared to the procurement processes in other industries. Your Round 2 Response: Group Round 2 Mean Response: 3.8 Median: 4 Standard Deviation: 0.936 IQR: 3-4.5 Justification, if needed:</p>	☐	☐	☐	☐	☐
	Not Relevant (1)	Limited Relevant (2)	Moderately Relevant (3)	Significantly Relevant (4)	Most Relevant (5)

<p>5) Knowledge of Logistics Management Description: Defense acquisition methods are unique and often complex compared to the procurement processes in other industries. Understanding the logistics process of integrating DoD acquired products and contractor provided products is critical to defense industry project managers. An understanding of logistics and the associated constraints with military methods are required to successfully complete many of today's defense industry projects. As an example, the critical factor on military transport aircraft is the pallet foot print. As fuel costs continue to rise, designing smaller and lighter systems will be crucial. Your Round 2 Response: Group Round 2 Mean Response: 3.1 Median: 3 Standard Deviation: 0.668 IQR: 3-3.5 Justification, if needed:</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Not Relevant (1)	Limited Relevant (2)	Moderately Relevant (3)	Significantly Relevant (4)	Most Relevant (5)
<p>6) Knowledge of Customer Organization Description: A successful project manager in the defense industry understands how the military is comprised. This will enable the project manager to have a greater understanding of how to access stakeholder value. Project managers in the defense industry need a working knowledge of their customer's organization as well as their own. All too often we limit organizational process assets to one's own organization. It is very important to understand the processes and procedures of the customer's organization. This is especially true if the customer is the Government. One example is the budgeting process. Your Round 2 Response: Group Round 2 Mean Response: 3.7 Median: 4 Standard Deviation: 0.962 IQR: 3-4.5 Justification, if needed:</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Not Relevant (1)	Limited Relevant (2)	Moderately Relevant (3)	Significantly Relevant (4)	Most Relevant (5)

<p>7) Knowledge of FEMA Incident Command Systems Description: FEMA Incident Command Systems contain incident best practices born from the 9/11 commission report. These practices are widely used within the Department of Defense. Your Round 2 Response: Group Round 2 Mean Response: 2.1 Median: 2 Standard Deviation: 0.900 IQR: 1.5-2.5 Justification, if needed:</p>	☐	☐	☐	☐	☐
	Not Relevant (1)	Limited Relevant (2)	Moderately Relevant (3)	Significantly Relevant (4)	Most Relevant (5)
<p>8) Program Protection Description: A security clearance is normally needed to work in the DoD and a lack of one will severely limit your information access. Security protocol are common practices that are well supported in the Project Management Body of Knowledge (PMBOK), however, the defense industry applies a level of scrutiny well beyond that practiced in non-DoD commercial projects. Your Round 2 Response: Group Round 2 Mean Response: 3.0 Median: 3 Standard Deviation: 0.853 IQR: 2-4 Justification, if needed:</p>	☐	☐	☐	☐	☐
	Not Relevant (1)	Limited Relevant (2)	Moderately Relevant (3)	Significantly Relevant (4)	Most Relevant (5)
<p>9) Knowledge of Software Development Description: Testing and verification may be conducted in cyclical and redundant parallel processes not anticipated by any project management discipline. Your Round 2 Response: Group Round 2 Mean Response: 2.7 Median: 3 Standard Deviation: 0.862 IQR: 2-3 Justification, if needed:</p>	☐	☐	☐	☐	☐
	Not Relevant (1)	Limited Relevant (2)	Moderately Relevant (3)	Significantly Relevant (4)	Most Relevant (5)

<p>10) Knowledge of Technology Management Description: Project managers in the defense industry need to have a working knowledge of the technology involved with their project. Technology management is a disciplined approach to vetting the near future from the far future, and the realistic cost objectives from the prohibitive. Although common project management practices apply and are very useful, understanding the import and impact of technologies that have not been implemented into tangible products pushes all one into the realm of "imagineering". This is counter-intuitive to a disciplined process, but it must be allowed for. Your Round 2 Response: Group Round 2 Mean Response: 3.1 Median: 3 Standard Deviation: 0.793 IQR: 3-3 Justification, if needed:</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Not Relevant (1)	Limited Relevant (2)	Moderately Relevant (3)	Significantly Relevant (4)	Most Relevant (5)
<p>11) Knowledge of the DoD Customer Motivations Description: Generally speaking, the DoD customer is motivated by their mission and the accomplishment of that mission; not profit. This makes all the difference in the world in terms of how the DoD customer defines and then prioritizes their requirements for a particular project. The DoD customer is focused on "spending money" as opposed to "making money." Now, that is not to say that the DoD customer isn't interested in being efficient and effective. They probably are concerned with efficiency and effectiveness to a degree (so that they can ultimately get more for their money), but this is not necessarily a "driving factor" like it is in a commercial for-profit company that has shareholders to answer to. Your Round 2 Response: Group Round 2 Mean Response: 3.3 Median: 3 Standard Deviation: 0.862 IQR: 3-4 Justification, if needed:</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Not Relevant (1)	Limited Relevant (2)	Moderately Relevant (3)	Significantly Relevant (4)	Most Relevant (5)

<p>12) Leading a Team of People with Diverse Backgrounds</p> <p>Description: For example, members of the team will be from different disciplines (Engineering, Budget & Finance, Test, Logistics, etc.) and may also be members of the Armed Forces (Army, Navy, Air Force, Marines, and Coast Guard), Federal Employees (Government Civilians), Other Contractors (both Materiel Developer Contractors as well as Support Engineering & Technical Assistance (SETA) Contractors), National Laboratories (Lincoln Labs, Sandia Labs, etc.), Other Government Agencies and Organizations, Federally Funded Research & Development Centers (FFRDCs), Historically Black Colleges & Universities (HBCUs), and University Affiliated Research Centers (UARCs), just to name a few. It is very important for the leader to know and understand that each member of "The Team" has a different perspective and motivation based on what organization they belong to and that those perspectives and motivations influence how they act and behave. It is imperative that the project manager, operating in such an environment, has the skill and the ability to bring all of the different team members together as a cohesive team focused on the cost, schedule, and performance goals of the project from the start of the project on through to the successful completion of the project.</p> <p>Your Round 2 Response: Group Round 2 Mean Response: 3.8 Median: 4 Standard Deviation: 1.113 IQR: 3-5</p> <p>Justification, if needed:</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Not Relevant (1)	Limited Relevant (2)	Moderately Relevant (3)	Significantly Relevant (4)	Most Relevant (5)

<p>13) Knowledge of Communication with Government Customers Description: Communicating with the government customer is critical to the successful project. While this is not exclusive to the DoD project manager, it is important to note that the government operates very differently from domestic customers. Project managers must be able to communicate customer requirements to internal resources and communicate procurement processes to the customer. Your Round 2 Response: Group Round 2 Mean Response: 4.1 Median: 4 Standard Deviation: 0.793 IQR: 3.5-5 Justification, if needed:</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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APPENDIX I
ROUND 4 INSTRUCTIONS

To:
From: Cole Kupec <ckupe001@odu.edu>
Subject: PMP Delphi Study Round 4
Date: February 22, 2013

Dear _____,

Thank you for your input into Rounds 1 through 3 of our study titled Project Management Professional Training Needs for Defense Industry Projects. Round 4 provides an opportunity for the participants to decide whether knowledge and abilities generated in the study are necessary additions to the PMP® credential as they relate specifically to the defense industry.

Round 4 consists of a survey found in the Microsoft Word attachment to this email. This is the last round of the study and provides a final opportunity for participants to consider and substantiate the qualifications including knowledge and abilities that have been agreed upon by panelists during the first three rounds of this Delphi study.

Please answer and return the Round 4 survey by March 3, 2013. Your expertise and assistance are critical to the completion of this study. Feel free to contact me with any questions either by phone at (703) 338-8306 or by e-mail at ckupe001@odu.edu.

Thank you for your time and assistance in this study.

Very Respectfully,

Cole J. Kupec II
Ph.D. Candidate
Old Dominion University
ckupe001@odu.edu

Dr. John M. Ritz
Professor
Department of STEM Education
and Professional Studies
Old Dominion University

APPENDIX J

ROUND 4

Round 4 Project Management Professional Training Needs for Defense Industry Projects

Purpose: The purpose of this study is to determine if the Project Management Professional (PMP®) credential requirements encompass the knowledge and abilities for project managers required to effectively manage defense industry projects. Whereas previous rounds insisted that participants choose a level of relevancy, this round provides an opportunity for the participants to decide whether knowledge and abilities generated in the study are necessary additions to the PMP® credential as they relate specifically to the defense industry.

Directions: Sometimes what is initially thought to be a necessary knowledge or ability is, in fact, not as necessary as believed at the start of the study. It is important for the each participant to consider the importance of the knowledge and abilities and decide if a knowledge or ability should be pursued in formal training.

A **Necessary** knowledge or ability is at the core of what is needed for a person to be considered adequate. Individuals that possess the necessary knowledge and abilities are considered capable in the foundations and principles in the field of defense industry project management. Necessary knowledge and abilities make up the body of knowledge of a subject.

A **Supplemental** knowledge or ability can sometimes be considered necessary when, in fact, it is not at all. Supplemental knowledge and abilities are not critical to the body of knowledge. They fall under the “nice to have” category or supply greater efficiency, but they are not essential to the completion of a project management task and comprehension of the body of knowledge.

You may also decide that the knowledge and abilities are **Neither** necessary nor supplemental. You may decide that a topic previously thought to be a knowledge and ability is actually something else relating to the defense industry (e.g., a policy issue).

Decide if the knowledge and abilities addressed would be best described as necessary, supplemental, or neither. For each knowledge or ability please mark an “X” on the appropriate necessity as an addition to the PMP® credential as it pertains to defense industry project management. Mark only one answer for each.

Timetable: It is important to move the process along as efficiently as possible to minimize the inconvenience to each of the participants. I will do my utmost to achieve that efficiency. The e-mail with this attachment was sent on February 22, 2013. Please respond within 10 days.

Likert-scale from Rounds 2 and 3 for reference:

Most Relevant = 5

Significantly Relevant = 4

Moderately Relevant = 3

Limited Relevant = 2

Not Relevant = 1

Knowledge and Abilities	Necessary	Supplemental	Neither
<p>1) Management of Contracts Description: The project manager is expected to be able to participate in the contracting process from proposal through closure of the contract. In order to ensure that all contractual requirements are being met, the project manager must not just understand the Statement of Work (SOW), but also the rules and regulations behind the requirements. This includes knowledge of the Federal Acquisition Regulation (FAR) which will enhance a defense industry project manager's experience with their DoD counterpart. An understanding of the FAR is important to project managers in the defense industry because the underlying laws and regulations directly impact requirement, cost, and schedule implications that may not be encountered in other commercial sectors. Your Round 3 Response: Round 3 Mean: 3.833 Round 3 Median: 4 Round 3 Standard Deviation: 0.687 Round 3 IQR: 4-4 Round 3 Coefficient of Variation: 0.179</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Necessary	Supplemental	Neither
<p>2) Developing Positive Relationships with Stakeholders Description: Earning stakeholder's confidence and trust is a critical qualification for any project manager in the defense industry. Stakeholders include senior DoD oversight management, relationships with the Government Accounting Office, and Congressional Staffers, for examples. This often requires the need to have great interpersonal skills in human relations, leading, and consensus building. Your Round 3 Response: Round 3 Mean: 4.083 Round 3 Median: 4 Round 3 Standard Deviation: 0.493 Round 3 IQR: 4-4 Round 3 Coefficient of Variation: 0.121</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Necessary	Supplemental	Neither

<p>3) Knowledge of Fiscal Law Description: Knowledge of fiscal law specific to the defense industry that is not encountered in other commercial sectors is important to a defense industry project manager. An understanding of this area is important because the underlying laws and regulations directly impact requirement, cost, and schedule implications. Your Round 3 Response: Round 3 Mean: 3.000 Round 3 Median: 3 Round 3 Standard Deviation: 0.707 Round 3 IQR: 2.8-3.25 Round 3 Coefficient of Variation: 0.236</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Necessary	Supplemental	Neither
<p>4) Knowledge of DoD 5000 Series Regulations Description: The DoD 5000 series regulations is a critical body of knowledge to the success of the vast majority of project managers in the defense industry as it guides all DoD acquisitions. In order to meet the contract requirements within the DoD Acquisition Community, a basic knowledge of the DoD 5000 series regulations that outline the acquisition cycles and all of the standard requirements (concept development, engineering development, test and evaluation, and the rest) along with the standard timelines within the DoD and Congress is a necessity. Defense acquisition methods are unique and often complex compared to the procurement processes in other industries. Your Round 3 Response: Round 3 Mean: 3.583 Round 3 Median: 4 Round 3 Standard Deviation: 0.759 Round 3 IQR: 3-4 Round 3 Coefficient of Variation: 0.212</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Necessary	Supplemental	Neither
<p>5) Knowledge of Logistics Management Description: Defense acquisition methods are unique and often complex compared to the procurement processes in other industries. Understanding the logistics process of integrating DoD acquired products and contractor provided products is critical to defense industry project managers. An understanding of logistics and the associated constraints with military methods are required to successfully complete many of today's defense industry projects. As an example, the critical factor on military transport aircraft is the pallet foot print. As fuel costs continue to rise, designing smaller and lighter systems will be crucial. Your Round 3 Response: Round 3 Mean: 2.833 Round 3 Median: 3 Round 3 Standard Deviation: 0.373 Round 3 IQR: 3-3 Round 3 Coefficient of Variation: 0.132</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Necessary	Supplemental	Neither
6) Knowledge of Customer Organization Description: A successful project manager in the defense industry understands how the military is comprised. This will enable the project manager to have a greater understanding of how to access stakeholder value. Project managers in the defense industry need a working knowledge of their customer's organization as well as their own. All too often we limit organizational process assets to one's own organization. It is very important to understand the processes and procedures of the customer's organization. This is especially true if the customer is the Government. One example is the budgeting process. Your Round 3 Response: Round 3 Mean: 3.667 Round 3 Median: 4 Round 3 Standard Deviation: 0.850 Round 3 IQR: 3-4 Round 3 Coefficient of Variation: 0.232	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Necessary	Supplemental	Neither
7) Knowledge of FEMA Incident Command Systems Description: FEMA Incident Command Systems contain incident best practices born from the 9/11 commission report. These practices are widely used within the Department of Defense. Your Round 3 Response: Round 3 Mean: 1.917 Round 3 Median: 2 Round 3 Standard Deviation: 0.759 Round 3 IQR: 1.8-2 Round 3 Coefficient of Variation: 0.396	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Necessary	Supplemental	Neither
8) Program Protection Description: A security clearance is normally needed to work in the DoD and a lack of one will severely limit your information access. Security protocol are common practices that are well supported in the Project Management Body of Knowledge (PMBOK), however, the defense industry applies a level of scrutiny well beyond that practiced in non-DoD commercial projects. Your Round 3 Response: Round 3 Mean: 3.167 Round 3 Median: 3 Round 3 Standard Deviation: 0.687 Round 3 IQR: 3-4 Round 3 Coefficient of Variation: 0.217	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Necessary	Supplemental	Neither

<p>9) Knowledge of Software Development Description: Testing and verification may be conducted in cyclical and redundant parallel processes not anticipated by any project management discipline. Your Round 3 Response: Round 3 Mean: 2.667 Round 3 Median: 3 Round 3 Standard Deviation: 0.624 Round 3 IQR: 2-3 Round 3 Coefficient of Variation: 0.234</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Necessary	Supplemental	Neither
<p>10) Knowledge of Technology Management Description: Project managers in the defense industry need to have a working knowledge of the technology involved with their project. Technology management is a disciplined approach to vetting the near future from the far future, and the realistic cost objectives from the prohibitive. Although common project management practices apply and are very useful, understanding the import and impact of technologies that have not been implemented into tangible products pushes all one into the realm of "imagineering". This is counter-intuitive to a disciplined process, but it must be allowed for. Your Round 3 Response: Round 3 Mean: 3.167 Round 3 Median: 3 Round 3 Standard Deviation: 0.799 Round 3 IQR: 3-3.25 Round 3 Coefficient of Variation: 0.252</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Necessary	Supplemental	Neither
<p>11) Knowledge of the DoD Customer Motivations Description: Generally speaking, the DoD customer is motivated by their mission and the accomplishment of that mission; not profit. This makes all the difference in the world in terms of how the DoD customer defines and then prioritizes their requirements for a particular project. The DoD customer is focused on "spending money" as opposed to "making money." Now, that is not to say that the DoD customer isn't interested in being efficient and effective. They probably are concerned with efficiency and effectiveness to a degree (so that they can ultimately get more for their money), but this is not necessarily a "driving factor" like it is in a commercial for-profit company that has shareholders to answer to. Your Round 3 Response: Round 3 Mean: 3.250 Round 3 Median: 3 Round 3 Standard Deviation: 0.722 Round 3 IQR: 3-3.25 Round 3 Coefficient of Variation: 0.222</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Necessary	Supplemental	Neither

<p>12) Leading a Team of People with Diverse Backgrounds Description: For example, members of the team will be from different disciplines (Engineering, Budget & Finance, Test, Logistics, etc.) and may also be members of the Armed Forces (Army, Navy, Air Force, Marines, and Coast Guard), Federal Employees (Government Civilians), Other Contractors (both Materiel Developer Contractors as well as Support Engineering & Technical Assistance (SETA) Contractors), National Laboratories (Lincoln Labs, Sandia Labs, etc.), Other Government Agencies and Organizations, Federally Funded Research & Development Centers (FFRDCs), Historically Black Colleges & Universities (HBCUs), and University Affiliated Research Centers (UARCs), just to name a few. It is very important for the leader to know and understand that each member of "The Team" has a different perspective and motivation based on what organization they belong to and that those perspectives and motivations influence how they act and behave. It is imperative that the project manager, operating in such an environment, has the skill and the ability to bring all of the different team members together as a cohesive team focused on the cost, schedule, and performance goals of the project from the start of the project on through to the successful completion of the project.</p> <p>Your Round 3 Response: Round 3 Mean: 3.833 Round 3 Median: 4 Round 3 Standard Deviation: 0.898 Round 3 IQR: 3-4.25 Round 3 Coefficient of Variation: 0.234</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Necessary	Supplemental	Neither
<p>13) Knowledge of Communication with Government Customers Description: Communicating with the government customer is critical to the successful project. While this is not exclusive to the DoD project manager, it is important to note that the government operates very differently from domestic customers. Project managers must be able to communicate customer requirements to internal resources and communicate procurement processes to the customer.</p> <p>Your Round 3 Response: Round 3 Mean: 4.250 Round 3 Median: 4 Round 3 Standard Deviation: 0.433 Round 3 IQR: 4-4.25 Round 3 Coefficient of Variation: 0.102</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

APPENDIX K

RATIONALES SUPPORTING DIVERGENT VIEWS

In Round 3 participants were asked to reflect on their responses in Round 2 in light of the other panel members' collected responses. Participants were directed to select a response for each question in Round 3. If they choose to respond outside of the group's consensus, they were directed to provide a justification as to why they believed that the response should be higher or lower than the group consensus. The justifications for responses outside of the group's consensus are displayed below.

1. Management of Contracts

- The successful PM [project manager] needs to have a good general knowledge and understanding of his/her contracts but will leave the details to their Contract Specialists, e.g., Contracting Officer Representative (COR), the Contracting Officer's Technical Representative (COTR), and Subcontract Program Managers (SCPMs).
- The PMBOK and the PMI PMP Certification exam prep training do not adequately address the particulars of the FAR/DFARs requirements to be meaningful to a DoD Industry project manager.

2. Developing Positive Relationships with Stakeholders

- Unless a PM [project manager] has the ability to develop positive relationships with all stakeholders then they will not be successful.

3. Knowledge of Fiscal Law

- In my experience this was critical.

- The PMBOK and the PMI PMP Certification exam prep training do not adequately address the particulars of fiscal law to be meaningful to a DoD Industry project manager.

4. Knowledge of DoD 5000 Series Regulations

- Granted most DoD Projects fall under the purview & jurisdiction of DoD5000.2 and thus are not exempt from it. But some DoD Projects are indeed exempt from 5000.2 for any number of reasons. A great example of this is the National Missile Defense (NMD) Program back in the early 2000's. The NMD Program was exempted from DoD 5000.2, we threw away the Operational Requirements Document (ORD), established a set of Key Performance Parameters (KPPs) and drastically accelerated the development and deployment of the system in less than 2 years time. I just wanted to make the point that not ALL DoD Programs fall under DoD 5000.2
- My DoD experience has always allowed me to focus on my level of Project Management. While I don't believe the 5000 series would have helped me I will freely admit there was always someone above me who understood it. It's possible I simply didn't place emphasis on it because someone else already had.
- The PMBOK and the PMI PMP Certification exam prep training do not adequately address the particulars of DoD 5000 series to be meaningful to a DoD Industry project manager.

5. Knowledge of Logistics Management

- The PMBOK and the PMI PMP Certification exam prep training do not adequately address DoD ILS functions to be meaningful to a DoD Industry project manager.

6. Knowledge of Customer Organization

- This requirement is in no way unique to the defense industry.
- This question may be worded incorrectly. You give an example of the budgeting process at the end while referencing how the military is comprised. One is work flow and the other is an org [organizational] chart. When I read I was referencing how the military is compromised and knowing how a Captain is lower than a General would not help me with my work.
- Everybody thinks they are unique; DoD has some peculiarities, but is a Government organization and functions like the others
- The Customer Org [organization] is the environment in which we work. I do not see how this could possibly be less than a 5.

7. Knowledge of FEMA Incident Command Systems

- I still believe that ICS [Incident Command System] plays a vital part of DoD operations. In a response situation with many agencies from DHS, DoD and DoJ come together they must use a common language and ICS supports this. I've also responded to many Federal and State emergencies and they all used ICS.
- This is a bit of a random question, but FEMA has not once been relevant in my experience on IT efforts.

- The PMBOK and the PMI PMP Certification exam prep training do not adequately address FEMA best practices nor is it relevant to a DoD Industry project manager as a general rule.

8. Program Protection

- A security clearance is not optional and I do not see what it has to do with project management curriculum.
- I took this question to mean the relevance of a clearance and in the DoD space in DC it's a must.
- Clearance is binary, so I think it is very important.
- The PMBOK and the PMI PMP Certification exam prep training do not adequately address the particulars of FEMA best practices to be meaningful to a DoD Industry project manager.

9. Knowledge of Software Development

- I don't believe that specific knowledge of software development is that relevant. It's simply a nature of Agile development and can be applied to many areas, not just software.
- The PMBOK and the PMI PMP Certification exam prep training do not adequately address the particulars of SW [software] development to be meaningful to a DoD Industry project manager.

10. Knowledge of Technology Management

- Cost prohibitive is not a phrase you hear very often. The DoD has a budget greater than the GDP of most countries! They will purchase something just because they want it, not because it's useful in the long term.
- I may be biased here due to being in IT, but technology is what we manage.

- Since technology is driving everything within DoD, this factor needs a higher rating.

11. Knowledge of the DoD Customer Motivations

- Again, it is very important for the DoD PM to have knowledge of and understand the DoD customer's motivation since it greatly influences what actions that customer can & cannot and will & will not take. This knowledge & understanding is imperative.
- I may be biased here by being at the Executive Level (above the PM [project manager]). From my vantage point, Customer Motivations drive how we scope our product.

12. Leading a Team of People with Diverse Backgrounds

- If the PM [project manager] cannot lead a diverse group of people then he/she will not be successful. All other knowledge & understanding are secondary to this. This is Management 101 stuff.
- Also not unique to the defense industry or working with the government.
- The DoD has a very structured militaristic approach to leadership, and it's quite often, "do as I say." I still believe that building relationships is better than wielding power that I might have through legitimate authority.
- I will up it to a 3, but the commonality is the mission and the commercial sense of diversity is less important here.

13. Knowledge of Communication with Government Customers

- Good communications is more important than I originally rated it, but I believe the PMBOK does a very good job on that.

- Communications are my deliverable until the product, service or result is finished.
It is critically important.

VITA

Cole Jerome Kupec II

Darden College of Education
Old Dominion University
Norfolk, VA 23529

Education:

Old Dominion University, Norfolk, VA
Ph.D. – May 2013
Occupational and Technical Studies – Human Resources

Auburn University, Auburn, AL
M.B.A. – December 2009
Business Administration

University of Wyoming, Laramie, WY
B.S. – May 2008
Finance

**Professional
Experience:**

Welkin Associates, Chantilly, VA
Senior Business Analyst, 2010 – present

Madison City School Board, Madison, AL
Career and Technical Commission Member, 2012- Present

Auburn University, Auburn, AL
Graduate Research Assistant, Strategic Management, 2008 – 2009

CIBER Corporation, Chantilly, VA
National Reconnaissance Office Intern, 2006 & 2008

Memberships:

Iota Lambda Sigma Member

Alpha Tau Omega Member

Golden Key Member

Publications:

Kupec, C. (2012, June). Adult learning for earned value management analysts. *American society for the advancement of project management*, Retrieved from http://www.asapm.org/asapmag/articles/AdultLearning_and_EVM.pdf

Kupec, C., Lochbaum, G., Mosier, E., & Massey, C. (2011, June). *Integrating earned value analysis and independent cost estimating for large, multiyear system procurement*. 2011 ispa/scea joint annual conference, Albuquerque, NM. Retrieved from [https://www.iceaaonline.org/documentation/files/Table of Contents 2000-2012.pdf?CFID=5345254&CFTOKEN=fc422b224401bac3-66EFA70A-EF77-49DF-3C402A823E3DF84C&jsessionid=8e30bd0486bc215257b64e69371e7da17928](https://www.iceaaonline.org/documentation/files/Table%20of%20Contents%202000-2012.pdf?CFID=5345254&CFTOKEN=fc422b224401bac3-66EFA70A-EF77-49DF-3C402A823E3DF84C&jsessionid=8e30bd0486bc215257b64e69371e7da17928)