The Impact of Project Management Maturity Upon IT/IS Project Management Outcomes

by

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I certify that I have read this dissertation and that in my opinion it meets the academic and professional standards required by Wilmington University as a dissertation for the degree of Doctor of Business Administration.

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Dedication

This dissertation is dedicated to my family:

My wife and best friend, Rita Jean Carcillo, who provided unwavering support and encouragement throughout the doctoral journey.

To my daughters, Bianca and Melanie, who provided a constant source of inspiration.

Acknowledgement

It is with great appreciation and gratitude that I acknowledge the following people for their patience, support and guidance during the dissertation process.

First and foremost, I thank my dissertation committee. I especially thank Dr. Ruth Norman for serving as chair of the dissertation committee. Dr. Norman's insightful feedback and probing questions led me to a greater appreciation for research. I thank Dr. George Slentz for serving as a committee member. Dr. Slentz's insights into qualitative research, and advice, were invaluable and greatly appreciated. Thank you to Dr. Charles Poplos for serving as a committee member. Dr. Poplos's knowledge and guidance in the field of project management are second to none.

The faculty and staff at Wilmington University were always supportive and provided encouragement.

Finally, and most importantly, I thank my family, Rita Jean, Bianca and Melanie for their love, patience and understanding.

Abstract

Although it is assumed that increasing the institutionalization (or maturity) of project management in an organization leads to greater project success, the literature has diverse views. The purpose of this mixed methods study was to examine the correlation between project management maturity and IT/IS project outcomes. The sample consisted of two groups. The project manager group consisted of 47 IT/IS project managers, and the project sponsor group consisted of nine IT/IS project sponsors. The project sponsors participated in individual interviews and the project managers completed online surveys. Inferential statistical analysis (chi square and Fischer's Exact Test) was used to test the following possible correlations:

- Cost maturity and cost performance
- Time maturity and time performance
- Scope maturity and scope performance
- Cost/time maturity and efficiency
- Scope maturity and effectiveness

None of these relationships was statistically significant on an overall basis, but one of the sub-tests for time maturity showed a significant relationship. A key limitation of the study is the small sample which may not be representative of the target population. There are also other variables not captured in this study which may impact success. However, this study adds a further note of caution with regard to the assumed benefits of project management maturity.

Keywords: project management, maturity model

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CHAPTER 1

INTRODUCTION

Historically, information technology (IT) and information system (IS) projects have been plagued with high failure rates; too few successful IT/IS projects exist (McClure, 2007; McManus & Wood-Harper, 2008; Standish Group, 2009). At best, most IT/IS project are considered marginally successful. This is an important shortfall because many organizations rely on computer systems as integral components of their organizations' competitiveness (Jiang, Klein, & Ellis, 2002). Furthermore, some businesses, such as Amazon and e-Bay, rely on their computer systems as the fundamental mechanism for staying in business. More and more businesses have ebusiness and ecommerce as part of their value chain. As businesses, organizations, and individuals increasingly utilize and depend upon information technology and systems, the systems become increasingly complex and expensive. Therefore, it is important for project managers and organizations to improve their IT/IS project effectiveness and efficiency.

The Standish Group (2009) defines project success as meeting the project's cost, time, and scope objectives. This definition is used in this study. Another key concept is project management maturity level. Project management maturity levels are a way to classify or categorize an organization's project management maturity from immature to mature, with mature levels being institutionalized throughout the organization (Kerzner, 2003; Robertson, n.d.; Schwalbe, 2006).

There is debate as to the degree to which project management maturity levels affect project success. For example, Nieto-Rodreguez and Evrard's (2004) work supports a strong correlation between project management maturity and project success, while Kwak and Ibbs (2000b) found the relationship only in specific areas of project management maturity. Many of the studies supporting or rejecting a relationship between project management maturity levels and project success have not focused on IT/IS projects. Those that have looked at IT/IS projects did not focus solely on the core processes of project management, those relating to cost, time and scope (Morris, 2002). Instead, they include both the project management core processes and supporting processes, making it difficult to separate out the effects on core processes. What differentiates this study from previous studies is (a) focus only on three core processes, (b) focus on IT/IS projects, and (c) project success being measured in terms of a quadrant whose axes consist of efficiency and effectiveness as well as meeting the three core objects of time, cost, and scope.

Brief Description of Project Success

The Standish Group (2009) categorizes projects as being successful, challenged, or failed. A brief description or characteristic of a successful project is one that meets or exceeds its cost, time and scope objectives. A challenged project is one that misses: (a) planned cost objectives; (b) planned time objectives; (c) planned scope objectives; or (d) a combination of missed cost, time, and/or scope objectives. A failed project is one that is stopped before developing or delivering planned product (Standish Group, 2009). These definitions will be used in this study.

Brief Description of Project Management Maturity

The maturation of project management depends on the degree to which project management methodology, tools, techniques, decision-making, and strategy have been developed and implemented (PMSolutions, n.d.; Tarne, 2007). The concept of project management maturity applies to organizations, not individual project managers (The Versatile Project Management Company, n.d.).

Project management maturity is composed of various levels that range from immature to mature. For this research, the items measured are the tools and processes associated with time, cost, and scope. An example of an organization with their time management maturity at level one (immature) is an organization where all the project managers use different standards and tools to develop and manage their project schedules. If some of the project managers started adhering to consistent use of tools and processes related to time, then the organization may be at level two. Level two is still immature, but it is progressing towards maturity. The organization may eventually mature to level five. If the organization achieves level five for time management, there would be (a) continual improvement to the time related project management processes and tools used in the organization, and (b) time related techniques are incorporated into management (such as using estimating effort and duration in projects may be used by management for non-project related activities.

Statement of the Problem

Studying the relationship between project management maturity and IT/IS project efficiency and effectiveness should provide insight into improving the poor success rate

of projects. Information systems (IS) and information technology (IT) projects have a very poor rate of success (Kappelman, McKeeman, & Zhang, 2006; Keil & Robey, 2001; Pan, Pan, & Newman, 2007). In 2002, failed and partially successful IT/IS projects in the United States cost $55 billion (Standish Group as cited in Schwalbe, 2006, p. 13). From a more detailed cost perspective, in 2003, the poor success rate consists of $17 billion in project cost overruns and $38 billion in sunk costs for failed projects ("Latest Standish", 2003). In 2006, the Standish Group (as cited in "Failure is not," 2007) concluded that 35% of IT/IS projects were successful, 19% failed, and 46% were only partially successful. Whereas a survey study considering various types of projects from various industries by "Benchmarking Project Management" (as cited in "Executive guide to project", 2006) identified success rate between 85% and 90%.

Purpose of the Study

This research examines how project management maturity levels influence IT/IS project success in terms of efficiency and effectiveness. Being efficient involves completing a task or purpose without wasting time or other resources ("Efficient," 1996). The Random House Dictionary (1996), defines effectiveness as "adequate to accomplish a purpose; producing the intended or expected result" ("Effective," 1996, p. 622). For this study, efficiency is a function of cost and time while effectiveness is a function of scope. Since efficiency is a function of both cost and time, this research will analyze cost and time as discrete variables that contribute to efficiency. This mixed methods research focuses on data collected from IT/IS project management practitioners and project sponsor / executive level professionals.

As previously explained, the criteria for project success are typically based upon meeting cost, time, and scope targets (Wazed & Ahmed, 2009). Morris (2002) describes the basic core processes of project management as managing scope, cost and time. With this in mind, it seems reasonable to focus this study of project management maturity levels from the perspective of: (a) cost management, (b) time management, and (c) scope management. An organization could have differing levels of maturity for each of these components. In terms of efficiency and effectiveness, cost management and time management are associated with efficiency, while scope management is associated with effectiveness.

The results of this study should: (a) add to the current academic and practitioner knowledge base of IT/IS project management by publishing this research and sharing the findings, and (b) clarify the relationship between project management maturity and project outcomes. Outcomes measured by:

- Efficiency: consisting of cost and time
- Effectiveness: consisting of scope

Research Questions

The research question addressed in this study is: How do project management maturity levels affect IT/IS project efficiency and effectiveness?

Research Hypotheses

This research study has the following seven hypotheses:

- Hypothesis 1: Projects managed in organizations with an immature time management maturity level will have fewer projects completed on time than those managed in an organization with a mature time management maturity level.
- Hypothesis 2: Projects managed in organizations with an immature cost management maturity level will have fewer projects completed within budget than those managed in an organization with a mature cost management maturity level.
- Hypothesis 3: Projects managed in an organization with an immature scope management maturity level will complete fewer projects that meet the agreed upon scope than those managed in an organization with a mature scope management maturity level.
- Hypothesis 4: Projects managed in an organization that has an immature cost management maturity level will have fewer projects categorized as cost/efficient than projects managed in an organization that has a mature cost management maturity level.
- Hypothesis 5: Projects managed in an organization that has an immature time management maturity level will have fewer projects categorized as time/efficient than projects managed in an organization that has a mature time management maturity level.
- Hypothesis 6: Projects managed in an organization with an immature scope management maturity level will have fewer projects categorized as effective than projects managed in an organization that has a mature scope management maturity level.

Limitations

Two limitations of this research project are:

- The sampling method used for both the project manager group and the project sponsor group is convenience sampling.
- Because the data type for most of the data collected is ordinal or nominal, it limits the statistical analysis options.
- The project manager group is limited to participants with access to specific LinkedIn professional groups. The only exception to this is the few project manager participants known by the researcher who were invited to participate.

Delimitations

The boundaries, or limitations placed on the research by the researcher is:

- The intent was to sample mainly project managers in the United States of America.

Assumptions

Three assumptions of the research project are:

- Participants have at least a basic understanding of project management and project management maturity.
- The project manager sample would consist of mostly project managers in the United States of America

Definition of Terms

IT/IS — Abbreviation for information technology / information system.

LinkedIn — LinkedIn is a professional / career networking site that, as of September 9, 2012, has over 175 million members ("LinkedIn", n.d.).

PMI — PMI is an abbreviation that stands for the Project Management Institute. PMI is a not- for- profit association of project management professionals with members in over 185 countries ("PMI-About Us", 2011).

PMML — Abbreviation for project management maturity level.

PMMM — Abbreviation for project management maturity model.

Project Cost Management — Project cost management typically consists of the following processes: (a) estimating, (b) budgeting, and (c) controlling ("A Guide to the project", 2008).

Project Management Maturity Level — Project management maturity levels are a way to classify or categorize an organization's project management maturity from immature to mature (Kerzner, 2003; Robertson, n.d.; Schwalbe, 2006).

Project Scope Management — Project scope management typically consists of the following processes: (a) requirements gathering, (b) scope definition, (c) creating the work breakdown structure (WBS), (d)

scope verification, and (e) scope control ("A Guide to the project", 2008).

Project Success The Standish Group (2009) defines project success as meeting the project's cost, time and scope objectives.

Project Time Management Project time management typically consists of the following processes: (a) activity definition, (b) activity sequencing, (c) identifying activity resource needs, (d) estimating durations, (e) create the schedule, and (f) controlling the schedule ("A Guide to the project", 2008).

CHAPTER 2

LITERATURE REVIEW

Chapter II, the literature review, consists of seven major sections. The first sections identify the inclusion criteria and key literature references. A description and brief analysis of the various project management maturity models follows the first two sections. Along with the description and analysis, previous research on project management maturity is included. The previous research covers specific maturity models as well as project management maturity in general. Additionally, the literature review touches on what is measured in the maturity models.

The inclusion criteria and key literature references provide background information regarding collection of the literature review sources. The section entitles 'Descriptions of project management maturity models' provides: (a) the model used for this research, (b) a description of various PMMMs, (c) the strengths and weaknesses of the various models, and (d) a comparison of the various models. The next two sections 'How Methodology relates to PMMMs' and 'How PMBOK relates to PMMMs' provides a brief introduction and description of how the maturity models use project management methodology and PMBOK. Typically, the methodology and the PMBOK address the question of 'what to measure?' when determining the maturity of project management at an organization. The literature review chapter finishes with the sections entitled 'The Value of PMMMs' and "PMMMs relationship to success.' These sections identify some of the previous studies on project management maturity models.

Inclusion Criteria

The main source of information comes from (a) the Internet; (b) EBSCOHost; (c) Google Scholar; and (d) various professional organizations, books, and papers. To find material on the Internet, Google Scholar, and EBSCOHost, the search criteria consisted of a number of key word combinations. These key words include, but are not limited to (a) project, (b) management, (c) success, (d) outcomes, (e) maturity models, (f) scope, (g) cost, (h) time, (i) methodology, (j) project management maturity models, and (k) project management maturity levels. Articles focusing on IT/IS project management were included. Articles focusing on other areas of IT/IS were excluded. For example, system development life cycles (SDLC) and the various methodologies such as waterfall, scrum, and spiral were excluded from this research.

Key Literature References

The literature references focus on the works of various recognized leaders and authors in the field of project management. The key authors include: (a) Erling S. Andersen and Svein Arne Jessen, (b) C. William Ibbs, (c) Young Kwak and C. William Ibbs, (d) Kam Jugdev, and (e) Harold Kerzner. The Project Management Institute is a prominent organization in the field of project management that produces a number of recognized standards such as the Project Management Body of Knowledge (PMBOK). The research and documents produced by the Project Management Institute are important to this literature review. Additionally, the research by the Standish Group, specifically the various Chaos reports and research on IT/IS project management success, are

prominent findings. The Chaos report is the title of the report created by the Standish Group. The report is updated periodically and focuses on IT/IS project management.

Project Management Maturity Model

Maturity models are instruments used to identify and measure an organization's project management capabilities, sophistication, experience and institutionalization compared to a set of standards (Lee & Anderson, 2006). Typically, PMMMs do not prescribe how to measure project performance, only that it should be measured (Kwak & Ibbs, 2000b; "Portfolio, programme", 2006). The development of project management maturity models have been influenced by various quality management practices and theories (Cooke-Davies & Arzymanow, 2003; Kwak & Ibbs, 2002). Many of the PMMMs are based upon the Software Engineering Institute's (SEI) capability maturity model (CMM) in that their framework consists of five maturity levels, each with specific characteristics as in the CMM (Skulmoski, 2001).

In the common five level format, the characteristics of the PMMMs range from level one project management being ad-hoc through its being institutionalized integrated into the organization's overall management process in level five (Crawford, 2006; Kerzner, 2003; Mullaly, 2006). Each project management maturity model has a slightly different definition of what constitutes the characteristics of each level. The following bullet points are an overall description that is consistent with most five level project management maturity models:

- Level 1: An ad-hoc approach to project management with little to no consistency between projects and / or project managers.

- Level 2: Some project management consistency with project managers using basic processes across projects. Examples of some basic processes include (a) stakeholder identification, (b) sequencing activities or tasks, and (c) developing a work breakdown structure ("A guide to the project", 2008). Support for project management maturity and consistency across projects begins.
- Level 3: Defined project management processes applied and integrated across projects. Institutionalization of a standard project management process and methodology across the organization begins. However, the project management data such as resource usage and needs (in terms of people) is not used at an organizational level for decision-making.
- Level 4: Organization wide use of project management process adopted, including project data used by management for decision-making. An example of this is factoring the project resource needs (in terms of people) of upcoming projects when determining staffing levels.
- Level 5: Project management is a part of the organization management process. Within project management, there is an emphasis on continual improvement and measurement of project outcomes (Crawford, 2006; Kerzner, 2003; Mullaly, 2006).

Each level in the PMMM builds upon previous levels. Figure 1 is a graphical representation of a typical five level PMMM. Other maturity models, such as the project management maturity model developed by Andersen and Jessen (2003) consist of three levels:

- Project Level: The focus is on the individual project so that the project meets its goal(s).
- Program Level: The focus is on the coordinated management of multiple projects that have a common objective.
- Portfolio Level: The focus is on multiple projects and programs that may or may not have a common objective. This level also focuses on resource allocation and prioritization across the projects and programs.

There are a number of project management maturity models, and the number of levels categorizing their specific characteristics varies (Center for Business, n.d.; Gareis & Heumann, 2001; Porskrog, 2008). Table 1 provides a listing of some of the project management maturity models; however, this literature review focuses on just a few of the models listed in table 1. The maturity model used for this research study is a combination of Berkeley's and Kerzner's models. These models have a number of similarities and nicely combine into one project management maturity model.

Table 1.

PMMMs with Number of Levels (Center for Business,n.d.; Gareis & Heumann, 2001; Porskrog, 2008)

Project Management Maturity Model	Number of Levels
Andersen and Jessen's PMMM	3
Berkeley's PMMM	5
Gareis's PMMM	4
Kerzner's PMMM	5
OCG's P3M3	5
PMI's OPM3	4
PM Solutions' PMMM	5

The project management maturity models typically measure knowledge areas or other content such as process groups (Brookes & Clark, 2009). This generic framework could be visualized as a matrix or grid work of columns and rows, with the columns representing the maturity levels and the rows representing the knowledge areas or content of what to measure. Note, the knowledge areas are also used as a guide to manage projects ("A Guide to the project," 2008).

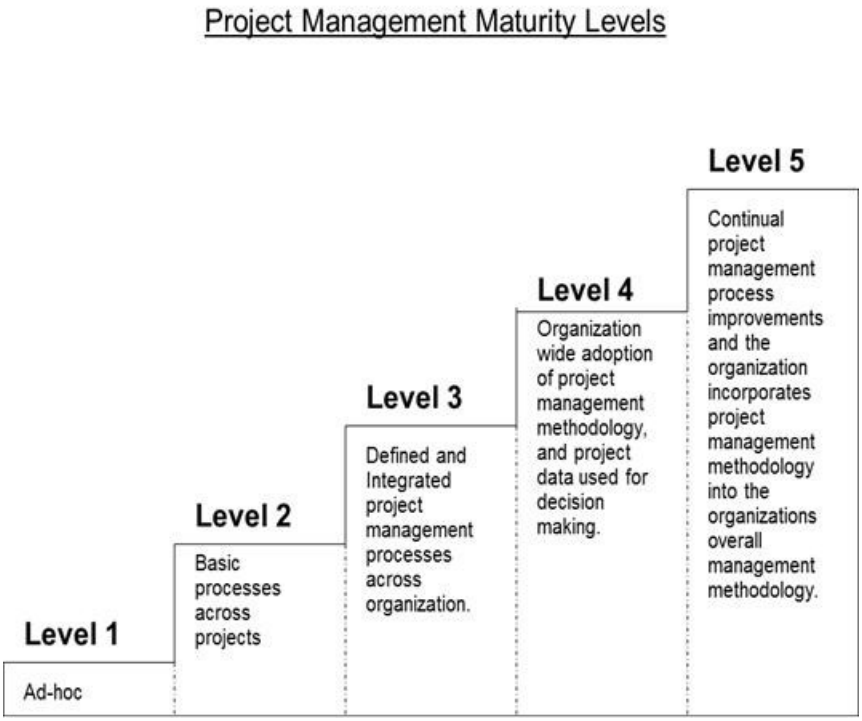


Figure 1. Generic Five-Level PMMM for Organization's Overall Project Management Maturity Model as adapted from (Center for Business,n.d.; Gareis & Heumann, 2001; Kerzner, 2003; Porskrog, 2008).

Comparison of the three and five level framework. Although the project management maturity levels have been described, a comparison of the two basic frameworks for PMMMs can be performed. Overall, from the perspective of the levels, the five-level model and the three-level model appear to be in alignment and have no significant difference other than granularity. In the five-level model, levels 1 and 2 identify maturity that focuses on the project level, while level 3 focuses on the program level, and levels 4 and 5 focus on the portfolio level. For example, the portfolio level

involves resource management and project prioritization. This appears to be covered in level 4 of the five-level mode because it involves the use of project related data (such as resource needs) and decision making at the organization level (which projects receive the resources). It is worth noting that measuring maturity is not a totally objective endeavor; it also involves subjective judgments (Andersen & Jessen, 2003).

Generalized project management maturity levels using PMBOK knowledge areas. Typically, all nine of the project management knowledge areas are considered when determining an organization's project management maturity level. The nine knowledge areas are: (a) project integration management, (b) project scope management, (c) project time management, (d) project cost management, (e) project quality management, (f) project human resource management, (g) project communications management, (h) project risk management, and (i) project procurement management ("A Guide to the," 2008, p. 70). Figure 2 is a graphical representation of how the PMI knowledge areas can be combined with a five level project management maturity model so that the project management maturity level for each knowledge area may be assessed. The one knowledge area frequently excluded from the project management maturity models is integration management (Ibbs & Kwak, 2000).

Projects are measured by how well they meet cost, time, and scope objectives (Schwalbe, 2006; Standish Group, 1994; Standish Group, 2009). It is reasonable to narrow the focus of this research to the three dimensions because they are used to measure project success as well as core components of most project management maturity models.

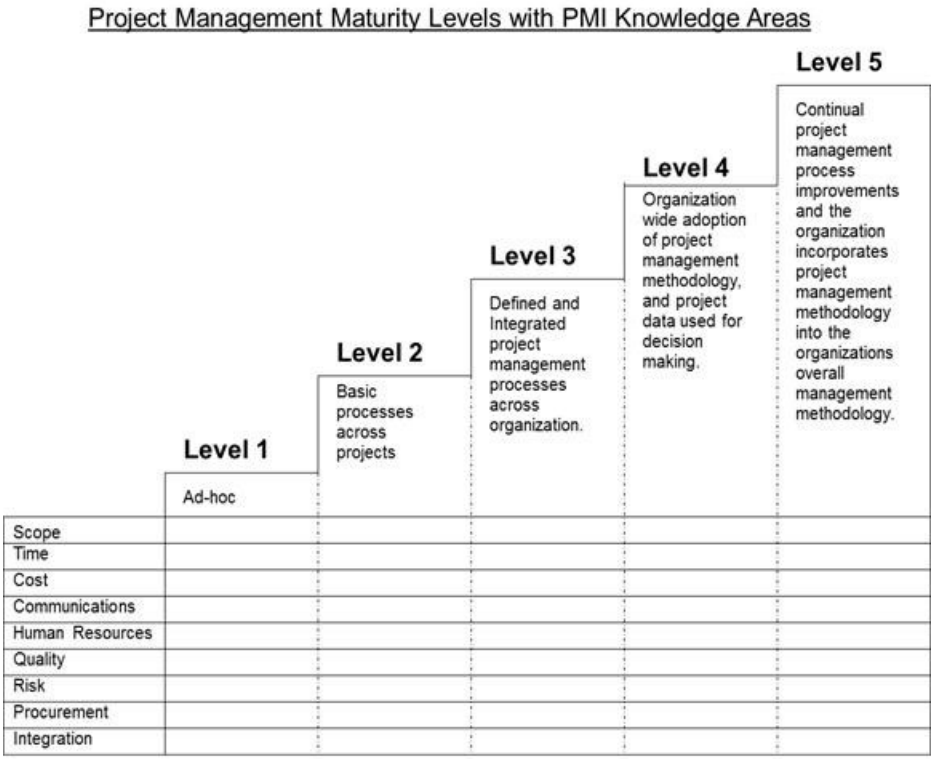


Figure 2. Five Level PMMM with Knowledge Areas.

Berkeley project management maturity model. The Berkeley project management maturity model was developed after reviewing the results of various maturity models (Kwak & Ibbs, 2000b). This maturity model, as well as many other models, is generic in that it is not tied to a specific type of project, such as new product development or software development. Unlike the capability maturity model (CMM) that is specific to the software industry and software development, it can be used in any

industry for any type of project. The benefit of such a generic project management maturity model is that an organization can compare itself to other organizations that are both within and outside their industry (Kwak & Ibbs,2000b).

The Berkeley PMMM uses five levels, ranging from one at the lowest level and five at the highest level (Kwak & Ibbs, 2000b). The content being measured in the Berkeley PMMM is twofold. First, it measures each of the nine project management knowledge areas then it measures the five process groups (Kwak & Ibbs, 2000b). Figure 3 is a graphical representation of the Berkeley PMMM. This maturity model closely aligns itself with the Project Management Institute's PMBOK standards in that it uses the nine knowledge areas and the five process groups. Compared to the other maturity models, the Berkeley project management maturity model is rather thorough and detailed because it factors in the nine knowledge areas and the five process groups. The inclusion of these two factors differentiates it from the other models discussed in this paper.

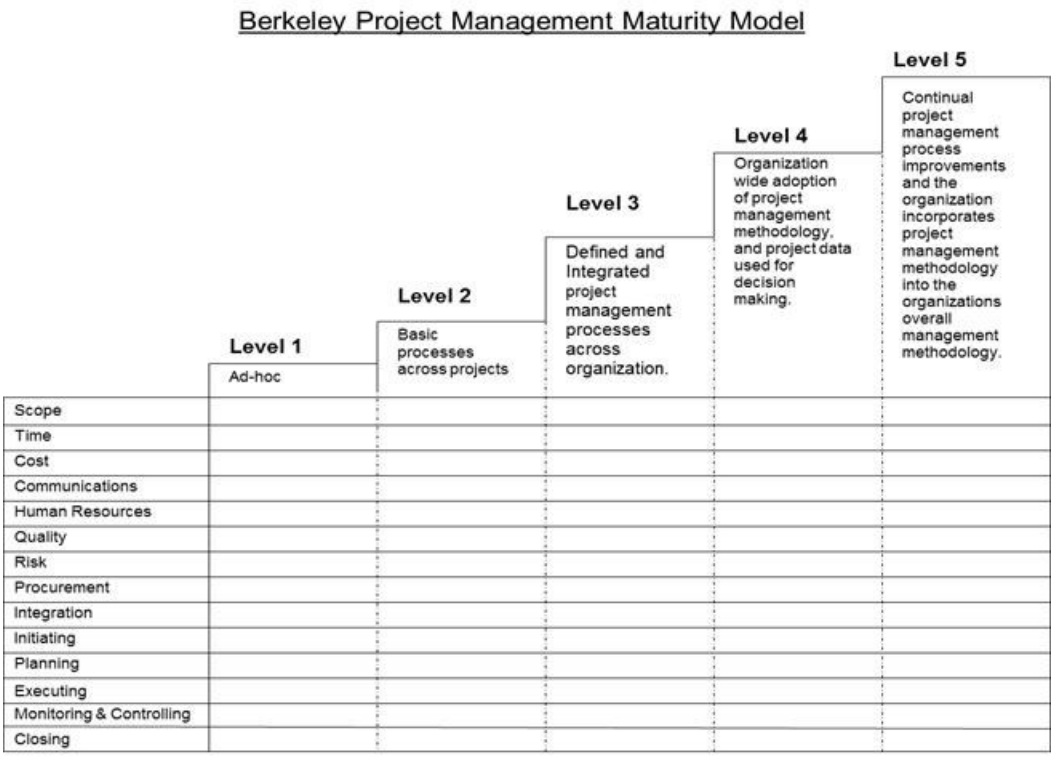


Figure 3. Graphical Representation of the Berkeley PMMM.

Strength of the Berkeley project management maturity model. The Berkeley PMMM has a number of strengths. First, it enables an organization to identify its project management strengths and weaknesses as they relate to the PMBOK knowledge areas and process groups (Kwak & Ibbs, 2000b). Second, the model does not require sophisticated project management tools or techniques to be used (Kwak & Ibbs, 2000b). Third, it is possible for organizations to determine the return on investment (ROI) from their project management by performing the following seven steps:

1. Calculate the current cost index for the project.
2. Calculate the current schedule index for the project.

3. Calculate the profit margin by using recent project data.
4. Select the desired or next project management maturity level the organization wants to achieve.
5. The regression line is y = -1.4701Ln(x) + 2.9099.
    a. y is the forecasted cost index
    b. x is the level of overall project management maturity
6. Calculate the estimated project profit return by using the following formula: profit return = (current cost index * estimated project profit return) / forecasted cost index.
7. To estimate the project management ROI, use the following formula: PM/ROI = ((estimated project profit return * current profit margin) * Annual Project Revenues) / Annualized Project Management Expenditures. (Kwak & Ibbs, 2000a)

Except for step five that involves the regression line, the seven steps seem as though they could be applied to many of the maturity models; however, a new regression line may need to be calculated. The work by Kwak and Ibbs consisted of a sample size of 28 participants from the following industries: (a) 15 engineering/construction, (b) 10 information systems, and (c) 3 high-technology. With an R^2 value of 0.2337, there is little to no correlation and is unproven; yet Kwak and Ibbs believed it to have merit and attributed the very low correlation to the small sample size used in the study. The Kwak and Ibbs study did not provide a p value. Additionally, the research suggests that the benefits of project management maturity marginalize as maturity increases. It still may be worth maturing to level five; however, the return on the investment to get an

organization to level five may be relatively small when compared to the return on investment from achieving previous maturity levels. Finally, the Berkeley PMMM is one of the models that have anecdotal and research study support that indicates value in it application (Kwak & Ibbs, 2000a).

Weakness of the Berkeley project management maturity model. Although the model does not require sophisticated project management tools or techniques, it can be difficult to perform the assessment (Khoshgoftar & Osman, 2009). According to Khoshgoftar & Osman (2009), support for the model is limited.

Kerzner project management maturity model. Kerzner (2001) project management maturity model contains the following five levels with level one being the lowest and five being the highest or pinnacle of project management excellence. Kerzner (2001)labels the five levels as: (a) level 1 – common language, (b) level 2 – common processes, (c) level 3 – singular methodology, (d) level 4 – benchmarking, and (e) level 5 – continuous improvement, (p.1046-1047). In this model, the following levels can overlap one another:

- Levels 1 and 2: occur because an organization may be refining their common language while developing their common processes.
- Levels 3 and 4: occur because benchmarking may take place as the singular methodology is solidifying.
- Levels 4 and 5: occur because there is a feedback loop for continuous improvement. It may be possible for levels 3, 4 and 5 to overlap.

In addition to the levels, Kerzner (2001) identifies the degree of difficulty an organization may face while trying to implement the various project management maturity levels. Table 2 identifies the maturity levels with the difficulty of implementation.

Table 2.

Kerzner (2001, p. 1048-1059) PM Model with Risk and Implementation Rank

Model Level	Name	Risk	Difficulty
Level One	Common Language	---	Medium
Level Two	Common Process	---	Medium
Level Three	Singular Methodology	High	High
Level Four	Benchmarking	---	Low
Level Five	Continuous Improvement	---	Low

Kerzner's (2001) model is different from most models in that it does not dictate the methodology or content that must be measured. Instead, Kerzner (2001) suggests that each organization develop or customize an existing methodology.

Strength of the Kerzner project management maturity model. The Kerzner (2001) PMMM is a traditional five level model that allows individual organizations to define the methodology or content measured by the levels. The flexibility of the Kerzner model appears to be an advantage over other models in that it can be customized and find tuned for various industries, organizations, and unique environments.

Weakness of the Kerzner project management maturity model. The same characteristics that make the Kerzner PMMM flexible could be considered a weakness. For example, the organization performing the assessment must develop or identify the appropriate methodology or content to be measured. An organization with immature project management might find it difficult to develop an appropriate initial methodology.

PMI's organizational project management maturity model. The Project Management Institute developed the organizational project management maturity model (OPM3), which includes an assessment and fundamental information for improving an organization's project management capabilities ("An Executive's Guide," 2004). Organizational strategies typically fail because of the inability to implement them at the tactical level (Fahrenkrog, Wesman, Lewandowski, & Keuten, 2003). Rao (2004) asserts that OPM3 guides the organization in finding a solution for bridging the gap between organizational strategy and the tactical execution of projects so that project management success is realized; however, it seems this assertion can be applied to other maturity models as well. It guides the organization in finding a solution for bridging the gap between organizational strategy and project execution through a series of iterative

assessments focusing on project management, program management, portfolio management, while also focusing on organizational strategy (Crnkovie & Ross, 2006 Rao, 2004) As with many of the models, it is a model geared toward improving organizational project management; it is not a tool for measuring and improving an individual project manager's skills and capabilities (Fahrenkrog et al., 2003).

OPM3 consists of three major sections: (a) knowledge, (b) assessment, and (c) improvement (Rao, 2004). The knowledge section provides the organization with information regarding the model (OPM3) and its application. The assessment section provides the organization with an understanding of where they rank in project management maturity. The improvement section helps the organization identify where to mature and how to reach the desired state of project management maturity (Rao, 2004). When implementing OPM3, most organizations address knowledge, assessment, and improvement, by executing the following six steps:

1. Assess the organization's best practices.
2. Identify the navigation paths.
3. Assess capabilities
4. Plan for improvements
5. Implement changes
6. Repeat the process (Fahrenkrog et al, 2003)

The model identifies over 600 project management best practices, 3000 capabilities and the relationships between the capabilities, and aligns with PMI's

PMBOK process groups (Fahrenkrog, et al, 2003, Rao, 2004). The model is a holistic view of project management and its relationship to an organization. OPM3 increases organizational project management maturity by standardizing, measuring, controlling, and continuously improving the organization's portfolio management, program management, and project management (Fahrenkrog, et al, 2003). Figure 4 is a visual representation of the OPM3 model.

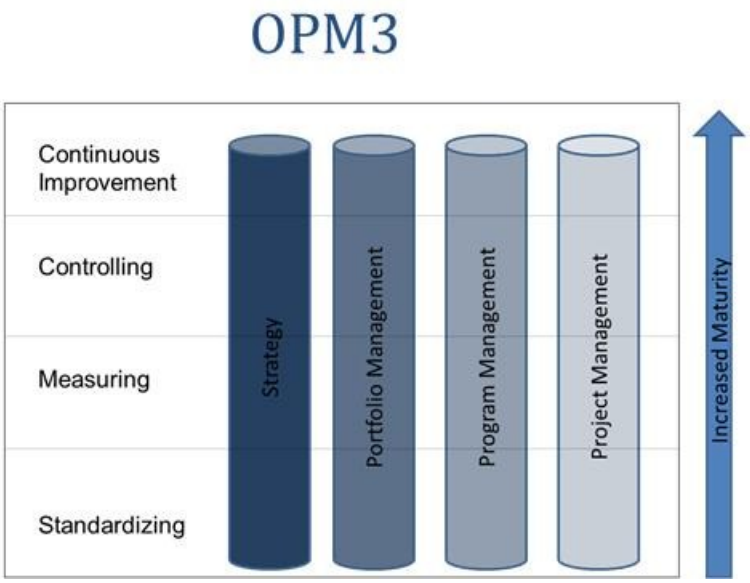


Figure 4. Graphical View of the PMI's OPM3 Model.

OPM3 assessment. OPM3 is a multidimensional assessment model that measures project, program and portfolio management against the following four levels of maturity: (a) standardization, (b) measurement, (c) control, and (d) continuous improvement (Chui,

2005; Fahrenkrog et al., 2003; Schlichter, 2006). Figure 5 provides a visual representation of the assessment model.

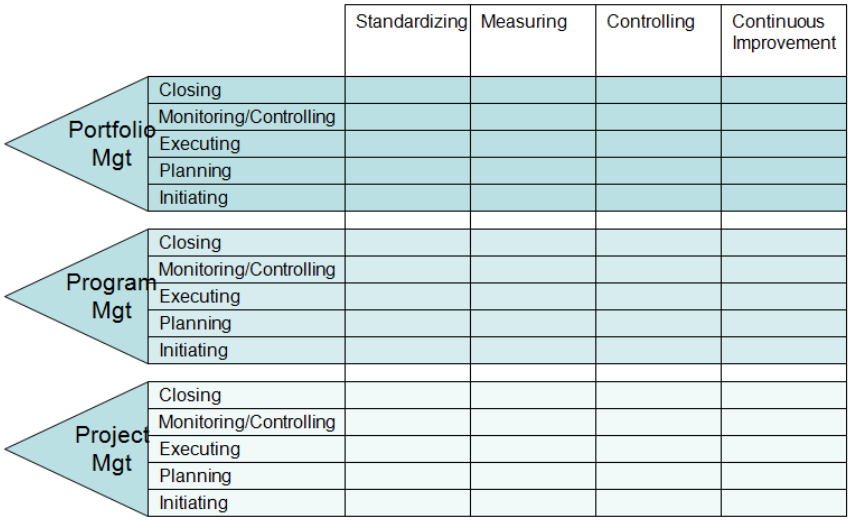


Figure 5. Visualization of the OPM3 Assessment Model.

Strength of OPM3. OPM3 is a model that assesses project, program, and portfolio management capabilities from an organizational perspective, and the model provides guidance for bridging the gaps between the organizational strategy and the tactical execution of projects ("An Executive's Guide," 2004; Rao, 2004). This holistic and encompassing view of project management and organizational strategy is the strength of OPM3. Additionally, OPM3 is aligned with the Project Management Institute's

PMBOK. The International Organization for Standardization recognized the PMBOK Guide as an international standard in 1999 (Schwalbe, 2006).

Weakness of the OPM3. Using OPM3 requires an organizational commitment because of the breadth and scope of the assessment and potential solutions. From the perspective of one person or an individual department, the weakness is that you must have organizational buy-in and a person high in the organization structure supporting the initiative (Fahrenkrog et al., 2003).

SEI's CMM

It is worth gaining a basic history and understanding of the Software Engineering Institute's (SEI) capability maturity model (CMM) because it is the forerunner of many of today's PMMMs (Skulmoski, 2001).The SEI of Carnegie Mellon University designed the CMM ("CMMI FAQ", 2011; Woods, 1999). The model has evolved over the years since it was introduced in 1993 (Software Engineering, 2010). From the original CMM evolved various flavors and revisions such as: (a) CMM-DEV for software development, (b) CMMI-ACQ that focuses on the purchaser of solutions, (c) SA-CMM, and (d) CMM-AM that focuses on documented processes for managing acquisitions ("CMMI FAQ," 2011). The model has seen a number of revisions, the core framework has been consistent (Software Engineering, 2010).

The model's framework consists of three components: (a) maturity levels, (b) process capabilities, and (c) key process areas (Twaites & Sibilla, 2002). The following bullet points identify each of the five maturity model levels and a summarization of the characteristics for each level:

- Level 1: Initial. The characteristics of this level are ad hoc and even chaotic approaches to software development.
- Level 2: Repeatable. Basic project management processes learned.
- Level 3: Defined. Organizational acceptance of defined software development processes and documentation occurs.
- Level 4: Managed. Measured processes and quality measurements for software and products consistently performed.
- Level 5: Optimizing. Feedback loop and processes established to ensure continual improvements. (Li, Chen, & Lee, 2003; Paulk, 1995; Twaites & Sibilla, 2002)

The five maturity model levels were written specifically for software engineering / development, and not for IT/IS project management. Figure 6 is a graphical representation of the five CMM levels, process capabilities, and key process areas as adapted from (Li, Chen, & Lee, 2003; Paulk, 1995; Twaites & Sibilla, 2002).

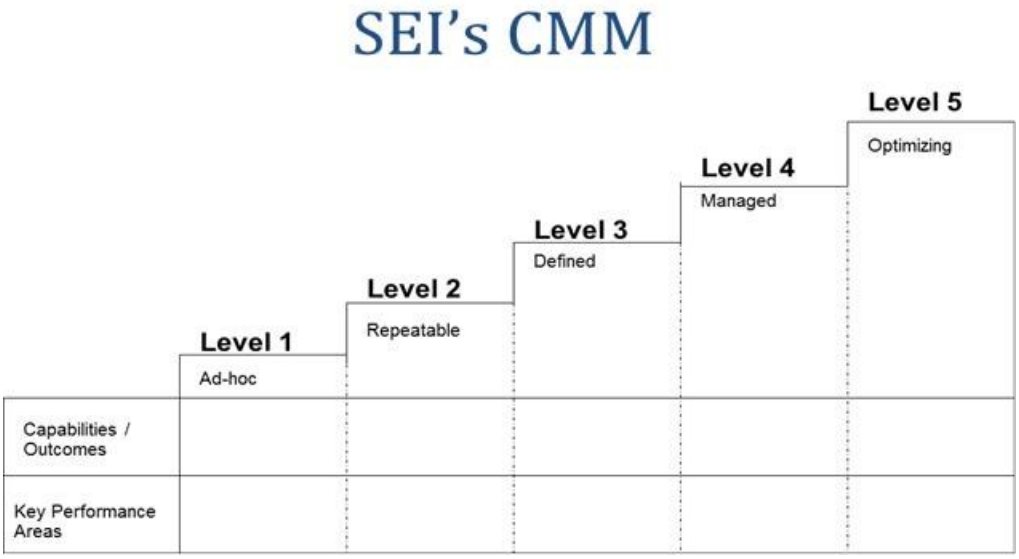


Figure 6. CMM Levels, Process Capabilities, and KPA's.

A number of studies provide anecdotal support for the relationship between software development project success and SEI's CMM (Jiang, Klein, Hwang, Huang, & Hung, 2003).

However, the relationship between the CMM levels and project success is not linear but curvilinear (Jiang et al., 2003). Significant improvements in project success do not occur until CMM level 3 (Jiang et al, 2003). Table 3 provides a brief overview of the learnings (comparisons) from the various project management maturity models.

In a survey study of 70 companies, with 21 questionnaires returned, Brodman and Johnson (1995) identified that implementing CMM at any level provides a benefit. However, a precise measurement was not possible because the population studied had no single definition or formula for calculating return on investment (ROI) (Brodman & Johnson, 1995).

The benefits of applying the CMM to software development can be viewed from multiple perspectives such as time, cost, quality, and customer satisfaction (Herbsleb, Zubrow, Goldenson, Hayes, & Paulk, 1997). When viewing the benefits of the CMM levels, some studies find that there is benefit in maturing at every level except for cycle time (completing work within the planned time constraints) (Diaz & King, 2002; Diaz & Sligo, 1997). The work of Diaz and King (2002), and Diaz and Sligo (1997) identifies a decrease in productivity when maturing from level two to level three of the CMM.

Table 3.

Comparison of Project Management Maturity Models.

Researcher	Maturity Model	Industry	Relationship	Limitations, Comments & Statistical Significance
Eskerod & Riis (2009)	Various	Various	Slightly positive relationship to efficiency, but effectiveness not examined.	Anecdotal evidence, based on 5 case studies
Stausser, Sopko, & Barney (2009)	OPM3	Health-care IT/IS systems	Improvements seen with the adoption of OPM3, but the actual numbers were not provided. No statistical analysis performed.	Anecdotal evidence. Case study has confounding variables in the form of ongoing improvements such as Lean Six Sigma.
Nelson (2007)	Not specified	IT/IS	Poor estimating and/or scheduling topped the list of mistakes/problems.	Anecdotal evidence. Ninety-nine retrospectives

				collected an IT graduate program.
Jiang et al. (2003)	CMM	IT/IS	Curvilinear benefits to maturing. Jiang et al. found a statistical significance occurring at level 3 and higher.	Limited to 154 IEEE Computer Society members $p < 0.75$
Kerzner (2003)	Kerzner	Various	Positive	Anecdotal evidence based on a few organizations. Many variables unaccounted
Jugdev & Thomas (2002)	Generic	Various	Maturity model provides limited benefits. Not statistically significant.	Anecdotal support. Review of various models and previous studies/papers.
Dooley, Subra, & Anderson (2001)		Various	Positive relationship	Adjusted r2 = 0.32 p = 0.00029

Kwak & Ibbs (2000a)	Berk-eley	Cons-truction & IT/IS	Mixed. Weak to fair correlations between maturity & success (cost & time), but no statistical significance.	Small sample size (28) participants. r2 = 0.23 for cost r2 = 0.49 for time

Project Management Methodology

It is important to discuss project management methodologies because a number of project management maturity models use all or part of the methodology as the knowledge areas or context that tells an organization what to measure (Brookes & Clark, 2009). For example, OPM3 incorporates much of the methodology and processes found in PMI's project management body of knowledge (Fahrenkrog, et al, 2003, Rao, 2004). The project management methodology could be used to measure the project management maturity in an organization. There are a variety of project management methodologies such as PMBOK and PRINCE II (PRojects IN Controlled Environments II). Some argue that even with such a variety of methodologies and best practices, organizations should customize the methodology and best practices for their environment (Chin & Spowage, 2010).

PMBOK. Some project management maturity models such as the Berkeley model and OPM3 incorporate PMI's five process groups along with PMI's nine knowledge areas (Kwak & Ibbs, 2000b; Rao, 2004). With this in mind, a brief description of PMI's

process groups and nine knowledge areas is appropriate. The project management body of knowledge (PMBOK) is a guide of best practices, and it is generally considered the standard for project management knowledge (Chin, Yap, & Spowage, 2010). The PMBOK framework consists of five process groups and nine project management knowledge areas (Chin et al., 2010). The five process groups are: (a) initiating, (b) planning, (c) executing, (d) monitoring/controlling, and (e) closing ("A Guide to the project," 2008, p. 40). The nine knowledge areas are: (a) project integration management, (b) project scope management, (c) project time management, (d) project cost management, (e) project quality management, (f) project human resource management, (g) project communications management, (h) project risk management, and (i) project procurement management ("A Guide to the project," 2008, p. 70). The PMBOK maps the knowledge areas back to the process group (Chin et al., 2010). All of these processes and knowledge areas become more standardized and institutionalized as maturity level increases (Chin et al., 2010).

Value of PMMMs

There are a number of PMMMs, all of which imply improved project stability, efficiency, and effectiveness through a maturation process. Throughout the literature, there is varying support for the value of PMMMs. For example, in a study conducted by Eskerod and Riis (2009), their findings support the assertion that PMMMs provide an organization with values such as efficiency and stakeholder satisfaction. In their study, Eskerod and Riis framed the term efficiency as a set of value statements obtained from the study participants. The findings identified efficiency as meeting or reducing time and

or cost (Eskerod & Riis, 2009). Jugdev and Thomas (2002) assert that PMMMs provide an organization with: (a) some tactical benefits, and (b) marginal strategic benefits.

PMMMs relationship to project success. Some of the support for project management maturity models is anecdotal. Kerzner (2003) points to the success of organizations such as Ericsson and Nortel, which strategically implemented their project management strategy and maturity models. Kerzner (2003) attributes the organizations' success in part to the organizations' project management maturity. However, this potential correlation is not necessarily causation. In a study of 10 famous IT project failures, the number one reason for the failure traced back to poor estimating and scheduling (Nelson, 2007). Improvement of estimating and scheduling tends to improve as an organization's project management maturity improves (Kwak & Ibbs, 2002). As an organization's project management maturity level increases, so too does the organization's adoption and proficiency of scheduling tools and techniques (Kwak & Ibbs, 2002). The efficiency and effectiveness of an IT project can be greatly impacted by the estimating and scheduling processes relating to scope, time, and cost. Nelson (2007) suggests that the use of work breakdown structures and techniques such as the Delphi approach, improves project estimates and scheduled; which also improves maturity. In addition to improving estimating, one could use the list of processes and tools identified by Nelson (2007) as question to measure an organizations project management maturity. According to the Guide to the Project Management Body of Knowledge (PMBOK), these suggestions are processes; processes that can be improved and matured. If the tools and

techniques suggested by Nelson (2007) were adopted organizationally, it leads to improved project management maturity and should improve project outcomes.

In a study healthcare IT/IS by Stausser et al., (2009), that focused on project success using the OPM3 maturity model, the anecdotal evidence led the researchers to conclude that there is a positive relationship between project maturity and project success. Additionally, Stausser et al., (2009) noted that the skills and experience of the project manager greatly influence project effectiveness (meeting scope).

Not all the studies based on anecdotal evidence supports a positive relationship between project management maturity and successful project outcomes. In a six-year longitudinal study of 550 international organizations, Mullaly (2006) identified a trend of decreasing project management maturity while project outcomes remained constant. This anecdotal evidence suggests there is no relationship between project management maturity and project outcomes. Mullaly (2006) concluded that maturity is not a critical variable for project management success.

Dooley, Subra, and Anderson (2001) conducted a study involving 39 participants focusing construction and IT/IS project management. The study used a four level project management maturity model similar to the CMM. Regression analysis resulted in a positive relationship between project success and project management maturity. Regression analysis resulted in an adjusted $r2 = 0.32$ and $p = 0.00029$ (Dooley et al., 2001).

The Eskerod and Riis (2009) performed a case study of five companies from various industries such as IT, financial services, and pharmaceutical. The anecdotal evidence from the Eskerod and Riis (2009) study found that project management maturity

provided a slight improvement in project efficiency (cost and time). The Eskerod and Riis (2009) study did not include project effectiveness.

Not all the support or rejection for project management maturity models is anecdotal. The following subsections present research and statistical results of studies involving maturity models.

Kwak and Ibbs 2000 study. According to Kwak and Ibbs (2000a), not all organizations should strive for the highest level of project maturity. Using the Berkeley project management maturity model, Kwak and Ibbs (2000a) performed a study of 38 organizations from various industries. Of the 38 organizations, only 17 provided enough cost related data and only 15 for schedule related data. The study concluded that the relationship between:

- Project outcomes in terms of cost index and project management maturity level increased curvilinearly
- Project outcomes in terms of schedule index and project management maturity level increased curvilinearly.

The relationship between project cost performance (cost index) and overall project maturity was $y = -1.470\text{Ln}(x) + 2.9099$, $r^2 = 0.2337$. The relationship between project schedule performance and overall project maturity was $y = -7.5992\ x^{-1.5494}$, $r^2 = 0.4922$ (Kwak & Ibbs, 2000a, p.43). The Kwak and Ibbs (2000a) study shows a fairly robust correlation coefficient for time; however no p values were provided. This finding is similar to that of Jiang et al.'s (2003) finding of support for a curvilinear relationship between SEI's CMM to project success.

The Kwak and Ibbs (2000a) study used project management maturity as the independent variable, and the dependent variables consisted of a cost index and a schedule index. Kwak and Ibbs' (2000a) study did not support a strong correlation between project management maturity and (a) project cost performance ($R^2 = 0.2337$), and (b) project schedule performance ($R^2 = 0.4922$). However, the study indicates there is a weak relationship between overall project management maturity and improved cost performance; and there is a moderate relationship between overall project management maturity and improved schedule performance. To calculate a project's cost performance and schedule performance, the researchers used the following formulas:

- Cost performance index = actual project cost / original budget.
- Schedule performance index = actual project duration / originally planned duration. (Kwak & Ibbs, 2000a).

One would expect an inverse relationship between the performance indices and the project management maturity level. For example:

- An organization with a low project management maturity level would exceed its original budget, resulting in a cost performance index greater than 1.0
- An organization with a high project management maturity level would meet or spend less than the original budget and have a cost performance index equal to or less than 1.0.

The major concerns with the results of the Kwak and Ibbs (2000a) study are the small sample size and the weak correlations. Only 15 participants provided schedule information and 17 provided cost information (Kwak & Ibbs, 2000a). By not having 30

or more observations or participants providing enough information for analysis, leads one to question if the sample accurately represents the population (Rountree, 1981). The second concern involves the correlations between performance and project maturity level. Using the classification system provided by Salkind (2008), an r^2 of 0.4922 for schedule performance and project maturity level is classified as a moderate relationship and an r^2 of 0.2337 is considered a weak relationship. Unfortunately, the Kwak and Ibbs (2000a) did not report the details of statistical significance except for the correlations not being significant. Overall, the correlation between project outcomes and project management maturity level is at best moderate. Even though the methodology for Kwak and Ibbs (2000a) may be sound, the small sample size and lack of a strong correlation leads one to questions the results.

Jiang et al., (2003) CMM study. Jiang et al., (2003) conducted a study on the CMM and project success. The study was limited to IT/IS software development projects. One thousand surveys were sent to randomly selected members of the Institute of Electrical and Electronics Engineers (IEEE). Of the 1,000 surveys sent, 154 responded and provided enough information for the study. Regression analysis of project performance and project management process resulted in a coefficient of -0.03 and a $p = 0.75$. Regression analysis of project performance and software development maturity resulted in a coefficient of 0.39 and a $p = 0.0001$. The results of the (Jiang et al., 2003) analysis resulted in the relationship between project management maturity and project performance (success) not being statistically significant.

Project Success and Failure

In the traditional sense, measuring project success focuses on the following perspectives: (a) project cost or budget, (b) project time or schedule, and (c) project scope (Kupakuwana & van der Berg, 2005). According to Collins and Baccarini (2004), there is support indicating a relationship between successfully managing a project's time, cost, and quality, and the success of both the project and the product or service created by the project. It is worth noting that in the case of IT/IS projects, meeting a project's requirements does not necessarily translate into internal acceptance and external market acceptance due to the possibility of deficiencies in defining requirements and/or changes in external variables However, as Collins and Baccarini (2004) noted, there is a relationship between successfully managing the dimensions of a project and the product's internal and external success.

Some assert that project success and project failure are vaguely defined terms within project management, not just for IS/IT projects (Chua, 2009; Hyvari, 2006; Zedler, 2007). Others see project success and failure as endpoints on a continuum. Failure and success are not necessarily absolute conditions because a project could be considered a success if it meets or exceeds the organization's needs even though it exceeds its planned budget or timeframe (Cleland & Ireland, 2002).

Clearly, not all projects are absolute failures or absolute successes (Baccarini, 1999; Cleland & Ireland, 2002). The Standish Group (as cited in Marchewka, 2006, p. 6) identifies three types of projects: (a) successful, (b) challenged, and (c) impaired / failed. A challenged project is one that fell short of meeting the projects' scope, time, and/or cost goals (Standish Group, 1994; Sterpe, Schwaber, Stone, & D'Silva, 2007). It is easier

to define a successful project. A successful project is one that is within budget, completed within the scheduled timeframe, and delivers all the requirements initially identified (Standish Group, 1994). The failed project is one that is cancelled or halted during the development lifecycle. Table 4 represents the Standish Group's (1994) description of successful, challenged, and failed projects. This research will use the Standish Group's definition of success (successful, challenged, and impaired/failed). It is being used because it widely cited in the IT/IS literature.

Table 4.

Project disposition with associated criteria per the Standish Group (1994)

Project Disposition	Met Scope / Requirements	Met Budget	Met Schedule	Halted / Cancelled
Successful	Yes	Yes	Yes	No
Challenged	Yes	Yes	No	No
Challenged	Yes	No	Yes	No
Challenged	No	Yes	Yes	No
Challenged	Yes	No	No	No
Challenged	No	No	Yes	No
Challenged	No	Yes	No	No
Challenged	No	No	No	No
Failed	---	---	---	Yes

Why IT/IS Projects Fail

Many projects, not limited to IT/IS, face obstacles that threaten their success. Phillips (2002) identified the following four challenges that threaten the success of any project: (a) cost overruns; (b) time overruns; (c) customer dissatisfaction, related to scope, time, and cost; and (d) turnover and low morale. In general, optimism bias is an issue for all projects (Valerdi, 2010; Parekh, Roy, & Baguley, 2009). The difficulty in reviewing software deliverables results in the project manager relying on the software developer to report accurate status (McDonald, 2001). Further clouding the accuracy of status reports, is the belief that software developers, and IS professionals in general, are over optimistic when reporting status (McDonald, 2001). If IS professionals are over optimistic it could also result in poor cost and schedule estimates. Having a mature project management maturity level, could reduce the impact of being overly optimistic.

Optimism bias can be reduced through critical thinking about the future event and by providing information on how other people view or analyze the event (Weinstein, 1980). In Valerdi's (2010) paper on project cost estimation, it is asserted that optimism bias exists. The optimism bias could be mitigated through improved project management maturity (Valerdi, 2010).

A survey study, focusing on cost estimation within the bidding process, found that optimism bias could be reduced through improving current process, method, or using multiple methods (Parekh et al., 2009), which in turn improves project cost management maturity. This could lead one to conclude optimism bias could be reduced as one progresses through the levels of project management maturity.

Beyond these general issues, IT/IS projects face some additional challenges (McDonald, 2001; Snow & Keil, 2002). For example, the nebulous nature of IT/IS projects causes difficulty for stakeholders to visualize the project's ultimate goal(s) during the initiation and planning phases. Additionally, software development projects challenge the project manager by making it difficult to review project and product related deliverables (McDonald, 2001; Snow & Keil, 2002). However, advanced project management maturity should provide ways to reduce the nebulous nature of IT/IS projects and/or provide a way to manage them better (Dowson, 2007).

Project failure warning signs. Shifting from the metrics of success/failure (cost, time, and scope) to possible causes of failure, people, process, and/or product breakdowns (failures) are three major categories as to why IT and IS project fail (Abbas & Sanavullah, 2008; Kappelman et al., 2006). Abbas and Sanavullah (2008) conducted a study of IT/IS projects and identified twelve warning signs of a troubled project. Table 5 is a listing of Abbas and Sanavullah's (2008) twelve warning signs along with a column identifying the related PMBOK knowledge area. As shown in Table 5, a good deal of the warning signs involves scope and time management.

Table 5.

Early Warning Signs as adapted from (Abbas & Sanavullah, 2008)

Warning Sign	PM Knowledge Area
Requirements and/or success criteria incomplete	Scope
Milestone deliverables and due dates lacking	Time
Project planning and /or management is not effective	All Knowledge Areas
Objectives unclear	Scope
Timelines impractical	Time
Project team lacking appropriate technology skill sets	Human Resource
Breakdown in communications	Communications
Lacking risk management processes and documentation	Risk Management
Scope creep and changing requirements or specifications	Scope
Over allocated project team members	Time
Weak project manager	All
Low project team commitment	Human Resource

Project Management Maturity by Industry

Project management maturity levels vary by industry (Brookes & Clark, 2009; Cooke-Davies & Arzymanow, 2003). Utilizing the data from researcher performed by Cooke-Davies and Arzymanow (2003), Brookes and Clark (2009) identified the average project management maturity level to be 4.69 for the petrochemical industry, 3.66 for the

financial services industry, 3.56 for the construction industry, and 3.46 for the telecommunications industry. There appears to be a connection between when the industry as a whole adopted project management and the current level of project management maturity (Cooke-Davies & Arzymanow, 2003). IT/IS project management maturity levels typically are at level two (Pennypacker & Grant, 2003). Interestingly, in a six year longitudinal study of 550 international organizations, project management maturity levels across all industries appear to be declining (Mullally, 2006). Mullally (2006) cannot identify why the drop occurred, but conjectures that it could be due to a shift in organizational attitudes from that of a methodical approach to one of just 'get it finished.' However, the study by Mullaly (2006) and the work of Jugdev and Thomas (2002) do not show a significant statistical relationship between project management maturity level and project success.

CHAPTER 3

METHODOLOGY

The research methodology for this study is a non-experimental, cross sectional, mixed-methods design with triangulation. The independent variables consist of the three project management maturity measures that focus on cost, time, and scope (CostPMML, TimePMML, and ScopePMML). The concept behind using these three sub-maturity levels is twofold. First, projects are typically judged by how successful they met cost, time and scope objectives. It seems there should be relationship between the maturity dimension and meeting the corresponding objective. Second, most of the research focuses on project management maturity as a whole, not on the individual dimension of maturity. Research studies focusing on describing, explaining, and building theory tend to be qualitative research studies while studies focusing on numeric data and testing theory tend to be quantitative studies (Leedy & Ormrod, 2005). The focus of this study is to test the theory that project management maturity level influences project performance. With project performance being measured in terms of efficiency (cost and time) and effectiveness (scope). Since efficiency is a function of both cost and time, this research analyzes cost and time as discrete variables that contribute to efficiency.

The researcher used triangulation of the following three data sets to answer the research questions and associated hypotheses:

- Quantitative data collected from the project manager group.
- Quantitative data collected from the project sponsor group.
- Qualitative data collected from the project sponsor group.

Using mixed methods with triangulation of the three data sets typically leads to more reliable and credible conclusions (Creswell & Clark, 2011).

This research used surveys and interviews to collect data from two groups. The first group consists of project executives and sponsors of IT/IS projects, and the second group consists of IT/IS project managers. Moving forward the group of IT/IS project executives and sponsors will be written as the sponsor group, and the group if IT/IS project managers will be written as the project manager group.

Research Design

This research used quantitative data such as cost and time, as well as qualitative data derived from asking open-ended questions regarding project management maturity. This research study focuses on: (a) how project management cost, time and scope maturity levels affect the corresponding project outcomes of meeting cost, time, and scope objectives; (b) how cost, time, and scope project management maturity levels relate to project efficiency (reflecting cost and time) and effectiveness (reflecting scope); and (c) perceptions about the relationship between project success and project maturity. The two data collection instruments consist of one self-administered survey to individual participants in the manager group and the second is an interview with sponsors. Each participant in the manager group focused on an individual project they, as the project manager, Managed; while the sponsor group focuses on a portfolio of projects. The data collected consists of nominal, ordinal, and ratio data types. Most of the data collected is ordinal. Appendix A is a graphical map of the project manager group data analysis from

survey question to associated hypothesis. Appendix B is a graphical map of the sponsor group data analysis from survey question to associated hypothesis.

The quantitative data from both groups (project manager and the project sponsor) plus the qualitative data from the project sponsor group provided the framework so that a level of triangulation occurred to support or reject the stated hypotheses. The target population consists of members from: (a) the Project Management Institute's Delaware Valley chapter membership on LinkedIn with N=1,251; (b) members of the Project Manager Networking Group on LinkedIn, with N=109,114; (c) other project management professionals known to the researcher; and (d) other project management groups on LinkedIn. Table 6 contains a detailed list of the LinkedIn groups and project manager target population. Nine executive level leaders with IT/IS project sponsorship responsibilities were individually interviewed.

Strengths and weaknesses of the design. The research design for the study is a cross sectional, mixed-methods design. This section addresses the strengths and weaknesses of the cross sectional survey research, mixed-methods research, and convenience sampling.

Cross sectional surveys / design. One of the strengths of a cross sectional research design is that it is well suited for studies in which the researcher has little to no control over the independent variable (Leming, 1997). For example, in this dissertation research study, the researcher cannot control the project management maturity levels of organizations. Leming (1997) identifies additional benefits or strengths of a cross sectional research designs such as: (a) it occurs in the real world, not in an artificially

created environment; (b) it has good generalizability; and (c) data collection and analysis can be completed in a relatively short timeframe.

The weakness of data collected from the cross sectional survey approach is that it can be difficult to establish causation (Jex, 2002, p. 31; Leming, 1997). Leming (1997) also notes that the researcher's ability to control external variables is limited in a cross sectional research design. In this research, correlation, not causation is the objective of the research. The researcher did not intend to control the independent variables. Therefore, the cross sectional survey design is appropriate.

Sampling. Originally, the researcher attempted to limit the project manager sample to the members of a specific project management association known worldwide. However, due to time and cost constraints, it was decided to use professional groups found on LinkedIn. The strength of a convenience sampling is that it enables the researcher to obtain participants relatively quickly and easily (Johnson & Christensen, 2012). The weaknesses of a convenience sampling are: (a) it is not a random sample, and (b) there is self-selection bias (Dubin & Rivers, 1989; Johnson & Christensen, 2012).

In this research, the convenience sampling limited the project manager group to specific professional groups on LinkedIn and to project managers known to the researcher. It also limited the participants of the project sponsor group to the people known to and amenable to meeting with the researcher.

Mixed method design. Mixed methods research enables the researcher to utilize the appropriate qualitative and quantitative approaches to answer a research question (Johnson & Onwuegbuzie, 2004). Additionally, the mixed methods research enables triangulation and increases generalizability (Johnson & Onwuegbuzie, 2004). Some of

the weaknesses include: (a) the possibility for conflicting results, (b) the researcher needs to understand multiple methods, and (c) purists may argue that research should only be qualitative or quantitative (Johnson, 2006).

Support for the methodology. The use of surveys, interviews, or a combination of both is not new to research and studies (Cox, Issa & Ahrens, 2003; Kutsch & Hall, 2009; Yeung, Chan & Chan, 2009). The reason for the mixed methods was to allow the researcher to collect detailed data as well as "gain a deep insight as to what is relevant from the respondent's point of view" (Kutsch & Hall, 2009, p. 75). The use of triangulation or multiple data sources to support a hypothesis is not uncommon for qualitative and mixed method research designs (Leedy & Ormrod, 2005).

Source of the data to be collected

The data collected from the project manager group consists of specific professional network groups on LinkedIn. Table 6 is a listing of professional networking groups on LinkedIn along with their membership numbers as of June 2011.

Although the number of people in the potential sample population is relatively large, the actual number of participant is very small in comparison. With a sample population between 181,199 and 323,413 and the number of usable respondents being 47, the sample population is very small, being between 0.000259% and 0.000145%. Unfortunately, the total number of IT/IS project managers in the United States of America during the time of this study are unknown.

Table 6.

LinkedIn Professional Groups and membership

Professional Group on LinkedIn	Membership Count
PMI DVC	1,251
Global Program and Project Network Group	9,400
PMI Information Systems Specific Interest Group	7,413
Project Management Initiatives and New Ideas	24
Project Manager Networking Group	181,199
PMI Credentialed PMPs	41,611
Project Management Link	82,515

Note: All groups include IT/IS project managers as well as non-IT/IS project managers. The only exception to this is the "PMI Information Systems Specific Interest Group."

The intent was to sample mainly IT/IS project managers within the United States of America. However, the sample population contained only 30 respondents, or 63%, from the United States of America. When comparing the sample population to all IT/IS project managers in the United States of America, the percentage becomes even smaller.

The sponsor group consisted of executives and project sponsors drawn from various industries such as healthcare, technology, transportation, and education. The potential participants were project sponsors known to the researcher. The relationship

between the researcher and the sponsor group participants could influence the answers provided by the participants. For example, the participants may consciously or unconsciously provide answers that they believe help the researcher.

The researcher emailed 15 potential participants. Of the 15 potential participants, nine agreed to participate in the study. The data collection instrument for the project manager group was a questionnaire while the data collection instrument for the sponsor group was an interview guide.

Instrumentation

This research study used two data collection instruments. The first is the Project Manager PMML survey and the second is the Sponsor PMML interview questions. The researcher created both data collection instruments because existing data collection instruments did not meet the needs of the research study.

Project manager project management maturity level survey. The purpose of the Project Manager PMML Survey Instrument was to collect project management outcome and project management maturity level data. Appendix C contains the Final Project Manager PMML Survey Instrument used to collect the actual data. A Likert-type scale from one to five was used to collect project management maturity level for cost, time, and scope. Most of the dependent variables, such as cost index and duration index are ratio data calculated from answers to specific survey questions. Additionally, a Likert-like scale characterized other measures of project outcomes, as ordinal data. Having both the ordinal and ratio data types for the project outcomes enabled the researcher to assess whether the questions were understood and consistently answered.

The Project Manager PMML Survey Instrument was tested for validity and reliability during the pilot study.

Sponsor interview questions. The purpose of the Sponsor Interview Questions was to collect project management outcome and project management maturity level data from the perspective of the project sponsor and/or the executive level. The questionnaire includes the Likert-type questions used for the project manager survey. Additionally, the questionnaire contains open-ended qualitative questions.

Data Collection Procedures

The data collection process started after the approval by Wilmington University's Human Subjects Research Committee (HSRC). The data collection consists of two parallel phases. Phase I was the collection of data from project managers. Phase II was the collection of data from sponsors.

Data from project manager group. The use of an online survey tool, Survey Gizmo, was employed so that a larger population could be sampled electronically. The link to Survey Gizmo was sent to seven professional groups (see table 6 for the list of professional groups) via posting(s) to each group on LinkedIn. Appendix D contains the draft message that was posted to the each identified professional group on LinkedIn. Finally, an email with the link to the survey was sent to project managers known by the researcher (see Appendix D).

After collecting data for a period of approximately 2 months, all data was downloaded to a thumb/USB drive and secured. The thumb/USB drive data file is

password protected. When not in use, the drive was locked in a fireproof safe. To ensure anonymity, no identifying data such as name, address, social security number, etc. was collected. The data on Survey Gizmo was deleted by the researcher after confirming successfully downloading the data to the thumb/USB drive.

Data was securely stored on a second USB/Thumb drive as a file using the statistical package for the social sciences (SPSS) application. The SPSS file was, and remains password protected and the USB/Thumb drive secured in a locked, fireproof safe. The data will be kept for at least three years.

Data from sponsor group. The researcher performed interviews with selected executives, project sponsors, and project management office (PMO) managers/directors. The individuals came from various industries, but they had some level of responsibility for the success of IT/IS projects. Table 7 identifies the industries and size by number of employees and by 2011 sales. At the beginning of the interview, the interviewer reminded the participant to focus on all projects (portfolio of projects), not just an individual project. Additionally, the interviewer took notes and recorded the answers provided by the participants on paper. Although scheduled for 20 minutes, the interviews typically lasted 30 minutes.

Table 7.

Sponsor Participant Industry and Size

Industry	Number of Employees	2011 Sales
Education	1,000	100,000,000.00
Finance	10,000	47,000,000,000.00
Healthcare	4,000	1,500,000,000.00
Healthcare	20,000	N/A
Service Industry	2,500	750,000,000.00
Service Industry	2,500	750,000,000.00
Technology	5,000	1,000,000,000.00
Technology	15,000	4,500,000,000.00
Transportation	18,000	1,900,000,000.00

Note: the list is sorted alphabetically by industry.

The handwritten answers and notes were converted to an electronic format in two ways. First, a scanned image of the notes were saved on a thumb/USB drive. Second, the answers / notes were entered into an SPSS data file. Both the saved images and the SPSS data file were password protected. When not in use, the thumb/USB drive was stored in a locked fireproof safe. The handwritten notes were secured in a locked

fireproof safe until they were digitized. Once digitized, the handwritten notes were shredded.

Coding of sponsor group data. The quantitative and qualitative nature of the interviews with the project sponsor group required some portions of the data to be coded.

Coding of the qualitative questions. The first qualitative question is question number 4 on the survey (See Appendix E). If the sponsor answers yes, they plan to move to the next level, or they plan to move to the next level and they see value in maturing, then the variables tracking "Moving to Next Level" and "See Value in Maturing" are set to yes. The second qualitative question is question number 5 on the survey. If the sponsor indicates and describes a formal plan to move to the next level, then the variable tracking "Formal Plan for Maturity" is set to yes.

During the interviews, the researcher kept alert for verbal indications that the participant believes in a relationship between the three dimension of maturity (cost, time and scope) and the associated success in meeting cost, time and scope.

While the participant described their desired state of project management maturing, the research kept alert for characteristics or descriptions of a level 5 maturity level. If the participant's description or characteristics of a level 5 maturity were mention as the desired state, then the researcher recorded this as an affirmation of level 5 maturity is perceived as being good for an organization.

During the course of the interviews, the interviewer kept alert for certain processes, methods, and tools that relate to the dimensions (cost, time and scope) of project management maturity. This was used as a reliability check between the stated maturity level and the processes, methods, and tools used at the organization. In a similar

vein, the interviewer kept alert for key words describing a relationship between a dimension of maturity and meeting the objective of the dimension.

Pilot

The purpose of the pilot study was to ensure validity and reliability of the project manager survey instrument, and validity of the quantitative executive interview questions. The following subsections identify the pilot study process, findings, and modifications to the data collection instruments.

Piloting the project manager survey instrument. The steps for ensuring validity and reliability of the project manager survey instrument consisted of the following five steps:

1. The researcher recruited five experienced project managers to participate in the study.
2. The researcher communicated the purpose of the research and the pilot study to the participants.
3. The researcher asked the project managers to complete the survey and to provide feedback regarding the survey questions, such as the appropriateness and clarity of the questions.
4. After confirming face validity (step 3), the researcher checked internal consistency reliability by calculating Cronbach's alpha on three of the independent variables and nine reliability check question variables using SPSS Predictive Analytical Software (PASW). The nine reliability check questions consists of three questions focusing on time management maturity, three

questions focusing cost management maturity, and three questions focusing on scope management maturity. These questions assist the researcher in evaluating reliability of the survey instruments. Table 8 provides information about the nine reliability check variables as well as information about the related independent variables. The sets of data analyzed are:

- The reliability of the time management maturity level response was checked by questions assessing use of baselines, critical path, and milestones. Running a Cronbach's alpha using the time related variables / questions, indicates the level of consistency between the time management maturity level provided by the participant and the three time related reliability check questions . The reliability check questions identify the participants' use of time management related best practices. The Cronbach's alpha for time management resulted in $\alpha = 0.607$.
- The reliability of the cost management maturity level response was checked by questions assessing use of earned value, budget management and cost estimating techniques. Running a Cronbach's alpha using the cost related variables / questions, indicates the level of consistency between the cost management maturity level provided by the participant and the three cost related reliability check questions. The reliability check questions identify the participants' use of cost management related best practices. The Cronbach's alpha for cost management resulted in $\alpha = 0.680$.

- The reliability of the scope management maturity level response was checked by questions assessing use of work breakdown structures, scope statements, and scope management. Running a Cronbach's alpha using the time related variables / questions, indicates the level of consistency between the scope management maturity level provided by the participant and the three time related reliability check questions . The reliability check questions identify the participants' use of scope management related best practices. The Cronbach's alpha for scope management resulted in $\alpha = 0.557$.

5. The researcher adjusted the project management group survey questions after reviewing the results of the pilot study. The revision consisted of two changes. The first being minor editorial changes. The second change was a reduction in the number of 'reliability check' questions from nine questions to six questions. These changes are discussed in more detail in the 'Pilot study findings" section. Since the changes were relatively minor, the researcher and the dissertation committee agreed that a second pilot was not needed.

Table 8.

Pilot Survey - Chronbach's Alpha Variables

Variable	Description	Question	Metric Measured
CMML	Cost management maturity level	6	Likert like scale of the organization's CMML.
CMR1	Cost Management Reliability Question 1	18	Organizational use of earned value
CMR2	Cost Management Reliability Question 2	19	Organizational use of budgets.
CMR3	Cost Management Reliability Question 3	20	Organizational use of formal cost estimating techniques.
SMML	Scope Management Maturity Level	7	Likert like scale of the organization's SMML.
SMR1	Scope Management Reliability Question 1	21	Organizational use of WBS.
SMR2	Scope Management Reliability Question 2	22	Organizational use of scope statements.
SMR3	Scope Management Reliability Question 3	23	Organizational use of a scope management plan.
TMML	Time management maturity level	5	Likert like scale of the organization's TMML.
TMR1	Time Management Reliability Question 1	15	Organizational use of baselines.
TMR2	Time Management Reliability Question 2	16	Organizational use of critical path.
TMR3	Time Management Reliability Question 3	17	Organizational milestone usage.

Sponsor group interview question validation steps. The steps for ensuring validity of the sponsor group interview questions consisted of the following four steps:

1. The researcher recruited three project sponsors to participate in the review of the interview questions.

2. The researcher communicated the purpose of the research and the interview questions.
3. The researcher had the participants provide feedback regarding the appropriateness and clarity of the sponsor group interview questions.
4. The researcher adjusted the sponsor group interview questions after reviewing the results of the pilot study. With the dissertation committee's agreement, the following adjustments were made:
    a. Removed the open ended question "What are your thoughts on project management maturity models"
    b. Removed the open ended question "There have been some assertions that the benefits received as you progress through the project management maturity model are not linear. In other words, you receive a greater ROI when you achieve level 3 then levels 1 or 2. What are your thoughts on the ROI at each level?"
    c. Removed the open-ended question "Do you believe that all organizations should strive for level 5? Why or why not?"
    d. Added the following open-ended question "Over the next 1-2 years, do you plan to move to the next level of project management maturity?"
    e. Added the following open-ended question "If you are planning to move to the next level of project management maturity, what major steps do you need to take?

Pilot study findings. Overall, the pilot study findings support the validity and reliability of the data collection instruments. A few modifications were made to the PM survey instrument to improve reliability and to reduce the number of extraneous questions needed in the survey.

Validity and reliability of the pm survey instrument. Following the steps identified in the 'Piloting the PM Survey Instrument' section, the researcher recruited five IT/IS project managers from different organizations and industries. Each of the participants confirmed the face validity of the survey instrument. The participants found that some acronyms and words were not consistently capitalized. The researcher updated the questionnaire to address minor editorial changes.

The initial reliability calculations using Cronbach's alpha produced the following results:

- $\alpha = 0.607$ for the questions associated with time management maturity.
- $\alpha = 0.680$ for the questions associated with cost management maturity.
- $\alpha = 0.557$ for the questions associated with scope management maturity.

Table 8 provides information regarding the fields used in the Cronbach's alpha test. After further analysis, it was determined that reducing the number of reliability check questions improved the Cronbach's alpha results for two of the three sets of variables:

- $\alpha = 0.690$ for the questions associated with time management maturity.
- $\alpha = 0.716$ for the questions associated with cost management maturity

Kent (2001) recommends that Cronbach's alpha levels should be 0.5 or above before starting preliminary research. With this in mind, the alpha levels from the pilot are

acceptable. Based on the results of the Cronbach's alpha, the following survey questions were removed from the PM survey instrument:

- question regarding the use of schedule baselines
- question regarding the use of formal cost estimating techniques
- question regarding the use of scope management plans.

Based upon the dissertation committee's recommendation, the question regarding the PM's perception of customer satisfaction, was removed from the survey instrument because the research does not involve customer satisfaction. Appendix C contains the updated or finalized PM survey instrument.

Validity of the sponsor group interview questions. Following the steps identified in the 'Sponsor/Executive Interview Question Validation Steps' section, the researcher recruited four people to review the interview questions. The group consisted of IT/IS project sponsors and executives from different organizations and industries. They confirmed the face validity of the interview questions and were enthusiastic and supportive of the research.

Data Analysis Procedures

The researcher used SPSS for most of the chi square analysis and MS Excel for generating the pie and bar charts. The project management group data was exported from SurveyGizmo.com into SPSS and into MS Excel. The sponsor group data was manually entered into SPSS and into MS Excel.

A chi square test, and in some instances a Fischer's Exact test, were used to analyze the data collected from both data groups. From a descriptive statistics

perspective, charts and bar graphs are used. The chi square alpha level of significance for this research is set to 0.10. An alpha of 0.10 is an acceptable alpha level for business research (Gravetter & Wallnau, 2009). Because previous research on the topic has at best, mixed results, the alpha for this research was set to the largest acceptable limit. This increases the risk of rejecting the null hypothesis when it should not be rejected. This is an acceptable risk to the researcher.

Threats to Validity and Reliability

A major threat to the validity and reliability of the research is the sample population. The inherent disadvantage of the convenience sampling is that it may not be representative of the population. In this research, use of professional groups within the boundaries of LinkedIn may not be a fair representation of all IT/IS project managers. Even more importantly, is the group that responded representative of the whole. The intention of the study was to focus mainly on IT/IS project managers within the United States of America. However, a significant percentage of the project manager group participants were outside the United States.

New data collection instruments must be tested to ensure validity and reliability. Because of this, the following measures were taken to reduce the threats to validity and reliability. To reduce the threat to validity of the survey instruments, the pilot participants performed a face validity assessment of the instruments. maturity.

There is a risk that the project managers who responded to the survey are above average, seasoned project management professionals. Since the surveys do not collect

information regarding project management experience or certification, this is a recognized threat to validity.

Ethical Concerns

Typically, cross sectional research studies not involving treatments have few ethical issues (Mann, 2003). This cross sectional, mixed methods research study has no treatments. Ethical concerns for this study focus on study participant anonymity and influencing the study participants.

Participation in the study was voluntary. All study participants remain anonymous and only aggregate data reported and shared. Additionally, none of the data collected indicate the participants' name, age, or other data elements that directly identify the participant. Study participants were not paid, however they were provided with a link to some of the aggregate data. The link was be periodically updated so that participants could view the aggregated data as it was collected. In the case of the individual interviews with executives, the researcher knows the participants; however, no identifiable information will be published.

CHAPTER4

RESULTS

The purpose of the research is to identify the relationship between project management maturity and project success. This chapter presents the quantitative and qualitative findings following the methodology described in Chapter III. Each hypothesis identified in Chapter I is addressed in the following subsections of this chapter. The subsections of this chapter have been organized by: (a) cost management, (b) time management, and (c) scope management. However, before reviewing the results, a brief discussion of the data is appropriate.

Data

The project manager group consists of 63 respondents. Of the 63 respondents, 16 were eliminated because they: (a) provided no information, (b) provided only independent variable information, or (c) provided only dependent variable information. Appendix F contains descriptive graphical information regarding the 47 respondents who provided usable information.

The sponsor group consists of nine respondents from various industries such as finance, healthcare, and travel. Appendix G contains descriptive graphical information for this group.

It is worth noting that the data collected from the project manager group contains subjective information, such as the project managers' perception on how well their project met cost objectives, time objectives, and scope objectives. Additionally, the project manager group contains more quantified information regarding the time and cost. This objective information is in the form of cost and time indices that are calculated by

the researcher using the budget information and actual performance information provided by the project manager group participant. Because the sponsor group focuses on all IT/IS projects in an organization (not an individual project's performance), their data is subjective. They are based on perceptions.

Before analyzing the data, the data variables were collapsed or categorized so that: (a) the various cost management maturity levels could be categorized as an immature cost management maturity level or a mature cost management maturity level, (b) the various time management maturity levels could be categorized as an immature time management maturity level or a mature time management maturity level, and (c) the various scope management maturity levels could be categorized as an immature scope management maturity level or a mature scope management maturity level. Additionally, various dependent variables were collapsed, such as: (a) project efficiency, (b) project effectiveness, and (c) meeting scope objectives. Appendix H contains detailed information regarding the collapsed data variables and the schema used to collapse the data.

Data Schema / Collapsing Process. Due to the relatively small sample obtained, ordinal information was collapsed into a smaller number of categories. For the independent variables, the schema consisted of categorizing maturity levels one and two as an immature level. Any maturity level above a two is categorized as being at a mature level. The rational for the being at level three is because most maturity models identify level three as the point at which project management maturity is characterized as defined, integrated, and organization wide (Kwak & Ibbs, 2000b).

The cost and time management indices (dependent variables) were collapsed. If an index was less than one, the index was categorized as missing the objective. An index equal to or greater than one was categorized as achieving the objective.

The dependent variables ranking cost, time, and scope objectives were collapsed using the following schema. If the participant's response was equal to or less than two, then the objective is categorized as being missed. If the participant's response was greater than two, then the objective is categorized as being achieved. Appendix H contains the complete set of variables, including details regarding the collapsing process.

Data reliability. Cronbach's alpha on the following sets of variables / questions from the project manager group data indicated acceptable validity:

- Time management data set (TMML, TMR1, TMR2) with TMML representing the time management maturity level, TMR1 representing the reliability check question focusing on critical path, and TMR2 representing the reliability check question focusing on use of milestones.
- Cost management data set (CMML, CMR1, CMR2) with CMML representing the cost management maturity level, CMR1 representing the reliability check question focusing on earned value, and CMR2 the reliability check question focusing on managing budgets.
- Scope management data set (SMML, SMR1, SMR2) with SMML representing the scope management maturity level, SMR1 representing the reliability check question focusing on work breakdown structures, and

SMR2 representing the reliability check question focusing on use of scope statements.

Running the Cronbach's alpha resulted in the following:

- $\alpha = 0.623$ for the questions associated with time management maturity.
- $\alpha = 0.793$ for the questions associated with cost management maturity.
- $\alpha = 0.833$ for the questions associated with scope management maturity.

Project manager group demographics. The majority of the project manager group participants (64%) are from the United States of America. The pie chart in Figure 7 provides a graphical view of the project management group participants by country.

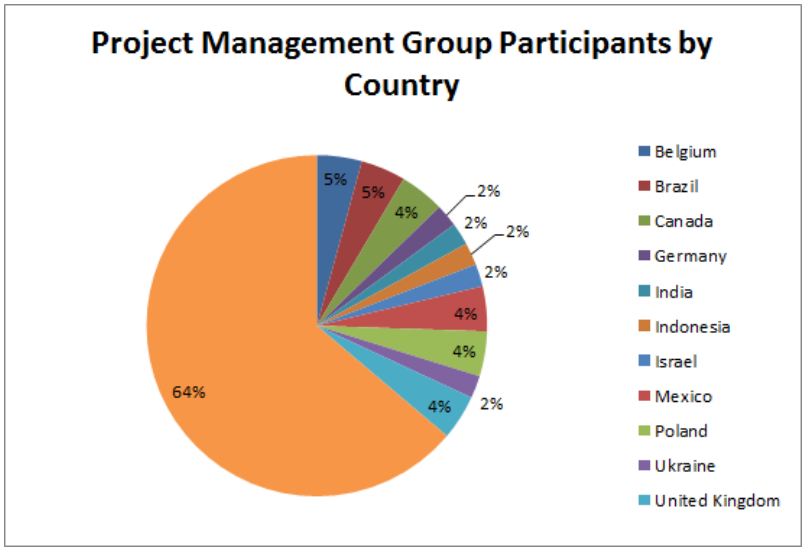


Figure 7. Pie Chart of Project Management Group Participants by Country.

Project size can be measured in a number of ways and using a number of criteria such as cost, time, lines of code, type of project, and effort (Boehm, Valerdi, Lane, &

Brown, 2005; "COSYSMO", 2011; Koch, 2005). However, there is no one standardized criteria for measuring project size (Schalken, Brinkkemper, & van Vliet, 2005).

From the perspective of cost, the majority of the projects from the project management group are under $500,000. At the high end, eight are at or above three million dollars. Figure 8 provides a visual representation of the actual project cost from the project management group.

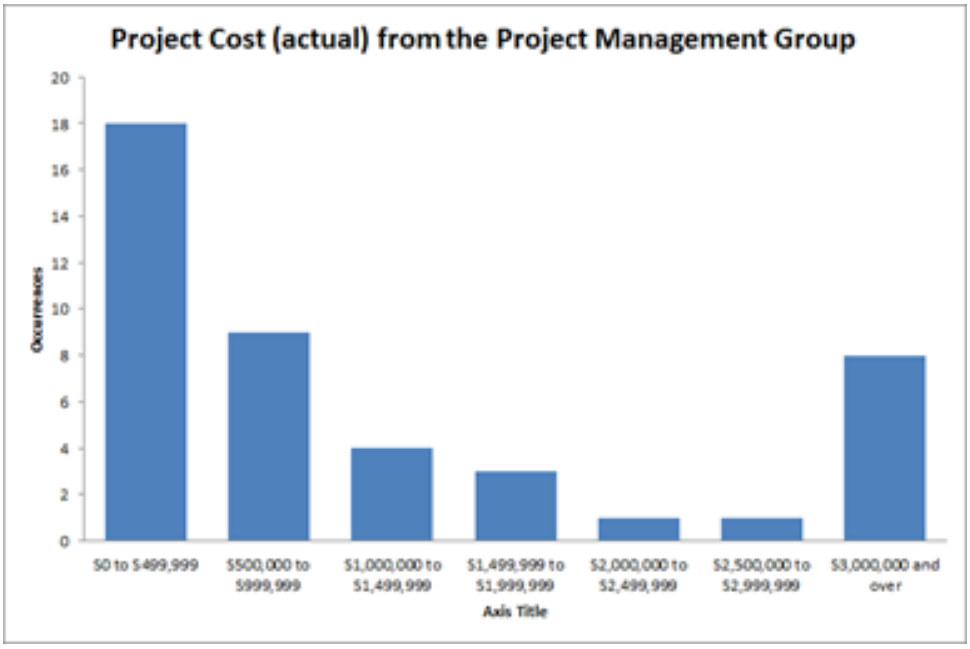


Figure 8. Bar Chart of Actual Project Cost from the Project Management Group.

From the perspective of time, the majority of the projects from the project management group are between seven to twelve months in duration, with one to six months being a close second. Figure 9 represents a graphical view of the actual project duration from the project manager group.

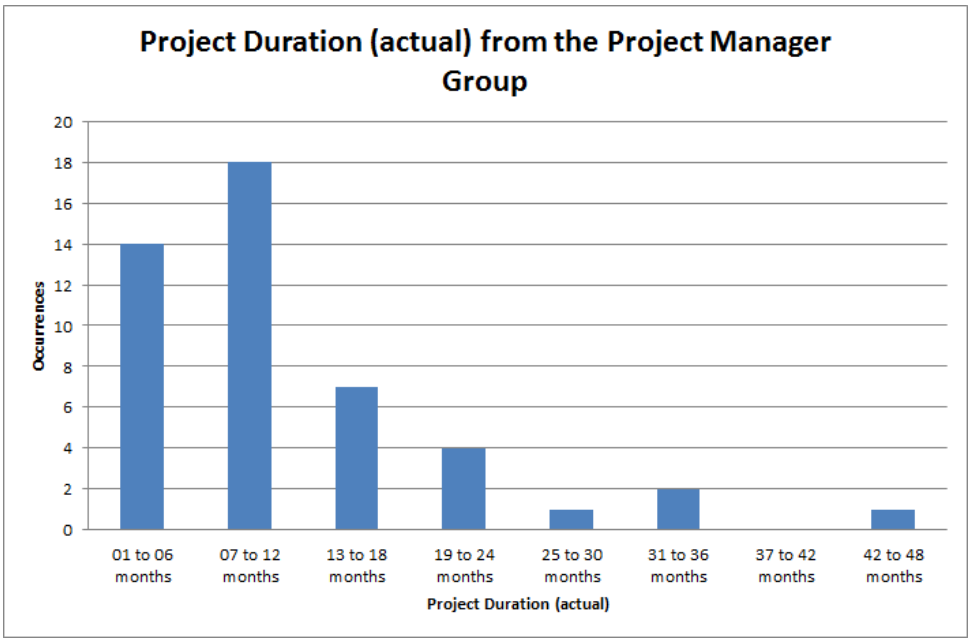


Figure 9. Bar Chart of Actual Project Duration from the Project Management Group.

Project sponsor group demographics. The project sponsor participants work in organizations of various sizes. More project sponsor group participants' work in organizations with 2,500 employees or less; however, the distribution is still good. Figure 10 represents the participant's organization size by number of employees. Additionally, more participants work in organizations with annual sales of up to $1,000,000,000 than any other annual sales category. Again, there is a good distribution. Figure 11 provides a graphical view of the annual sales. Appendix F provides additional graphical information such as participants by industry.

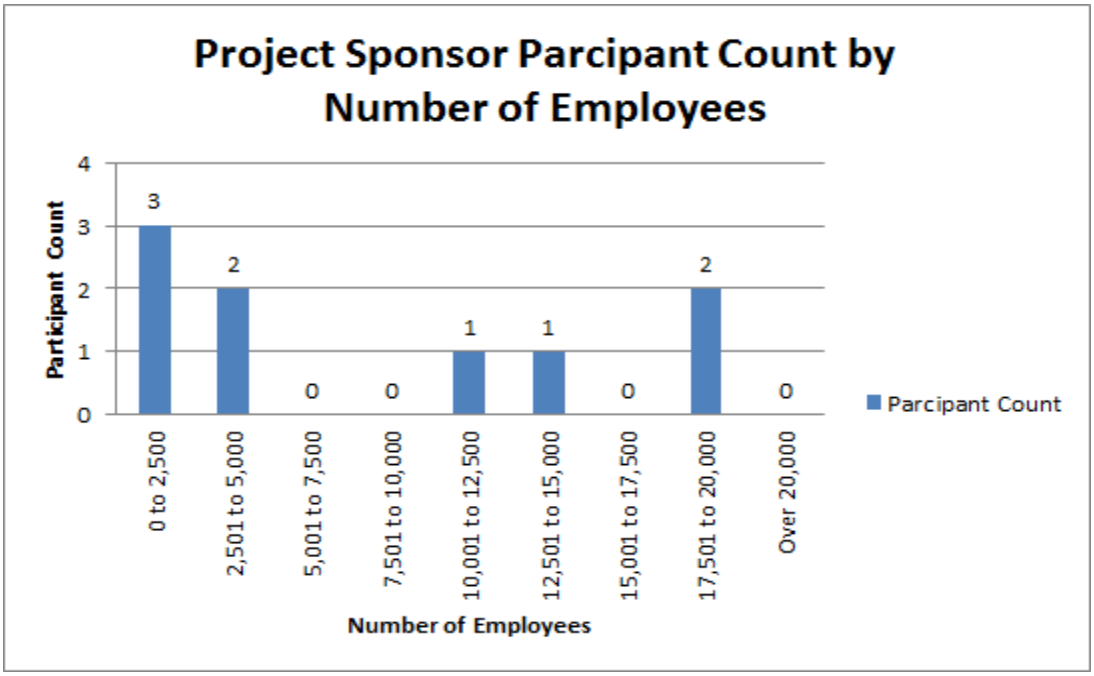


Figure 10. Bar Chart of Project Sponsor Group Organization by Number of Employees.

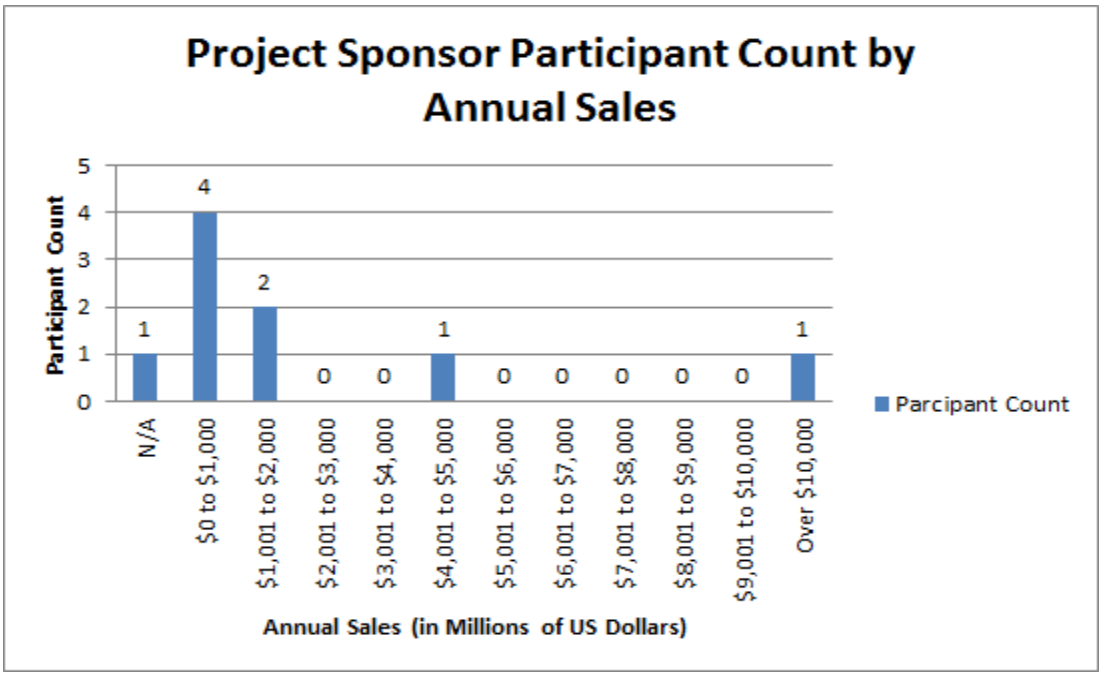


Figure 11. Bar Chart of Project Sponsor Group Organization Size by Annual Sales.

Cost Management

In this research, the impact of cost management maturity is measured by how it relates to meeting cost objectives and how it relates to project cost/efficiency. The following hypotheses focus on cost management:

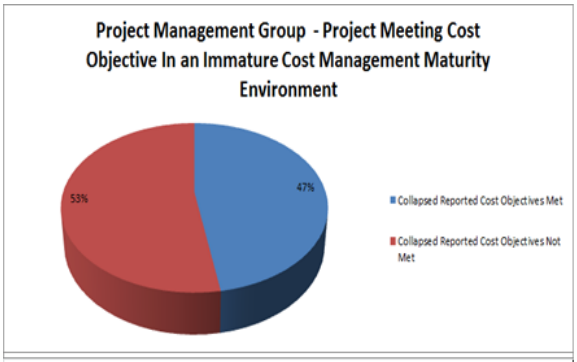
- Hypothesis 2: Projects managed in organizations with an immature cost management maturity level will have fewer projects completed within budget than those managed in an organization with a mature cost management maturity level.
- Hypothesis 4: Projects managed in an organization that has an immature cost management maturity level will have fewer projects categorized as cost/efficient, than project managed in an organization that has a mature cost management maturity level.

Hypothesis 2 – Cost Management Maturity and Meeting Cost Objectives. To determine if the null hypothesis should be rejected or retained, the following sets of data were used:

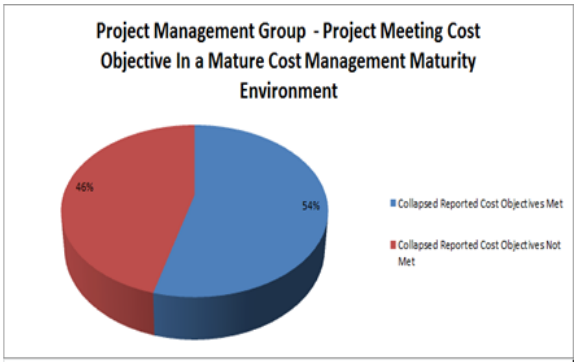
- Data set 1, from the project manager group: Cost Management Maturity and Cost Objectives Met
- Data set 2, from the project manager group: Cost Management Maturity and Cost Index
- Data set 3, from the project sponsor group: Cost Management Maturity and Cost Objectives Met.

Pie charts were used to visualize the data. Appendix H contains the complete set of data variables including a description of how variables were collapsed.

Hypothesis 2 – pie charts. Figure 12 is a pie chart of the project manager group responses showing the number of projects that meet the cost objectives in an organization with an immature cost management level as well as a mature cost management level, as reported by project managers. Figure 13 is a pie chart of the project manager group data showing the number of projects that meet or exceed cost index objectives by organizations that have an immature cost management environment and organizations with a mature cost management environment. It was unexpected to see more projects meet or exceed cost index objects in organizations with an immature cost management environment (see Figure 13); however, the difference is not statistically significant. The pie chart (Figure 12) shows that more projects meet cost objectives in an organization with an immature cost management maturity level than in organizations with a mature cost management maturity level.

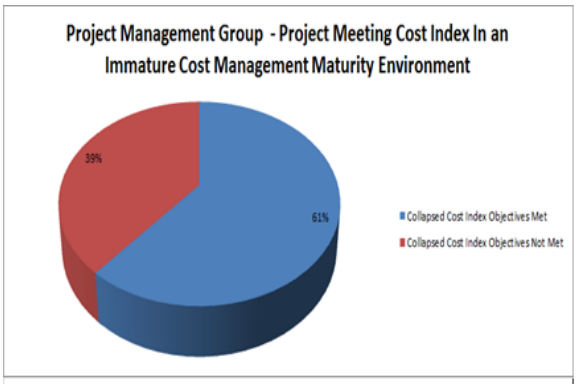


Project Management Group		
	Collapsed Reported Cost Objectives Met	Collapsed Reported Cost Objectives Not Met
Immature Cost Management Maturity Level	9	10

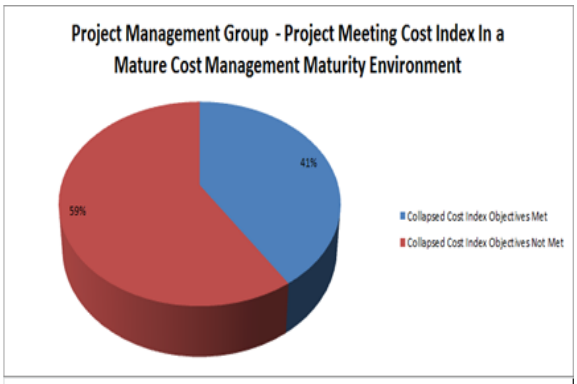


Project Management Group		
	Collapsed Reported Cost Objectives Met	Collapsed Reported Cost Objectives Not Met
Mature Cost Management Maturity Level	13	11

Figure 12. Pie Chart of Project Manager Collapsed Cost Management Maturity Level and Project Manager Collapsed Reported Cost Objectives Met.



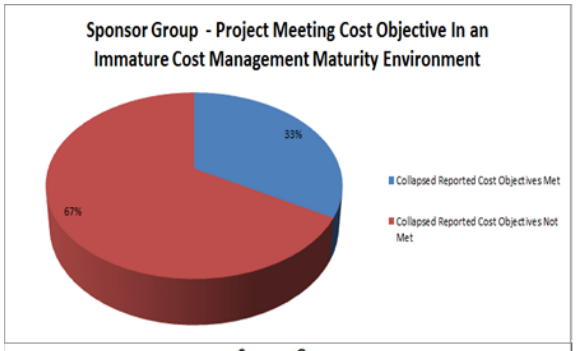
Project Management Group		
	Collapsed Cost Index Objectives Met	Collapsed Cost Index Objectives Not Met
Immature Cost Management Maturity Level	11	7



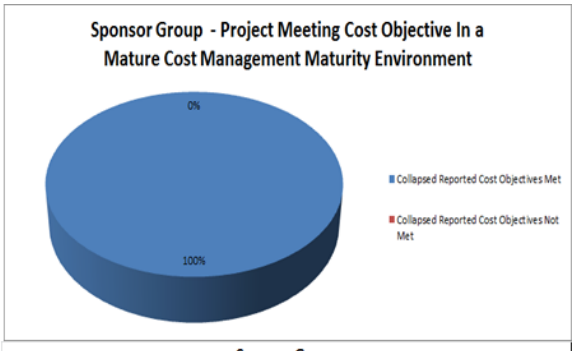
Project Management Group		
	Collapsed Cost Index Objectives Met	Collapsed Cost Index Objectives Not Met
Mature Cost Management Maturity Level	9	13

Figure 13. Pie Chart of Project Manager Collapsed Cost Management Maturity Level and Project Manager Collapsed Cost Index.

Figure 14 is a pie chart of the sponsor group responses showing the number of projects that meet the cost objectives in an organization with an immature cost management maturity level as well as a mature cost management maturity level, as reported by project sponsors. The null hypotheses for hypothesis two is retrained because the chi square and Fischer's Exact Test resulted in no statistical significance.



Sponsor Group		
	Collapsed Reported Cost Objectives Met	Collapsed Reported Cost Objectives Not Met
Immature Cost Management Maturity Level	2	4



Sponsor Group		
	Collapsed Reported Cost Objectives Met	Collapsed Reported Cost Objectives Not Met
Mature Cost Management Maturity Level	3	0

Figure 14. Pie Chart of Sponsor group Sponsor group Collapsed Cost Management Maturity Level and Sponsor group Collapsed Reported Cost Objectives Met.

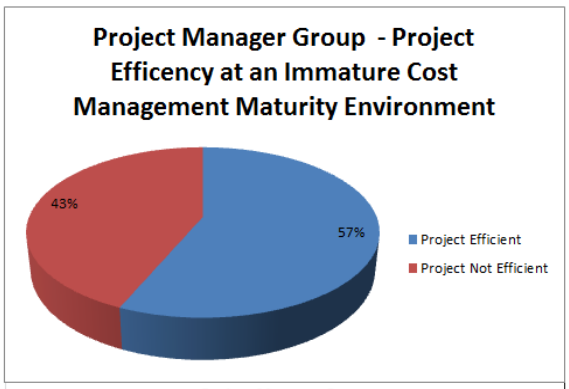
Hypothesis 2 – chi square analysis. A chi square analysis of the collapsed project manager group data involving the project managers' and the sponsor groups' perspective of meeting cost objectives produced mixed results. The data from the project manager group (Cost Management Maturity and Cost Objectives Met) resulted in χ^2 (1) = 0.196, p = 0.66. Using the Fischer's Exact Test for the sponsor group data (Cost Management Maturity and Cost Objectives Met) resulted in a p = 0.167. The Fischer's Exact Test is used because the number of observations in the chi square was below five. Appendix I contains the SPSS output related to hypothesis 2. Additionally, a chi square analysis of the collapsed project manager group data using the collapsed cost index (Cost Management Maturity and Cost Index) resulted in χ^2 (1) = 1.616, p = 0.20. Note, the cost index is a better test because it involves planned cost and actual cost instead of perceptions of success. See Appendix I for the SPSS output related to hypothesis 2.

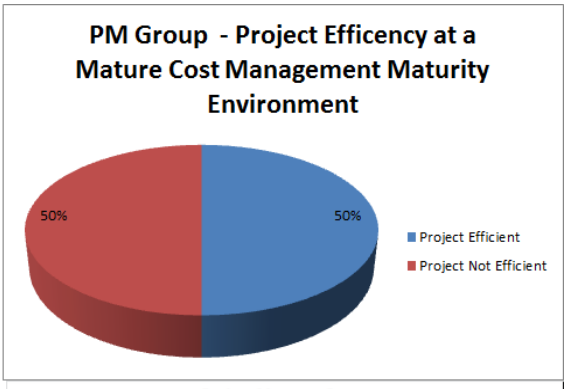
There were no statistically significant differences in any of these analyses, and the null for Hypothesis 2 is accepted.

Hypothesis 4 – cost management maturity and project cost/efficiency. To determine acceptance or rejection of the null hypothesis, four data variables were analyzed using chi square. The first set of data variables consisted of the project manager group collapsed cost maturity level and collapsed reported project cost/efficiency. The second set of data variables consisted of the sponsor group cost maturity level and collapsed reported project cost/efficiency. Pie charts were used to visualize the data. Appendix H contains the complete set of data variables including a description of how variables were collapsed.

Hypothesis 4 – pie charts. Figure 15 is a pie chart of the project manager group responses showing the number of projects that were classified as being cost/efficient or cost/inefficient in an organization with a mature or immature cost management maturity level.

Because the data from the sponsor group did not have any participants identify their projects as being cost/efficient, a pie chart was not created. The null hypothesis for hypothesis 4 is retained.





Project Manager Group		
	Project Efficient	Project Not Efficient
Immature Cost Management Maturity Level	13	10

Project Manager Group		
	Project Efficient	Project Not Efficient
Mature Cost Management Maturity Level	11	11

Figure 15. Pie Chart of Project Manager Collapsed Cost Management Maturity Level and Project Manager Collapsed Reported Project Efficiency.

Hypothesis 4 – chi square analysis. A chi square analysis of the cost management maturity level and the project cost/efficiency reported by project managers resulted in $\chi 2\ (1) = 0.192$, $p = 0.66$. See Appendix I for the SPSS output. Because the data from the sponsor group did not have any participants identify their projects as being cost/efficient, a chi square analysis was not performed. During the interviews with the sponsor group participants, no one selected projects as being categorized cost/efficient. From a portfolio perspective, each participant noted that their projects typically would meet time or cost objectives, but not both. There were individual projects that achieved this, but from a portfolio perspective, it did not.

Cost management summary.

Hypothesis 2 – summary. There is no support for this hypothesis 2, the null hypothesis is retained:

- The chi square analysis of the Cost Management Maturity and Cost Objectives Met for project managers resulted in χ^2 (1) = 0.196, p = 0.66.
- The chi square analysis of the Cost Management Maturity and Cost Index for project managers resulted in χ^2 (1) = 1.616, p = 0.20. The index is a probably a better measure because it is based on actual costs and planned costs, not perceptions of meeting cost objectives.
- A Fischer's Exact Test was performed because the number of observations in the chi square was below five. The Fischer's Exact Test of the Sponsor group Cost Management Maturity and Sponsor group Cost Objectives Met resulted in p = 0.43.

Appendix I contains the SPSS chi square output for hypothesis 2. The project manager group data shows no relationship between cost management maturity level and meeting project cost objectives in terms of perceptions and index.

Hypothesis 4 – summary. The data from this research supports retention of the null hypothesis for hypothesis 4 because the chi square analysis of the Project Manager Collapsed Cost Management Maturity Level and Project Manager Collapsed Reported Project Efficiency data resulted in $\chi 2$ (1) = 0.192, p = 0.66. Additionally, no project sponsors identified any of their projects as being efficient. Therefore, the null hypothesis is retained.

Time Management

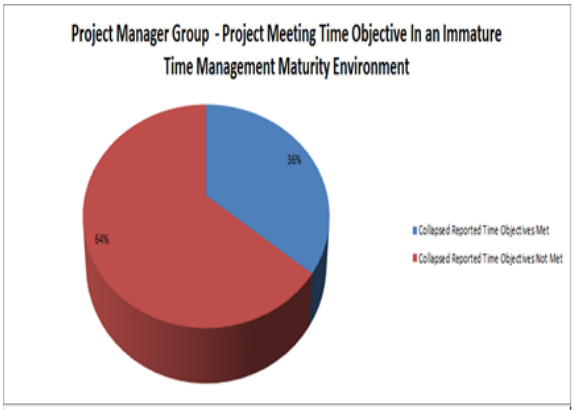
The following hypotheses revolve around time management:

- Hypothesis 1: Projects managed in organizations with an immature time management maturity level will have fewer projects completed on time than those managed in an organization with a mature time management maturity level.
- Hypothesis 5: Projects managed in an organization that has an immature time management maturity level will have fewer projects categorized as time/efficient, than projects managed in an organization that has a mature time management maturity level.

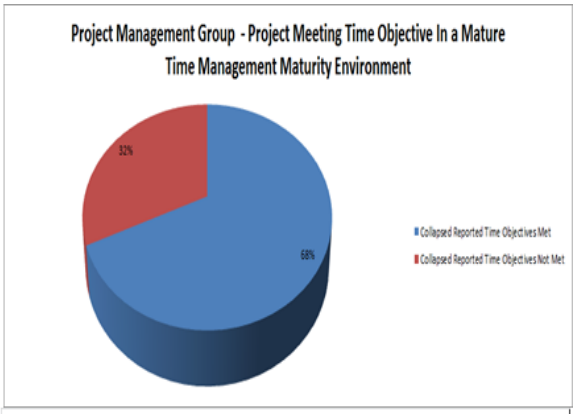
Hypothesis 1 – Time Management Maturity and Meeting Time Objectives. To determine acceptance or rejection of the null hypothesis, six data variables were analyzed using chi square. The first set of data variables consisted of the project manager group time maturity level and reported project time objectives met. The second set of data variables consisted of the project manager group time maturity level and time index. The third set of data variables consisted of the sponsor group time maturity level and reported time objectives met. Appendix H contains the complete set of data variables including a description of how variables were collapsed.

Hypothesis 1 – pie charts. Figure 16 is a pie chart of the project manager group responses showing the number of projects that were classified as meeting time objectives in an organization with a mature and immature cost management maturity level. Figure 17 is a pie chart of the project manager group data showing the number of projects that

meet or exceed time index expectations by organizations that have an immature cost management environment and organizations with a mature time management environment. Figure 18 is a pie chart of the sponsor group responses showing the number of projects that were classified as meeting time objectives in an organization with a mature and immature cost management maturity level. The descriptive data is consistent in showing a greater number of projects that are successful in the time dimension in organizations with mature time management.

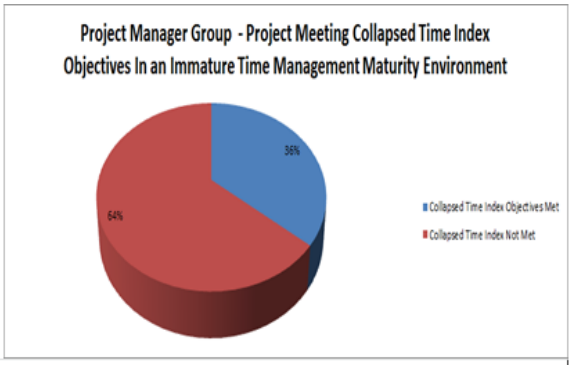


Project Manager Data		
	Collapsed Reported Time Objectives Met	Collapsed Reported Time Objectives Not Met
Immature Time Management Maturity Level	9	16

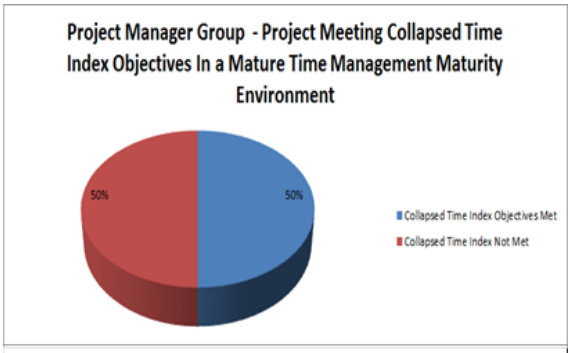


Project Manager Data		
	Collapsed Reported Time Objectives Met	Collapsed Reported Time Objectives Not Met
Mature Time Management Maturity Level	15	7

Figure 16. Pie Chart of Project Manager Collapsed Time Management Maturity Level and Project Manager Collapsed Reported Time Objectives Met.

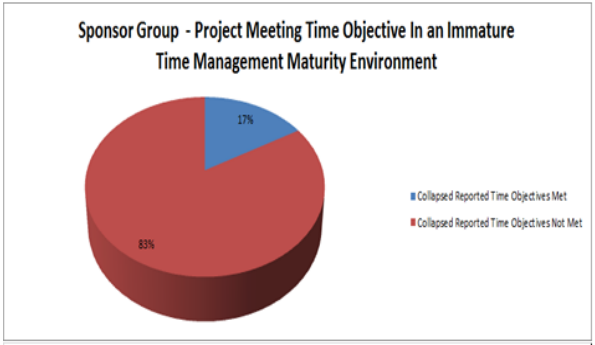


Project Manager Group		
	Collapsed Time Index Objectives Met	Collapsed Time Index Not Met
Immature Time Management Maturity Level	9	16

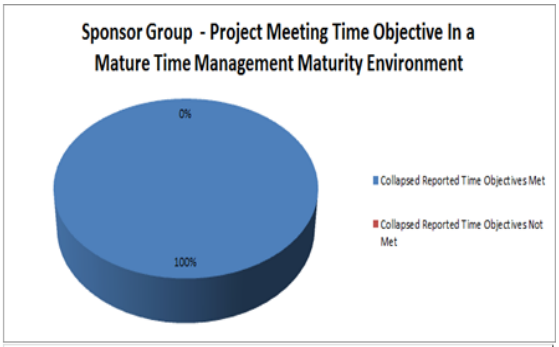


Project Manager Group		
	Collapsed Time Index Objectives Met	Collapsed Time Index Not Met
Mature Time Management Maturity Level	11	11

Figure 17. Pie Chart of Project Manager Collapsed Time Management Maturity Level and Project Manager Collapsed Time Index Objectives Met.



Sponsor Group		
	Collapsed Reported Time Objectives Met	Collapsed Reported Time Objectives Not Met
Immature Time Management Maturity Level	1	5



Sponsor Group		
	Collapsed Reported Time Objectives Met	Collapsed Reported Time Objectives Not Met
Mature Time Management Maturity Level	3	0

Figure 18. Pie Chart of Sponsor group Collapsed Time Management Maturity Level and Sponsor group Collapsed Time Objectives Met.

Hypothesis 1 – chi square analysis. The chi square analysis of the data related to this hypothesis produced mixed results:

- The chi square analysis of the Time Management Maturity and Time Objectives Met for project managers resulted in χ^2 (1) = 4.850, p = 0.03.
- The chi square analysis of the Time Management Maturity and Project Manager Collapsed Time Index for project managers resulted in χ^2 (1) = 0.938, p = 0.33
- A Fischer's Exact Test was performed because the number of observations in the chi square was below five. The Fischer's Exact Text of the Sponsor group Time Management Maturity and Time Objectives Met data resulted in p = 0.005.

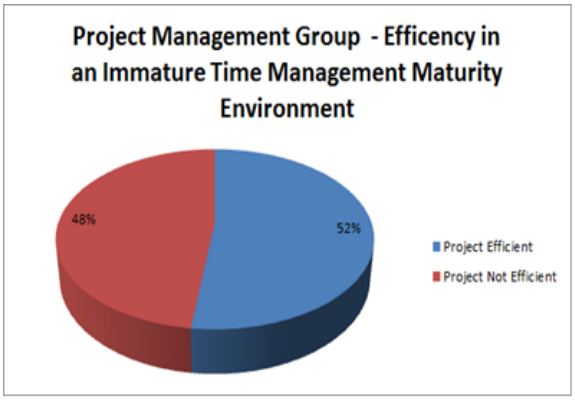
Appendix I contains the SPSS chi square output for hypothesis 2.

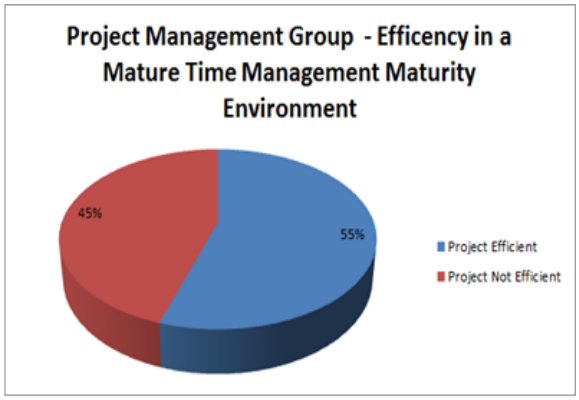
It is interesting to note, that if only perceptions of meeting time objectives been measured (Time Objectives Met and Time Objectives Met reported from the sponsors), the null hypothesis would have been rejected. The time relationship looks promising, though not consistently supported in this study.

Hypothesis 5 – Time Management Maturity and Project Time/Efficiency. To determine acceptance or rejection of the null hypothesis, four data variables were analyzed using chi square. The first set of data variables consisted of the project manager group time maturity level and reported project time/efficiency. The second set of data variables consisted of the sponsor group time maturity level and reported project

time/efficiency. Appendix H contains the complete set of data variables including a description of how variables were collapsed.

Hypothesis 5 – pie chart analysis. Figure 19 is a pie chart of the project manager group responses showing the number of projects that were classified as being time/efficient or time/inefficient by time management maturity. As can be seen in Figure 19, slightly more projects were rated as being efficient in organizations with a mature time management environment. However, this relationship is statistically insignificant χ^2 (1) = 0.040, p = 0.84. No pie chart for executives was developed since no participant from the sponsor group identified any project as being efficient.





Project Manager Group		
	Project Efficient	Project Not Efficient
Immature Time Management Maturity Level	13	12

Project Manager Group		
	Project Efficient	Project Not Efficient
Mature Time Management Maturity Level	11	9

Figure 19. Pie Chart of Project Manager Collapsed Time Management Maturity Level and Project Manager Reported Effectiveness.

Hypothesis 5 – chi square analysis. The chi square analysis of the project manager group data (Time Management Maturity and Project Efficiency) resulted in χ^2 (1) = 0.040, p = 0.84. Because none of the participants from the sponsor group identified any projects as being efficient, a chi square analysis was not performed.

Time management summary

Hypothesis 1 – summary. The null hypothesis is retained because the chi square analysis of the project management group collapsed TMML (Time Management Maturity) and the collapsed time index resulted in $\chi 2$ (1) = 0.938, p = 0.33. Although the null hypothesis is retained, all three sets of data used to analyze this hypothesis indicate that projects managed in an organization with mature time management have increased their chance of success. Two measures were statistically significant (data set one and data set two) and all descriptive analyses exhibited the expected relationship. The following bullet points provide additional information regarding the data sets:

- Data set one (project manager group) identified that only 36% of the projects met time objects in an organization with an immature time management environment, while 68% of the projects met time objectives in an organization with a mature time management environment. See Figure 16 for the pie chart.
- Data set two (sponsor group) identified that only 17% of the projects met time objects in an organization with an immature time management environment, while 100% of the projects met time objectives in an organization with a mature time management environment. See Figure 18 for the pie chart.

- Data set three (project manager group using collapsed cost index) identified that only 36% of the projects met time objects in an organization with an immature time management environment, while 50% of the projects met time objectives in an organization with a mature time management environment. See Figure 17 for the pie chart.

Hypothesis 5 – summary. Although analysis of the project manager group data showed a slight increase in projects categorized as time/efficient in organizations with a mature time management environment (52% categorized as efficient in an immature environment and 55% categorized as efficient in an mature environment), the increase is statistically insignificant. Additionally, none of the participants from the sponsor group identified any projects as being efficient. With this in mind, the null hypothesis for hypothesis is retained.

Scope Management

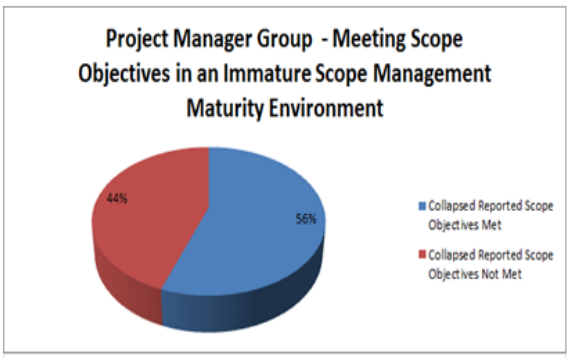
In this research, the impact of scope management maturity is measured by how it relates to meeting scope objectives and how it relates to project effectiveness. The following hypotheses revolve around scope management:

- Hypothesis 3: Projects managed in an organization with an immature scope management maturity level will complete fewer projects that meet the agreed upon scope than those managed in an organization with a mature scope management maturity level.

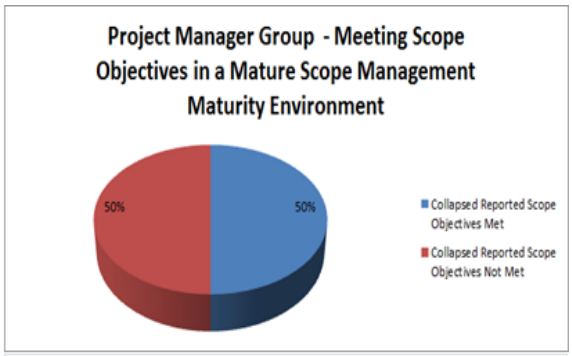
- Hypothesis 6: Projects managed in an organization with an immature scope management maturity level will have fewer projects categorized as effective, than projects managed in an organization that has a mature scope management maturity level.

Hypothesis 3 – Scope Management Maturity and Meeting Scope Objectives. To determine acceptance or rejection of the null hypothesis, four data variables were analyzed using chi square. The first set of data variables consisted of the project manager group scope maturity level and reported scope objectives met. The second set of data variables consisted of the sponsor group scope maturity level and reported project scope objectives met. To determine if the null hypothesis should be rejected or retained, four data variables were analyzed using chi square and the data visualized using pie charts. Appendix H contains the complete set of data variables including a description of how variables were collapsed.

Hypothesis 3 – pie charts. Figure 20 is a pie chart of the project manager group responses showing the number of projects that meet the scope objectives in an organization with an immature scope management maturity level as well as a mature scope management maturity level, as reported by project managers. The pie chart (Figure 20) shows that slightly more projects meet scope objectives in an organization with an immature scope management maturity level than in organizations with a mature time management maturity level.



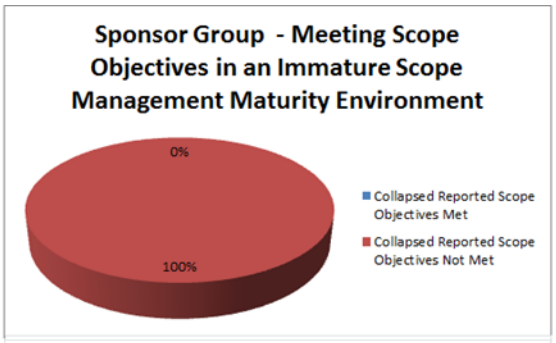
	Project Manager Group	
	Collapsed Reported Scope Objectives Met	Collapsed Reported Scope Objectives Not Met
Immature Scope Management Maturity Level	15	12



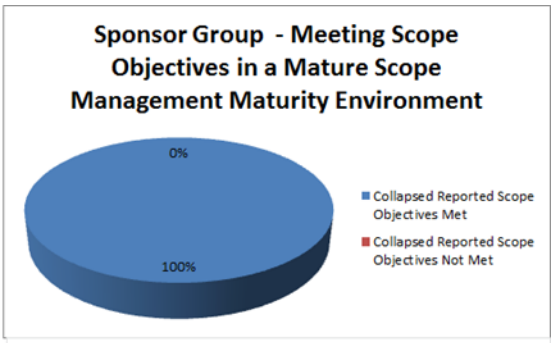
	Project Manager Group	
	Collapsed Reported Scope Objectives Met	Collapsed Reported Scope Objectives Not Met
Mature Scope Management Maturity Level	10	10

Figure 20. Pie Chart of Project Manager Project Manager Collapsed Scope Management Maturity Level and Project Manager Collapsed Reported Scope Objectives Met

Figure 21 is a pie chart of the sponsor group responses showing the number of projects that meet the scope objectives in an organization with an immature scope management maturity level as well as a mature scope management maturity level, as reported by project sponsors. The pie chart (Figure 21) shows that no projects met scope objectives in an organization with an immature scope management maturity, while projects managed in organizations with a mature scope management maturity level met all their scope objectives.



Sponsor Group	Collapsed Reported Scope Objectives Met	Collapsed Reported Scope Objectives Not Met
Immature Scope Management Maturity Level	0	4



Sponsor Group	Collapsed Reported Scope Objectives Met	Collapsed Reported Scope Objectives Not Met
Mature Scope Management Maturity Level	5	0

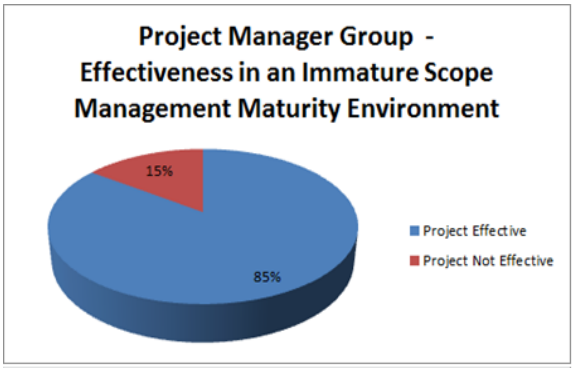
Figure 21. Pie Chart of Project Manager Sponsor group Collapsed Scope Management Maturity Level and Sponsor group Collapsed Reported Scope Objectives Met

Hypothesis 3 – chi square. A chi square analysis of the collapsed project manager group data involving the project managers and the sponsor groups' perspective of meeting scope objectives produced mixed results. The data from the project manager group (Scope Management Maturity and Scope Objectives Met) resulted in χ^2 (1) = 0.142, p = 0.71. A Fischer's Exact Test was performed using the sponsor group data because the number of observations in the chi square was below five. The Fischer Exact Test was performed and resulted in p = 0.008. SPSS includes the Fischer Exact Test when running a chi square analysis. Therefore, the SPSS output found in Appendix I contains both the chi square results and the Fischer Exact Test results.

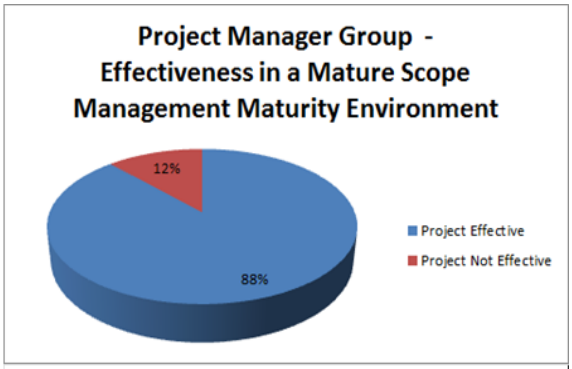
Hypothesis 6 – Scope Management Maturity and Project Effectiveness. To determine acceptance or rejection of the null hypothesis, four data variables were analyzed using chi square. The first set of data variables consisted of the project manager

group cost maturity level and collapsed reported project effectiveness. The second set of data variables consisted of the sponsor group cost maturity level and reported project effectiveness. To determine if the null hypothesis should be rejected or retained, four data variables were analyzed using chi square. Appendix H contains the complete set of data variables including a description of how variables were collapsed.

Hypothesis 6 – pie charts. Figure 22 is a pie chart showing the number of projects considered effective in an organization with an immature scope management maturity level as well as a mature scope management maturity level, as reported by project managers. The pie chart (Figure 22) shows that more projects are considered effective in an organization with a mature scope management maturity level than in organizations with an immature scope management maturity level. However, the improvement is statistically insignificant with the results of the Fisher's Exact Test resulting in p = 1.00.



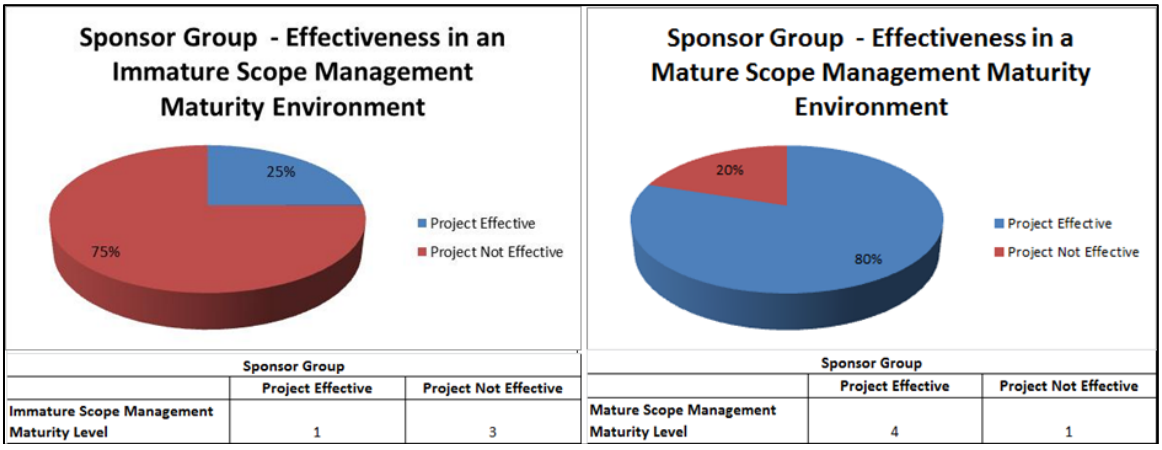
Project Manager Group		
	Project Effective	Project Not Effective
Immature Scope Management Maturity Level	17	3



Project Manager Group		
	Project Effective	Project Not Effective
Mature Scope Management Maturity Level	22	3

Figure 22. Pie Chart of Project Manager Group Project Manager Collapsed Scope Management Maturity Level and Project Manager Collapsed Reported Scope Objectives Met

Figure 23 is a pie chart showing the number of projects considered effective in an organization with an immature scope management maturity level as well as a mature scope management maturity level, as reported by project sponsors. The pie chart (Figure 23) shows that more projects are considered effective in an organization with a mature scope management maturity level than in organizations with an immature scope management maturity level.



Sponsor Group		
	Project Effective	Project Not Effective
Immature Scope Management Maturity Level	1	3

Sponsor Group		
	Project Effective	Project Not Effective
Mature Scope Management Maturity Level	4	1

Figure 23. Pie Chart of Project Effectiveness by Scope Management Maturity as Reported by the Sponsors

Hypothesis 6 – chi square. A chi square analysis of the collapsed project manager group data involving the project managers and the sponsor groups' perspective of project effectiveness resulted in the acceptance of the null hypothesis. The data from the project manager group (Scope Management Maturity and Reported Effectiveness) resulted in χ^2 (1) = 0.087, p = 0.77. A Fischer's Exact Test was performed using the sponsor group data because the number of observations in the chi square was below five. The Fischer

Exact Test resulted in p=0.206. Appendix I contains the SPSS output related to hypothesis 2.

Scope management summary

Hypothesis 3 – summary. The data analyzed for hypothesis 3 produced mixed results. The data from the project manager group resulted in retention of the null hypothesis χ^2 (1) = 0.142, p = 0.71, while the data from the sponsor group resulted in rejection of the null hypothesis. A Fischer Exact Test was perform and resulted in p = 0.02. The pie charts from figures 22 and 23 provide an excellent graphical view of the mixed results. Because of the mixed results, the null hypothesis for hypothesis 3 is retained.

Hypothesis 6 – summary. The analysis of the project manager group data resulted in retention of the null hypothesis with the Fisher's Exact Test resulting in p = 1.00 and the analysis of the sponsor group data also resulted in retention of the null hypothesis with the Fischer's Exact Test resulting in p = 0.46. Because of the consistent results, the null hypothesis for hypothesis 3 is retained. However, the pie charts from figures 24 and 25 indicate that both groups show more projects identified as effective when managed in an organization with a mature scope management maturity level; however, the increase is not statistically significant.

Summary of Quantitative Results.

By performing the chi square analysis, and when needed the Fischer's Exact Test, the research accepted the null hypotheses for both hypothesis 2 and hypothesis 4. A Fischer's Exact Test is was used when the number of observations in the chi square analysis was below five. Both of these hypotheses are related to cost management. Table 9 provides additional information regarding the testing of the cost related hypotheses. Using the data from this research, there is no statistically significant correlation between project management cost maturity and achieving project cost objectives. Nor is there a statistically significant correlation between project cost management maturity and project efficiency.

The null hypothesis for hypothesis 1 and hypothesis 5 is accepted. Table 10 provides additional information regarding the testing of the time related hypotheses. Using the data from this research, there is not statistically significant correlation between project time management maturity and achieving project time objectives. Nor is there a statistically significant correlation between project time management maturity and project time/efficiency; however, the time relationship is the one that comes closest to being statistically significant.

The null hypothesis for hypothesis 3 and hypothesis 6 is accepted. Table 11 provides additional information regarding the testing of the scope related hypotheses. Using the data from this research, there is not statistically significant correlation between project management scope maturity and achieving project scope objectives. Nor is there a statistically significant correlation between project scope management maturity and project effectiveness.

Overall project efficiency. Because project efficiency consists of two dimensions (cost and time), each of these dimensions were associated with separate hypotheses (hypothesis four and five). Since no sponsors categorized their projects as efficient, the null hypotheses are retained. Additionally, both analyses (cost maturity and project efficiency, and time maturity and project efficiency) as reported from the project manager group, resulted in accepting the null hypotheses.

Table 9.

Summary of Tests Associated with the Cost Related Hypotheses

Hyp.	Variables	Chi Square Result	Fischer's Exact Test	Accept / Reject Null Hyp.
2	Project Manager Collapsed Cost Management Maturity Level and Project Manager Collapsed Reported Cost Objectives Met	χ^2 (1) = 0.196, p = 0.66.	N/A	Accept
2	Sponsor Collapsed Cost Management Maturity Level and Sponsor Collapsed Reported Cost Objectives Met		p = 0.17.	Accept
2	Project Manager Collapsed Cost Management Maturity Level and Project Manager Collapsed Cost Index	χ^2 (1) = 1.616, p = 0.20.	N/A	Accept
4	Project Manager Collapsed Cost Management Maturity Level and Project Manager Collapsed Reported Project Efficiency	χ^2 (1) = 0.192, p = 0.66.	N/A	Accept
4	Sponsor Collapsed Cost Management Maturity Level and Project Manager Collapsed Reported Project Efficiency	*	*	*

Note: * indicates the test was not performed because no sponsor identified projects as being efficient. Fischer's Exact Test was not performed for each analysis, only when there were less than five occurrences in the chi square.

Table 10.

Summary of Tests Associated with the Time Related Hypotheses

Hyp.	Variables	Chi Square Result	Fischer's Exact Test	Accept / Reject Null Hyp.
1	Project Manager Collapsed Time Management Maturity Level and Project Manager Collapsed Reported Time Objectives Met	χ^2 (1) = 4.850, p = 0.03.	N/A	Reject
1	Project Manager Collapsed Time Management Maturity Level and Project Manager Collapsed Time Index	χ^2 (1) = 0.938, p = 0.33.	N/A	Accept
1	Sponsor Collapsed Time Management Maturity Level and Sponsor Collapsed Reported Time Objectives Met		p = 0.05.	Reject
5	Project Manager Collapsed Time Management Maturity Level and Project Manager Collapsed Reported Project Efficiency	χ^2 (1) = 0.040, p = 0.84	N/A	Accept
5	Sponsor Collapsed Time Management Maturity Level and Sponsor Collapsed Reported Project Efficiency	*	*	*

Note: * indicates the test was not performed because no sponsor identified projects as being efficient. Fischer's Exact Test was not performed for each analysis, only when there were less than five occurrences in the chi square.

Table 11.

Summary of Tests Associated with the Scope Related Hypotheses

Hyp.	Variables	Chi Square Result	Fischer's Exact Test	Accept / Reject Null Hyp.
3	Project Manager Collapsed Scope Management Maturity Level and Project Manager Collapsed Reported Scope Objectives Met	χ^2 (1) = 0.142, p = 0.71	N/A	Accept
3	Sponsor Collapsed Scope Management Maturity Level and Sponsor Collapsed Reported Scope Objectives Met		p = 0.008.	Reject
6	Project Manager Collapsed Scope Management Maturity Level and Project Manager Collapsed Reported Effectiveness	χ^2 (1) = 0.087, p = 0.77.	p = 1.00.	Accept
6	Sponsor Collapsed Scope Management Maturity Level and Sponsor Collapsed Reported Effectiveness		p = 0.206.	Accept

Dimensions of Project Management Maturity

The three dimensions of project management maturity studied in this research are: (a) time, (b) cost, and (c) scope. Figure 24 is a graphical representation of the project sponsor responses to their organization's maturity level by the three dimensions. Of the nine project sponsor participants: (a) only one (11%) ranked all three dimensions the

same, (b) six (67%) ranked two dimensions the same, and (c) two (22%) ranked all three dimensions differently.

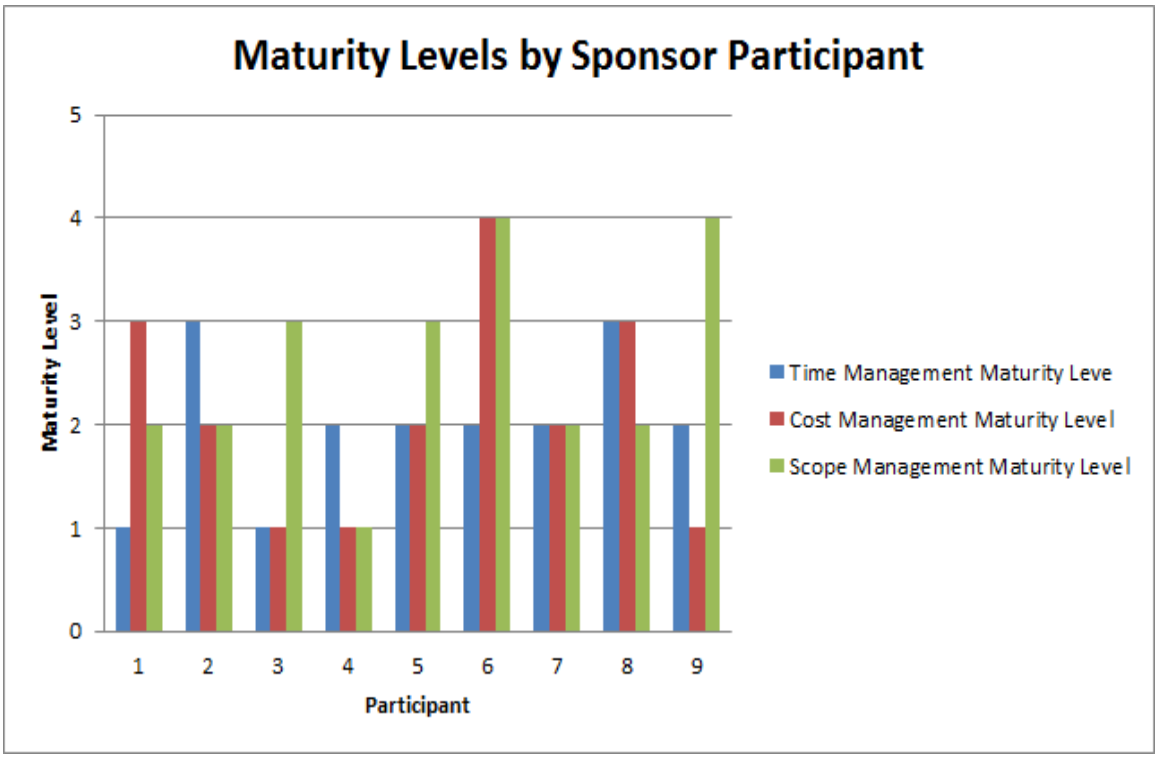


Figure 24. Bar Graph of Project Sponsor Responses to Three Dimensions of Project Management Maturity.

Figure 25 is a graphical representation of the project manager responses to their organization's maturity level by the three dimensions. Of the 47 project manager participants: (a) 17 (36%) ranked all three dimensions the same, (b) thirty (64%) ranked two dimensions the same, and (c) nine (19%) ranked all three dimensions differently. It appears the participants of this study see multiple dimensions of project management maturity since most have not ranked all three dimensions the same in their organization.

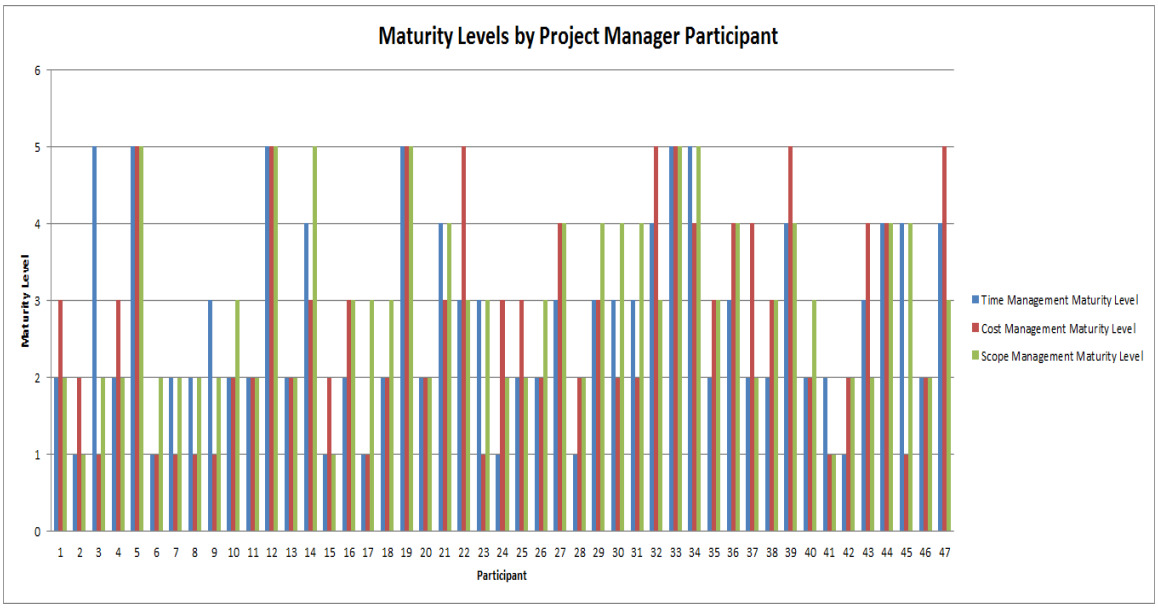


Figure 25. Bar Graph of Project Sponsor Responses to Three Dimensions of Project Management Maturity.

Qualitative Component

Nine project sponsors were interviewed. Due to geographical locations, some of the participants were interviewed via phone call instead of in person. Whether by phone or in person, the interviews were scheduled for 20 minutes, but typically lasted 30 minutes. Of the nine participants interviewed, all nine participants stated that they want to improve their project management maturity so that it matures to the next level within the next 1-2 years. This infers that sponsors believe that increasing maturity will increase success. However, only five participants developed formal plans to move the organization to the next project management maturity level (Figure 26 is a graphical representation of the

data related to number of participants with maturation plans). This indicates that increasing maturity may only be a medium priority for the sponsors.

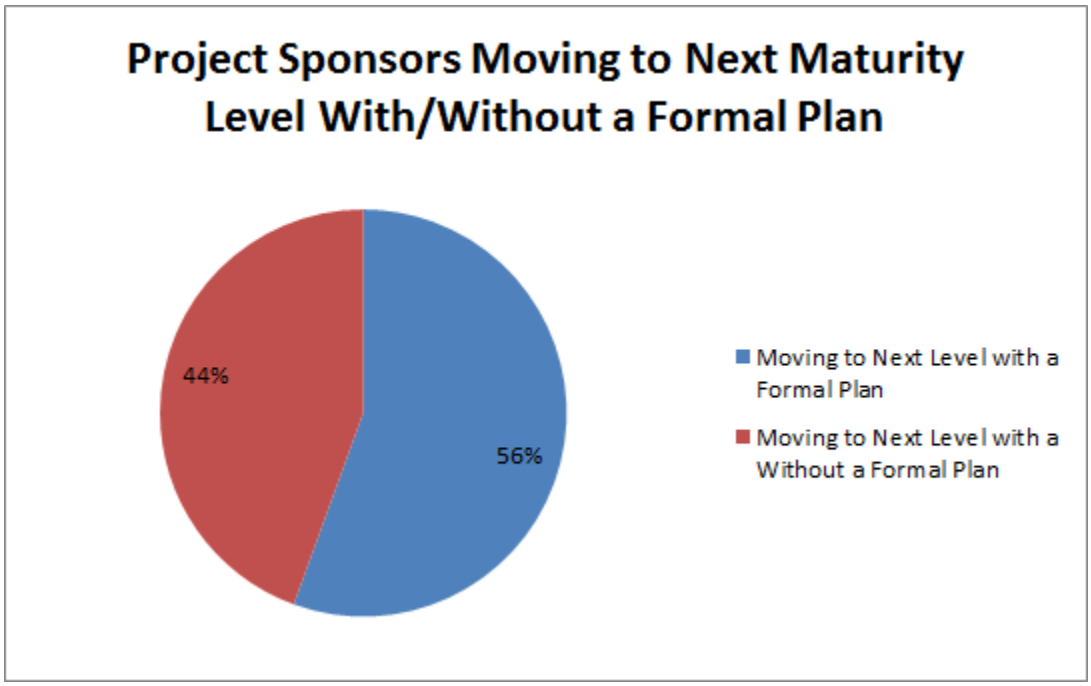


Figure 26. Pie Chart of Project Sponsor Data Related to Maturation Plans.

Although all sponsor group participants believe it is important and valuable for their organization to move to the next level of project management maturity, only five participants have formal plans to mature. However, six sponsor group participants indicated that maturing to level five is a goal worth pursuing (See Figure 27).

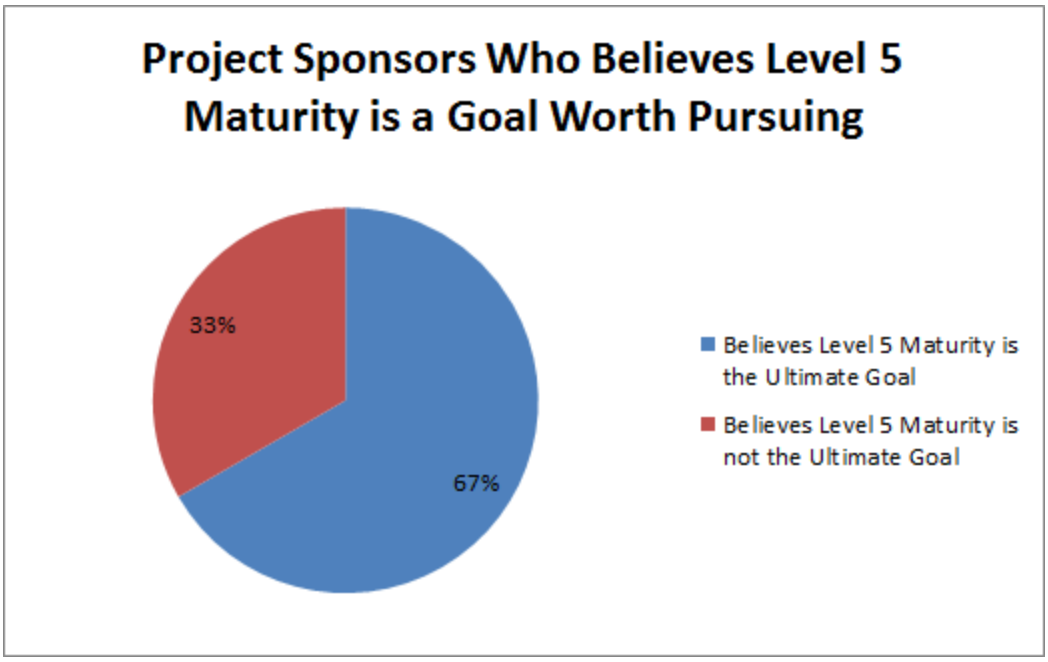


Figure 27. Pie Chart of Project Sponsors Believe in Level 5 Maturity.

Patterns / themes. Although the sample size of the sponsor group was small, patterns or themes developed. The three main themes are: (a) improving PMM, (b) implementing a strategic view, and (c) improving quality.

Theme 1 – improving project management maturity. All participants from the sponsor group identified a desire to improve their organizational project management maturity. This desire to improve was true for organizations regardless of their current level of project management maturity. This desire to improve PMM came from the participant's belief that improving PMM results in improved project outcomes (cost, time

and scope). The following quotes support the perceived connection between maturity and project outcomes:

- Participant one stated that "I see value in maturing. It improves project success."
- Participant four stated, "It is worth moving to the next maturity level. The focus will be on improving how scope is defined."
- Participant six stated they "believe there is a connection between project management maturity and project success." Participant six also stated that "as companies need to do more with less, then PM maturity levels are even more important".

Theme 2 – strategic view. Half of the participants mentioned a strategic view or components of a strategic view as part of their efforts to improving their organization's current project management maturity. A few participants identified incorporating and improving the project selection process. Others mentioned knowledge sharing, quality improvements, and lessons learned as part of their improvement. One participant included organizational resource allocation as something that should be done, but they had no plan or budget in place to make this a reality. As can be seen in figures 1, 2 and 3, these activities typically are found in organizations with a more mature project management mature level (levels 3, 4 and 5), which typically involve the introduction and establishment of strategic processes.

Theme 3 – improving quality. A number of participants mention quality as an area to improve. There is an overlap between quality and scope; without quality, the requirements and functional expectations identified in the scope statement may be missing or under delivered at the end of a project (Phillips, 2006). The approaches to improving quality varied by participant, such as:

- Have the project managers learn six sigma and incorporate it into the project management methodology.
- Reduce the quantity or number of projects per project manager so that the project managers can have the time to focus more on quality.
- Leverage the existing quality management department so that project quality improves.
- Use post mortems and lessons learned as a tactic for improving quality on future projects.

Although the approaches vary, many of the participants identified quality as an area to improve.

Theme 4 – relationship between maturity dimensions and associated objective success. One participant stated that they believe there is a relationship between maturing in one of the maturity dimensions and success in the associated objective. Participant five (Personal Communication, November 2011) stated "if we improve scope management, then we should see an increase in project meeting scope." Other participants were not as explicit, but indicated they should see an increase in the dimension of maturity that improves. The qualitative information supports the

quantitative information received from the sponsor group. The sponsor group consistently ranked the higher dimensions of maturity with meeting the associated objective, as can be seen in the pie charts for figures 15, 19 and 23.

Triangulation Results

Triangulation occurs by using the quantitative data collected from the project manager group, and the quantitative and qualitative data collected from the project sponsor /executive group. For rejection of the null hypothesis, all three elements must support the hypothesis.

Cost related hypotheses triangulated. The cost related hypotheses consist of hypothesis 2 and hypothesis 4. Hypothesis 2 states that projects managed in organizations with an immature cost management maturity level will have fewer projects completed within budget than those managed in an organization with a mature cost management maturity level. Although there is strong support from the sponsor group (both from a qualitative and quantitative approach), the null hypothesis is retained because the results from the project manager group data analysis is not statistically significant.

Hypothesis 4 states that projects managed in an organization that has an immature cost management maturity level will have fewer projects categorized as cost/efficient, than project managed in an organization that has a mature cost management maturity level.

Although there is strong support from the sponsor group (both from a qualitative and quantitative approach), the null hypothesis is retained because the results from the project manager group data analysis is not statistically significant.

Time related hypotheses triangulated. The time related hypotheses consist of hypothesis 1 and hypothesis 5. Hypothesis 1 states that projects managed in organizations with an immature time management maturity level will have fewer projects completed on time than those managed in an organization with a mature time management maturity level. Although there is strong support from the sponsor group (both from a qualitative and quantitative approach), and mixed support from the project manager group data, the null hypothesis is retained because the chi square analysis of Time Management Maturity and Time Index resulted in χ^2 (1) = 0.938, p = 0.33. The null hypothesis is retained even though all other analysis resulted in rejecting the null hypothesis.

Hypothesis 5 states that projects managed in an organization that has an immature time management maturity level will have fewer projects categorized as time/efficient, than projects managed in an organization that has a mature time management maturity level. Although the qualitative data supports a belief in improved maturity resulting in improved efficiency (cost and time), the null hypothesis is retained because no sponsor group participant identified a project as efficient.

Scope related hypotheses triangulated. The scope related hypotheses consist of hypothesis 3 and hypothesis 6. Hypothesis 3 states that projects managed in an organization with an immature scope management maturity level will complete fewer projects that meet the agreed upon scope than those managed in an organization with a mature scope management maturity level. There is strong support from the sponsor group (both from a qualitative and quantitative approach), especially with the chi square analysis of Scope Management Maturity and Scope Objectives Met resulting in χ^2 (1) = 9.00, p = 0.003. Because of the small project sponsor sample size, the Fischer Exact Test was performed and resulted in p = 0.008. Although the analysis of the project sponsor group supports rejecting the null hypothesis, the null hypothesis is retained because the results from the project manager group data analysis is not statistically significant.

Hypothesis 6 states that projects managed in an organization with an immature scope management maturity level will have fewer projects categorized as effective, than projects managed in an organization that has a mature scope management maturity level. Although the qualitative data provides indirect support that improved scope management maturity would result in improved project effectiveness, the null hypothesis is retained because of the lack of statistical significance.

Linear Regression using Kwak and Ibbs (2000a)

Kwak and Ibbs (2000a) identified the relationship between project cost performance (cost index) and overall project maturity as y = -1.470Ln(x) +2.9099, r^2 = 0.2337; and the relationship between project schedule performance and overall project maturity was y

$= -7.5992\ x^{-1.5494}$, $r^2 = 0.4922$. Applying the Kwak and Ibbs (2000a) formulas to the data collected in this study, resulted in the following:

- The formula predicted the schedule index within ten percent accuracy, eleven percent of the time.
- The formula predicted the cost index within ten percent accuracy, twelve percent of the time.

Relationship Between Large Projects and Maturity

Checking the relationship between project size and maturity consisted of pie charts for the descriptive statistics and chi square analysis for the inferential statistics. The following sets of data were analyzed:

- The collapsed overall project management maturity and collapsed actual project costs.
- The collapsed cost management maturity and collapsed actual project costs.
- The collapsed overall project management maturity and collapsed actual duration.
- The collapsed time management maturity and collapsed actual duration.

Actual project costs were collapsed so that a large project was one that costs one million dollars or more, while small projects were less than one million dollars. Actual project duration were collapsed so that a large project was one that had at least a one year in actual duration, while small projects were less than one year in actual duration.

No statistically significant results were found after analyzing project size and maturity level data. Appendix J contains the pie charts and chi square analysis.

Relationship Between Project Size and Success

Checking the relationship between project size and project success consisted of pie charts for the descriptive statistics and chi square analysis for the inferential statistics. The following sets of data were analyzed:

- The collapsed overall project success and collapsed actual project costs.
- The collapsed overall project success and collapsed actual project duration.

Actual project costs were collapsed so that a large project was one that costs one million dollars or more, while small projects were less than one million dollars. Actual project duration were collapsed so that a large project was one that had at least a one year in actual duration, while small projects were less than one year in actual duration.

No statistically significant results were found after analyzing project size and project success variables. Appendix K contains the pie charts and chi square analysis.

CHAPTER 5

CONCLUSION

Summary

The purpose of this research is to examine how project management maturity levels influence IT/IS project success in terms of efficiency (cost and time), and effectiveness (scope). This mixed methods research focuses on data collected from IT/IS project management practitioners and project sponsors / executive level professionals.

Chi square analysis and when appropriate (number of observations in the chi square were below five), the Fischer Exact's Test, were performed to analyze the quantitative data. Multiple chi square analyses and Fischer's Exact Test with alpha level set to 0.10 were performed using collapsed data from the project manager group and the sponsor group. In addition to the chi square analysis, pie charts provided graphical representation of the descriptive statistics. The qualitative data collected from the interviews with the sponsor group participants was used to enrich the quantitative data.

Research Hypotheses

Seven hypotheses were developed to answer the question of how project management maturity levels affect IT/IS project efficiency (cost and time) and effectiveness (scope). Hypotheses two and three focus on cost management, hypotheses one and five focus on time management, and hypotheses three and six focus on scope management. Table 12 summarizes the results.

Table 12.

Summary of Tests Associated with the Cost Related Hypotheses

Hyp #	Hypothesis Description	Conclusion
1	Projects managed in organizations with an immature time management maturity level will have fewer projects completed on time than those managed in an organization with a mature time management maturity level.	Null hypothesis retained. Both groups identified improvements in a mature time management environment; however, it was not statistically significant.
2	Projects managed in organizations with an immature cost management maturity level will have fewer projects completed within budget than those managed in an organization with a mature cost management maturity level.	Null hypothesis retained. The sponsor group had statistically significant results supporting maturity while the project management group did not.
3	Projects managed in an organization with an immature scope management maturity level will complete fewer projects that meet the agreed upon scope than those managed in an organization with a mature scope management maturity level.	Null hypothesis retained. The sponsor group had statistically significant results supporting maturity; however the project manager group had a drop in meeting scope objectives

		in a mature scope management environment.
4	Projects managed in an organization that has an immature cost management maturity level will have fewer projects categorized as efficient, than project managed in an organization that has a mature cost management maturity level.	Null hypothesis retained. The sponsor group had no projects categorized as efficient. The project manager group seen a drop in efficiency.
5	Projects managed in an organization that has an immature time management maturity level will have fewer projects categorized as efficient, than projects managed in an organization that has a mature time management maturity level.	Null hypothesis retained. The sponsor group had no projects categorized as efficient. The project manager group seen a slight improvement in a mature time management; however, the improvement was statistically insignificant.
6	Projects managed in an organization with an immature scope management maturity level will have fewer projects categorized as effective, than projects managed in an organization that has a mature scope	Null hypothesis retained. Both groups identified improvements in a mature time management environment; however, it was not statistically

management maturity level.	significant.

Findings

Although all null hypotheses were accepted, there were interesting findings as a result of this study. There are similarities and differences between the sponsor group and the project manager group.

Similarities and differences between the sponsors and managers. In performing the inferential statistical analyses, some similarities and differences arose between the two groups. Additionally, there were interesting patterns that were not statistically significant, but worthy of discussion.

Statistically significance. The following are the similarities as they relate to statistical significance:

- There is no significant relationship between a project meeting cost objectives and the cost dimension of project management maturity.
- There is no significant relationship between a project being categorized as efficient and the cost dimension of project management maturity.
- There is no significant relationship between a project being categorized as effective and the scope dimension of project management maturity.

- The project manager group data and the sponsor group data show a significant relationship between time dimension of project management maturity and meeting perceived time management objectives.

The following are the differences between the two groups are:

- The project manager group data shows no significant relationship between a project meeting scope objectives and the scope dimension of project management maturity being mature. However, the project sponsor group does show a significant relationship.

One possible reason for the differences between the groups could be that the project sponsor has a broader view of the entire portfolio of projects in an organization, while the project manager has a restricted view. For example, the IT/IS project manager may only manage one type of IT/IS project, such as: (a) infrastructure projects, (b) software development projects, of (c) maintenance projects. On the other hand, the sponsor may have responsibility for all types of projects. This may result in the project sponsor having greater insight into the portfolio of projects, while the project manager has greater insight into a specific type of project. It could also be the result of highly skilled project managers being over-represented in the sample. Hence, their skills and abilities may allow success even in less than ideal corporate environments.

Interesting pattern. One striking pattern that arose, yet statistically not significant was in the dimension of time management maturity. The mature environment consistently outperforms the immature environment. Table 13 provides the percentages

for the mature and immature time management environments, as well as the percentage point increase or decrease; however, the index was not statistically significant.

Table 13.

Time Management Maturity and Meeting Time Objectives

Perception or Index	Group	Immature	Mature	Percentage Point Difference
Perception	Sponsor	17%	100%	+83
Perception	Manager	36%	68%	+32
Index	Manager	36%	50%	+14

One possible reason for the consistency in the time management dimension is that it generally involves hard skills as opposed to soft skills (Marando, 2012). Hard skills often are easier to teach and understand, and typically are associated with developing schedules and budgets (Pant & Baroudi, 2008).

In addition to the time management dimension, the cost management dimension showed an interesting pattern. From the project manager and project sponsor perception, meeting cost objectives improved in a mature cost management environment. Table 14 provides the percentages for the mature and immature time management environments, as well as the percentage point increase or decrease. The improvement was not statistically

significant, and could be due to chance. Again, this could be to cost management requiring more hard skills than soft skills (Marando, 2012).

Marando (2012) identifies scope management as requiring more soft skills than hard skill. Interestingly, there was no agreement between the project sponsors and the project managers when it came to the value of scope management (the sponsor group saw value while the project manager group did not). It could be that IT/IS project managers have more hard skills than soft skills, thus the reason why they see a relationship with maturity and the dimensions of time and cost, but not with scope.

Table 14.

Cost Management Maturity and Meeting Cost Objectives

Perception	Group	Immature	Mature	Percentage Point Difference
Perception	Sponsor	47%	54%	+7
Perception	Manager	33%	100%	+67

Project manager group perceptions and actual numbers. The research study collected perceptions of success from the project management group participants and collected actual numbers. The actual numbers were used to create indices for cost and

time. Although not statistically significant, there is a difference between the perceived and actual success of a project in a mature environment:

- Projects managed in an organization with mature cost management environment, have a perception of meeting cost objectives 61% of the time. However, when using the cost index instead of perception, the percentage falls to 41%. A difference of 20 percentage points.
- Projects managed in an organization with mature time management environment, have a perception of meeting time objectives 68% of the time. However, when using the time index instead of perception, the percentage falls to 50%. A difference of 18 percentage points.

All project managers compared to US project managers. Since a significant number of project manager participants (37%) were located outside the United States of America, it is worth recalculating the chi square and Fischer's Exact Test using only the participants located in the United States. Appendix L contains the detailed statistical output / results from SPSS. From a cost management maturity perspective, there is little difference between IT/IS project managers within the United States and all IT/IS project managers. Table 15 contains information that is more granular.

When focusing on time management maturity, there is little difference between the two groups, with one exception. The exception involves the project manager collapsed time management maturity level and the project manager collapsed reported time objectives met. When considering all IT/IS project managers, the chi square analysis resulted in χ^2 (1) = 4.850, p = 0.03. The Fischer's Exact Test resulted in p =

0.04. While performing the chi square analysis, none of the counts fell below five; therefore, the Fischer's Exact Test was not required. However, because one count was close to five, it may be prudent to consider the Fischer's Exact Test instead of the chi square.

When considering only IT/IS project managers within the United States, the chi square analysis resulted in χ^2 (1) = 1.071, p = 0.30, and the Fischer's Exact Test resulted in p = 0.44. This indicates that the IT/IS project managers outside of the United States have a stronger perception that organizations with a mature project time management environment tend to achieve project time management objectives more often. Table 16 contains information that is more granular.

From a scope management maturity perspective, there is little difference between IT/IS project managers within the United States and all IT/IS project managers. Table 17 contains information that is more granular.

Table 15.

Comparison of All Project Manager Participants and US Only Project Manager Participants for the Cost Related Hypotheses.

Hyp #	Variables	Results (All Participants)	Results (US Only)	Overall Impact
2	Project Manager Collapsed Cost Management Maturity Level and Project Manager Collapsed Reported Cost Objectives Met	χ^2 (1) = 0.196, p = 0.66.	χ^2 (1) = 0.735, p = 0.39.	Does not change conclusion.
2	Project Manager Collapsed Cost Management Maturity Level and Project Manager Collapsed Cost Index	χ^2 (1) = 1.616, p = 0.20.	χ^2 (1) = 0.887, p = 0.35. Fischer's Exact Test, p = 0.43	Does not change conclusion.
4	Project Manager Collapsed Cost Management Maturity Level and Project Manager Collapsed Reported Project Efficiency	χ^2 (1) = 0.192, p = 0.66.	χ^2 (1) = 0.023, p = 0.88.	Does not change conclusion.

Table 16.

Comparison of All Project Manager Participants and US Only Project Manager Participants for the Time Related Hypotheses.

Hyp #	Variables	Results (All Participants)	Results (US Only)	Overall Impact
1	Project Manager Collapsed Time Management Maturity Level and Project Manager Collapsed Reported Time Objectives Met	χ^2 (1) = 4.850, p = 0.03.	χ^2 (1) = 1.071, p = 0.30. Fischer's Exact Test resulted in p = 0.44	Changes one aspect or component, but does not change conclusion.
1	Project Manager Collapsed Time Management Maturity Level and Project Manager Collapsed Time Index	χ^2 (1) = 0.938, p = 0.33.	χ^2 (1) = 1.071, p = 0.30. Fischer's Exact Test resulted in p = 0.44	Does not change conclusion.
5	Project Manager Collapsed Time Management Maturity Level and Project Manager Collapsed Reported Project Efficiency	χ^2 (1) = 0.040, p = 0.84	χ^2 (1) = 0.0680, p = 0.79 Fischer's Exact Test, p = 1.00	Does not change conclusion.

Table 17.

Comparison of All Project Manager Participants and US Only Project Manager Participants for the Scope Related Hypotheses.

Hyp #	Variables	Results (All Participants)	Results (US Only)	Overall Impact
3	Project Manager Collapsed Scope Management Maturity Level and Project Manager Collapsed Reported Scope Objectives Met	χ^2 (1) = 0.142, p = 0.71	χ^2 (1) = 1.158, p = 0.28	Does not change conclusion.
6	Project Manager Collapsed Scope Management Maturity Level and Project Manager Collapsed Reported Effectiveness	χ^2 (1) = 0.087, p = 0.77. Fischer's Exact Test, p = 1.00.	χ^2 (1) = 0.021, p = 0.89. Fischer's Exact Test, p = 1.00.	Does not change conclusion.

Aggregated analysis. Since the research collected data regarding the overall success of projects from the project manager group, due diligence requires that the research analyze the relationship between the dimension of maturity (cost, time, and

scope) and overall project success. In performing the analysis, no significant correlations after running a series of chi square analyses. Additionally, no significant correlations exist after running a chi square analysis on the aggregated maturity levels and overall project success. Appendix M contains the SPSS output from the analysis.

Recommendations for Future Research

Three recommendations for future research are:

- Explore the difference between project manager perceptions of meeting time and cost objectives and the actual numbers (indices).
- Examine the relationship between project management maturity and large projects.
- Increase the sample size
- Use a different sampling technique.
- Narrow the research by focusing on one dimension such as time, and possibly one industry.
- Explore how the hard skills and soft skills of the project manager impact IT/IS project success
- Explore how the combination of project manager expertise and project management maturity level impact project success

In this research, the data from the project manager group identified there was gap between the actual time objectives met and the perceived time objectives met. The same is true for the dimension of cost management. There is an opportunity for a future research to identify why this gap exists. With hard skills associated with time and cost

dimensions of project management (Pant & Baroudi, 2008; Marando, 2012), a future researcher may want identify the role that hard and soft skills have in IT/IS project success.

Intuitively, it would seem acceptable that higher maturity levels are more important for large projects. A research may want to conduct research to see if this is true and explore the relationship between maturity levels and large projects.

Because of the small sample population, future researchers may want to conduct a similar study with a larger sample population. By increasing the sample size, it increases the accuracy of the analysis.

This research used a simple random sampling technique. Future researchers may want to use a different technique such as stratified sampling so that subgroups could be identified and studied. This could lead to researching the impact that project management certification has upon project success and/or organizational project management maturity.

Future research may include a more granular focus. The focus could be on one facet of project success such as scope, but not all three (scope, time, and cost). Additionally, the researcher could focus on IT/IS project management within one industry (such as transportation or education) instead of multiple industries.

Instead of looking at project management maturity, future research may look at other factors such as the hard and soft skills needed by the project manager to deliver a successful project.

Future research may focus on a combination of organizational project management maturity and project manager expertise. For example, the research may attempt to see if:

- A weak project manager may be more successful in organizations with a mature project management environment.
- A strong project manager may be successful in organizations with or without a mature project management environment.

Conclusion

This research did not show a relationship between scope management maturity and project effectiveness. Nor did it show a conclusive relationship between (a) time management maturity and project time/efficiency, and (b) cost management maturity and project cost/efficiency. This may be due to the sample size and sampling technique utilized by the researcher.

There is similarity between this research study and the work of Kerzner (2003) and Nelson (2007). Both Kerzner (2003) and Nelson (2007) identified anecdotal support for project management maturity. When viewing their descriptive data, there are positive relationship between the dimensions of maturity and improved project outcomes (Kerzner, 2003; Nelson, 2007).

Of all the relationships studied in this research, the dimension of time appears most promising. This research did show a relationship between meeting time objectives and time management maturity. However, this relationship was not statistically significant. Even so, cost is a relationship that may be worth pursuing. This is similar to the Kwak and Ibbs (2000a) study from the perspective of the time dimension. In the

Kwak and Ibbs (2000a) study, project management maturity and meeting time objectives showed the strongest relationship with an r^2 of 0.49. In this research study, the time dimension also showed the strongest relationship.

This research study supports the findings of other researchers such as Mullaly (2006), and Jugdev and Thomas (2002), who found no significant statistical relationship between project management maturity and project success. If other factors influence project success greater than project management maturity, then the finding in this research could be used to encourage others to find those influential factors.

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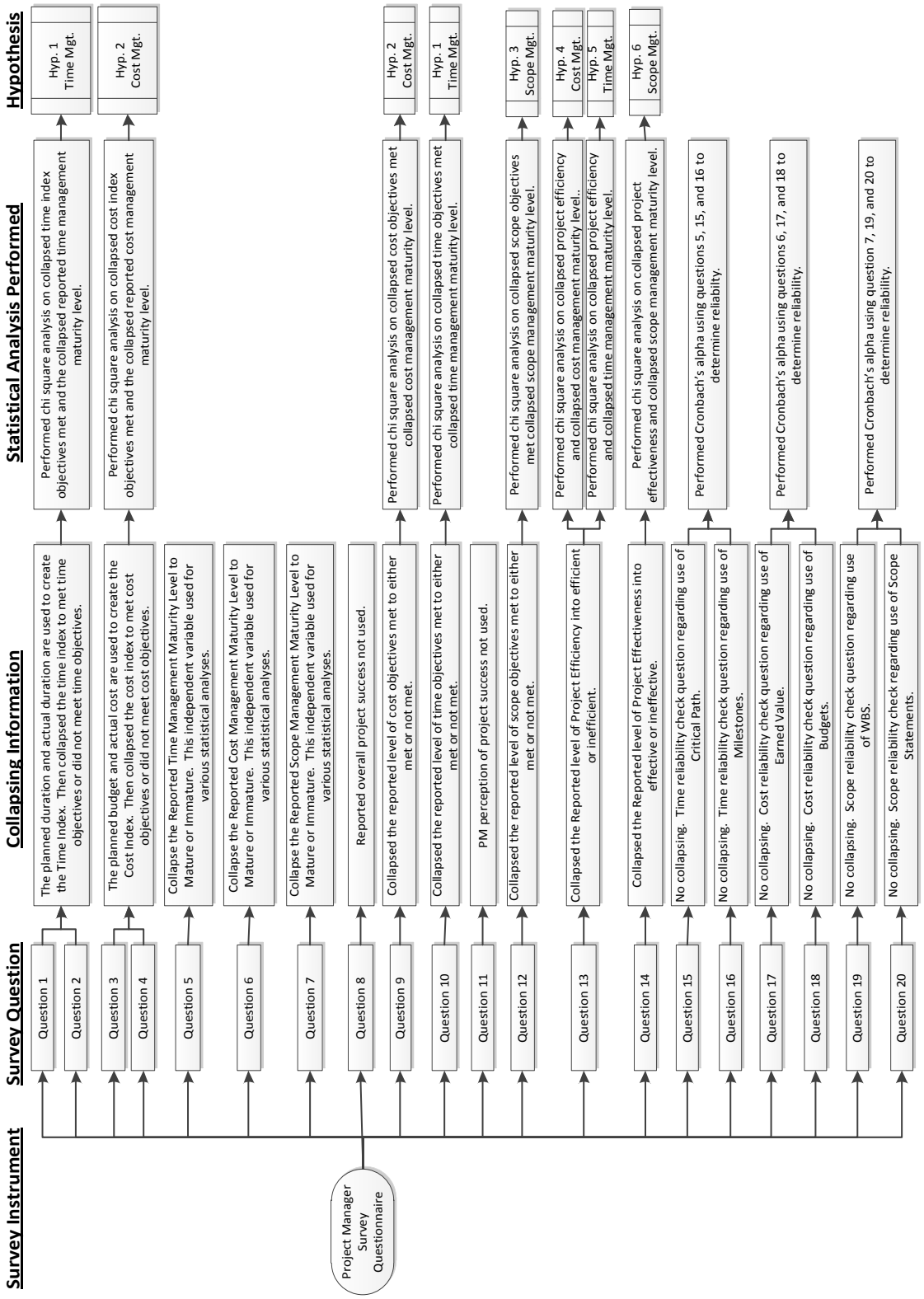
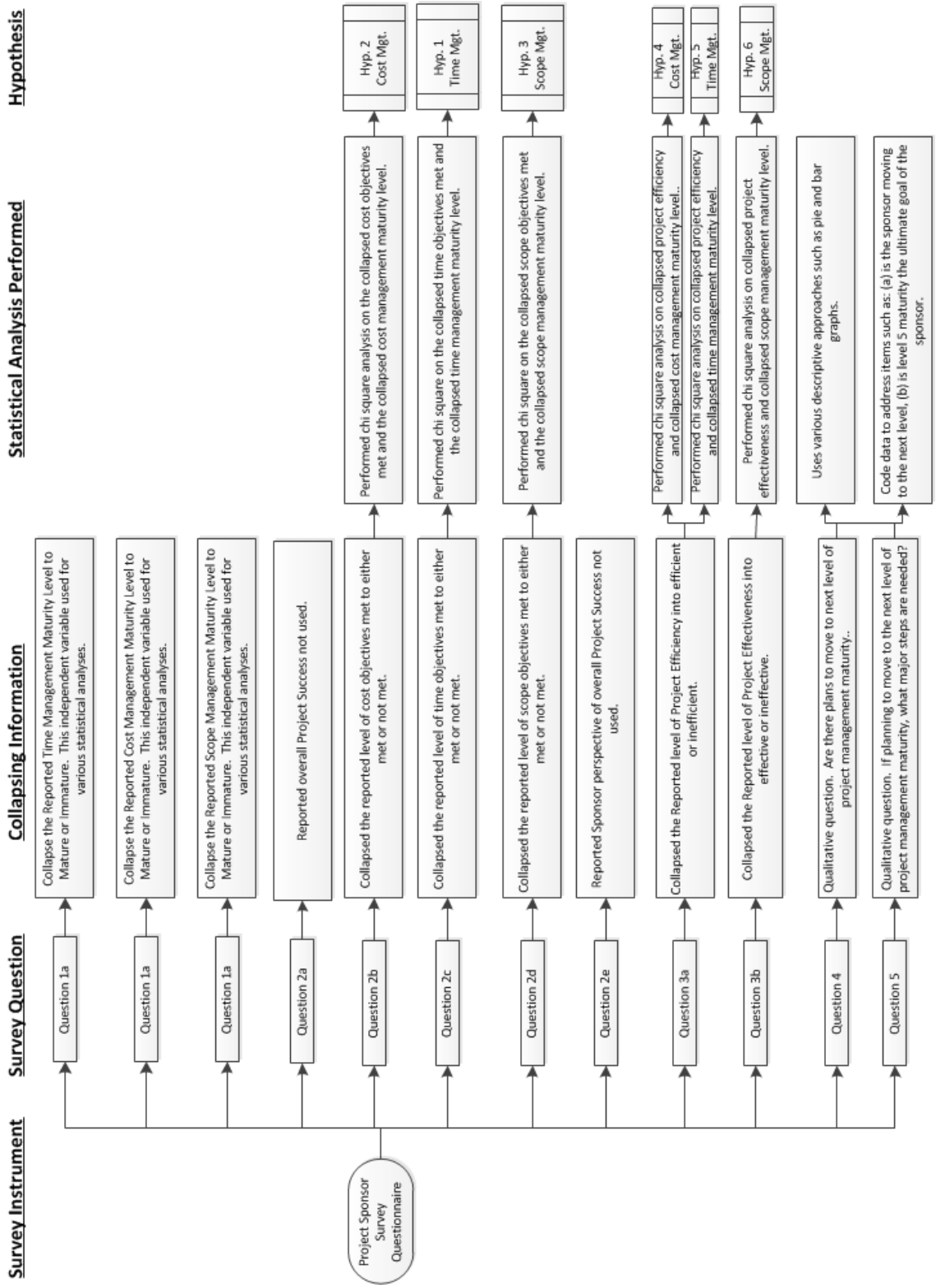
Appendix A Mapping of Project Manager Survey Questions, Statistical Analysis, and Hypotheses



Appendix B Mapping of Sponsor Survey Questions, Statistical Analysis, and Hypotheses



Appendix C

Final Project Manager PMML Survey Instrument

When completing the survey, please base it on the last project you managed, be it successful, marginally successful, failed or terminated. However, the project must have lasted at least one month in duration.

Before answering the survey questions, please take a minute to think about the project's:

- Goals and objectives
- Customer and sponsor expectations
- Status / progress reports
- The organization's project management maturity
- Other important facets of the project, which at the time, were important to you as the project manager

1. Approximately, what was the planned project duration (in months)?

2. Approximately, what was the actual duration of the project (in months)?

3. Approximately, what was the planned project budget (in US Dollars)?

4. Approximately, what was the actual project cost (in US Dollars)?

For questions 5 through 7, please indicate the level of project management maturity at your organization as it applies to cost, time, and scope management. Please use the following guidelines:

Level 1 = Ad-hoc.

Level 2 = Basic set of processes and standards followed by most project managers in the organization. There is a minimum level of consistency in the process, tools, and techniques used in the projects across the organization.

Level 3 = Project management processes integrated and standardized across the organization. There is much consistency in the process, tools, and techniques used in the projects across the organization.

Level 4 = Project management methodology accepted across the organization (meets Level 3 requirements) plus the project management methodology and data are used by leaders for organization wide decision making.

Level 5 = Process for continual project management process / methodology improvements established and functional. Project management is considered part of the organizations overall management process/methodology. Additionally, this level requires that the characteristics (requirements) of Level 4 have been met.

5. Time Management

Level 1	Level 2	Level 3	Level 4	Level 5
○	○	○	○	○

6. Cost Management

Level 1	Level 2	Level 3	Level 4	Level 5
○	○	○	○	○

7. Scope Management

Level 1	Level 2	Level 3	Level 4	Level 5
○	○	○	○	○

For questions 8 through 12, please select the option that best describes how well the project met its objectives.

8. Overall success of the project

Few or no objectives met	Most objectives met	All objectives met	Slightly exceeded objectives	Far exceeded objectives	NA
○	○	○	○	○	○

9. Cost or budget objectives

Few or no objectives met	Most objectives met	All objectives met	Slightly exceeded objectives	Far exceeded objectives	NA
○	○	○	○	○	○

10. Time or schedule objectives

Few or no objectives met	Most objectives met	All objectives met	Slightly exceeded objectives	Far exceeded objectives	NA
○	○	○	○	○	○

11. Your perception of customer satisfaction.

Few or no objectives met	Most objectives met	All objectives met	Slightly exceeded objectives	Far exceeded objectives	NA
○	○	○	○	○	○

12. Scope objectives

None or few objectives met	Most objectives met	All objectives met	NA
○	○	○	○

For questions 13 and 14, please indicate the level to which you agree or dissagree with the associated statements.

13. The project was effective

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
○	○	○	○	○

14. The project was efficient.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
○	○	○	○	○

Questions 15 and 16 relate to time management.

15. Select the answer that best describes the use the critical path in your organization.

- Critical path not calculated nor used.
- Some project managers calculate and use the critical path.
- All project managers use critical path. Those who do not use critical path provide a justification or reason for not using it.
- Project managers provide critical path information to the organizations' leadership / management. Those who do not provide this information provide a justification or reason for not doing so.
- In addition to project managers and the organizations' leadership / management using information from the critical path, 'critical path' best practices and lessons learned are shared with all project managers.

16. Select the answer that best describes the use of milestones in your organization.

- Project managers do not use milestones.
- Some project managers develop and use milestones.
- All project managers use milestones. Those who do not use milestones provide a justification or reason for not using them.
- Project managers provide milestone information to the organizations' leadership / management. Those who do not provide this information provide a justification or reason for not doing so.
- In addition to project managers and the organizations' leadership / management using milestone information, milestone best practices and lessons learned are shared with all project managers.

Questions 17 and 18 relate to cost management.

17. Select the answer that best describes the use of Earned Value (or a modified version of earned value) in your organization.

- Project managers do not calculate or utilize Earned Value.
- Some project managers calculate or utilize Earned Value.
- All project managers calculate and use Earned Value. Those who do not use Earned Value provide a justification or reason for not using it.
- Project managers provide earned value information to the organizations' leadership / management. Those who do not provide this information provide a justification or reason for not doing so.
- In addition to project managers and the organizations' leadership / management using earned value information, earned value best practices and lessons learned are shared with all project managers.

18. Select the answer that best describes the use of managing Budgets and costs in your organization.

- Project managers do not use budgets.
- Some project managers calculate and track budget information (actual vs planned).
- All project managers calculate and track their budget (actual vs planned costs). Those who do not track their budget provide a justification or reason for not doing so.
- Project managers provide budget and actual cost information to the organizations' leadership / management. Those who do not provide this information provide a justification or reason for not doing so.
- In addition to project managers and the organizations' leadership / management using budget and actual cost information, budgeting and cost variance best practices and lessons learned are shared with all project managers.

Questions 19 and 20 relate to scope management.

19. Select the answer that best describes the use of Work Breakdown Structures (WBS) in your organization.

- Project managers do not use WBS.
- Some project managers use WBS.
- All projects have a WBS. Those that do not have a WBS have a justification or reason for not using a WBS.
- Project managers provide a WBS to the organizations' leadership / management. Those who do not provide a WBS provide a justification or reason for not doing so
- In addition to project managers and the organizations' leadership / management using WBS information, 'WBS' best practices and lessons learned are shared with all project managers.

20. Select the answer that best describes the use of Scope Statements in your organization.

- Project managers do not use scope statements.
- Some project managers use scope statements.
- All projects include a scope statement as part of their project plan. Those that do not have a scope statement provide a justification or reason for not using one.
- Project managers provide scope statements to the organizations' leadership / management. Those who do not provide a scope statement provide a justification or reason for not doing so.
- In addition to project managers and the organizations' leadership / management using scope statement information, 'scope statement' best practices and lessons learned are shared with all project managers.

Appendix D
Letter Posted to LinkedIn Professional Groups

Hello,

I am working on my doctoral dissertation at Wilmington University and I am seeking to advance the understanding of how various dimensions of an organization's project management maturity affect IT/IS project success. If you are an IT/IS project manager or have held an IT/IS project management position, I would greatly appreciate your help in responding to a brief survey that should take less than 15 minutes to complete.

This study will add to the current understanding on IT/IS project management. The results of this study will be useful in identifying ways to improve IT/IS project management and outcomes. Your participation in this study is voluntary and anonymous. The study is supported by Wilmington University.

If you wish to participate in the survey, you can click on the following link to begin the survey: http://www.surveygizmo.com

At the end of the survey, you will be provided information that enables you to view the aggregate results as data is collected.

Thank you in advance for taking the time to participate and to further the body of academic knowledge in the field of IT/IS Project Management.

Sincerely,
Anthony Carcillo, PMP

Appendix E Finalized Project Sponsor Interview Instrument

Project Management Maturity Level (Executive/Sponsor) Interview Questions

Quantitative Portion

1. Please indicate the level of project management maturity at your organization as it applies to the following area:

   Level 1 = ad-hoc.

   Level 2 = Basic set of processes and standards set and followed by most project managers. There is a minimum level of consistency in the process, tools, and techniques used in the projects across the organization.

   Level 3 = Project management processes integrated and standardized across the organization. There is much consistency In the process, tools, and techniques used in the projects across the organization.

   Level 4 = Project management methodology accepted across the organization (meets Level 3 requirements) plus the project management methodology and data are used by leaders for organization wide decision making.

   Level 5 = Process for continual project management process / methodology improvements established and functional. Project management is considered part of the organizations overall management process/methodology. Additionally, this level requires that the characteristics (requirements) of Level 4 have been met.

Time Management	1	2	3	4	5
Cost Management	1	2	3	4	5
Scope Management	1	2	3	4	5

2. Please rate the following questions on a five point scale with 1= met none or few of the objective, 2= most objectives met, 3 = all objectives met, 4 = slightly exceeded objectives, and 5 = far exceeded objectives. Please circle "NA" if not applicable to the project.

Overall success of the project	1	2	3	4	5	NA
Cost or budget objectives	1	2	3	4	5	NA
Time or schedule objectives	1	2	3	4	5	NA
Scope objectives	1	2	3	4	5	NA
Your perception of overall customer satisfaction	1	2	3	4	5	NA

3. In terms of project outcomes, please identify the level of project efficiency and effectiveness:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The project was efficient	1	2	3	4	5
The project was effective	1	2	3	4	5

Qualitative Portion

1. Over the next 1-2 years, do you plan to move to the next level of project management maturity?

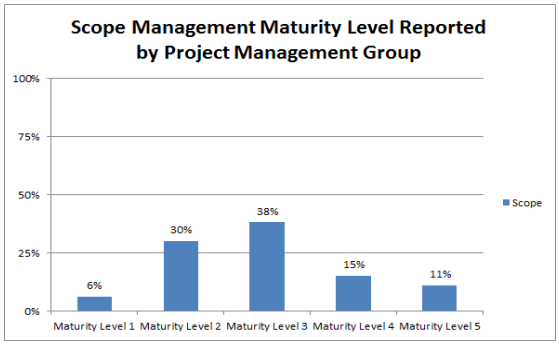
   _____
   _____
   _____
   _____
   _____

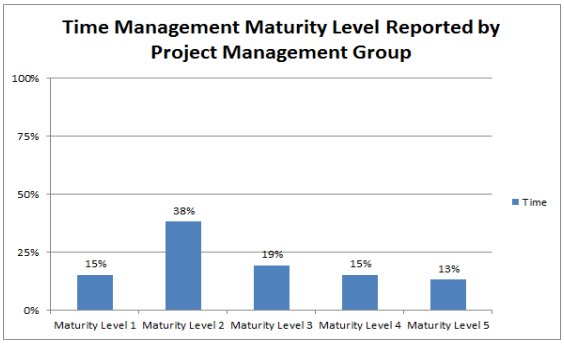
2. If you are planning to move to the next level of project management maturity, what major steps to you need to take?

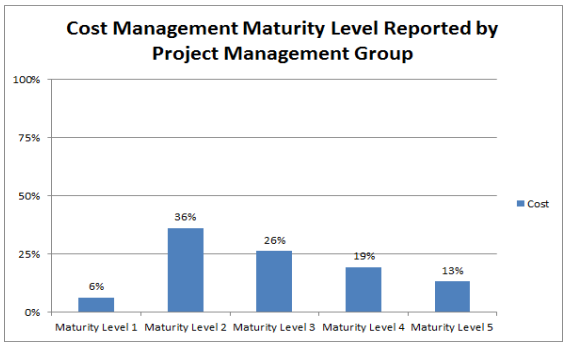
   _____
   _____
   _____
   _____
   _____

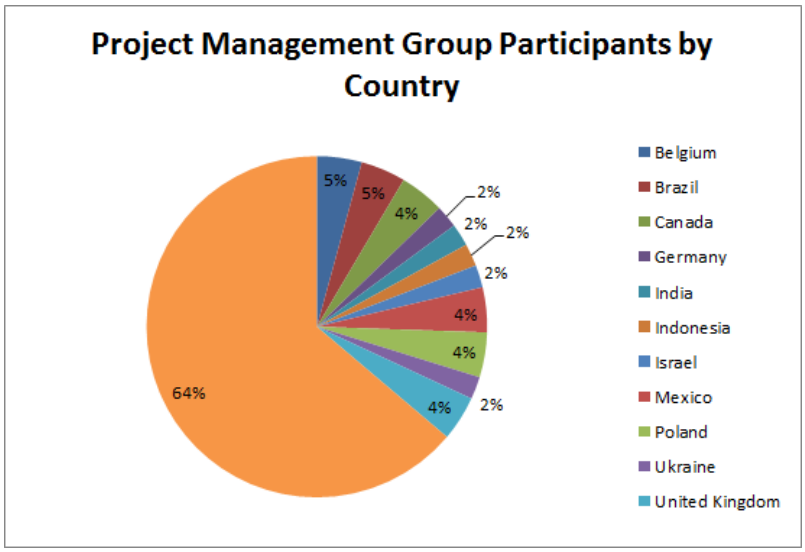
Appendix F Project Manager Group Graphical Information

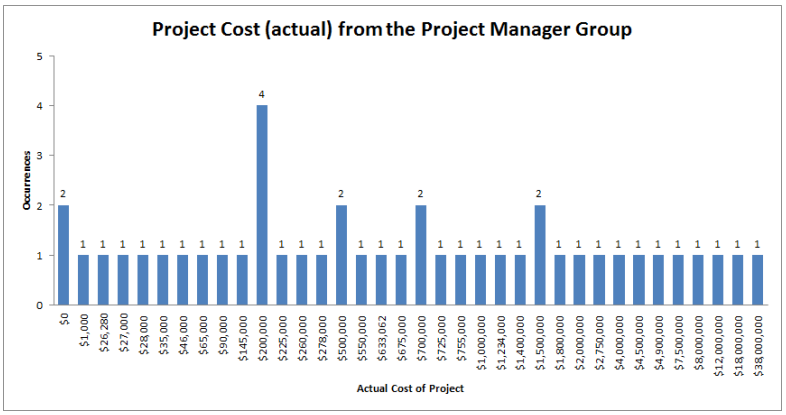
The following graphs represent the usable data from the project management group respondents.

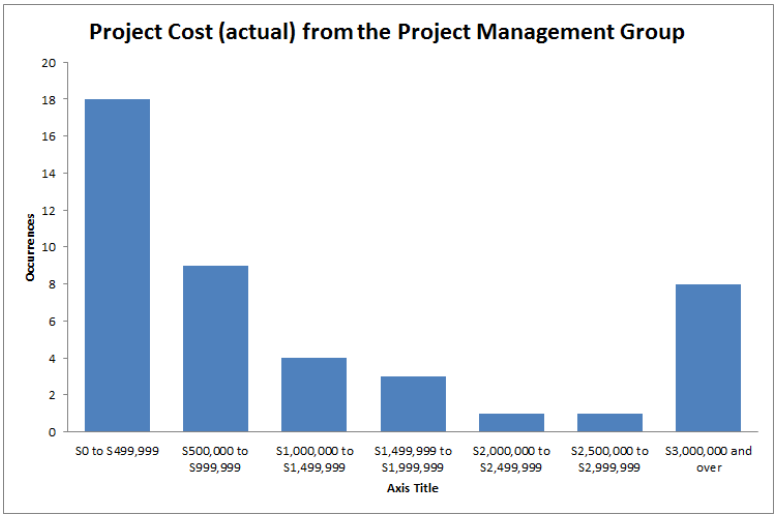


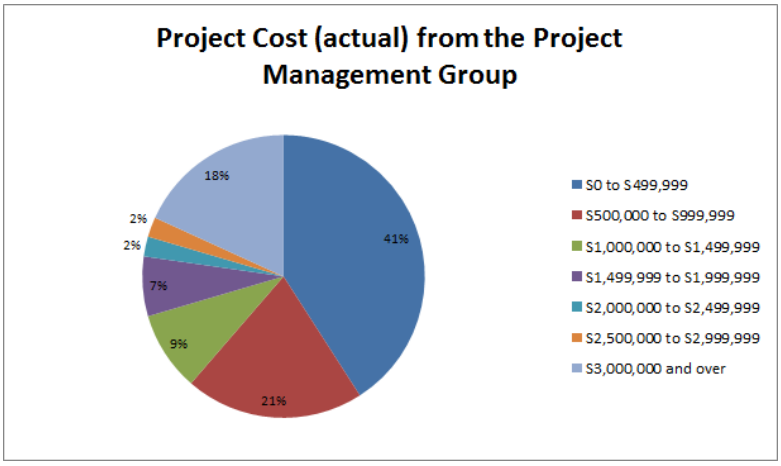


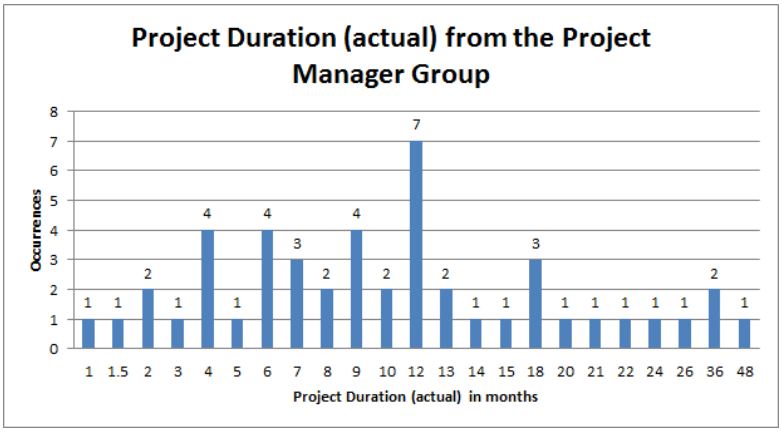


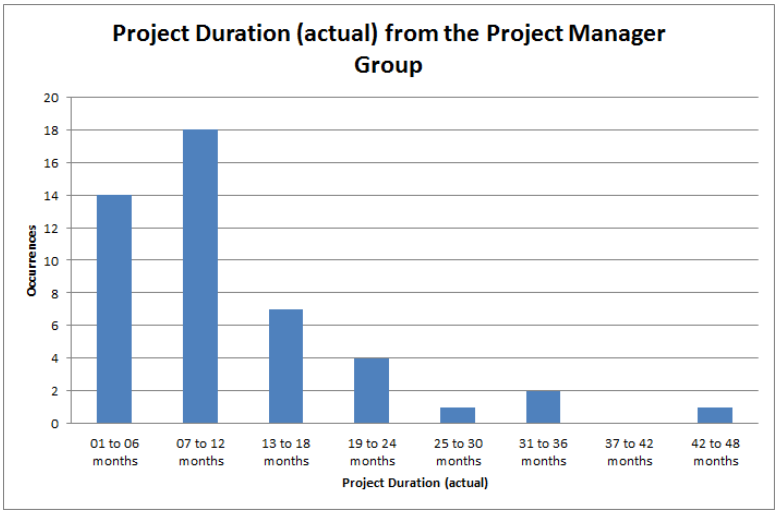


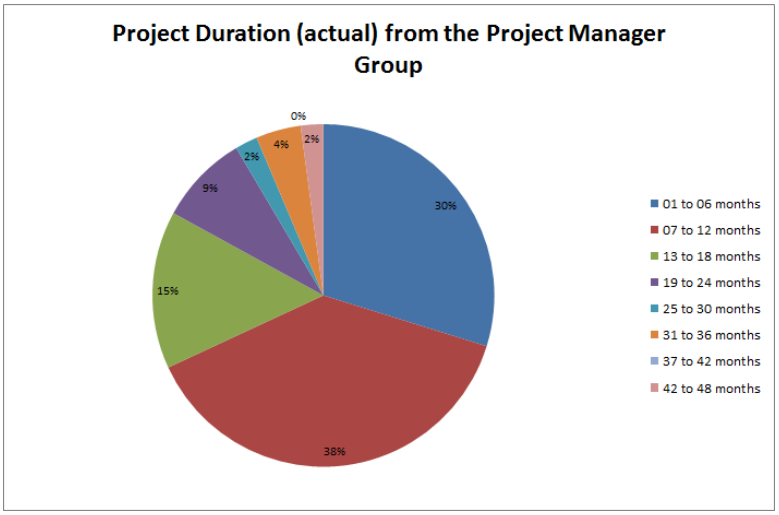


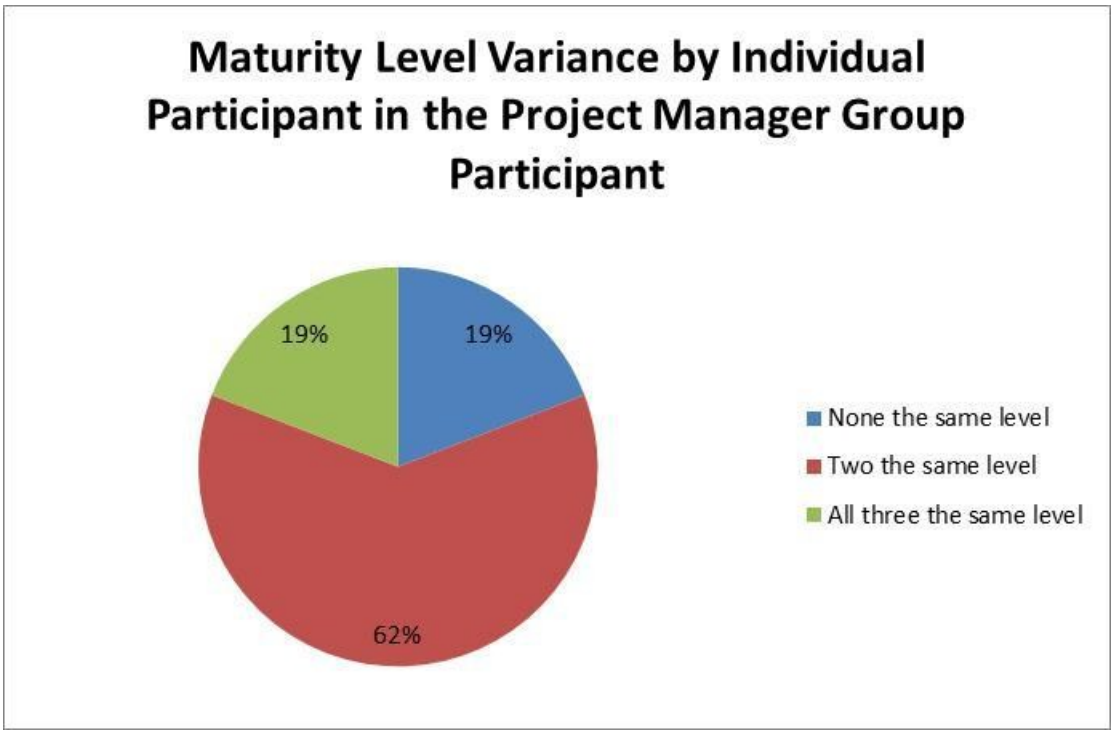


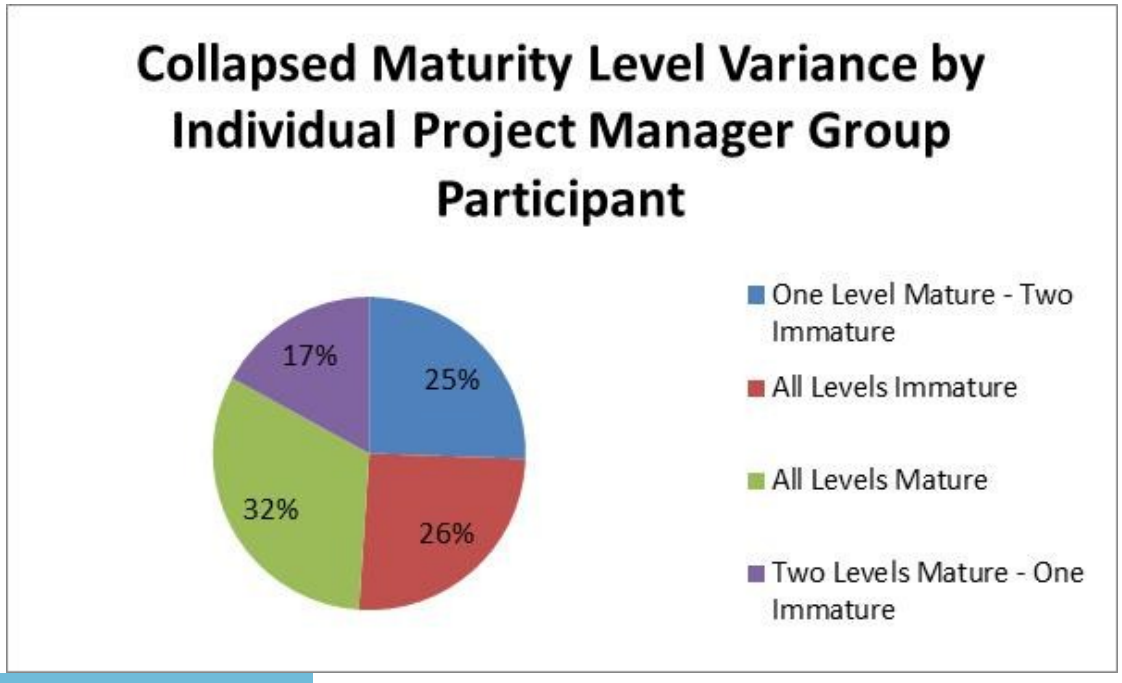




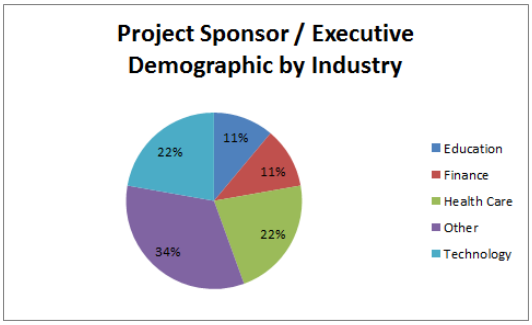


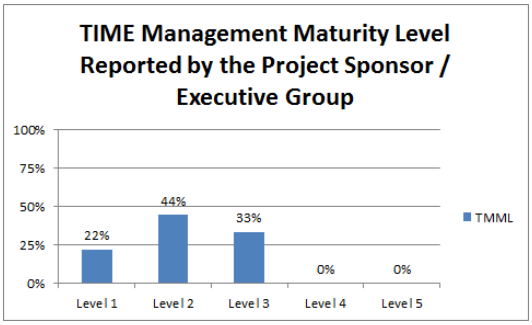


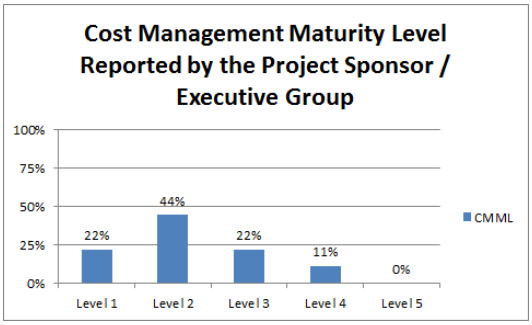


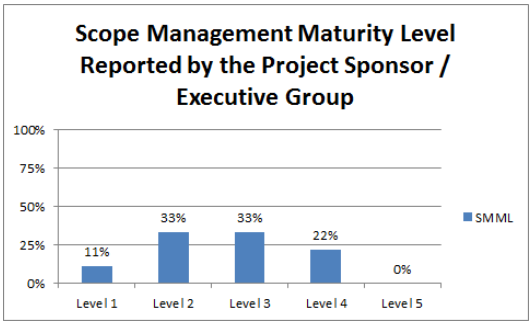


Appendix G Sponsor Group Graphical Information









Appendix H

Codebook

Variable Type	Variable Name	Description
Independent	SpCCMML2d	Collapsed Cost Management Maturity Level. Instead of five levels, there are two. One that represents an immature cost management maturity level and one that represents a mature cost management maturity level. If SpCMML ≤2 then SpCCMML2d=1 (or immature). If SpCMML ≥ 3 then SpCCMML2d=2 (or mature). This collapses the cost management maturity level into two categories (immature or mature).
Independent	SpCMML	Reported Cost Management Maturity Level. Cost Management Maturity Level reported by the Executive group. 1 through 5 represents the five project management maturity levels.
Dependent	SpCobj	Reported Cost Objectives met. Cost objectives met reported by the Executive group. 1= none to few, 2 = most, 3 = all, 4 = slightly exceeded, 5 = far exceeded, and 6 = N/A
Dependent	SpCRCOM	The SpCobj is collapsed into the SpCRCOM field. This collapse categorizes the data into two categories: one representing 'cost objectives met' and the other representing 'cost objectives not met'. If SpCobj ≤2 then SpCRCOM = 1 (cost objectives not met). If SpCobj ≥ 3 then SpCRCOM = 2 (cost objectives met). This collapses the cost objectives into two categories (met or not met).
Dependent	SpCRPEffective	Collapsed project effectiveness. The project effectiveness is collapsed into two categories. One representing an ineffective project and one representing an effective project. If SpRPEffectiveness ≤3 then SpCRPEffective = 1 (ineffective). If SpRPEffectiveness ≥4 then SpCRPEffective =2 (effective). This collapses the reported project effectiveness into two categories (ineffective and effective).
Dependent	ExCRPEfficiency	Collapsed project efficiency. The project efficiency is collapsed into two categories. One representing an inefficient project and one representing an efficient project. IfSpRPEfficiency ≤3 thenSpCRPEfficiency = 1 (inefficient). IfSpRPEfficiency ≥4 thenSpCRPEfficiency =2 (effective). This collapses the reported project efficiency into two categories (inefficient and efficient).
Dependent	SpCRSOM	The SpSobj is collapsed into the SpCRSOM field. This collapse categorizes the data into two categories: one representing 'scope objectives met' and the other representing 'scope objectives not met'. If SpSobj ≤2 then SpCRSOM = 1 (scope objectives not met). If SpSobj = 3 then SpCRSOM = 2 (scope objectives met).

Dependent	SpCRTOM	The SpTobj is collapsed into the SpCRTOM field. This collapse categorizes the data into two categories: one representing 'time objectives met' and the other representing 'time objectives not met'. If SpTobj ≤2 then SpCRTOM = 1 (time objectives not met). If SpTobj ≥ 3 then SpCRTOM = 2 (time objectives met). This collapses the time objectives into two categories (met or not met).
Independent	ExCSMML2d	Collapsed Scope Management Maturity Level. Instead of five levels, there are two. One that represents an immature scope management maturity level and one that represents a mature scope management maturity level. If ExSMML ≤2 then ExCSMML2d=1 (or immature). If ExSMML ≥ 3 then ExCSMML2d=2 (or mature). This collapses the scope management maturity level into two categories (immature or mature).
Independent	SpCTMML2d	Collapsed Time Management Maturity Level. Instead of five levels, there are two. One that represents an immature time management maturity level and one that represents a mature time management maturity level. If SpTMML ≤2 then SpCTMML2d=1 (or immature). If SpTMML ≥ 3 then SpCTMML2d=2 (or mature). This collapses the time management maturity level into two categories (immature or mature).
Dependent	SpRPEffectiveness	Reported project effectiveness. Project effectiveness reported by the Executive group. The participant was asked if their projects are effective. 1 = Strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree.
Dependent	ExRPEfficiency	Reported project efficiency. Project efficiency reported by the Executive group. The participant was asked if their projects are efficient. 1 = Strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree.
Independent	ExSMML	Reported Scope Management Maturity Level. Scope Management Maturity Level reported by the Executive group. 1 through 5 represents the five project management maturity levels.
Dependent	SpSobj	Reported Scope Objective met. Scope objectives met reported by the Executive group. 1= none to few, 2 = most, 3 = all.
Independent	SpTMML	Reported Time Management Maturity Level. Time Management Maturity Level reported by the Executive group. 1 through 5 represents the five project management maturity levels.
Dependent	SpTobj	Reported Time Objective met. Time objectives met reported by the Executive group. 1= none to few, 2 = most, 3 = all, 4 = slightly exceeded, 5 = far exceeded, and 6 = N/A.

Dependent	PmAC	The actual cost is measured in US dollars. The participant from the project management group enters the actual cost of the project.
Dependent	PmAD	The actual duration is measured in months. The participant from the project management group enters the actual duration of the project.
Dependent	PmCCI2	If PmCI < 1 then PmCCI2 = 1. If PmCI ≥ 1 then PmCCI2 = 2. This collapses the PmCI (cost index) into two categories (met planned time or did not meet planned cost). If PmCI = 1 then the project did not meet the planned cost objective. If PmCI ≥ 1 then the project did meet the planned cost objective.
Independent	PmCCMML2d	Collapsed Cost Management Maturity Level. Instead of five levels, there are two. One that represents an immature cost management maturity level and one that represents a mature cost management maturity level. If PmCMML ≤2 then PmCCMML2d=1 (or immature). If PmCMML ≥ 3 then PmCCMML2d=2 (or mature). This collapses the cost management maturity level into two categories (immature or mature).
Dependent	PmCI	The Cost Index is calculated by using the following formula: PmCI = PmPC / PmAC. This results in an index. If PmCI = 1, then the planned cost and the actual cost were the same. If PmCi is greater than 1, then the actual cost was less than the planned cost. If PmCI is less than 1, then the actual cost was greater than the planned cost.
Independent	PmCMML	Reported Cost Management Maturity Level. Cost Management Maturity Level reported by the Project Management group. 1 through 5 represents the five project management maturity levels
Dependent	PmCobj	Reported Cost Objectives met. Cost objectives met reported by the Project Management group. 1= none to few, 2 = most, 3 = all, 4 = slightly exceeded, 5 = far exceeded, and 6 = N/A
Dependent	PmCRCOM	The SpCobj is collapsed into the SpCRCOM field. This collapse categorizes the data into two categories: one representing 'cost objectives met' and the other representing 'cost objectives not met'. If PmCobj ≤2 then PmCRCOM = 1 (cost objectives not met). If PmCobj ≥ 3 then PmCRCOM = 2 (cost objectives met). This collapses the cost objectives into two categories (met or not met).
Dependent	PmCRPEffective	Collapsed project effectiveness. The project effectiveness is collapsed into two categories. One representing an ineffective project and one representing an effective project. If PmRPEffectiveness ≤3 then PmCRPEffective = 1 (ineffective). If PmRPEffectiveness ≥4 then PmCRPEffective =2 (effective). This collapses the reported project effectiveness into two categories (ineffective and effective).

Dependent	PmCRPEfficiency	Collapsed project efficiency. The project efficiency is collapsed into two categories. One representing an inefficient project and one representing an efficient project. If PmRPEfficiency ≤3 then PmCRPEfficiency = 1 (inefficient). If PmRPEfficiency ≥4 then PmCRPEfficiency =2 (effective). This collapses the reported project efficiency into two categories (inefficient and efficient).
Dependent	PmCRSOM	The SpSobj is collapsed into the SpCRSOM field. This collapse categorizes the data into two categories: one representing 'scope objectives met' and the other representing 'scope objectives not met'. if PmSobj ≤2 then PmCRSOM = 1 (scope objectives not met). If PmSobj = 3 then PmSobj = 2 (scope objectives met).
Dependent	PmCRTOM	The SpTobj is collapsed into the SpCRTOM field. This collapse categorizes the data into two categories: one representing 'time objectives met' and the other representing 'time objectives not met'. If PmTobj ≤2 then PmCRTOM = 1 (time objectives not met). If PmTobj ≥ 3 then PmCRTOM = 2 (time objectives met). This collapses the time objectives into two categories (met or not met).
Independent	PmCSMML2d	Collapsed Scope Management Maturity Level. Instead of five levels, there are two. One that represents an immature scope management maturity level and one that represents a mature scope management maturity level. If PmSMML ≤2 then PmCSMML2d=1 (or immature). If PmSMML ≥ 3 then PmCSMML2d=2 (or mature). This collapses the scope management maturity level into two categories (immature or mature).
Dependent	PmCTI2	If PmTI < 1 then PmCTI2 = 1. If PmTI ≥ 1 then PmCTI2 = 2. This collapses the PmTI (time index) into two categories (met planned time or did not meet planned time). If PmTI = 1 then the project did not meet the planned time objective. If PmTI ≥ 1 then the project did meet the planned time objective.
Independent	PmCTMML2d	Collapsed Time Management Maturity Level. Instead of five levels, there are two. One that represents an immature time management maturity level and one that represents a mature time management maturity level. If PmTMML ≤2 then PmCTMML2d=1 (or immature). If PmTMML ≥ 3 then PmCTMML2d=2 (or mature). This collapses the time management maturity level into two categories (immature or mature).
Dependent	PmPC	The planned cost is measured in US dollars. The participant from the project management group enters the planned cost of the project.
Dependent	PmPD	The planned duration is measured in months. The participant from the project management group enters the planned duration of the project.

Dependent	PmRPEffectiveness	Reported project effectiveness. Project effectiveness reported by the Project Management group. The participant was asked if their projects are effective. 1 = Strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree.
Dependent	PmRPEfficiency	Reported project efficiency. Project efficiency reported by the Project Management group. The participant was asked if their projects are efficient. 1 = Strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree.
Independent	PmSMML	Reported Scope Management Maturity Level. Scope Management Maturity Level reported by the Project Management group. 1 through 5 represents the five project management maturity levels
Dependent	PmSobj	Reported Scope Objective met. Scope objectives met reported by the Project Management group. 1= none to few, 2 = most, 3 = all.
Dependent	PmTI	The Time Index is calculated by using the following formula: PmTI = PmPD / PmAD. This results in an index. If PmTI = 1, then the planned duration and the actual duration were the same. If PmTI is greater than 1, then the actual duration was less than the planned duration. If PmTI is less than 1, then the actual duration was greater than the planned duration.
Independent	PmTMML	Reported Time Management Maturity Level. Time Management Maturity Level reported by the Project Management group. 1 through 5 represents the five project management maturity levels
Dependent	PmTobj	Reported Time Objective met. Time objectives met reported by the Project Management group. 1= none to few, 2 = most, 3 = all, 4 = slightly exceeded, 5 = far exceeded, and 6 = N/A

Appendix I SPSS Output

Hypothesis 1 Related Chi Square Output (from SPSS)

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PmCTMML2d * PmCRTOM	47	100.0%	0	.0%	47	100.0%

PmCTMML2d * PmCRTOM Crosstabulation

Count

		PmCRTOM		Total
		1.00	2.00	
PmCTMML2d	1.00	16	9	25
	2.00	7	15	22
Total		23	24	47

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.850[a]	1	.03		
Continuity Correction[b]	3.648	1	.06		
Likelihood Ratio	4.942	1	.03		
Fisher's Exact Test				.04	.03
Linear-by-Linear Association	4.747	1	.03		
N of Valid Cases	47				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.77.
b. Computed only for a 2x2 table

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PmCTMML2d * PmCTI2	47	100.0%	0	.0%	47	100.0%

PmCTMML2d * PmCTI2 Crosstabulation

Count

		PmCTI2		Total
		1.00	2.00	
PmCTMML2d	1.00	16	9	25
	2.00	11	11	22
Total		27	20	47

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.938[a]	1	.33		
Continuity Correction[b]	.453	1	.50		
Likelihood Ratio	.940	1	.33		
Fisher's Exact Test				.39	.25
Linear-by-Linear Association	.918	1	.34		
N of Valid Cases	47				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.36.
b. Computed only for a 2x2 table

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
SpCTMML2d * SpCRTOM	9	100.0%	0	.0%	9	100.0%

SpCTMML2d * SpCRTOM Crosstabulation

Count

		SpCRTOM		
		1.00	2.00	Total
SpCTMML2d	1.00	5	1	6
	2.00	0	3	3
Total		5	4	9

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.625[a]	1	.02		
Continuity Correction[b]	2.756	1	.10		
Likelihood Ratio	6.959	1	.01		
Fisher's Exact Test				.05	.05
Linear-by-Linear Association	5.000	1	.03		
N of Valid Cases	9				

a. 4 cells (100.0%) have expected count less than 5. The minimum expected count is 1.33.
b. Computed only for a 2x2 table

Hypothesis 2 Related Chi Square Output (from SPSS)

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PmCCMML2d * PmCCI2	40	85.1%	7	14.9%	47	100.0%

PmCCMML2d * PmCCI2 Crosstabulation

Count

		PmCCI2		
		1.00	2.00	Total
PmCCMML2d	1.00	7	11	18
	2.00	13	9	22
Total		20	20	40

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.616[a]	1	.20		
Continuity Correction[b]	.909	1	.34		
Likelihood Ratio	1.628	1	.20		
Fisher's Exact Test				.34	.17
Linear-by-Linear Association	1.576	1	.21		
N of Valid Cases	40				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.00.
b. Computed only for a 2x2 table

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PmCCMML2d * PmCRCOM	43	91.5%	4	8.5%	47	100.0%

PmCCMML2d * PmCRCOM Crosstabulation

Count

		PmCRCOM		
		1.00	2.00	Total
PmCCMML2d	1.00	10	9	19
	2.00	11	13	24
Total		21	22	43

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.196[a]	1	.66		
Continuity Correction[b]	.018	1	.89		
Likelihood Ratio	.196	1	.66		
Fisher's Exact Test				.76	.45
Linear-by-Linear Association	.192	1	.66		
N of Valid Cases	43				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.28.
b. Computed only for a 2x2 table

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
SpCCMML2d * SpCRCOM	9	100.0%	0	.0%	9	100.0%

SpCCMML2d * SpCRCOM Crosstabulation

Count

		SpCRCOM		Total
		1.00	2.00	
SpCCMML2d	1.00	4	2	6
	2.00	0	3	3
Total		4	5	9

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.600[a]	1	.058		
Continuity Correction[b]	1.406	1	.236		
Likelihood Ratio	4.727	1	.030		
Fisher's Exact Test				.167	.119
Linear-by-Linear Association	3.200	1	.074		
N of Valid Cases	9				

a. 4 cells (100.0%) have expected count less than 5. The minimum expected count is 1.33.
b. Computed only for a 2x2 table

Hypothesis 3 Related Chi Square Output (from SPSS)

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PmCSMML2d * PmCRSOM	47	100.0%	0	.0%	47	100.0%

PmCSMML2d * PmCRSOM Crosstabulation

Count

		PmCRSOM		
		1.00	2.00	Total
PmCSMML2d	1.00	10	10	20
	2.00	12	15	27
Total		22	25	47

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.142[a]	1	.71		
Continuity Correction[b]	.007	1	.93		
Likelihood Ratio	.142	1	.71		
Fisher's Exact Test				.77	.47
Linear-by-Linear Association	.139	1	.71		
N of Valid Cases	47				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.36.
b. Computed only for a 2x2 table

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
SpCSMML2d * SpCRSOM	9	100.0%	0	.0%	9	100.0%

SpCSMML2d * SpCRSOM Crosstabulation

Count

		SpCRSOM		
		1.00	2.00	Total
SpCSMML2d	1.00	4	0	4
	2.00	0	5	5
Total		4	5	9

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	9.000[a]	1	.003		
Continuity Correction[b]	5.406	1	.020		
Likelihood Ratio	12.365	1	.000		
Fisher's Exact Test				.008	.008
Linear-by-Linear Association	8.000	1	.005		
N of Valid Cases	9				

a. 4 cells (100.0%) have expected count less than 5. The minimum expected count is 1.78.
b. Computed only for a 2x2 table

Hypothesis 4 Related Chi Square Output (from SPSS)

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PmCCMML2d * PmCRPEfficient	45	95.7%	2	4.3%	47	100.0%

PmCCMML2d * PmCRPEfficient Crosstabulation

Count

		PmCRPEfficient		
		1.00	2.00	Total
PmCCMML2d	1.00	10	13	23
	2.00	11	11	22
Total		21	24	45

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.192[a]	1	.66		
Continuity Correction[b]	.019	1	.89		
Likelihood Ratio	.192	1	.66		
Fisher's Exact Test				.77	.44
Linear-by-Linear Association	.188	1	.66		
N of Valid Cases	45				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.27.
b. Computed only for a 2x2 table

Hypothesis 5 Related Chi Square Output (from SPSS)

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PmCTMML2d * PmCRPEfficient	45	95.7%	2	4.3%	47	100.0%

PmCTMML2d * PmCRPEfficient Crosstabulation

Count

		PmCRPEfficient		
		1.00	2.00	Total
PmCTMML2d	1.00	12	13	25
	2.00	9	11	20
Total		21	24	45

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.040[a]	1	.84		
Continuity Correction[b]	.000	1	1.00		
Likelihood Ratio	.040	1	.84		
Fisher's Exact Test				1.00	.54
Linear-by-Linear Association	.039	1	.84		
N of Valid Cases	45				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.33.
b. Computed only for a 2x2 table

Hypothesis 6 Related Chi Square Output (from SPSS)

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PmCSMML2d * PmCRPEffective	45	95.7%	2	4.3%	47	100.0%

PmCSMML2d * PmCRPEffective Crosstabulation

Count

		PmCRPEffective		Total
		1.00	2.00	
PmCSMML2d	1.00	3	17	20
	2.00	3	22	25
Total		6	39	45

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.087[a]	1	.77		
Continuity Correction[b]	.000	1	1.00		
Likelihood Ratio	.086	1	.77		
Fisher's Exact Test				1.00	.55
Linear-by-Linear Association	.085	1	.77		
N of Valid Cases	45				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 2.67.
b. Computed only for a 2x2 table

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
SpCSMML2d * SpCRPEffective	9	100.0%	0	.0%	9	100.0%

SpCSMML2d * SpCRPEffective Crosstabulation

Count

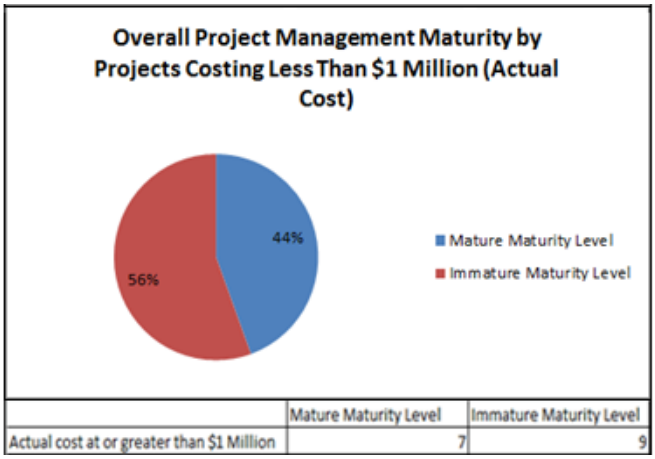
		SpCRPEffective		Total
		1.00	2.00	
SpCSMML2d	1.00	3	1	4
	2.00	1	4	5
Total		4	5	9

Chi-Square Tests

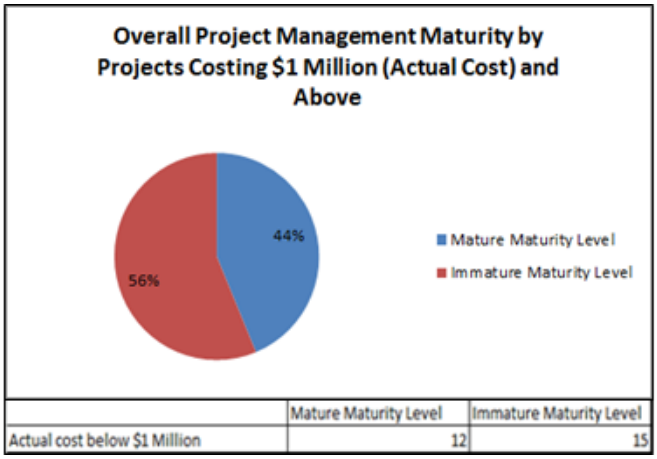
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.723[a]	1	.099		
Continuity Correction[b]	.951	1	.330		
Likelihood Ratio	2.863	1	.091		
Fisher's Exact Test				.206	.167
Linear-by-Linear Association	2.420	1	.120		
N of Valid Cases	9				

a. 4 cells (100.0%) have expected count less than 5. The minimum expected count is 1.78.
b. Computed only for a 2x2 table

Appendix J – Analysis of Project Size and Maturity Level



	Mature Maturity Level	Immature Maturity Level
Actual cost at or greater than $1 Million	7	9



	Mature Maturity Level	Immature Maturity Level
Actual cost below $1 Million	12	15

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PmCPMML * PmCAC	43	91.5%	4	8.5%	47	100.0%

PmCPMML * PmCAC Crosstabulation

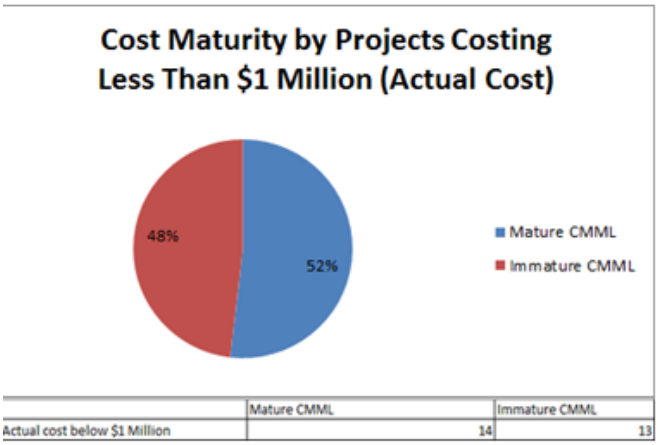
Count

		PmCAC		Total
		.00	1.00	
PmCPMML	.00	15	9	24
	1.00	12	7	19
Total		27	16	43

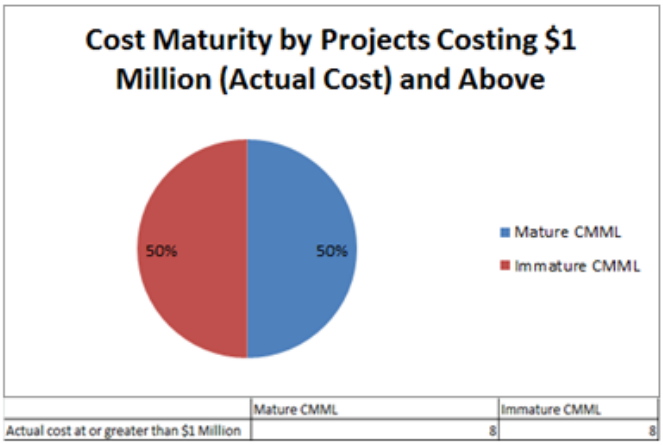
Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.002[a]	1	.965		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.002	1	.965		
Fisher's Exact Test				1.000	.609
Linear-by-Linear Association	.002	1	.965		
N of Valid Cases	43				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.07.
b. Computed only for a 2x2 table



	Mature CMML	Immature CMML
Actual cost below $1 Million	14	13



	Mature CMML	Immature CMML
Actual cost at or greater than $1 Million	8	8

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PmCCMML2d * PmCAC	43	91.5%	4	8.5%	47	100.0%

PmCCMML2d * PmCAC Crosstabulation

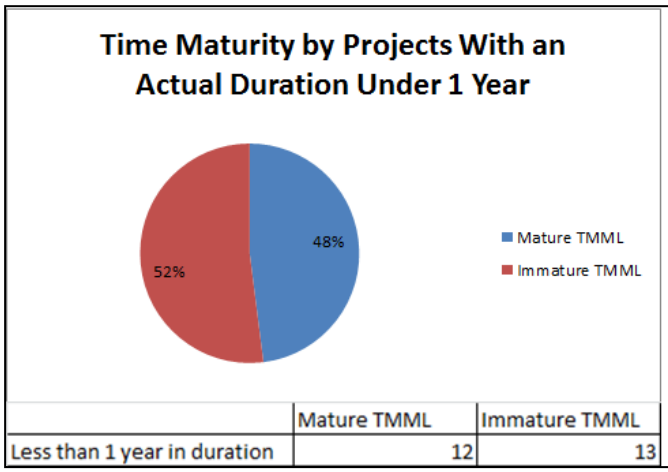
Count

		PmCAC		Total
		.00	1.00	
PmCCMML2d	1.00	13	8	21
	2.00	14	8	22
Total		27	16	43

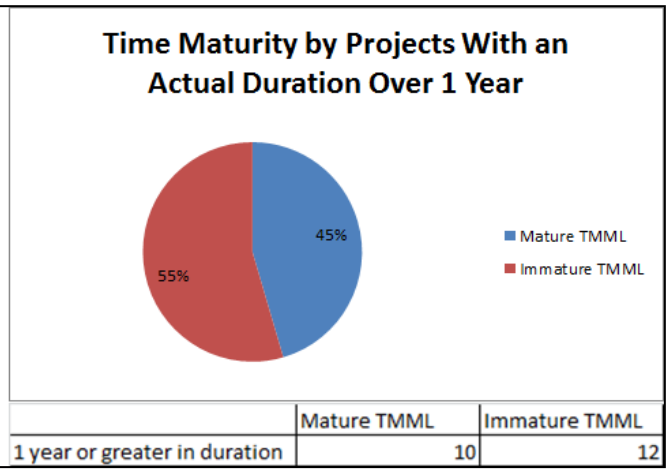
Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.014[a]	1	.907		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.014	1	.907		
Fisher's Exact Test				1.000	.578
Linear-by-Linear Association	.013	1	.908		
N of Valid Cases	43				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.81.
b. Computed only for a 2x2 table



	Mature TMML	Immature TMML
Less than 1 year in duration	12	13



	Mature TMML	Immature TMML
1 year or greater in duration	10	12

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PmCTMML2d * PmCAD	47	100.0%	0	.0%	47	100.0%

PmCTMML2d * PmCAD Crosstabulation

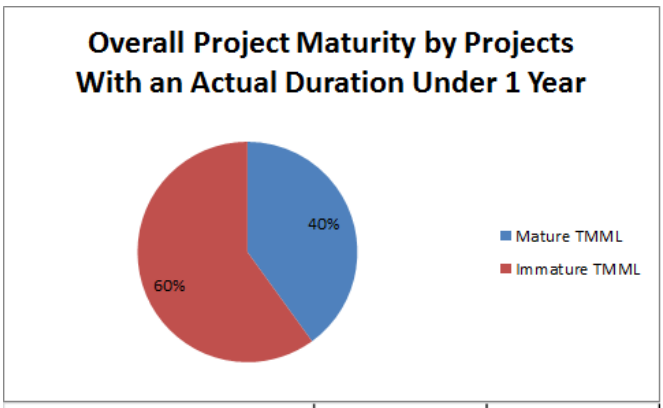
Count

		PmCAD		Total
		.00	1.00	
PmCTMML2d	1.00	13	12	25
	2.00	12	10	22
Total		25	22	47

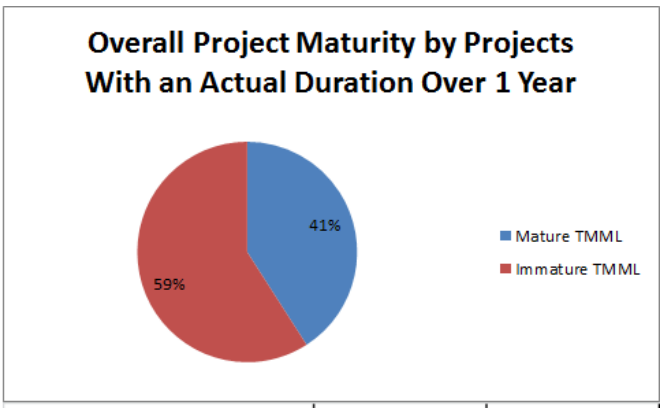
Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.030[a]	1	.861		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.030	1	.861		
Fisher's Exact Test				1.000	.547
Linear-by-Linear Association	.030	1	.863		
N of Valid Cases	47				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.30.
b. Computed only for a 2x2 table



	Mature TMML	Immature TMML
Less than 1 year in duration	10	15



	Mature TMML	Immature TMML
1 year or greater in duration	9	13

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PmCPMML * PmCAD	47	100.0%	0	.0%	47	100.0%

PmCPMML * PmCAD Crosstabulation

Count

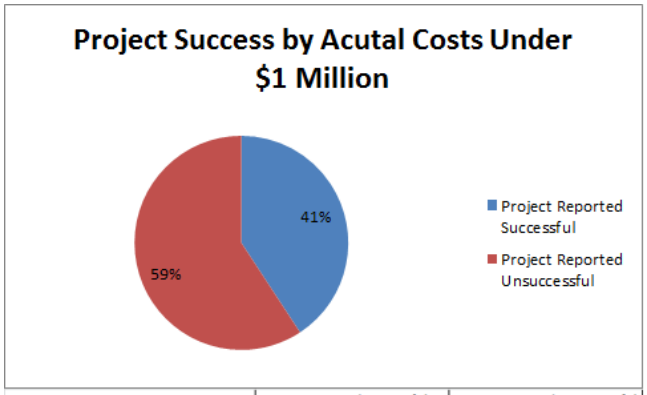
		PmCAD		Total
		.00	1.00	
PmCPMML	.00	15	13	28
	1.00	10	9	19
Total		25	22	47

Chi-Square Tests

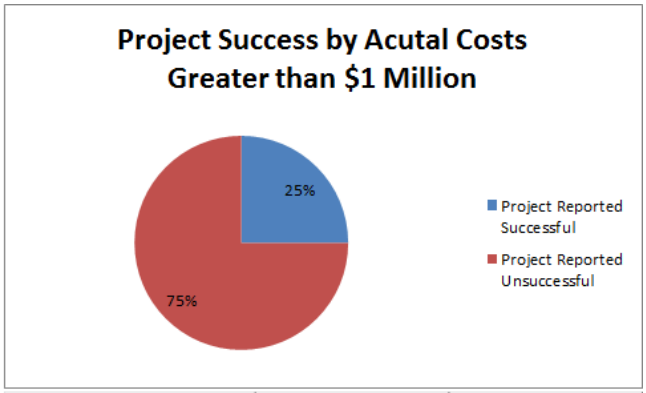
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.004[a]	1	.949		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.004	1	.949		
Fisher's Exact Test				1.000	.592
Linear-by-Linear Association	.004	1	.950		
N of Valid Cases	47				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.89.
b. Computed only for a 2x2 table

Appendix K Analysis of Project Size and Project Success



	Project Reported Successful	Project Reported Unsuccessful
Actual cost below $1 Million	11	16



	Project Reported Successful	Project Reported Unsuccessful
Actual cost at or greater than $1 Million	4	12

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PmCollapsedOverall ProjectSuccess * PmCAC	43	91.5%	4	8.5%	47	100.0%

PmCollapsedOverallProjectSuccess * PmCAC Crosstabulation

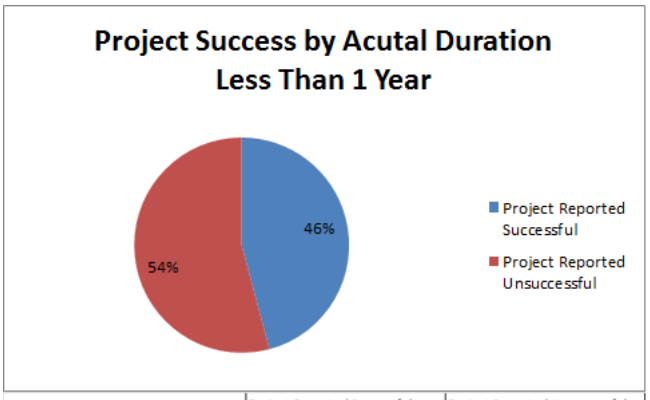
Count

		PmCAC		Total
		.00	1.00	
PmCollapsedOverall ProjectSuccess	.00	16	12	28
	1.00	11	4	15
Total		27	16	43

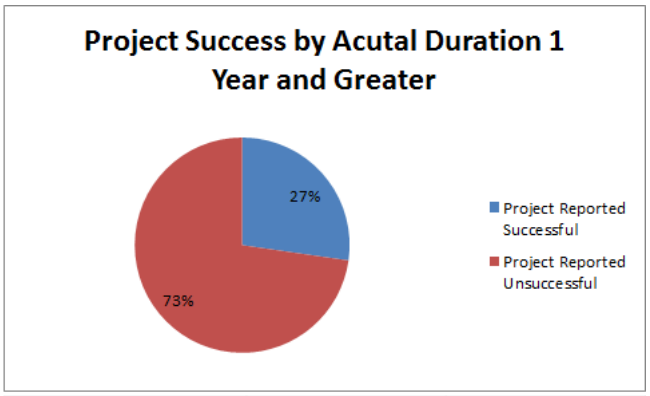
Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.096[a]	1	.295		
Continuity Correction[b]	.512	1	.474		
Likelihood Ratio	1.125	1	.289		
Fisher's Exact Test				.342	.239
Linear-by-Linear Association	1.070	1	.301		
N of Valid Cases	43				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.58.
b. Computed only for a 2x2 table



	Project Reported Successful	Project Reported Unsuccessful
Less than 1 year in actual duration	11	13



	Project Reported Successful	Project Reported Unsuccessful
1 year or greater in actual duration	6	16

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PmCollapsedOverall ProjectSuccess * PmCAD	47	100.0%	0	.0%	47	100.0%

PmCollapsedOverallProjectSuccess * PmCAD Crosstabulation

Count

		PmCAD		Total
		.00	1.00	
PmCollapsedOverall ProjectSuccess	.00	13	16	29
	1.00	12	6	18
Total		25	22	47

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.128[a]	1	.145		
Continuity Correction[b]	1.341	1	.247		
Likelihood Ratio	2.158	1	.142		
Fisher's Exact Test				.229	.123
Linear-by-Linear Association	2.082	1	.149		
N of Valid Cases	47				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.43.
b. Computed only for a 2x2 table

Appendix L – Spot Check of Project Manager Statistics (US Participants Only)

Hypothesis 1 Related Chi Square Output (from SPSS, US Participants Only)

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PmCTMML2d * PmCTI2	30	100.0%	0	.0%	30	100.0%

PmCTMML2d * PmCTI2 Crosstabulation

Count

		PmCTI2		Total
		1.00	2.00	
PmCTMML2d	1.00	12	8	20
	2.00	4	6	10
Total		16	14	30

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.071[a]	1	.30		
Continuity Correction[b]	.419	1	.52		
Likelihood Ratio	1.075	1	.30		
Fisher's Exact Test				.44	.26
Linear-by-Linear Association	1.036	1	.31		
N of Valid Cases	30				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.67.
b. Computed only for a 2x2 table

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PmCTMML2d * PmCRTOM	30	100.0%	0	.0%	30	100.0%

PmCTMML2d * PmCRTOM Crosstabulation

Count

		PmCRTOM		Total
		1.00	2.00	
PmCTMML2d	1.00	12	8	20
	2.00	4	6	10
Total		16	14	30

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.071[a]	1	.30		
Continuity Correction[b]	.419	1	.52		
Likelihood Ratio	1.075	1	.30		
Fisher's Exact Test				.44	.26
Linear-by-Linear Association	1.036	1	.31		
N of Valid Cases	30				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.67.
b. Computed only for a 2x2 table

Hypothesis 2 Related Chi Square Output (from SPSS, US Participants Only)

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PmCCMML2d * PmCCI2	25	83.3%	5	16.7%	30	100.0%

PmCCMML2d * PmCCI2 Crosstabulation

Count

		PmCCI2		
		1.00	2.00	Total
PmCCMML2d	1.00	5	9	14
	2.00	6	5	11
Total		11	14	25

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.887[a]	1	.35		
Continuity Correction[b]	.287	1	.59		
Likelihood Ratio	.889	1	.35		
Fisher's Exact Test				.43	.30
Linear-by-Linear Association	.851	1	.36		
N of Valid Cases	25				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.84.
b. Computed only for a 2x2 table

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PmCCMML2d * PmCRCOM	26	86.7%	4	13.3%	30	100.0%

PmCCMML2d * PmCRCOM Crosstabulation

Count

		PmCRCOM		
		1.00	2.00	Total
PmCCMML2d	1.00	7	7	14
	2.00	4	8	12
Total		11	15	26

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.735[a]	1	.39		
Continuity Correction[b]	.211	1	.65		
Likelihood Ratio	.741	1	.39		
Fisher's Exact Test				.45	.32
Linear-by-Linear Association	.707	1	.40		
N of Valid Cases	26				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.08.
b. Computed only for a 2x2 table

Hypothesis 3 Related Chi Square Output (from SPSS, US Participants Only)

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PmCSMML2d * PmCRSOM	30	100.0%	0	.0%	30	100.0%

PmCSMML2d * PmCRSOM Crosstabulation

Count

		PmCRSOM		Total
		1.00	2.00	
PmCSMML2d	1.00	10	6	16
	2.00	6	8	14
Total		16	14	30

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.158[a]	1	.28		
Continuity Correction[b]	.503	1	.48		
Likelihood Ratio	1.164	1	.28		
Fisher's Exact Test				.46	.24
Linear-by-Linear Association	1.119	1	.29		
N of Valid Cases	30				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.53.
b. Computed only for a 2x2 table

Hypothesis 4 Related Chi Square Output (from SPSS, US Participants Only)

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PmCCMML2d * PmCRPEfficient	30	100.0%	0	.0%	30	100.0%

PmCCMML2d * PmCRPEfficient Crosstabulation

Count

		PmCRPEfficient		Total
		1.00	2.00	
PmCCMML2d	1.00	8	10	18
	2.00	5	7	12
Total		13	17	30

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.023[a]	1	.88		
Continuity Correction[b]	.000	1	1.00		
Likelihood Ratio	.023	1	.88		
Fisher's Exact Test				1.00	.59
Linear-by-Linear Association	.022	1	.88		
N of Valid Cases	30				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.20.
b. Computed only for a 2x2 table

Hypothesis 5 Related Chi Square Output (from SPSS, US Participants Only)

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PmCTMML2d * PmCRPEfficient	30	100.0%	0	.0%	30	100.0%

PmCTMML2d * PmCRPEfficient Crosstabulation

Count

		PmCRPEfficient		Total
		1.00	2.00	
PmCTMML2d	1.00	9	11	20
	2.00	4	6	10
Total		13	17	30

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.068[a]	1	.79		
Continuity Correction[b]	.000	1	1.00		
Likelihood Ratio	.068	1	.79		
Fisher's Exact Test				1.00	.55
Linear-by-Linear Association	.066	1	.80		
N of Valid Cases	30				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.33.
b. Computed only for a 2x2 table

Hypothesis 6 Related Chi Square Output (from SPSS, US Participants Only)

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PmCSMML2d * PmCRPEffective	30	100.0%	0	.0%	30	100.0%

PmCSMML2d * PmCRPEffective Crosstabulation

Count

		PmCRPEffective		Total
		1.00	2.00	
PmCSMML2d	1.00	2	14	16
	2.00	2	12	14
Total		4	26	30

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.021[a]	1	.89		
Continuity Correction[b]	.000	1	1.00		
Likelihood Ratio	.021	1	.89		
Fisher's Exact Test				1.00	.65
Linear-by-Linear Association	.020	1	.89		
N of Valid Cases	30				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.87.
b. Computed only for a 2x2 table

Appendix M SPSS Output of Aggregated Data

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PmCTMML2d * PmCollapsedOverall ProjectSuccess	47	100.0%	0	.0%	47	100.0%

PmCTMML2d * PmCollapsedOverallProjectSuccess Crosstabulation

Count

		PmCollapsedOverallProject Success		
		1.00	2.00	Total
PmCTMML2d	1.00	18	7	25
	2.00	11	11	22
Total		29	18	47

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.397[a]	1	.122		
Continuity Correction[b]	1.556	1	.212		
Likelihood Ratio	2.411	1	.120		
Fisher's Exact Test				.144	.106
Linear-by-Linear Association	2.346	1	.126		
N of Valid Cases	47				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.43.
b. Computed only for a 2x2 table

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PmCCMML2d * PmCollapsedOverall ProjectSuccess	47	100.0%	0	.0%	47	100.0%

PmCCMML2d * PmCollapsedOverallProjectSuccess Crosstabulation

Count

		PmCollapsedOverallProject Success		
		1.00	2.00	Total
PmCCMML2d	1.00	15	8	23
	2.00	14	10	24
Total		29	18	47

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.236[a]	1	.627		
Continuity Correction[b]	.034	1	.853		
Likelihood Ratio	.236	1	.627		
Fisher's Exact Test				.766	.427
Linear-by-Linear Association	.231	1	.631		
N of Valid Cases	47				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.81.
b. Computed only for a 2x2 table

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PmCSMML2d * PmCollapsedOverall ProjectSuccess	47	100.0%	0	.0%	47	100.0%

PmCSMML2d * PmCollapsedOverallProjectSuccess Crosstabulation

Count

		PmCollapsedOverallProject Success		
		1.00	2.00	Total
PmCSMML2d	1.00	13	7	20
	2.00	16	11	27
Total		29	18	47

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.160[a]	1	.689		
Continuity Correction[b]	.009	1	.923		
Likelihood Ratio	.161	1	.688		
Fisher's Exact Test				.767	.463
Linear-by-Linear Association	.157	1	.692		
N of Valid Cases	47				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.66.
b. Computed only for a 2x2 table

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
COPPML * PmCollapsedOverall ProjectSuccess	47	100.0%	0	.0%	47	100.0%

COPPML * PmCollapsedOverallProjectSuccess Crosstabulation

Count

		PmCollapsedOverallProject Success		
		1.00	2.00	Total
COPPML	1.00	19	9	28
	2.00	10	9	19
Total		29	18	47

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.110[a]	1	.292		
Continuity Correction[b]	.560	1	.454		
Likelihood Ratio	1.106	1	.293		
Fisher's Exact Test				.365	.227
Linear-by-Linear Association	1.087	1	.297		
N of Valid Cases	47				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.28.
b. Computed only for a 2x2 table