THE CURRENT STATE OF PROJECT RISK MANAGEMENT PRACTICES AMONG RISK SENSITIVE PROJECT MANAGEMENT PROFESSIONALS

(GWU Medical Center Office of Human Research IRB Number U090201ER)

by

Robert James Voetsch

B.A., The American University, 1978
M.P.A., The American University, 1979
M.S.P.M., The George Washington University, 1997

A Dissertation Submitted to the School of Business and Public Management of The George Washington University in Partial Fulfillment of the Requirement for The Degree of Doctor of Philosophy

Washington, D.C.
November 2003

Dissertation directed by:

Professor Denis F. Cioffi
Department of Management Science

UMI Number: 3112236

The George Washington University
WASHINGTON DC

PH.D. PROGRAM

REPORT ON FINAL DOCTORAL DISSERTATION EXAMINATION

The undersigned Committee has examined Mr. Robert James Voetsch, a candidate for the Doctor of Philosophy degree, on his dissertation entitled: "The Current State of Project Risk Management Practices Among Risk Sensitive Project Management Professionals." The Committee has found the candidate's work to be acceptable and recommends to the Board of Trustees that he be granted the Doctor of Philosophy degree on January 30, 2004.

Kathryn E. Newcomer	Professor of Public Policy and Public Administration
Frank T. Anbari	Assistant Professor of Management Science
Young H. Kwak	Assistant Professor of Management Science
Peter Weiss	Assistant Professor of Management Science
Denis F. Cioffi	Advocate
Philip W. Wirtz	Former Member of the Committee on Doctoral Studies, presiding

October 23, 2003

SCHOOL OF BUSINESS AND PUBLIC MANAGEMENT
710 21ST STREET, N.W. • WASHINGTON, DC 20052

The George Washington University
WASHINGTON DC

PH.D. PROGRAM

THE CURRENT STATE OF PROJECT RISK MANAGEMENT PRACTICES AMONG RISK SENSITIVE PROJECT MANAGEMENT PROFESSIONALS

by

Robert James Voetsch

Bachelor of Arts
American University, 1978

Master of Public Administration
American University, 1979

Master of Science in Project Management
George Washington University, 1998

A Dissertation Submitted to the School of Business and Public Management of the George Washington University in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

Signatures of Committee:

Advocate:

Former Member of the Committee on Doctoral Studies, presiding

October 23, 2003

SCHOOL OF BUSINESS AND PUBLIC MANAGEMENT
710 21ST STREET, N.W. • WASHINGTON, DC 20052
(202) 994-6298 • FAX (202) 994-6382

To my wife Chandra and children Dakshana, Robert Jr., and Priya

ABSTRACT

The overall question of this research was: Does risk management make a difference? That is, do organizations that employ formal risk management practices outperform those that do not? Data collected from 175 web-survey respondents and 12 selective telephone interviewees from the Project Management Institute Risk Management Specific Interest Group answered this question in the affirmative.

The research was: exploratory, due to little project risk management survey data; descriptive, as it mapped current project risk management practices used by risk-sensitive project professionals; and, cross-sectional as the sample frame represented a wide range of risk management application areas – *e.g.,* insurance, financial, operational, environmental, and occupational. The research goals were to:

- Explore the scope of risk consideration in organization project operations;
- Describe the project risk practices in organizations executing projects;
- Assess the dynamics of current project risk management in organizations;
- Learn the frequency of various risk management practices in projects;
- Determine the impact of risk management practices on reported project management results; and,
- Update reported project success rates.

The main findings of this research are:

1. A positive statistical correlation between reported senior management support for project risk management practices, actual practices and reported positive project management results within the traditional triple constraint.
2. A majority of the survey respondents report a formal organization-wide or work unit-based policy for project risk management.
3. Project risk management, adequate resource allocation and staff training for it, lag behind its visibility in organization policymaking and expressed concern.
4. Use of quantitative risk management tools is low.
5. Reported use of project team risk identification sessions is almost universal.
6. Risk practices maybe subsumed into general project control activities and not identified as risk practices *per se.*
7. Respondents may equate project management success with perceived customer satisfaction.
8. If risk sensitive project professionals report a gap between actual risk management practice and expressed official support, the state of project risk management beyond this community is probably only worse. Necessitating development of practical guidelines on how and when to implement project risk management practices.

Finally, future research should focus on how the role of senior management risk utility can be reflected in organization practices that forgive unsuccessful risk-taking.

ACKNOWLEDGMENTS

I would like to take this opportunity to thank the following persons for their invaluable assistance, advice, consul and general support provided to me throughout my doctoral studies at George Washington University:

To begin, all the members of my doctoral dissertation committee:

- Dr. Denis F. Cioffi who directed my dissertation, kept a close eye on my progress and displayed great patience with me throughout the ups and downs that were inevitable in the process. Aside from this key support, Dr. Cioffi also assisted me to obtain invaluable experience teaching graduate students and in other administrative matters related to my doctoral study;
- Dr. Kathryn E. Newcomer who – despite her enormous portfolio of duties – worked closely with me to organize my research and finalize my dissertation document;
- Dr. Young-Hoon Kwak who provided invaluable assistance and advice during my telephone survey;
- Dr. Frank T. Anbari who graciously agreed to serve as an outsider reader for my final defense, served as second examiner during my primary field comprehensive examination, and always greeted me with words of support;
- Dr. Peter Weiss who helped me improve my survey instruments and shared his advice on how to proceed with my dissertation research; and,
- Dr. Philip Wirtz who presided at both my proposal and final defenses and, with him I knew I was in the ablest of hands.

I would like to thank the following George Washington University faculty members for their assistance during the course of my doctoral studies:

- Dr. Jerry B. Harvey who served as my supporting field advisor and lead comprehensive examiner in Organizational Behavior and Development and I am very grateful for his advice, concern and encouragement throughout my doctoral studies;
- Dr. John Lobuts who served as my second supporting field comprehensive examiner and was always a source of advice, optimism and support;
- Dr. Erik K. Winslow, who as Chair of the Management Science Department offered sound advice on how to prepare for my comprehensive examinations, proposal and final defenses, and helped me with crucial administrative support;
- Dr. Elias G. Carayannis who served as my primary field advisor and supervised my primary field comprehensive examination;
- Dr. Michael Harmon who, as Director of the School of Business and Public Management Doctoral Program office, was a great source of advice in helping me finalize my doctoral study plan;
- Dr. Ernest Foreman who served as a faculty recommendation to me during my application process and always had kind and supportive words when we met on campus; and,

- Dr. William G. Wells, Jr., who admitted me into the Masters Program in Project Management, which directly led to my application for the doctoral program, and later was instrumental in my admission into the doctoral program. Dr. Wells was always keen to see me succeed and offered me invaluable advice on how to manage my studies and dissertation.

I express deep gratitude to the following persons who made my doctoral research possible:

- The members of the PMI Risk Management Specific Interest Group for their participation in my research surveys;
- All the senior officers of the SIG – especially Mr. Charles W. Bosler Jr., CP CM, Chairman of the Risk SIG, and Mr. Craig Peterson, President of the Risk SIG – for their pivotal and indispensable role in pre-testing the survey instruments, advising in the construction of the survey website, providing the sample population database, and informing its membership of this research survey;
- Dr. David T. Hulett, Ph.D., Director of Technical Activities of the Risk SIG who served as a pre-tester of my survey instruments and expended a considerable amount of time and energy in helping me to refine these instruments;
- Dr. Yanping Chen, President of the University of Management and Technology, for allowing me to field test my web survey instrument with her university students in Beijing and Shanghai, China; and,

- Dr. J. Davidson Frame, Dean of the University of Management and Technology, for pre-testing my survey instruments and for his timely advice on how to conceptualize my research model and manage my dissertation.

Additional thanks to Dr. Parviz Rad and Dr. Scott Serich who served as my initial committee members before their departures to other universities; and, Mr. Howard Smith, doctoral candidate in the Public Administration Department, for his technical assistance in my statistical analysis.

Finally, I would like to thank Mr. J. LeRoy Ward, Executive Vice President of Educational Services Institute International for providing vital financial support to me in the final stages of my dissertation. Mr. Ward also agreed to publish a summary of my doctoral research in his company newsletter *ESI Horizons*.

In closing, one last acknowledgement: If 'Murphy's Law' is said to rule project execution in so far as anything that can happen will happen, then 'Parkinson's Law' can be said to rule dissertations as the work expands or contracts according to the time allocated for it and, even then, it takes a little longer than planned. It has certainly been the experience of this doctoral graduate that, when time was of the essence, work proceeded quickly, and, when time was not so pressing, work proceeded slowly – progress depended on the presence or absence of tight deadlines. The message to all doctoral candidates: make sure you have tight deadliness within which to get things done and progress is assured.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDIXES

CHAPTER 1

RESEARCH INTRODUCTION

Introduction

This study examined risk management practices in project-based organizations, with a view toward determining whether such practices correlate with project performance. The overriding question of this research was: Does risk management make a difference? That is, do organizations that employ formal risk management practices outperform those that do not?

For the purposes of this research inquiry, *risk* is defined according to the Project Management Institute's *A Guide to the Project Management Body of Knowledge (PMBOK® Guide 2000).* The *PMBOK® Guide* defines risk as "…an uncertain event or condition that, if it occurs, has a positive or negative effect on a project objective. A risk has a cause and, if it occurs, a consequence."[1] Although the etymological roots of risk are negative in origin, this original definition has extended over time to include the possibility of both positive and negative outcomes. (Please see Chapter 2 for a more detailed history of the origins of the word risk and how its definition has changed.)

In recent years, organizations have increased the attention they direct to managing risk. This concern for risk management accelerated at the outset of the new millennium with the Year 2000 (Y2K) digital crisis, increased global terrorism, recent accounting scandals within major United States corporations, and ever-intensifying competition in the global marketplace. Organizations of all types must monitor constantly their operational environments for threats and opportunities to survive and thrive. Failure to assess and plan for risk adequately - in terms of dealing with both positive opportunities and negative threats - can be the difference between success and failure for organizations.

Increasingly, organizations that execute their operations by means of discrete projects are seen to be more efficient and manageable units for work. [2](Kerzner 1994) In this research a *Project* will be defined as "... a temporary endeavor undertaken to create a unique product or service. Temporary means that every project has a definite beginning and a definite end. Unique means that the product or service is different in some distinguishing way from all other products or services."[3]

In this age of hyper-competitive global trade and commerce, organizations need to have in place generally accepted "best practices," policies, procedures, protocols, and operations that enable, encourage, and — to the extent possible — ensure the maximum probability of success in project operations.

The Project Management Institute's *PMBOK® Guide 2000* represents the generally accepted practices of the discipline. The *PMBOK® Guide* defines generally accepted as meaning "... that the knowledge and practices described are applicable to most projects most of the time, and that there is widespread consensus about their value and usefulness."[4] The *PMBOK® Guide* adds that "[g]enerally accepted does not mean that the knowledge and practices described are or should be applied uniformly on all projects; the project management team is always responsible for determining what is appropriate for any given project."[5]

In project management, delivery of projects on time, within budget, and according to specifications combined with customer acceptance of and satisfaction with the project deliverable(s) form the constraints within which project success is determined. [6] [7] [8] The first three constraints are known as the triple constraint in project management. Failure to deliver projects within these constraints is the result of either poor planning and estimating or poor management of the threats and opportunities that present themselves during project execution. This managerial failure is itself often the result of poor project risk management. Thus, if a project is to be executed successfully, the managerial skills of planning, organizing and executing project work must be carried out in concert with the estimating and forecasting skills of risk management.

Project risk management is one of the many application areas of risk management. Some other key risk management application areas are: insurance risk management; financial risk management; operational risk management; environmental risk management; and, occupational health and safety risk management.

Risk management has its origins in the work of the early 18th century Swiss-Italian scholar Daniel Bernoulli. As a discipline, the origins of risk management lie in the insurance industry. Gaming (or gambling) was a key element in the earliest development of risk management. (For a more complete discussion on the origins of risk management and risk theory, see Chapter 2.)[9]

Finally, this research considers risk management to be implicit in realizing critical success factors. By explicitly exploring the role of risk management in reported project success, this research extends the continuum of project critical success factor research started by Pinto (1986) and continued by Dai (2002) and Tarnow and Frame (2003). (For a more complete discussion on critical success factors, see Chapter 2.)

Definitions of Risk

The initial definition and perspective on risk originated in the insurance field. Insurance risk is defined such that the focus is on accident-centered or "pure" risks. Pure risks are defined as those risks where there is only the possibility of loss or peril.[10]

The financial definition of risk varies considerably from the insurance definition. Financial risk is often referred to as business or "speculative risk," where there is the chance of loss, of no change, or of gain.[11] Therefore, the standard deviation or the variability of a situation is the finance risk management definition of risk.

In the field of operations or production (manufacturing) risk has another definition. In the operations application area, risk is defined as "the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events."[12]

The environmental safety application area definition of risk is provided by the United States Environmental Protection Agency. It defines risk as the impact of environmental stressors (biological, chemical, physical events) that have the potential to negatively affect human or ecological health systems.[13]

The occupational health and safety application area of risk management tends to focus on the negative events that can occur to an existing state of being.

Project risk management - the focus of this research inquiry - draws upon the other risk management application areas listed above. Some examples of this linkage:

- As projects are increasingly the way organizations conduct business, project documents need to be executed in a way that is efficient and economical for the performing organization. Thus, project risk management must be concerned with the financial risk management priorities of profit and loss.
- As projects rely on procedures and protocol for their successful execution, failure or rework can occur when project delivery is improperly handled. Therefore, project risk management must be concerned with operational risk management issues.
- Finally, as construction and manufacturing projects must be in legal compliance with existing statutes related to public, worker and environmental safety, these projects must be concerned with occupational, environmental and safety risk management issues.

Figure 1-1 below displays the interrelationship between these key risk management application areas and project risk management:

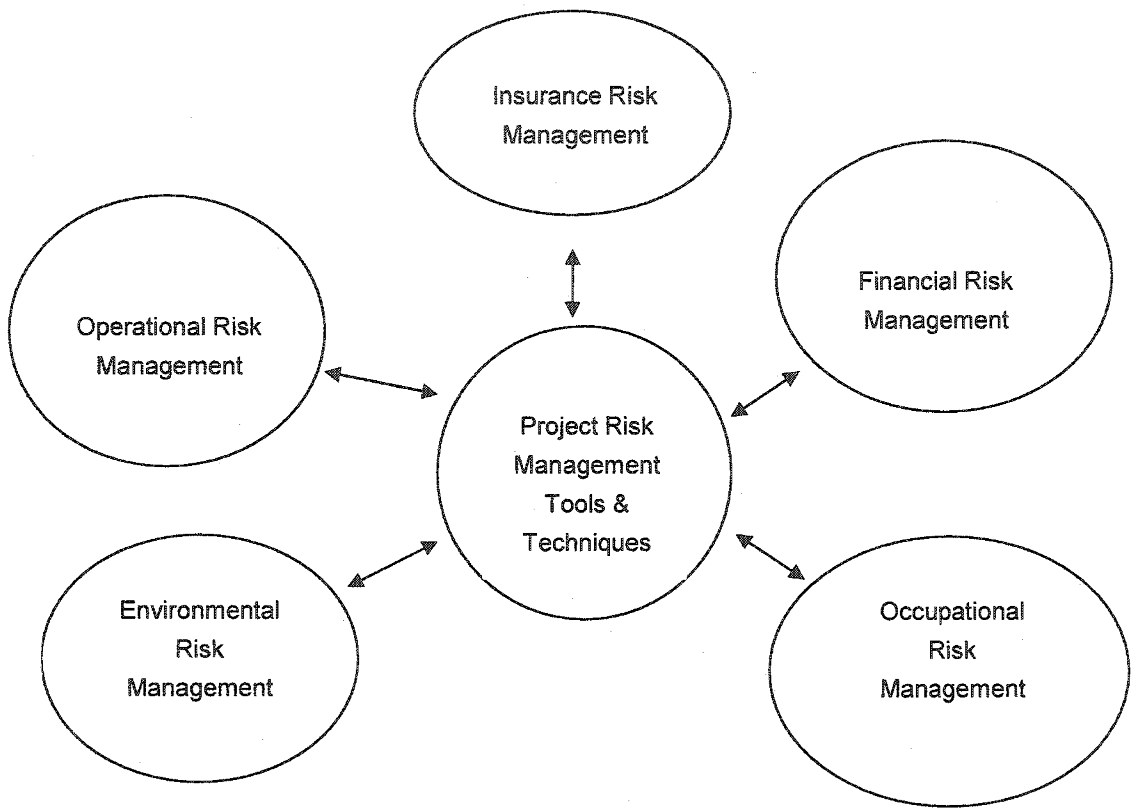


Figure `1-1: Risk Management Application Areas and Project Risk Management

The overall goal of risk management is to maximize gains from opportunities and minimize losses from threats and failures to any particular activity or operation.[14]

Research Model

This research investigated four key abstract issues or themes (constructs) that were identified during the literature review of relevant research, publications and writings on project risk management. (See Chapter 2 for additional information.) The specific research constructs investigated were:

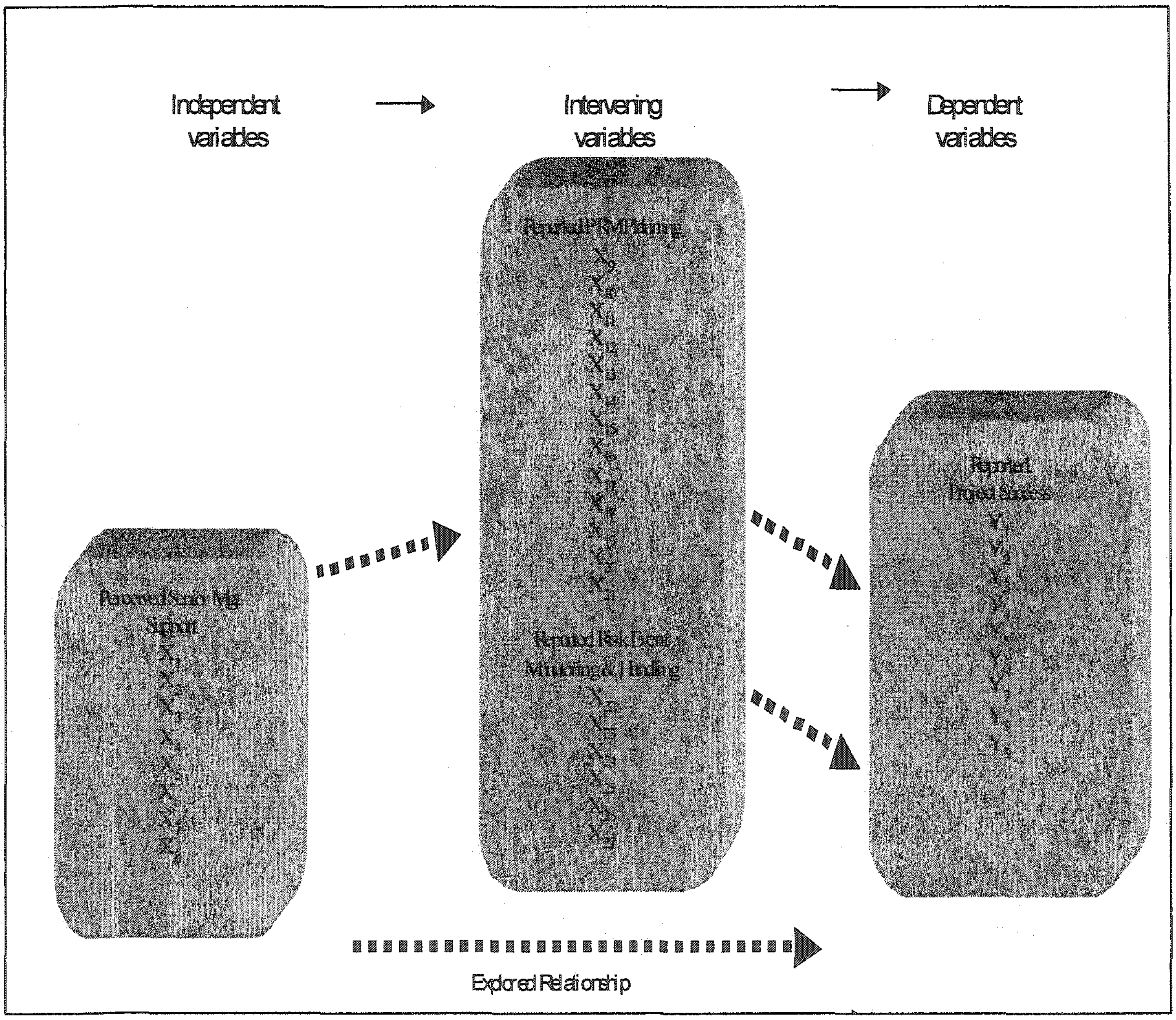
- Perceived senior management support for project risk management
- Reported project risk management planning practice
- Reported project risk response planning, risk event monitoring and handling practice, and
- Reported project success.

The research constructs were operationalized as independent, intervening and dependent variables in a research model. (See Figure 1-2: Research Model below.) Specifically,

- **Independent variable**: Perceived senior management support for project risk management practice in their organizations.
- **Intervening variables**: Reported project risk management planning; reported project risk response planning, risk event monitoring and handling practice.
- **Dependent variables**: Reported project success.

Figure 1-2 below graphically displays the model of this research and the explored relationships between the three variables described above. The dependent variable 'Reported Project Success' represents the focus of this research. (A detailed description of the research model for this study can also be found in Figure 3-1 in Chapter 3.)

Figure 1-2: Research Model



In addition to exploring the overriding question of whether or not project risk management affects overall reported project success, as mentioned in the introductory paragraph above, this research also explores:

- The extent to which perceived senior management support for project risk management practice is associated with specific practices (during the project planning and execution phases of a project) considered essential for effective project risk management.
- How these key project risk management practices (*e.g.,* risk management planning, risk response planning, and risk event monitoring and handling) that are generally accepted in project management are associated with reported project management success, failure, and workarounds (unplanned work due to risk events) of respondent organizations.

For the purposes of this research perceived senior management support for project risk management practice was considered to exist when one or more of the following is present:

- A formal organization policy requiring that projects identify, analyze and plan for risk and uncertainty in their operations.
- Allocation by management of adequate resources for project risk management planning, event monitoring and handling.
- A formal office or project team member is responsible for all project risk-related work in the project. (See Chapter 2 for a detailed discussion on the nature of perceived senior management support for project risk management practice.)

Generally accepted project risk management practice was seen as existing when risk is systematically identified, analyzed and planned for in the project plan and, risk events are continually monitored and handled during project execution. (See Chapter 2 for a detailed discussion on the nature of generally accepted project risk management practice.)

Finally, project success was defined as the delivery of projects that meet the constraints of their schedule, budget and specifications. Customer satisfaction is also necessary in order for a project to be considered successful.[15]

Need for this Research

Completion of projects within the triple constraints of time, budget and specifications is the generally accepted baseline measure for successful project management. Project managers and their senior managers must prepare for handling risk events during project execution if they are to complete their projects successfully. The majority of projects executed in the information technology field are not delivered within the triple constraint. (The Standish Group 1994, 1996 and 1998, and Frame 1997.)

To achieve project management success, project managers must not only maintain the time, cost and resource constraints of the project plan but they should experience a minimum number of negative surprises that require the unplanned expenditure of time, money and resources, i.e., "workarounds."[16] [17] [18] [19] Workarounds cause projects to spend more time and money than budgeted. Therefore, in order to be considered successful when evaluated against the triple constraint, project managers must keep workarounds to a minimum. Workarounds can be minimized – and perhaps even avoided entirely – if project managers ensure complete and correct articulation of customer needs and expectations in the specifications of the project deliverable(s) to assure proper execution of the project [20] [21] and, determine the identity, probability and impact of risk events, and prepare strategies (risk responses) that can best mitigate or negate the identified negative risk events and maximize the advantages from positive risks. [22] [23]

There is a dearth of empirical research on how widespread and formalized risk management practices are within organizations that execute projects. This research inquiry helps fill this gap by surveying project management professionals interested in project risk management on:

- Their perceived support from senior management for formalized project risk management within their organization;
- Their use of key project risk management planning tools;

- Their use of key risk response planning, risk event monitoring and control tools during their project execution; and
- Their completion of projects within the triple constraint and meeting with customer satisfaction.

The professional community surveyed in this research study was the general membership of the Project Management Institute Risk Management Specific Interest Group (PMI Risk SIG). This professional community (of which the author is a member) represents project management personnel who - by their membership in the Risk SIG - are interested in and sensitive to project risk management. Additionally, these individuals represent project management professionals who are aware of and interested in using the best project risk management practices in their project activities. Thus, this professional community was selected precisely because they are interested in project risk management and can competently report on its role in their project work, thereby making them potential standard bearers for the field reporting on the state of the art. If this group did not report any meaningful presence of project risk management practices in their project work, then no other professional community likely would report such practices due to reasons of knowledge and interest.

Major Research Questions and Supporting Hypotheses

The major research questions - and their supporting hypotheses - explored in this research were designed to help answer the overall question: Do project risk management practices correlate with project performance? To try and answer this overriding question, the research asks three major questions:

- In what ways does perceived senior management support of risk management practice affect implementation of reported project risk planning practices?
- In what ways does reported risk planning practices affect the implementation of reported risk response planning and risk event handling practices?
- How does the implementation of reported risk response planning and risk handling practices affect reported project success?

The specific questions and hypotheses explored are found in Table 1-1 below:

Table 1-1 Research Questions and Hypotheses	
Question or Hypothesis	Hypothesis Description
RQ 1	Is there an association between perceived senior management support of risk management practice and implementation of reported project risk planning practices?
Ho 1.1	Perceived risk sensitive organizations implement the same amount of reported formal risk management processes as those organizations that are not perceived to be risk sensitive.
Ha 1.1	Perceived risk sensitive organizations implement more reported formal risk management processes than those organizations that are not perceived to be risk sensitive.
Ho 1.2	Organizations that report senior managers providing adequate resources to implement risk management processes implement the same amount of reported formal risk management processes as those organizations that do not report senior managers providing adequate resources.
Ha 1.2	Organizations that report senior managers providing adequate resources to implement risk management processes implement more reported formal risk management processes than those organizations that do not report senior managers providing adequate resources.
RQ 2	Is there an association between reported risk planning practices and the implementation of reported risk event monitoring and handling practices?
Ho 2.1	Organizations where reported formal risk planning practices are implemented report monitoring risks the same as those organizations where reported risk-planning practices are weak.
Ha 2.1	Organizations where reported formal risk planning practices are implemented report monitoring risks more rigorously than those organizations where reported risk-planning practices are weak.
Ho 2.2	Organizations where reported formal risk planning efforts are implemented report experiencing the same number of workarounds as those organizations where reported formal risk planning efforts are weak.
Ha 2.2	Organizations where reported formal risk planning efforts are implemented report experiencing fewer workarounds than those organizations where reported formal risk planning efforts are weak.
RQ 3	Is there an association between the implementation of reported risk monitoring and handling practices and reported project success?
Ho 3.1	Organizations where reported formal risk planning efforts are implemented have the same reported project success rates as those organizations where reported formal risk planning practices are weak.
Ha 3.1	Organizations where reported formal risk planning efforts are implemented have higher reported project success rates than those organizations where reported formal risk planning practices are weak.
Ho 3.2	Organizations that report monitoring risks rigorously have the same reported project success rates as those organizations that do not.
Ha 3.2	Organizations that report monitoring risks rigorously have higher reported project success rates than those organizations that do not.

Research Procedures

This research effort consisted of seven steps: Pre-test of website survey instrument; field-test of website survey instrument; general website survey; structured telephone interviews of randomly selected PMI® Risk SIG members not participating in the website survey; transcription of the structured interviews; and data analysis using *SPSS*™ 11.5 and *Ethnograph*™ 5.0 software. These research procedures and the timetable of their execution are summarized in Table 1-2 below:

Table 1-2
Research Procedures

Step No.	Description	Sample Size	Dates (Month/Year)	Status
1.	Pre-test with PMI® Risk SIG Officers, APM/UK Risk SIG Officer, and Dean of the University of Management and Technology.	4 persons	11/01 – 3/02	Completed
2.	Field test with Chinese Project Management students of UMT	100 persons	4/02 – 5/02	Completed
3.	Pre-test of website and telephone interview survey instruments	4 persons	6/01 - 8/02	Completed
4.	Web survey	1,572 invitees (176 responses)	10/02 – 2/03	Completed
5.	Telephone interview survey	12 persons	12/02 – 3/03	Completed
6.	Transcription of structured interviews	N/A	3/03	Completed
7.	Data Analysis using *SPSS*™ and *Ethnograph*™	N/A	2/03 – 03/03	Completed

Data Analysis

The data generated from the website survey was analyzed using the *SPSS*™ 11.5 software. Specific tests used were:

- Basic descriptive statistics using histograms and pie charts to profile the individual respondents and their organizations (data generated in survey questions 1-9); and,
- Chi-square and contingency table analysis on how the responses to specific questions correlated to other questions with respect to the three major research questions and their supporting hypotheses.

The data generated from the telephone survey was analyzed using the *Ethnograph*™ 5.0 software. The specific test used was:

- Content analysis of the telephone survey transcripts to identify any emerging themes from the interview data obtained.

The above data analysis enabled preliminary conclusions on the statistical correlation between reported project success, project failure, and project workarounds and:

- Perceived senior management support for formal project risk management practices in their organization;

- The type(s) of historical data used to identify and quantify potential project risks;
- Use of key project risk management tools and techniques in project risk management planning; and,
- Use of key project risk management tools and techniques in project risk handling.

A detailed discussion of the data analysis procedures for this research can be found in Chapters 3 through 8.

Limitations of the Study

The limitations of this research effort include both internal and external threats to validity. (Please see Chapter 3 for a more detailed discussion of the limitations of this research and the control measures taken to mitigate these threats.)

The following internal validity threats may have affected this research study:

- Recall, this validity threat refers to how valid and confirmable is the data obtained from the respondents (Lincoln and Gupta 1985) [24]
- Selection bias, as this research inquiry used a self-selected sample of members of the PMI® Risk SIG as its sample population. [25]
- Response bias for both surveys as only 187 out of a potential 1,572 PMI® Risk SIG members responded to the invitation to participate in either survey.

- Location threat, [26] is a potential problem since the PMI® Risk SIG has endorsed this survey and encouraged participation from the Risk SIG membership.
- Reactivity, as the telephone survey was not anonymous. [27] [28]

This study is definitely affected by the following threat to its external validity:

- The generalizability of information garnered from members of the Project Management Institute Risk Management Specific Interest Group (PMI® Risk SIG). The over-riding question remains: How representative are the project risk management experiences of a group already interested in and sensitive to risk in a project management setting? A secondary question is: How representative of the general membership of the Risk SIG are the respondents to the web site and structured interview surveys?

Research Terminology

Aside from the definitions of risk and project success mentioned above, the following are additional key operational terms used in this research:

Project Management is defined, as "... the application of knowledge, skills, tools, and techniques to project activities to meet project requirements. Project management is accomplished through the use of the processes such as: initiating, planning, executing, controlling, and closing. The project team manages the work of the projects, and the work typically involves competing demands for: scope, time, cost, risk, and quality, stakeholders with differing needs and expectations, and identified requirements."[29]

As indicated in the introduction of this chapter, ***risk*** is defined according to the Project Management Institute's *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) 2000 Edition* © The *PMBOK® Guide* defines risk as "...an uncertain event or condition that, if it occurs, has a positive or negative effect on a project objective. A risk has a cause and, if it occurs, a consequence."[30]

Risk Management is defined in accordance with the *PMBOK® Guide* 2000, which states that "[r]isk Management is the systematic process of identifying, analyzing, and responding to project risk. It includes maximizing the probability and consequences of positive events and minimizing the probability and consequences of adverse events to project objectives."[31] (For a complete list of project risk management terms used in this dissertation, see Appendix 1.)

An example of a ***project risk management process model*** (method) widely followed in project management is the one presented in the *PMBOK® Guide*. This is the risk management method with which the sample frame of this research - the general membership of the PMI® Risk SIG - is likely to be most familiar. There are six processes in the *PMBOK® Guide* risk management model:

- **"11.1 Risk Management Planning**—deciding how to approach and plan the risk management activities for a project.
- **11.2 Risk Identification**—determining which risks might affect the project and documenting their characteristics.
- **11.3 Qualitative Risk Analysis**—performing a qualitative analysis of risks and conditions to prioritize their effects on project objectives.
- **11.4 Quantitative Risk Analysis**—measuring the probability and impact of risks and estimating their implications for project objectives.
- **11.5 Risk Response Planning**—developing procedures and techniques to enhance opportunities and to reduce threats to the project objectives.
- **11.6 Risk Monitoring and Control**—monitoring residual risks, identifying new risks, executing risk reduction plans and evaluating their effectiveness through the project life cycle."[32]

The *PMBOK® Guide* model is consistent with the other models available internationally. (For a more in-depth overview of these other project risk management models, please see both Chapter 2 and Appendix 2.)

Related Previous Research

Previous research in project risk management and project success falls into five categories:

- Surveys on reported project success and failure (The Standish Group 1994, 1996 and 1998, Frame 1997, Raz and Michael 1999, Shenhar, Levey and Dvir 1997, Moynihan 1997, and Christensen 1993);
- Surveys in business risk management practices and their correlation with reported project success (Price Waterhouse Coopers - Canada 2001, Kahkonen and Houvila 1996, Coppendale 1995, Rehesaar and Beames mid-1990s, McKim 1992, Hillment, La Salle, Medsker, and Welsh 1991);
- Interview case studies on the relationship between risk management practices and reported project success (Gerosa, Cencetti and Sarno 1999);
- Project Management Institute Risk Management Specific Interest Group (PMI® Risk SIG) membership surveys (projects);
- Research on the role of Critical Success Factors in reported project success (Pinto 1986, Dai 2002, and Tarnow and Frame 2003); and,
- Dissertation research on project risk management in specific settings. (Hecht 2001 and Bufaid 1987).

Chapter 2 discusses in greater detail the above categories of recent research related to this dissertation.

Contributions of the Study

The results of this research add to the body of knowledge on project risk management practices of project management professionals by:

- Exploring the scope of risk consideration in organization project operations;
- Describing the project risk practices in organizations executing projects;
- Assessing the dynamics of current project risk management in organizations;
- Learning the frequency of various risk management practices in projects;
- Determining the impact of risk management practices on reported project management results; and,
- Updating reported project success rates.

Chapter Two discusses how this research inquiry builds upon recent research and adds to the academic body of knowledge on perceived senior management support for project risk management, use of key specific project risk management practices and reported project workarounds, success, and failure.

Organization of the Dissertation

The remainder of the dissertation is organized as follows:

Chapter Two reviews the theoretical origins of project risk management in the fields of general management and risk theory; literature related to the research hypotheses and constructs; recent research related to the focus of this inquiry; and, how this research contributes to the field of project risk management.

Chapter Three discusses the research model, the research methodology, the research constructs and their operationalization in the hypotheses and survey instruments, the methodological limitations of the research, and the key results of the website survey instrument pre-tests.

Chapter Four discusses survey demographics as related to survey administration, the profile of individual respondents and their organizations and how the web and telephone survey responses compare to one another.

Chapter Five discusses the results of the exploratory data analysis conducted on the web site survey data. Chi-square statistical analysis was conducted to identify statistically significant relationships among the variables of Major Research Questions 1, 2 and 3 and their supporting hypotheses.

Chapter Six discusses the results of the content analysis conducted on the interview telephone survey data as related to Major Research Questions 1, 2 and 3 and their supporting hypotheses. Included in this chapter is a discussion of all identified underlying and emerging themes from this data set.

Chapter Seven discusses the overall conclusions of this research effort as related to the overall research question, the three major research questions, all supporting hypotheses, and how it furthers the research streams it originated from.

Chapter Eight explores possible follow-on research streams in the following areas: doctoral dissertations, professional society surveys, industry-specific surveys, and organization-specific case studies.

Chapter Nine discusses final thoughts on this doctoral research effort.

Endnotes

---

[1] Project Management Institute, *A Guide to the Project Management Body of Knowledge*, Project Management Institute, Newtown Square, Pennsylvania, 2000): P. 127.

[2] Harold Kerzner, "The Growth of Modern Project Management", *Project Management Journal*, Volume XXV, Number 2, June 1994: Page 6.

[3] Project Management Institute, *A Guide to the Project Management Body of Knowledge*: p 4.

[4] Ibid., 3.

[5] Ibid., 4.

[6] Ibid., 16.

[7] Ibid., 18.

[8] Ibid., 29.

[9] Peter L. Bernstein, *Against the Gods: The remarkable story of risk*, John Wiley & Sons, Inc., New York, NY; 1996:p.8.

[10] *Language Perils*™, an e-journal published by MultiTech Communications, Inc. http://www.insurancetranslation.com/ Language_Perils/00general.htm#02a. January 2002.

[11] *Language Perils*™: January 2002.

[12] Working Paper on the Regulatory Treatment of Operational Risk", http://www.bis.org/publ/bcbs_wp8.htm ; January 2002. Page 1.

[13] United States Environmental Protection Agency: "Integrated Environmental Decision-Making in the 21st Century: A report from the EPA Science Advisory Board's Integrated Risk Project", Peer Review Draft dated 3 May 1999. Located at: www.epa.gov/sab/irp/part1.pdf

[14] Project Management Institute, *A Guide to the Project Management Body of Knowledge*: p 127.

[15] Ibid., 32.

[16] Ibid., 104.

[17] Ibid., 207.

[18] Ibid., 146.

[19] Ibid., 209.

[20] Ibid., 32.

[21] Ibid., 57.

[22] Ibid., 46.

[23] Ibid., 127.

[24] Yvonna S. Lincoln and Egon G. Gupta, *Naturalistic Inquiry*, Sage Publications, Beverly Hills, CA, 1985: Page 300.

[25] Donald T. Campbell and Julian C. Stanley, *Experimental and Quasi-Experimental Designs for Research*, Houghton Mifflin Company, Boston, MA; 1963: Page 5.

[26] Fraenkel, Jack R., and Wallen, Norman E., *How to design and evaluate research in education*, McGraw-Hill, Incorporated, New York, New York, Second Edition, 1993: pages 224-225.

[27] Fraenkel and Wallen: pages 228-229.

[28] Ibid., pages 401-402.

[29] Project Management Institute, *A Guide to the Project Management Body of Knowledge*: P. 6.

[30] Ibid.,. 127.

[31] Ibid.,. 127

[32] Ibid.,. 127

CHAPTER 2
RESEARCH FOUNDATIONS

Introduction

This chapter examines literature and previous research relevant to the constructs to be explored and tested in this research inquiry. The chapter is divided into three parts:

Part 1 discusses the theoretical origins of project risk management. As introduced in Chapter 1, these theoretical origins or foundations lie in the disciplines of general management theory and risk theory. Additional theoretical influences on this research lie in the following fields: critical success factor theory, and the origins of modern project management and the emergence of project risk management as a discipline.

Part 2 reviews the important research streams related to the four constructs of this research inquiry: perceived senior management support for project risk management; risk management planning practices; risk monitoring and event handling practices; and, reported project success.

Part 3 describes the contributions this research inquiry will add to the body of knowledge on project risk management.

Part 1: Theoretical Foundations and Origins

The following pages discuss the key scientific management and risk gaming influences on project risk management. Included is a discussion on how project risk management has evolved and emerged as an important sub-discipline in project management. The following literature review traces the development of key management thinkers and researchers and charts their specific contributions to the emergence of project risk management.

Before discussing the influence of general management theory and risk theory on project risk management, a brief justification for use of these two theoretical influences is necessary. Figure 1-2 in the 2000 version of the *A Guide to the Project Management Body of Knowledge* displays how the *PMBOK® Guide* relates to General Management Knowledge and Practices and Application Area Knowledge and Practice. As introduced in Chapter 1, the *PMBOK® Guide* divides project management into nine inter-related knowledge areas one of which is project risk management. [1] As indicated in Figure 2-1 and 2-2 below, project risk management has its origins in the disciplines of scientific management and risk gaming, as these are the two disciplines that correspond with the general management and application area knowledge referred to in section 1.4 and Figure 1-2 of the *PMBOK® Guide*.

Figure 2-1
Overlap between management disciplines and risk management as reported in the *PMBOK® Guide* 2000 Knowledge Area Model

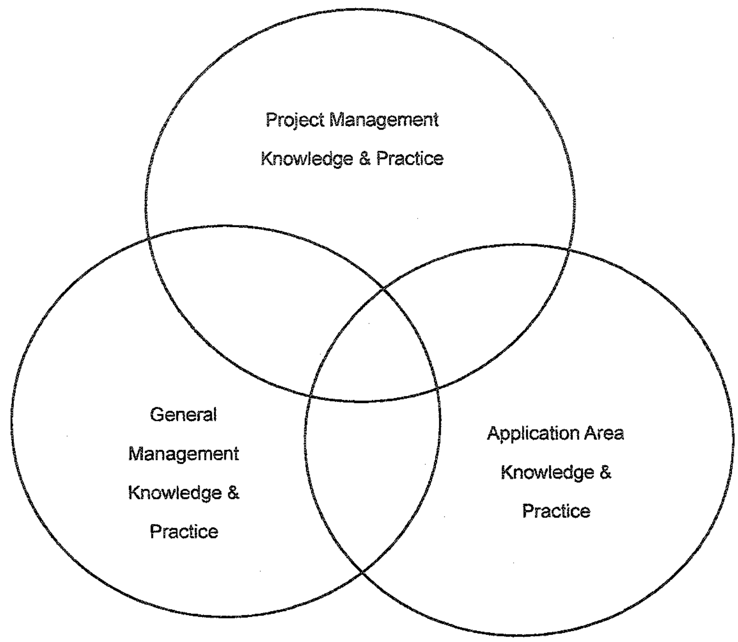


Figure 2-2
Theoretical Origins of Applied Project Risk Management

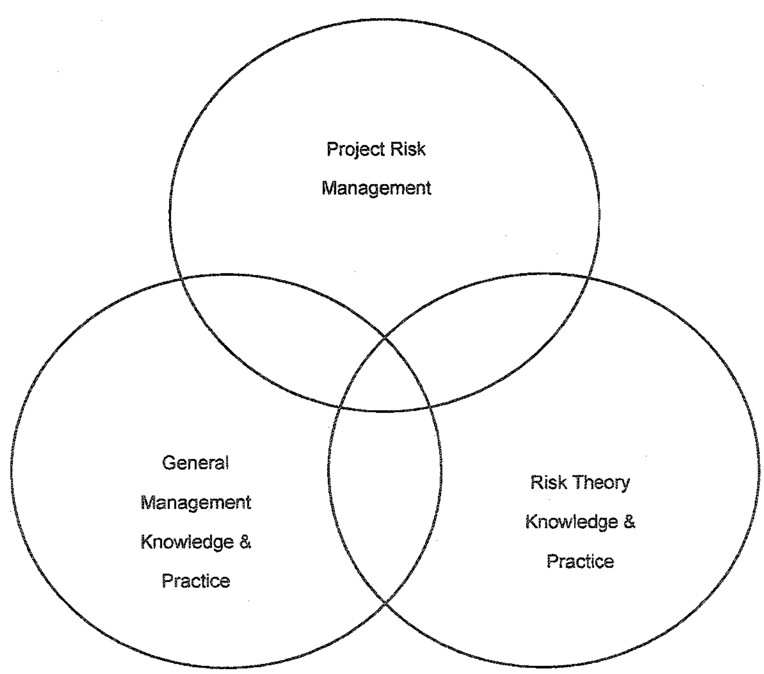
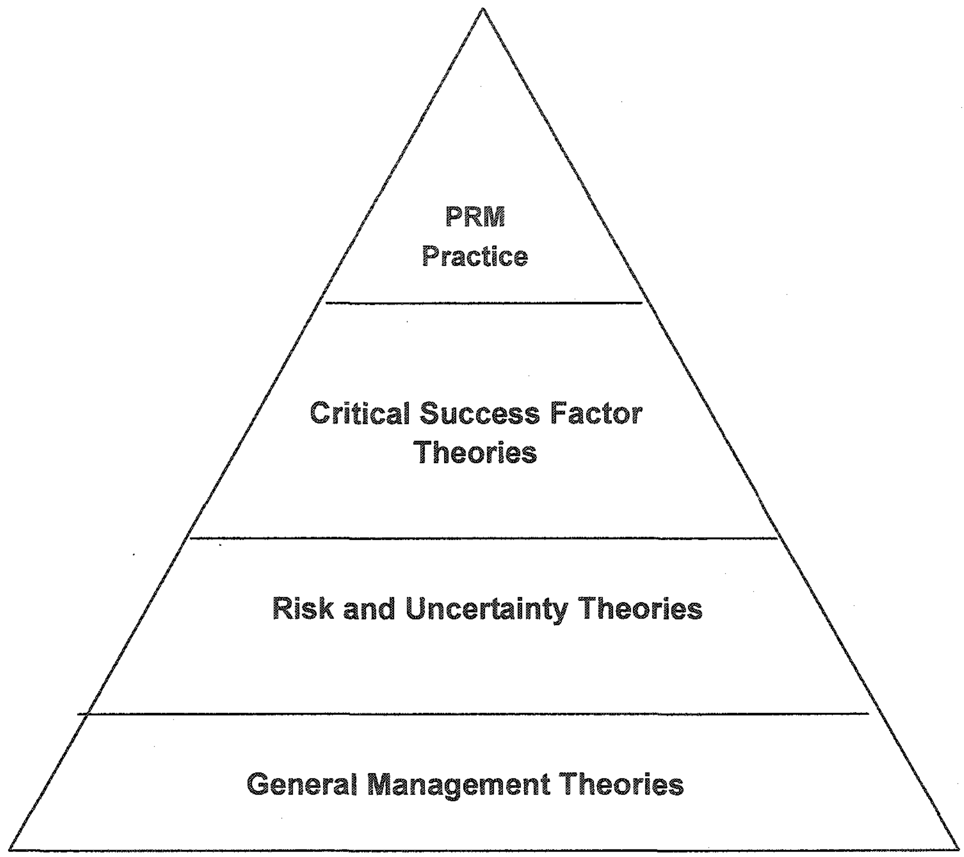


Figure 2-3
Theoretical Foundations for this Research in management literature



The operationalization of these two theoretical influences on project risk management can be found in Table 2-4 at the end of this Chapter. Briefly stated, the project management aspects of project risk management originate in the field of management theory and development and the risk aspects of the discipline emerged from risk theories and practices. Finally, the project risk management practices considered in this research are considered to be implicit in all the critical success factors of the Pinto-Dai-Tarnow research continuum; this relationship will be discussed in detail in Part 3, below.)

General Management Theoretical Origins

A review of general management theoretical writings indicates that the common theme in all books, articles and studies is this: management is concerned with control of operations. Specifically, management is concerned with executing work as quickly, cheaply and efficiently as possible and doing so in a manner that results in desirable outcomes. This is the dynamic that all writers and researchers on management are concerned with exploring and updating.

The history of management is as old as civilization itself. The organization of armies, slave labor to construct the first cities, temples, palaces and other great ancient building projects required methods of planning, organization, resource mobilization, operation control, resource coordination and even rudimentary systems analysis. [23] In short, the ancient world developed management systems of some nature in order to carry out the orders of sovereigns.

Three waves of management theoreticians have been identified as influencing the emergence of project risk management: Late 19th Century theoreticians who established the modern foundations for management theory and practice, early 20th century theoreticians who added to their trailblazing predecessors with specific management tools, techniques and worker behavior studies, and late 20th century theoreticians who contributed directly to the emergence of project management as a management discipline focused on maximizing results to organizations.

Modern management theory building begins in the 19th century during the industrial revolution in Europe, North America, and other parts of the world. The first wave of great researchers and writers were Henri Fayol of France, Frederick Winslow Taylor of the United States and Max Weber of Germany. These three men wrote about three key issues still relevant today: Long-term planning and risk management (Fayol), scientific management to maximize efficiency and economy in production (Taylor), and personnel organization (Weber).

The writings of French industrialist Henri Fayol are the most prescient with respect to modern project risk management. In a compilation of his writings on management titled *General and Industrial Management* and published in 1916, Fayol wrote about the key elements of modern day project risk management, including the importance of plans and forecasts for the short-term, the long-term, and special situations. It was with respect to the third category labeled 'special forecasts' that an early outline of project risk management can be found: "It is well known that the best-thought-out plan is never exactly carried out. Forecasts are not prophecies; their function is to minimize the unknown factor." [4] "The best of plans cannot anticipate all unexpected occurrences which may arise, but it does include a place for these events and prepare weapons which may be needed at the moment of being surprised." [5]

In addition to these early references to the uncertainty in executing plans and the need to minimize the unknown factor (risk in modern day terminology), Fayol also described the generic characteristics of a plan:

- *Unity,* as there must be only one plan regardless of how many parts into which it is divided;
- *Continuous,* so that there is no break in the sequence of plans presented from time period to time period;
- *Flexible,* to the extent that changes can be introduced to reflect changed circumstances; and,
- *Accuracy,* to the extent that unknown factors that may have a significant bearing on plan execution are identified and planned for.

To Fayol, the above four characteristics constituted the essential elements common to any good plan. [6]

Despite the significant contribution of Fayol to the development of management as a discipline, the first major contributor to the field of modern management theory was American industrialist Frederick Winslow Taylor. In his books *The Principals of Scientific Management* and *Shop Management,* Taylor presented his ideas and experiences on improving the productivity of workers in a factory setting. These ideas, which he labeled 'scientific management,' would be exported from an industrial setting to a civil administration setting to improve the efficiency and productivity of office workers.

The aspects of scientific management that have exerted the greatest influence on the development of project risk management are those related to:

- The deliberate gathering together of the great mass of traditional knowledge by means of time and motion studies. This principle relates to the essential role of historical information, document and experience in risk identification, impact analysis and response planning. [7]
- The scientific selection and development of workers to maximize productivity. This principle relates to the need in project risk management to select the best available resource inputs in order to minimize the risk of bad workmanship – *i.e.,* rework and workarounds. [8]
- The importance of team effort in work execution and the mutually accountable nature of this team effort regardless of the work role concerned – *i.e.,* management and workers are both accountable to each other for their failure to execute their portion of the work properly. This principle relates to the use of teams in projects to execute work and it represents the first – albeit indirect - reference to project management as a discipline. [9]

From these three points made by Taylor, an embryonic description of project management can be discerned: the importance of mutually accountable team work; the use of historical information to improve operations; and, the selection of the best possible resource inputs to improve productivity and overall work performance.

Max Weber is often referred to as the father of bureaucracy because of his writings on government administration in 19^{th} century Prussia (later Germany). In his seminal work, *The Theory of Social and Economic Organization*, Weber argued that "…[b]ureaucratic administration means fundamentally the exercise of control on the basis of knowledge." "This [knowledge] consists on the one hand in technical knowledge…[and by] …the knowledge growing out of experience…." [10] From these points made by Weber, the importance of historical information in project execution can be discerned: the development of databases of technical processes, historical performance data, and team member experiences. All of these are essential inputs for the proper use of the many tools and techniques developed to assist project teams in project selection, planning, estimating, executing, control, and evaluation.

The second wave of influential management thinkers emerged in the early 20th Century. Prominent among them were: Mary Parker Follett, Henry Gantt, Elton Mayo, Oliver Sheldon, and Walter Shewhart

The first of these writers was New England social worker and management adviser, Mary Parker Follett. Follett wrote extensively on leadership traits, types, and development methods. One of the most important types of leadership she referred to as "the invisible leader — common purpose." In her view, "…[l]oyalty to the invisible leader [provides] the strongest possible bond of union." [11] This invisible leader can be seen in the teamwork needed if a project is to be completed within the triple constraint and meet with customer satisfaction. Additionally, in the execution of the project risk management and risk response plans to minimize the occurrence and impact of workarounds and to maximize any opportunities that may present themselves during project execution.

Another major contributor in this second wave of management thinkers was an associate of Frederick Taylor associate, Henry Gantt (1861–1919). Gantt studied the order of operations in work (work flows). His management studies focused on Navy ship construction during World War I. His work flow charts became known as Gantt charts. These charts contained task bars, work milestone markers, and outlines on the sequence and duration of all tasks in a work process. Gantt charts have been such a useful and powerful management tool that it was not until the early 1990s that link lines were added to the task bars in order to more precisely show dependencies between tasks.[12] [13] Current project management and scheduling software use Gantt charts as the default pictorial view of project work.

A third major thinker from this second wave of management writers and thinkers was Australian born Harvard University professor Elton Mayo. Mayo is famous for his research on worker motivation at the Western Electric factory in Hawthorne, Massachusetts. Known as the Hawthorne experiments, these studies relied on interviewing to learn about the complaints and concerns of workers. The interview process was presented by Mayo in his book *The Social Problems of an Industrial Civilization.* [14] His major management contributions were in discovering that workers are not the rational and economic beings assumed by classical theorists, and that social interaction is important, and people work well if they feel valued. [15] His influence on project risk management can be seen in the role of stakeholder interviews to identify and prioritize potential risk events in project plan execution.

The fourth major thinker in this second wave of management theorists was British chocolate factory manager Oliver Sheldon, who wrote the first known creed of management in the final chapter of his book, *The Philosophy of Management,* published in 1923. His creed consisted of ten parts, the last of which is the importance of standards in improving the science of management. This piece of Sheldon's management philosophy can be seen as a call for the development and promotion of policies and protocols to govern the execution of work. [16] Sheldon's influence on project risk management can be seen in the need for formal policies and senior management support for the execution of project risk management practices in a consistent manner throughout an organization.

The final major influence on the development of project risk management was the work of statistician Walter Shewhart. Shewhart was a Western Electric and later Bell Telephone Laboratory engineer who conducted research in manufacturing process control that led to his development of control charts to help improve manufacturing processes. The work of Shewhart on control charts can be found in his book, *Economic Control of Quality of Manufactured Product,* published in 1931, and regarded as the first study on quality control.[17] Shewhart introduced the concept and use of statistical tools to monitor and control for quality (acceptable variation) in production processes. He also devised the *Plan, Do, Study and Act cycle* that would later be changed to *Plan-Do-Check and Act* by his famous pupil, William Edwards Deming. This cycle was based on the idea that constant evaluation of work results and management practices lead to steady improvement in the quality of both. [18] He is known both as the Grandfather of the Total Quality Movement, (William Edwards Deming is known as the Father of the TQM), and the Father of statistical quality control. Shewhart's influence on project risk management was in stressing the need for documentation and constant monitoring of project operations and results in order to identify and rectify undesirable outcomes and processes.

The third wave of key influential management writers and researchers on the development of project risk management consists of William Edwards Deming and Peter Drucker.

As introduced above, William Edwards Deming was a statistician who built upon Shewhart's work with control charts. Deming's most significant contributions to the emergence of project risk management were the *Plan-Do-Check-Act* Cycle to govern the improvement of both production quality and quantity and his fourteen points of management control of manufacturing processes to improve both the quantity and the quality of production. His work on quality cemented and refined the contributions of his teacher Walter Shewhart. The influence of Deming on project risk management can be seen most clearly in the need for a continual process of project planning, analysis, monitoring and control, and the use of lessons learned to further improve the process.

A final major 20th Century contributor to the development of management was Peter Drucker, the Austrian born management thinker and researcher best known for enunciating the philosophy of management by objectives (MBO). This management approach requires managers to think strategically, set objectives for staff, assess achievement, and decentralize operations. The approach facilitates managing in turbulent times, dealing with sudden changes, taking advantage of new situations, and improving on organization competitive advantages. [19] The influence of Drucker on the emergence of project management is that many organizations see projects as a competitive, efficient and effective way of carrying out their operations. International Business Machines is a good recent example of a large corporation that has re-engineered its operations to focus on project execution as a means of maintaining and improving on market share and competitiveness.

To summarize, modern project management owes its existence to the 19th century research and writings of Fayol, Weber and Taylor. These writers and their successors (Gantt, Shewhart, Deming, and Drucker) in the management field have all focused on the issues of how management tools and techniques can influence an organization's control over its operations and how this control can affect the outcome of organization activities. Since World War Two, with the emergence of many defense and space-related projects, great progress has been made in the development of project risk management as a management sub-discipline. The practical application of the various general management theoretical influences on the project risk management process presented in the *PMBOK® Guide* can be found in Table 2-4, located at the end of this chapter.

Risk Theoretical Origins

Whereas the theoretical origins of management are largely qualitative and conceptual in nature, the theoretical origins of risk are more quantitative and practical in nature. The contributors to the development of risk management and project risk management did more than just discuss concepts and describe protocols and procedures for the application of their ideas. Risk management theorists provided specific quantitative tools that could be used immediately in the actual practice of risk management.

The history of risk or the estimation and forecasting of future events based on historical experience is, like management theory, an ancient concept. The ancient world developed many methods of prediction to aid their sovereigns in the conduct of the affairs of state and empire. Astrology, oracles and soothsayers were the most prominent of these prediction methods. Central to all was the element of fate or preordained fate: The Gods had already decided the future and astrology, along with oracles and soothsayers, was merely a means of learning what was foretold in the stars. (Bernstein 1999) [20] (Zim and Baker 1985) [21]

Today, the Program Evaluation and Review Technique (PERT), Monte Carlo simulation, Bayesian Statistics, mathematical expectation, decision trees, and Nash's Equilibrium, among other tools, are used to forecast probable situations based on either statistical algorithms or historical data pertaining to the event or scenario that is being predicted. The crucial difference between modern risk management and the predictions of the ancients is that modern risk management does not assume any predetermination of outcomes. To the contrary, modern risk management seeks to estimate and forecast the probability of possible future outcomes based on historical trends and data. Contingencies and other factors can and will affect the probabilities. Thus, in risk management, estimates and forecasts are dynamic and uncertain.

The emergence of modern risk theory occurred during the Italian Renaissance in the 16^{th} century. It was enabled by the introduction of the Arabic and Hindu numeric system that simplified the process of mathematical computation and quantification. In particular, the introduction of the decimal point had a revolutionary impact on the way mathematicians were able to quantify and compute by enabling the use of percentages and probabilities. [22] (Bernstein 1999)

An early example of the role of probabilities was the solving of the Paccioli puzzle in 1654 by French mathematicians Blaise Pascal and Pierre de Fermat. Their ability to solve this puzzle using the Hindu-Arabic numbering system led to the discovery of the theory of probability, which is the mathematical heart of risk. (Bernstein page 3) [23] The discovery of the theory of probability is the basis for risk assessment and quantification in the use of the risk tools, including Monte Carlo simulation, PERT Analysis, and mathematical expectation, developed by later mathematicians.

The next major contributor to the development of risk theory was the Swiss-Italian mathematician Daniel Bernoulli. His paper, *Specimen Theorie Novae de Mensura Sortis* (*Exposition of a New Theory on the Measurement of Risk*). was published in St. Petersburg, Russia in 1731. This paper introduced the theoretical concepts of the utility theory, *i.e.*, that different people ascribe different values to the perception of risk. Additionally, his paper provided new mathematical concepts such as the bi-nominal distribution and expected value. These contributions of Bernoulli provide the practical and theoretical foundations for mathematical expectation, expected outcome calculation of the Program Evaluation and Review Technique (PERT) Analysis, and decision trees such as expected monetary value. [24]

A third major contribution to the field of risk was the development of Bayesian statistics; English minister Thomas Bayes published his work, *Essay Towards Solving A Problem In The Doctrine of Chances,* in 1764. Bayesian statistics rests on the integration of old and new information in decision-making. Specifically, Bayes theory of inference concerns the use of new information to revise earlier probabilities of an event occurring. This added to the development of risk management as it provided a theoretical and statistical means to update probabilities of certain events occurring. [25] (Bernstein page 130, 132-133)

The individuals highlighted above provided the initial groundwork for all subsequent theoretical developments in the fields of insurance, finance, statistics, and operations. However, other important 20th Century contributors to the development of risk management succeeded them. A brief overview of these contributors follows:

- *Risk, Uncertainty and Profit* published by Frank Knight in 1921. This book separates for the first time the concept of risk (where statistical probabilities are known) from that of uncertainty (where statistical probabilities are unknown).
- *A Treatise on Probability* published by John Maynard Keynes in 1921. In this book Keynes stresses the importance of judgment and relative perception when determining risk probabilities. This article represents the theoretical foundation for qualitative risk tools, *e.g.,* risk impact-probability matrix.
- *Theory of Games and Economic Behavior* published by John von Neumann and Oskar Morgenstern in 1944. This treatise introduced the risk utility function, which depicts and describes choice under uncertainty, and builds upon the earlier risk writings of Bernoulli. Mathematical formulas were presented for these three risk behaviors: risk-aversion (choosing the best probability option); risk-taking (choosing the best payoff option); and risk-neutral (indifference between best-payoff and best-probability options). Their paper led to the emergence of the academic fields Behavioral Decision Theory and Game Theory. [26] [27] [28]

- "Portfolio Selection," by Dr. Harry Markowitz, published in the *Journal of Finance* in 1952. This article leads to many of the financial risk tools currently used,(*e.g.,* expected value.
- Risk management circles, created in 1974 by Gustav Hamilton, the risk manager for Sweden's Statsforetag. This risk management tool graphically describes the elements in processes from assessment to control to financing to communication. [29]

To summarize, the first four major contributors to the development of risk management were Pascal, Fermat, Bernoulli, and Bayes. Collectively, these four writers and thinkers of risk formed the foundation for what is today project risk management: use of probability distributions, expected value, and the use of new information to update previously determined probability levels.

Modern Project Management

The planning, executing, and controlling of projects has its origins in antiquity. The first great projects undertaken by human societies were the construction of temples, cities and other engineering efforts – *e.g.,* roads, bridges, canals, walls and ships. Historical examples abound: the Great Walls of China; the seven wonders of the ancient world, such as the Giza pyramids; the Alexandria lighthouse; the Hanging Gardens of Babylon; the Temple of Zeus; and others. The Romans added to this human legacy of project execution with their great engineering feats, including a highway system linking and integrating their Mediterranean Empire and extensive water aqueducts and bridges, some of which are still in use today.

Prior to World War Two, many high-profile projects were undertaken by the United States, including: the American Highway; the Chesapeake and Ohio Canal; the trans-continental railway; the Panama Canal; Boulder Dam; and the Golden Gate Bridge. Although these engineering efforts were referred to as national projects, the emergence of modern project management as a clearly identified management discipline did not occur until after World War Two.

Modern project management arose from the many defense and space-related activities — projects — financed by the United States and the Soviet Union in the 1950's, during the early years of the Cold War. The direct origin of these projects was the Manhattan Project, which built the first atomic bomb, in 1945.

Aside from the management tools developed by Gantt and Shewhart and discussed earlier, a large number of the project management concepts, terminology, tools and techniques used today were developed in defense or space-related projects such as network diagrams to schedule and sequence project activities; Monte Carlo simulation; the Program (originally Polaris as in the nuclear submarine program) Evaluation and Review Technique to estimate the duration of an activity given a three-point historical duration distribution; and the concept of the critical path in project scheduling. [30]

After World War Two, project management emerged more fully as a separate management discipline. Highlights in the emergence of project management as a management discipline include:

- James Kelley presented research on road building projects at a symposium on computers and management decisions at Case Institute of Technology in 1957.[31]
- Paul Gaddis of Westinghouse Corporation wrote about the Project Manager in the *Harvard Business Review* in 1959.[32]
- Peter Norden of IBM Corporation wrote a piece, "On the Anatomy of Projects," while conducting his doctoral dissertation research in 1960.[33]
- And Keith Davis published an article, "Project Management in Scientific Management," in the *IRE Journal of Engineering* in 1962.[34]

In addition, numerous other writings were being accumulated in the engineering societies of the world and within the archives of government and corporate organizations that were implementing projects.[35]

Two important contributors to project management are David Cleland and Harold Kerzner. Cleland's work was among the first in the discipline. He has argued in his writings that organizations use projects as a way to execute their operations to ensure customer focus, greater efficiency, and effectiveness. His writings represent some of the earliest specifically identifying project management as a management discipline.

Harold Kerzner has provided numerous writings in the field of project management. One of his most enduring contributions to the field of project management is his book *Project Management: A Systems Approach to Planning, Scheduling and Controlling*. This 1,100-page book serves as both a standard textbook on project management and a practical desk reference for project managers around the world. Other contributions of Kerzner include development of a list of critical success factors for successful project management, as described above (see Table 2-1, page 32).

By the late 1960s, as the Apollo Manned Space Program to the moon was nearing completion, management thinkers, researchers and project practitioners sensed a need to compile and consolidate the accumulated experiences and expertise of the project management profession into a professional society that would enable the archiving and sharing of this knowledge and practice. To this end, the Project Management Institute (PMI®) was established in 1969. PMI® is now headquartered in Newtown Square, Pennsylvania, and is the world's leading project management professional association. Currently, PMI® has more than

114,000 members, more than 68,000 certified Project Management Professionals (PMP®) and more than 1,100,000 copies of the *PMBOK® Guide* in circulation in almost 120 countries worldwide[36]

Some of the organizational objectives of PMI® are to:

- Foster professionalism in the management of projects
- Advance the quality and scope of project management
- Stimulate the application of project management to the benefit of the public
- Collaborate with universities and other educational institutions to encourage appropriate education and career development at all levels in project management
- Encourage academic and industrial research in the field of project management.[37]

To accomplish these objectives, PMI® provides:

- Project Management Standards, Certification, and Practices Programs through its key publication *A Guide to the Project Management Body of Knowledge*, its *Project Management Professional* certification program, and its periodicals *PM Network®*, and *Project Management Journal®*.

- Shared Interest Groups that include more than one hundred PMI® chapters and affiliate societies throughout the world and Specific Interest Groups in more than thirteen industries.[38]

Table 2-1 below charts the development of project management as a discipline within the Project Management Institute's *A Guide to the Project Management Body of Knowledge*:

Table 2-1
PMBOK® Guide Development (1969 to 2002)

Time Period	Document Title	Function or Knowledge Areas (By order of appearance in document)	Number of Process Groups
1969 to 1983	Non-existent	No standards agreed to and no standards documentation produced	Not Applicable
1983 to 1987	Ethics, Standards and Accreditation (ESA)	Six (6) major functions: Scope Management; Cost Management; Time Management; Quality Management; Human Resource Management; and, Communications Management.	Not yet developed
1987 to 1996	Project Management Body of Knowledge	Eight (8) major functions: Scope Management; Quality Management; Time Management; Cost Management; Risk Management; Human Resource Management; Contract/Procurement Management; and, Communications Management.	Not yet developed
1996 to 2000	A Guide to the Project Management Body of Knowledge	Nine (9) Knowledge Areas: Project Integration Management; Project Scope Management; Project Time Management; Project Cost Management; Project Quality Management; Project Human Resource Management; Project Communications Management; Project Risk Management; and, Project Procurement Management.	37 project management processes
2000 to date	A Guide to the Project Management Body of Knowledge	Nine (9) Knowledge Areas: Project Integration Management; Project Scope Management; Project Time Management; Project Cost Management; Project Quality Management; Project Human Resource Management; Project Communications Management; Project Risk Management; and, Project Procurement Management.	39 project management processes

As indicated in the above table, the *PMBOK® Guide* is constantly changing and developing as a reference on the generally accepted best practices of the discipline. Aside from the Project Management Institute, The Association for Advancement of Cost Engineering, the American Society for the Advancement of Project Management, and the International Project Management Association are other prominent international societies dedicated to studying and sharing experiences in projects management. A global guide to project management that would harmonize and consolidate the standards documents of all project management professional societies is under development. (Morris 2001)

Project Risk Management

As introduced in Chapter 1 and illustrated by Figure 1-1, project risk management has emerged from a variety of application areas: insurance, finance, manufacturing operations, environmental safety, and occupational health and safety. Project risk management as a discipline, or as a sub-discipline of project management is emerging in a slow, but ever increasing manner. Although Monte Carlo simulation was developed by Enrico Fermi during the Manhattan Project as a way to simulate atomic reactions, it is now one of the most widely used methods of estimating project risk, especially in risk management software applications. In the late 1950s, Willard Frazer developed the Program Evaluation and Review Technique. [39] PERT (originally named the Polaris Evaluation and Review Technique), became a mandatory requirement for all United States Navy projects, and its use was then extended to other industries.

In recent years, the melding of these risk quantification probability models and computer software has further extended and expanded the knowledge and daily use of these risk tools by project managers and project teams.

R. Max Wideman provided one of the first major writings on project risk management with his Project Management Institute publication, *Program and Project Risk Management*. This book provided the basis for and is the practical companion, foundation, and supplement to the 1996 *PMBOK® Guide* chapter on *Project Risk Management*.

Later, in *Project Risk Management*, David Chapman and Chris Ward produced a comprehensive and detailed description of project risk management as a process that is part and parcel of the overall project management process. These authors argue that project risk management is not an add-on to general project management but, rather, an add-in to the process.

The various risk management practices such as PERT and Monte Carlo Simulation did not form a part of the risk management discipline until the publication of the 1987 PMI® standard, *The Project Management Body of Knowledge*. Prior to this time, these activities were discussed only in the context of schedule development and time management. Since 1987, risk management is the only knowledge area of the *PMBOK® Guide* to undergo radical change and refinement. It ranks as the seventh most widely discussed project management knowledge area in international meetings of PMI® and the European-based IPMA with a 3.45% score out of more than 3,500 articles or papers presented (Urli and Urli 2000).

As introduced in Chapter 1 and discussed in further detail in Chapter 3, the sample frame for this research survey is confined to the PMI® Risk Management Specific Interest Group.[40] [41] The Risk SIG provides its members with the opportunity to network with professionals from various industries, which broadens their view of risk management and serves to improve management of projects.[42] The official mission of the PMI® Risk SIG is to:

- Establish and promote the principles of Risk Management as the foundation for effective Project Management
- Increase the knowledge of Risk Management and promote Risk Management tools and techniques through communication, education and networking
- Involve the Risk Management SIG membership in the improvement of the tenets for Risk Management
- Promote the exchange of current project management information on tools and techniques among Risk Management Specific Interest Group (RM SIG) members[43]

Some of the official objectives of the PMI® Risk SIG are to:

- Establish a worldwide network of risk management professionals in both the Public and Private sectors
- Demonstrate and promote risk management principles as the most effective means for planning and managing projects
- Create forums for the free exchange of risk management ideas, solutions, experience and applications. [44]

Table 2-2 below charts the development of project risk management as a discipline within the Project Management Institute's *A Guide to the Project Management Body of Knowledge*.

Table 2-2 PMBOK® Guide Consideration of Project Risk Management 1969 to 2002			
Time Period	**Document Title**	**Number of project management processes** (By order of appearance in document)	**Total number of inputs, tools and techniques, and outputs**
1969 to 1983	None	No standards agreed to and no standards documentation produced.	Not Applicable
1983 to 1987	Ethics, Standards and Accreditation (ESA)	Included as part of Time and Cost Management.	Not yet developed but PERT as Time Mgt. Process and Risk/Rewards as Cost Mgt. Feedback.
1987 to 1996	Project Management Body of Knowledge	*Stand alone chapter on Risk* Management. No process groups per se. Only chapter sections and sub-sections.	*Not yet developed*
1996 to 2000	A Guide to the Project Management Body of Knowledge	Four process groups: Risk Identification; Risk Quantification; Risk Response Development; and, Risk Response Control.	Total number of Inputs: 13 Tools & Techniques: 14 Outputs: 13
2000 to date	A Guide to the Project Management Body of Knowledge	Six process groups: Risk Management Planning; Risk Identification; Qualitative Risk Analysis; Quantitative Risk Analysis; Risk Response Planning; and Risk Monitoring and Control.	Total number of Inputs: 40 Tools & Techniques: 23 Outputs: 25

Critical Success Factor Theories

A final theoretical foundation of this research lies in the field of critical success factor theory. Critical success factors (CSFs) have been defined as "...the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization. They are the key areas where things must go right for the business to flourish. If results in these areas are not adequate, the organization's efforts for the period will be less than desired. As such, these areas of activity should receive constant and careful attention from management."[45]

Studies in Critical Success Factor influences have sought to test if and to what extent the CSFs under study contributed to reported variance in project success. Table 2-3 lists 10 recent studies in Critical Success Factor influence on project success and the CSFs studied.

Table 2-3 Critical Success Factor Lists (Listed in reverse chronological order)	
List Developer and Year	**Critical Success Factors**
Tarnow and Frame 2003[46]	General Management factors: management commitment, user involvement. Project discipline factors: planning, control, schedule, budget. Project-specific traits: planned project duration.
Dai 2002[47]	Project Management Office: Project Management Standards/Methods Project Historical Archives Project Administrative Support HR/Staffing Assistance Project Management Consulting/Mentoring Project Management Training From Pinto's List: Project Mission Top Management Support Schedule Client Consultation Technical Tasks Communication Trouble-Shooting
Royer (2000) [48]	Project appropriately organized Project risks identified and appropriately managed Project appropriately planned Project milestones met on schedule Project status appropriately monitored and controlled Project scope appropriately controlled Project appropriately resourced Appropriate functional acceptance-testing processes and plans in place Appropriate capacity and performance acceptance-testing processes and plans in place
Belassi and Tukel 1996 [49]	Top management support Client consultations Preliminary estimates Availability of resources Project managers performance
The Standish Group 1995.[50]	User involvement in the project effort. Strong executive management support. Clear statement of project requirements.

Pinto and Slevin 1988 [51]	Project team leader Power and politics Environmental events Urgency.
Kerzner 1987 [52]	Corporate understanding of PM Executive commitment to PM Organizational adaptability Project manager selection criteria Project manager leadership style Commitment to planning and control
Morris and Hough 1987 [53]	Project objectives Technical uncertainty innovation Politics Community involvement Schedule duration urgency Financial contract legal problems Implement problems
Pinto CSFs 1986[54] [55]	Project Mission Top Management Support Project Schedule/Plan Client Consultation Personnel Technical Tasks Client Acceptance Monitoring and Feedback Communication Trouble-shooting
Might and Fischer 1985.[56]	Matrix Organizational structures
Locke 1984 [57]	Make project commitments known Project authority from the top Appoint competent project manager Set up communications and procedures Set up control mechanisms Progress meetings

Baker, Murphy and Fisher 1983 [58]	Clear goals Goal commitment of project team On-site project manager Adequate funding to completion Adequate project team capability Accurate initial cost estimates Minimum start-up difficulties Planning and control techniques Task (vs. social orientation) Absence of bureaucracy
Cleland and King 1983 [59]	Project summary Operational concept Top management support Financial support Logistic requirements Facility support Market intelligence (who is the client) Project schedule Executive development and training Manpower and organization Acquisition Information and communication channels Project review
Martin 1976 [60]	Define goals Select project organizational philosophy General management support Organize and delegate authority Select project team Allocate sufficient resource Provide for control and information mechanism Require planning and review
Sayles and Chandler 1971 [61]	Project manager's competence Scheduling Control systems and responsibilities Monitoring and feedback Continuing involvement in the project Communication

A review of these critical success factors reveals that many factors contribute to project success. The range of factors encompasses organization structure, political support, human resource management methods, decision-making processes, and specific management tools and techniques.

Of the critical success factor lists reviewed, only the Royer (2000) list includes specific mention of project risk management as a critical success factor in project success. Royer lists five critical success factors related to risk management. They are:

1. Have project risks been identified and categorized as to likelihood and impact?
2. Are appropriate risk mitigation strategies in place with appropriate monitoring measures?
3. For high probability or high impact risks, have contingency plans been developed in case the risk mitigation strategy fails?
4. Is an on-going risk identification, assessment and management process in place and operating effectively?
5. Have project assumptions been verified and appropriate monitoring measures been put in place to ensure failed assumptions do not become risks?[62]

The State of Washington's Year 2000 Risk Assessment Program developed this list of risk management practices. It was used to assess the Y2K efforts of the state government and state university information technology mitigation efforts. The Washington State list (see above) is the basis on which the variables for project risk management planning and risk event handling and monitoring in the survey instruments of this research inquiry have been developed and operationalized.

As noted in the introduction (Chapter 1), this research considers project risk management practice to be implicit in all critical success factors listed in Table 2-3 (Critical Success Factor Lists above). Risk must be addressed explicitly if the above factors are to be realized during project planning, implementation, and termination. Specifically, projects must identify, analyze, plan for, and handle all relevant risk events. Since project management is an iterative process requiring integration of its various knowledge areas (Cioffi 2002), [63] risk management must be explicitly practiced in all critical success factors, especially those related to scope, communication, cost, and schedule management. Thus, the periodic integration of risk management processes with other project management processes occurs throughout the project life cycle and is necessary for the proper execution of these other processes.

Part 1 Summary

In conclusion, project risk management and project management are directly linked with each other as disciplines and branches of management. The immediate historical roots of project management lie in the early management work of the 19^{th} Century theorists Frederick Taylor, Henri Fayol, and Max Weber . Project risk management also owes its genealogy to the work of early 18^{th} Century theorist Daniel Bernoulli, who first wrote about risk. . Finally, the project risk management practices studied in this research are considered to be implicit in all the critical success factors of the Pinto-Dai-Tarnow-Frame research continuum. Table 2-4 below charts the development of management theory and risk theory chronologically since the first recorded writings on management in ancient Ur and Sumer around 5000 BC. (George 1972) [64]

Table 2-4 Highlights in Management and Risk Development 5000 BC to 2002 AD		
Management Theory	**Time Period**	**Risk Theory**
Sumerian management systems Egyptian pyramids constructed Great Wall of China construction begun	5000 BC to 0	Use of astrology, temple worship, and soothsayers for predicting the future
Roman civil engineering achievements Mayan temple cities built	0 to 1500 AD	The Babylonian Talmud compilation of ancient Jewish law and the 'marriage contract' problem for dividing inheritance among multiple wives. Algebra developed in Arabia. Mayan concept of zero formulated.
	1500 to 1800 AD	Daniel Bernoulli thesis on risk The word 'risk' emerges
Fayol – planning and use of teams Taylor – scientific management Weber – bureaucracy Gantt – Gantt Chart development	1800 to 1900 AD	Fire Underwriters Association of the Pacific formed in California in 1876
Parker-Follett – leadership Shewhart – Control charts and PDSA cycle Mayo – Hawthorne experiments Sheldon – management creed.	1900 to 1930 AD	Knight – separation of risk and uncertainty Keynes – role of perception in determining risk.
Lewin – force field & stakeholder analysis, Deming – PDCA Cycle and 14 points. Maslow – Hierarchy of needs MacGregor – Theory X and Theory Y Herzberg –Two Factor Theory Drucker – Management by Objectives.	1930 to 1960 AD	Von Neumann and Morgenstern – Risk utility function presented Monte Carlo Simulation developed PERT Analysis developed Nash Equilibrium developed Markowitz – studies on portfolios and risk American Risk and Insurance Association (ARIA) formed 1932.
Cleland – early writings on project management. Project Management Institute formed in 1969	1960 to 1980 AD	Risk & Insurance Management Society inaugurated from earlier ASIM in 1975. Early risk simulation software development
Early PM software developed First standards in Project Management established by PMI® in 1983. Kerzner – writings and textbooks on project management.	1980 to 2000 AD	The Society for Risk Management formed in 1980. Advanced risk management software developed Project Risk Management emerges as a field AS/NZS 4360:1995 Risk Management Standard published. Global Association of Risk Professionals formed in 1996. PMI® Risk Management SIG formed
Impetus towards developing a global PM Body of Knowledge	2000 to date	Greater corporate and public interest in risk and risk theory especially since the terror attacks of 9-11-01.

Part 2: Research Construct Operationalization

The following pages discuss the research constructs in light of recent research. The key variables related to each construct are identified and listed by priority for inclusion in the survey instruments used in this research inquiry.

As introduced in Chapter 1, the literature review produced a large number of source material on how these constructs are most frequently operationalized in project management literature and research. The specific sources of material consulted for finalizing the research construct operationalization fall into the following categories: project management-related scholarly and course books; scholarly articles on project management in the journal of professional societies; surveys on reported project success and failure; surveys on business risk management practices and their correlation with reported project success; research on the role of critical success factors in reported project success; anecdotal case studies on the relationship between risk management practices and reported project success; and, anecdotal case studies on the correlation between project success and the combined use of total quality management and project risk management practices.

The following sections of this chapter report on how specific literature sources have operationalized the constructs of this study. The results of this literature review enabled finalization of how the constructs of this research were operationalized in the major questions, supporting hypotheses and survey questionnaires of this study.

Senior Management Support

The first construct to be examined is the independent variable of this research: perceived senior management support for project risk management practices in the execution of projects in an organization.

The initial research on literature related to senior management support for project risk management found that such support is associated with the level of organization risk management maturity. Seven models for evaluating organization project risk management maturity were identified during this literature review. Each maturity model provides a list of characteristics that a mature risk management organization exhibits. These models show that senior management support for project risk management is one factor in a mature risk management organization. However, because the other factors in these models rely upon senior management decisions regarding resource allocation or staff assignment or policy promulgation, collectively these factors are aggregated into the category of key indicators of senior management support.

Table 2-5 summarizes the various risk management process maturity models, and lists the key indicators of senior management support for project risk management practice in a risk mature organization.

Table 2-5
Senior Management Support for Risk Management Process
(Listed in reverse chronological order)

Developer, Last Year Updated	Senior Management Support Indicators
Risk Management Maturity Level Development the PMI® Risk SIG, INCOSE Risk Management Working Group, and the United Kingdom Association for Project Management Risk Specific Interest Group.[65] 2002	Level 4 (the highest level) – Managed (Measure the work, work the measures): Risk-aware culture Senior management support for risk management Formal risk management policy Proactive risk management approach Risk information continually developed and updated Pervasive standard risk management process documentation and use Full-time risk management personnel Organization-wide risk management training Project risk manager (officer) Risk reviews Risk audits
Mature Risk Management Process, Hulett 2001[66]	A risk-friendly organization culture Decision-making and resource allocation as a result of risk analysis Risk management as a career path in the organization Senior management support Continuous improvement of the risk management process Participation in professional interchanges

Successful Risk Architecture, Price Waterhouse Coopers, LLP-Canada. 2001 [67]	Acceptance of risk management framework as a focal point and basis for common language Senior management commitment Risk management/change process owner Process to reach the desired state Communication and training Measurement Reinforcement through training and other HR mechanisms Monitoring and management oversight
The Project Management Institute's *A Guide to the Project Management Body of Knowledge* chapter on *Project Risk Management* [68] *2000*	Risk Management Policy The Project Charter Formal roles and responsibilities Stakeholder risk tolerances Organization risk management plan templates
The *Australia/New Zealand Joint Risk Management Standard (AS/NZ 4360:1999).* [69]	Senior management commitment to risk management as a practice Formal establishment of a risk management system Assignment of risk management personnel Allocation of risk management resources Periodic review of risk management policies and practices
Bosler 1999 [70]	Strategic risk management thinking Institutionalized risk management practices Regular validation of risk data Senior-management decision-making body to prioritize organization needs
Murray 1998 [71]	Risk Control Organizations include: Risk management organization culture Risk management guidance committee Risk manager Risk Owners Risk action managers
Continuous Risk Management Guidebook Software Engineering Institute 1996 [72]	Continuous Risk Management requires: Top management sponsorship Top management commitment Process improvement groups Risk management monitoring staff Training on risk management for monitoring staff

In summarizing the lists of risk management process maturity, the following factors emerge as the key indicators of senior management support for project risk management:

- A risk-aware and sensitive culture
- Acceptance of risk as an unavoidable project phenomenon
- A formal project risk management policy
- Allocation of resources for project risk management
- Assignment of personnel for project risk management

The survey instruments used in this dissertation research addressed each one of these key indicators of senior management support for project risk management. Each indicator corresponded with at least one survey instrument question.

Risk Management Practices

This section includes a description and comparison of some of the most widely used project risk management process models. This list is not exhaustive since there may be many proprietary project risk management process protocols or models in use. However, the following list includes the most widely used and publicly available project management models. Risk management models are so widely used by project management professionals that any proprietary model, protocol or process for risk management likely is based to a greater or lesser extent on one or more of the following models. The risk management models reviewed for this research are:

1. The Project Management Institute (PMI® ®) chapter on *Project Risk Management* from the 2000 version of *A Guide to the Project Management Body of Knowledge.*
2. *Project Risk Analysis and Management for Projects (RAMP) A Guide,* prepared by The Association for Project Management (United Kingdom) Specific Interest Group on Risk Management.

3. *Risk Management AS/NZ 4360:1999,* a Joint Australia/New Zealand Standard prepared by the Joint Technical Committee OB/7 – Risk Management.
4. *ISO Standard 10006* from the International Organization for Standardization;
5. *British standard BS 6079-3: 2000* from the British Standard Institute, 2000;
6. *Risk Management Process (RMP)* as described in the book *"Project Risk Management: Processes, Techniques and Insights",* written by C. Chapman and S. Ward in 1997 and published by John Wiley & Sons.
7. *The Temper Risk Management Methodology* as described in the paper *"A Holistic Principle for Applying Project Risk Management Methods and Tools",* by K. Kahkonen, a paper presented at the XV International Cost Engineering Congress, International Cost Engineering Council, in Rotterdam, The Netherlands, April, 1998.
8. The Software Engineering Institute *Continuous Risk Management Guidebook* prepared and published by the Carnegie Mellon Software Engineering Institute and updated in 2001.
9. The United States Department of Defense (DoD) *Generic Risk Management Plan*
10. The United States Federal Aviation Administration (FAA) *Acquisition and Program Risk Management Guidance*
11. The United States Environmental Protection Agency (EPA) *Integrated Environment Decision-making Framework*

An examination of the risk management operational steps or processes of each model reveals that they all share the same basic tenets. These processes may be labeled, decomposed and described differently. However, every model reviewed includes five essential activities:

- Risk event identification
- Risk event impact analysis
- Risk event response planning
- Risk event monitoring
- Actual risk event handling

Many of the models describe a comprehensive risk management life cycle and provide a process that is more detailed and extensive than the above generic pattern. In these models, steps have been added at the beginning and the end of the generic pattern. Specifically, the planning for a formal risk management process in an organization before risk identification activity, and the generation of lessons learned documentation on actual risk management handling experiences for use in future project operations. These models will be described in detail below. After this description a sorting of the risk management process steps in these models will be made in relation to the above generic risk management process.

Figure 2-6 summarizes these models and how they correspond with one another in terms of the project risk management steps that they embody.

Table 2-6
Project Risk Management Process Models

Model Name, Developer, Last Year Updated	Process Step Names
The Project Management Institute's A Guide to the Project Management Body of Knowledge chapter on Project Risk Management 2000 [73]	11.1 Risk Management Planning: This process group describes the manner of deciding how to approach and plan the risk management activities for a project. 11.2 Risk Identification: This process group describes how to determine which risks might affect the project and documenting their characteristics. 11.3 Qualitative Risk Analysis: This process group describes how to perform a qualitative analysis of risks and conditions to prioritize their effects on project objectives. *11.4 Quantitative Risk Analysis: This process describes how to measure the* probability and impact of risks and estimate their implications for project objectives. 11.5 Risk Response Planning: This process describes how to develop procedures and techniques to enhance opportunities and to reduce threats to the project's objectives. 11.6 Risk Monitoring and Control: This process describes how to monitor residual risks, identify new risks, execute risk reduction plans and evaluate their effectiveness through the project life cycle.

Risk Management Process Chapman and Ward 1997 [74]	*Define* – This phase consists of consolidating relevant existing information about the project. Filling in any gaps uncovered in the consolidation process. *Focus* –This phase consists of cooping and providing both a strategic and operational plan for the RMP. *Identify* –this phase consists of identifying where risk might arise, what might be done about this risk, in proactive and reactive responses terms and what might go wrong with these responses. *Structure* –this phase consists of testing and simplifying assumptions and providing a more complex RMP structure when appropriate. *Ownership* – this phase consists of determining client/contractor allocation of ownership and management of risks and risk responses. *Estimate* – This phase consists of identifying areas of clear significant uncertainty and areas of possible significant uncertainty. *Evaluate*: This phase involves synthesizing and evaluating the results of the estimate phase. *Plan* – This phase consists of readying the overall project and risk management plans for implementation. *Manage* – This phase consists of monitoring and controlling project operations and performance and developing risk response plans for immediate implementation.
The *Association for Project Management-United Kingdom (APM) Project Risk Analysis and Management for Projects (RAMP) Guide* [75] *2000*	*Process launch* - this phase involves appointment of a risk team to implement the RAMP process, defining the objectives, scope and plans for the project including any underlying assumptions. *Risk review* - this phase involves the systematic identification of risks and their entering into a risk register. Risk evaluation follows during which the likelihood, impact, and any inter-relationships between risk events are determined. Risk mitigation measures include: avoidance, reduction or transfer. These measures are incorporated in a risk mitigation strategy. An investment model is used to estimate the overall risk level and viability of the project for all residual risks. Assuming the project is not aborted, a risk response plan is then prepared.[76] *Risk management* - this is the third activity and it is conducted between risk reviews as part of the mainstream management of each stage in the life of the investment. This phase involves implementing the risk mitigation strategy and risk response plan developed during the preceding risk review. Activities and events during project execution are monitored to identify new or changing risks and appropriate measures are taken to deal with them. Designated individuals assume managing those risks that fall within their areas of responsibility.[77] *Process closedown* -The last activity is the closing down of the RAMP process, when a retrospective review is made of the investment in terms of its success in meeting its objectives, and the effectiveness of RAMP in contributing to the outcome.[78]

The *Australia/New Zealand Joint Risk Management Standard (AS/NZ 4360:1999).* [79]	*Establish the Context* – This phase involves establishing the strategic, organizational and risk management contexts in which risk management is to be applied. *Risk Identification* – In this phase it is necessary to identify what why and how things (risks) can arise as the basis for further analysis. *Risk Analysis* – In this phase, identified risk are analyzed in order to determine the existing risk controls and analyze risks in terms of consequence and likelihood in the context of those controls. Consequence and likelihood may be combined to produce an estimated level of risk. *Risk Evaluation* – In this phase, risk estimate levels are compared against the pre-established criteria. This enables risks to be ranked so as to identify management priorities. If the levels of risk established are low, then risks may fall into an acceptable category and treatment may not be required. *Risk Treatment* – For those risk events that are not accepted, the risk treatment phase entails the following activities: Identifying treatment options; Evaluating treatment options; Selecting treatment options; Preparing treatment plans; and, Implementing treatment plans. *Monitoring and Review* – This phase involves monitoring and reviewing the performance of the risk management system and changes, which might affect it. Communication and consultation: This phase involves communicating and consulting with internal and external project stakeholders as appropriate at each stage of the risk management process and concerning the process as a whole.
Continuous Risk Management Guidebook Software Engineering Institute 1996 [80]	*Identify* – search for and locate risks before they become problems *Analyze* – Transform risk data into decision-making information. Evaluate impact, probability, and timeframe, classify risks, and prioritize risks. *Plan* – Translate risk information into decisions and mitigating actions (both present and future) and implement those actions. *Track* – Monitor risk indicators and mitigation actions. *Control* – Correct for deviations from the risk mitigation plans. *Communicate* – Provide information and feedback internal and external to the project on the risk activities, current risks, and emerging risks. (This model will be discussed in greater detail in Chapter 8, Part IV.)
Temper Risk Management Methodology Kalle Kohkanen 1997 [81]	*Definition of the risk management plan* – define risk management tasks and responsibilities. *Risk Identification* – Identify risks to the project based on relevant technical knowledge and prepare checklists (risk lists) for further fine-tuning and updating. *Risk Analysis* – Prioritize risk list items by defining the probability and the consequences for each item given a PERT analysis of three possible scenarios: Optimistic, Most Likely and Pessimistic. *Definition of Risk Handling Strategy* – Determining which risk list items to accept, mitigate or avoid altogether. *Response Planning* – Prepare a response for the selected risk items, define proposed actions with respect to identifying the action, costing it and estimating its effect on the risk item.

The United States *Department of Defense (DOD) Generic Risk Management Plan 1996*	*Risk Planning* – this phase of the plan consists of the up-front activities necessary to execute a successful risk management program. This is an integral part of the normal program planning and management. The planning should address each of the other risk management functions, resulting in an organized and thorough approach to assess, handle, and monitor risks. It also assigns responsibilities for specific risk management actions and establishes risk reporting and documentation requirements.[82] *Risk Assessment* – This phase of the plan includes the identification of critical risk events/processes, which could have an adverse impact on the program, and the analyses of these events/processes to determine the likelihood of occurrence/process variance and consequences. It is the most demanding and time-consuming activity in the risk management process.[83] *Risk Handling* – This phase of the plan consists of four techniques or options for handling risks: avoidance, control, transfer, and assumption. For all identified risks, the various handling techniques should be evaluated in terms of feasibility, expected effectiveness, cost and schedule implications, and the effect on the system's technical performance, and the most suitable technique selected.[84] *Risk Monitoring* – This phase of the plan "...systematically tracks and evaluates the performance of risk-handling actions. It is part of the PMO [Program Management Office] function and responsibility and will not become a separate discipline. Essentially, it compares predicted results of planned actions with the results actually achieved to determine status and the need for any change in risk-handling actions.[85] *Risk Management Information System and Documentation* – This aspect of the plan stores and allows retrieval of risk-related data. It provides data for creating reports and serves as the repository for all current and historical information related to risk.[86]
Environmental Protection Agency (EPA) Guidelines for Ecological Risk Assessment 1999 [87]	*Problem Formulation*: This phase asks the questions: What are the important environmental risks? What are the important environment goals? And, How do these correlate to one another? *Analysis and Decision Making*: This phase asks the questions: What are the best risk reduction opportunities? And, How environmental goals and objectives be achieved? *Implementation and Performance Evaluation*: This phase asks the question: How are operations doing in achieving their goals and objectives and in handling risk events?

Federal Aviation Administration (FAA) Acquisition and Program Risk Management Guidance 1999	*Risk Planning* – The purpose of the risk management-planning phase is to force organized purposeful thought to the subject of eliminating, minimizing, or containing the effects of undesirable occurrences.[88] *Risk Assessment* – This phase consists of two aspects: Identifying and describing risks; and, conducting preliminary quantification of risk in order to organize and stratify the priority of identified risks.[89] *Risk Analysis* – This phase involves an examination of the change in consequences caused by changes in the risk input variables. Sensitivity and "what-if" analysis are examples of the activities that should take place during risk analysis.[90] *Risk Handling* – This phase is the last critical element in the risk management process. It is the action taken to address the risk issues identified and evaluated in the risk assessment and risk analysis efforts. Generally, these actions fall into one of the following categories: Avoidance, Control and Assumption.[91]
ISO Standard 10006 the International Organization for Standardization; 2000	This international project management standard is largely based on the *PMBOK® Guide* of the Project Management Institute. It includes four processes for project risk management: • *Risk Identification* • *Risk Assessment* • *Risk Response Development* • *Risk Control*
British standard BS 6079-3: 2000 from the British Standard Institute, 2000	This British standard for project management calls for a structured risk management process that includes the following steps: • *Risk Identification* • *Risk Categorization* • *Risk Assessment* (probability and impact) • *Risk Response Planning* (and subsequent actions).

All of the above models relate to the generic risk management process model described at the beginning of this section. However, the manner in which the activities (steps) in each model are labeled and decomposed (broken-down) or consolidated varies. Additionally, the placement of the various generic risk management activities varies from model to model. (For a more detailed description of the above project risk management process models, please see Appendix 2.)

The origins of the various process models – internal or external – were based on the need for a process that is generic and therefore relevant to project management professionals regardless of the application area or industry in which the risk management was taking place. Half the reviewed process models operate under a dual definition of risk: risk is both a danger and an opportunity to meet or exceed the goals and objectives of the project executed. The other half define project risk as having only a negative connotation with respect to a project, *i.e.,* a risk event can only hurt or hinder the ability of a project team to deliver and complete their project within the operative constraints of scope, time, cost, and deliverable specifications.

As introduced in Chapter 1, The Project Management Institute *Project Risk Management* process served as the operational model used as the basis for the research survey instrument. The rationale for using the *PMBOK® Guide* risk management model is that it:

- Represents the most widely known model among project management professionals due to the size, scope and status of PMI® as the world's leading project management society
- Represents the generally accepted practices of risk management professionals in all industries and application areas because it was developed by the eclectic membership of PMI®
- Defines risk as a dual-natured (both positive and negative) phenomenon that is consistent with the other widely followed models, *e.g.,* PRAM, A/NZ 4360
- Defines risk management consistently with other risk models as a process that seeks at its core to prevent bad things from happening to the plans of a project or an organization
- Delineates a risk management process that either encompasses or is consistent with the processes described by all the other models

- Encompasses the risk management strategies described and included in the other models, *e.g.,* risk avoidance, risk reduction, risk transfer, and risk acceptance.

Finally, the other project risk management models also share the specific tools and techniques related to the *PMBOK® Guide* model. The most important tools for each process group from the *PMBOK® Guide* are:

- Risk Management Planning: organization risk culture, formal risk policy;
- Risk Identification: historical information sources, brainstorming sessions;
- Qualitative Risk Analysis: Strengths, Weaknesses, Opportunities, and Threats Analysis, risk ranking matrixes;
- Quantitative Risk Analysis: PERT Analysis, Monte Carlo Simulation, Expected Monetary Value;
- Risk Response Planning: contingency plans and allowances - both formal and informal; and,
- Risk Monitoring and Control: Risk reviews, risk audits.

The survey instruments used in this dissertation research addressed each one of these key project risk management planning, risk-event monitoring and handling practices. Each practice was addressed by at least one survey instrument question.

Definition of Project Success

The fourth project management question is: What is the definition of project success? This concept is essential to define. *The PMBOK® Guide* (2000) does not specifically address what constitutes or defines project success beyond its statement that the goal of project management is to meet or exceed stakeholder expectations. [92] However, a number of leading project management writers and researchers offer the following definitions of project success:

Kerzner (2000, 1998), [93] Shenhar, Levy and Dvir (1997) [94], Pinto and Kharbanda (1995) [95], Cleland (1994) [96], all argue that the traditional triple constraint of project success is no longer adequate. They suggest a more expansive definition of project success against which projects can be evaluated: the traditional triple constraint (completing a project on-time, within budget and according to specifications); customer satisfaction and the generation of repeat business for the organization from this customer; creating and innovating new processes, products and services to improve the competitiveness of the organization; and not radically altering or changing the nature of business operations of the organization.

Kerzner adds that the consistent successful completion of projects is the ultimate indicator of project management excellence. [97] Table 2-7 below summarizes the different lists of project success factors:

Table 2-7
Project Success Definitions
(Listed in reverse chronological order)

Success List Developer Last Year Updated	Success Metrics
The Project Management Institute's A Guide to the Project Management Body of Knowledge chapter on Project Risk Management 2000.[98]	Meet or exceed stakeholder expectations On-time delivery Within budget delivery Delivery within specifications of the statement of work Customer satisfaction

Kerzner (1998) [99] Kerzner (2000) [100]	*Internal project success:* Completed on time Completed within budget Completed at the desired level of quality[101] A the proper performance or specification level With minimum or mutually agreed upon scope changes Without disturbing the main work flow of the organization Without changing the corporate culture [102] *External project success:* Accepted by the customer/user Resulted in customer allowing contractor to use customer as a reference. [103] Finally, project success does not mean company success in its project management endeavors. Project management excellence is a continuous stream of successfully managed projects. [104]
Shenhar, Levy and Dvir (1997) [105]	Project efficiency – e.g. project completion on time and within the specified budget."[106] Impact on the customer - e.g. customer and/or the user of the end result. This dimension includes: Customer requirements and real needs Meeting performance measures, functional requirements, and technical specifications The level of customer satisfaction, The extent to which the customer is using the product, and Whether the customer is willing to come back for a follow-up project or for buying the next generation of the same product."[107] Business impact on the organization – e.g. the direct impact the project may have on the organization This dimension includes: Performance time Cycle time Yield and quality of the process, and Total improvement of organizational performance. [108] Opening new opportunities for the future – e.g. preparation of the organizational and technological infrastructure for the future. It is the longest-term dimension and involves the following questions: How does the organization prepare for future opportunities? Does it explore new opportunities for further markets, ideas, innovations and products?
Pinto and Kharbanda (1995) [109]	The traditional triple constraint: On-time Within budget According to specifications Customer satisfaction or client use and satisfaction

Frame (1995) [110]	The traditional triple constraint: On-time Within budget According to specifications Organizational factors Well identified customer needs Adequately specified project requirements Good planning and control"
Cleland (1994) [111]	*Time, cost, and technical performance constraints* (or objectives) Complexity, scope, or innovation beyond the operational work of the enterprise Preparing the organization for its future Significant contributions by two or more functional units of the organization A direct contribution to the success or failure of the enterprise"
Freeman and Beale (1992) [112]	Technical Performance: Scope Quality Efficiency of project execution: On-time Within budget Managerial and organizational implications: Client and user satisfaction Extent to which corporate values undisturbed Personal growth of project team members Project termination Completeness of termination Extent of post-project problems Quality of post-audit analysis Technical innovativeness Manufacturability and business performance: Ease of production Commercial success

The most important measures of project success shared by all models are: customer satisfaction, on-time delivery, within budget delivery, and according to specifications delivery of the project deliverable(s). Therefore, this research defines project success as occurring when projects are completed: on time, within budget, according to the formal specifications of the statement of work and to the satisfaction of their customer.

The survey instruments used in this dissertation research addressed each key indicator of project success. Each project success indicator was addressed by at least one survey instrument question.

Part 2 Summary

In conclusion, the four constructs explored in this research were operationalized after a comprehensive review of related literature, research and case histories.

The key indicators of perceived senior management support for project risk management practices are: presence of a formal project risk management policy; senior management encouragement of risk-taking in project selection and planning; senior management discouragement of project risk issues; senior management allocation and mobilization of resources to support project risk management planning; senior management allocation and mobilization of resources to support actual risk event monitoring and control; and, the establishment of formal risk assessment teams or groups to assess and analyze project risks.

The key indicators of best practice project risk management planning practice include: conducting risk analysis during project selection; conducting quantitative risk impact analysis during both project selection and project planning; including contingency funds - both formal and informal - during project planning; including contingency time - both formal and informal - during project planning; preparing advance plans for handling specific risk events should they occur; conducting formal risk identification sessions throughout the project life-cycle; and, appointing a full-time project team member to be responsible for all daily project risk management throughout the project life.

The key indicators of best practice project risk event monitoring and handling practice include: Conducting regular risk reviews to assess the emergence of risk events during project execution; conducting a risk audit during project execution to confirm the presence and use of a formal risk management plan; and, a low number of project workarounds in response to unidentified risk events.

The key indicators for measuring project success include on time delivery of a project; within budget delivery of a project; meeting the formal specifications of the project in full; and leaving the project customer satisfied at project completion by meeting their expectations for the project. Again, the role of project risk management in reported project success needs to be placed in its context as implicit in all project critical success factors. Some project risk management practitioners say '...risk management is ... project management....' (Lister 1998), [113] implying that risk management and project management are synonymous with one another. Other project management practitioners argue that good (disciplined) management more than risk management *per se* is the key factor in reported project success (Tarnow and Frame 2003). [114] However, this research takes the view of the PMI® *A Guide to the Project Management Body of Knowledge* that risk management is a part of but not synonymous with project management. [115]

As mentioned in the Critical Success Factor section above (page 61), this research considers risk management to be implicit in all critical success factors (CSFs) identified by Pinto (1986), Dai (2002), and Tarnow and Frame (2003). In other words, those attempting to ensure critical success factors (*e.g.*, project management office presence, scope, communication, cost, and schedule management) must systematically consider, support, and practice risk management if they are to succeed in improving reported project success.

Part 3: Research Context

This section looks at the research context in which this study took place. Central to this review are the nature and contributions of previous research related to the constructs of this study. The next sections review in detail previous doctoral, commercial, academic and corporate research. After this review, the role of this research study in the continuum of project risk management study and its potential contributions to the field is discussed. This section ends with a consideration of where future research in the field of project risk management may and should venture.

Previous Related Research

There have been a number of recent studies related to the constructs to be explored and examined in this research study. The basic categories of previous related research were obtained from three categories of source material: doctoral dissertations, research studies reported in the journals of professional societies, and case histories or studies reported in the journals of professional societies.

These research sources total 62 documents that can be divided into three categories, as follows: 24 doctoral dissertations between the periods of 1987 and

2002 (See Table 2-8 for a summary table of these doctoral dissertations.); 21 research studies reported in the journals of professional societies between the period 1991 and 2001 (see Table 2-9 for a summary table of these research studies.); and, 17 case histories or studies reported in the journals of professional societies between the period 1994 and 2002. (See Table 2-10 for a summary table of these case histories and studies.)

None of the above 62 documents exactly replicate the model used in this research (see Chapter 1) nor the four operationalized research constructs. The closest research survey was the Price Waterhouse Coopers - Canada 2001 survey of Business Risk Management in Canada. However, its scope was confined to business risk management and not to project risk management. Only two of the surveyed research studies mirror closely the scope, research constructs or sample frame proposed for this study. These are the case studies conducted by Royer (2000) on the Washington State Y2K Information Technology program and the Gerosa, Cencetti and Sarno (1999) case study of the Alenia Aerospazio Space Division in Italy. This research study provides new data on the relationship between perceived senior management support, reported project risk management, risk response planning and risk event handling practices, and reported project success.

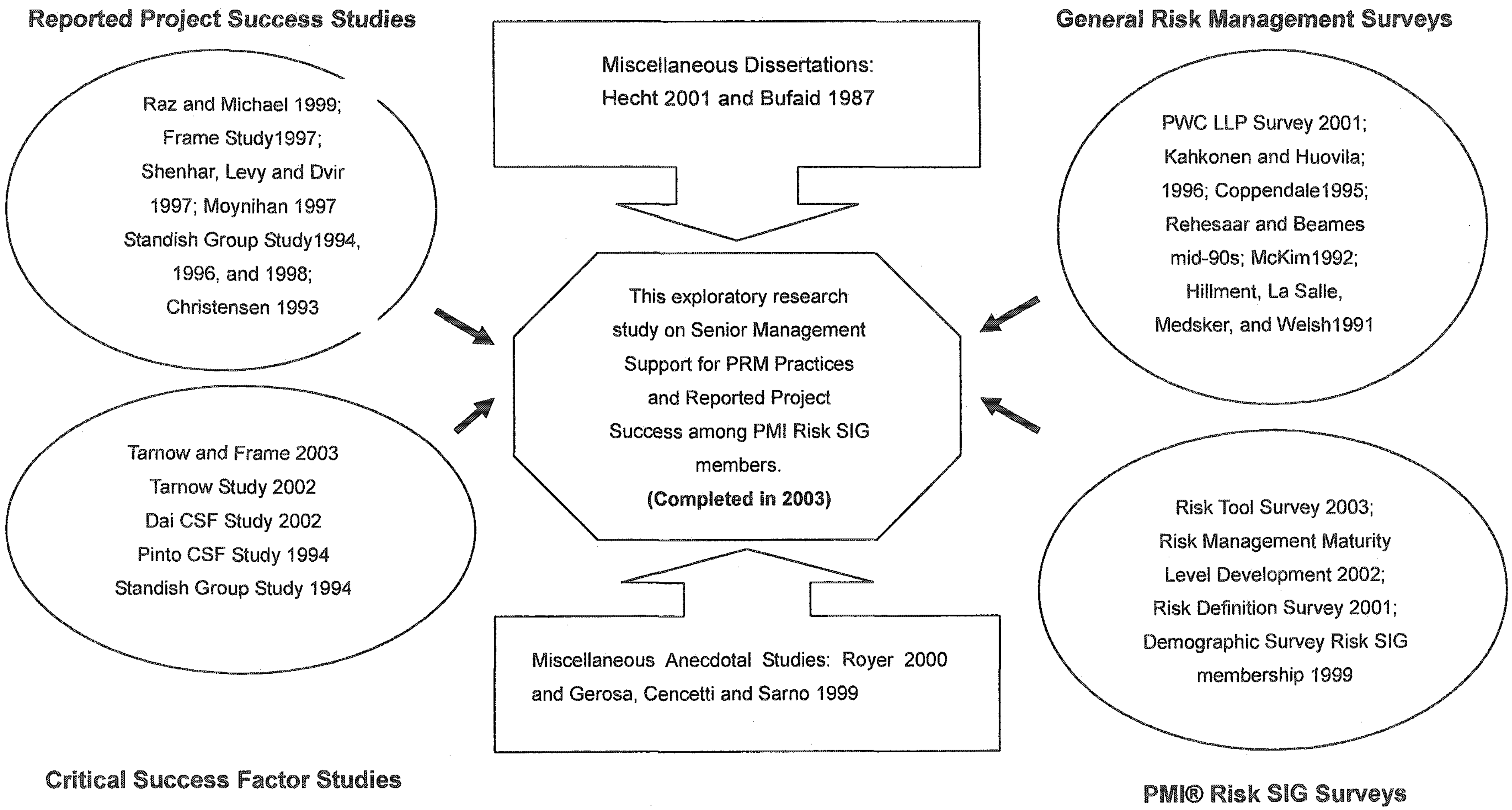
Figure 2-4 below displays the confluence of the various research sources in this research inquiry. Figure 2-4 also depicts and describes how this research continues the development of these four main research streams:

1. General surveys in risk management;
2. Project Management Institute Risk SIG Projects (Surveys);
3. Critical Success Factor research surveys; and,
4. Reported project success research surveys.

This research study adds to the repository of doctoral dissertations in project risk management and provides further data that can be used in more detailed case studies on the project risk management practices of organizations.

The following pages describe in greater depth the research stream origins of this dissertation and how this dissertation adds to them.

Figure 2-4
The Research Continuums of this Dissertation



General Risk Management Surveys

As mentioned above, the most recent research in risk management was the Price Waterhouse Coopers, LLP-Canada (PWC-Canada) survey in 2001. This survey looked at the cope and framework of risk management of 72 Canadian organizations that were both global and national-based from the private, public and not-for-profit sectors. The study looked at eight elements considered by PWC-Canada to be essential for successful risk management: Acceptance of risk management as a language framework; senior management commitment; a risk management/change process owner; an implementation process; communication and training in risk management issues; measurement; reinforcement through training and other mechanisms; and, monitoring and management oversight. (Despite many attempts, it was not possible to obtain a copy of the survey instrument or the response rate.) However, the basic findings of the study indicate gaps between organizational commitment to risk management and the actual implementation of risk management practices.[116]

The following project risk management research surveys that are relevant to this research inquiry preceded the above PWC-Canada survey:

- Kahkonen and Huovila 1996, surveyed the risk management processes used by Finnish construction companies on Russian construction projects. There is no reported survey methodology, sample size or response rate. However, the findings of this survey contributed to the development of the Temper Risk Management process model described in Table 2-6 above.

- Rehesaar and Beames surveyed 100 information system project managers in Australia in the mid-1990s. This survey consisted of a mail survey instrument and had a 37% response rate. The survey scope was limited to software project plans and schedule control procedures.
- Coppendale 1995, surveyed a number of United Kingdom-based companies on their risk management practices and reported project success and early termination rates. The survey consisted of a questionnaire but there is no reported sample size or response rate.
- McKim 1992, surveyed an unreported number of Canadian construction companies on their risk behavior and financial decision-making during project bidding. There was no reported response rate for this study.
- Hillment, La Salle, Medsker, and Welsh 1991, surveyed 30 expert system managers on risk identification practices. Survey administration consisted of a questionnaire and had a 46% response rate. The survey scope was limited to risk identification practices.

This research adds to this continuum by providing empirical data on the perceived senior management support for risk management and specific key risk management tools and technique use.

Project Management Institute Risk Specific Interest Group (Projects) Surveys

As indicated on their website, the Project Management Institute Risk Specific Interest Group (PMI® Risk SIG) has a number of on-going special projects. Recent projects conducted by the SIG include:

- Periodic risk tool surveys to learn of what risk-related software project risk management professionals use in their daily work. The survey is currently on going with its final report due later in 2003.
- Risk Management Maturity Level Development report dated April 2002. This report - it was not a research study - is the most recently completed PMI® Risk SIG project. It provides a four-tiered Risk Management Maturity Model (RMMM) for judging the maturity of an organization's risk management processes. The model recognizes the challenges of changing a work culture that does not 'think risk' to one that constantly considers the risk implications of its operations. The report was a collaborative project of the PMI® Risk SIG, INCOSE Risk Management Working Group, and the United Kingdom Association for Project Management Risk Specific Interest Group. (This model will be discussed in greater detail in Chapter 8, Part IV.)
- Risk definition survey of PMI® Risk SIG, Association for Project Management Risk SIG, and INCOSE Risk SIG members in 2001. The purpose of this survey was to canvass the views of project management professionals interested in risk management on how they perceive risk. Specifically, do these professionals view risk events as negative, positive and negative or value neutral. The study invited 2,000 Risk SIG members to participate in the

electronic mail survey and there was a 9.3% response rate (Including the author of this research inquiry). The study found that 54% of the respondent's organizations use a negative (threat-only) definition of risk, 34% used a dual positive-negative definition and the remaining 12% used a value neutral or some other definition of risk.

- Demographic Survey of the PMI® Risk SIG dated October 1999. This survey was the first membership profile survey conducted by the Risk SIG. It invited the SIG membership as of 1 September 1999. It asked over 50 questions covering a variety of subjects: demographic, Risk management experience, Risk management interest, and SIG membership expectations. There were 43 responses for a response rate was approximately 10% of the membership at that time. The demographic and experience related questions from this survey form a large part of the same questions in the survey instruments used in this research inquiry. (See Chapter 3 for further details.)

This research adds to the continuum of PMI® Risk SIG projects (surveys) of its membership on the support of senior management in their organizations to risk management, their actual risk management practices, reported project success, and current demographic profile. This research also provides a description of where most of the organizations represented by the survey respondents fall within the four-tiered Risk Management Maturity Model (RMMM) for judging the maturity of an organization's risk management processes. (This RMMM analysis of respondent organizations is found in Chapter 8, Part IV.)

Critical Success Factor Studies

Three doctoral research studies on critical success factors related to project management were reviewed. The most recent studies were the doctoral dissertations of: Thomas Tarnow in 2002 and Christine Dai in late 2001 (published in 2002).

The Tarnow dissertation looked at 72 information technology projects implemented by a major international consulting company to determine the underlying patterns associated with the success and failure of projects in this company. [117] This dissertation was supplemented by a more detailed statistical analysis of the underlying factors in project success by Tarnow and Dr. J. Davidson Frame in 2003. This study identified three broad factors that are associated with project success: strong project discipline, good management practice, and project-specific traits. This study added to the critical success factor work of The Standish Group International in 1994 and 1996 which identified three key critical success factors: user involvement in the project effort; strong executive management support; and, a clear statement of project requirements.

The Dai study was follow-on to the Pinto dissertation of 1986 on the same subject. However, the Dai dissertation considered the role of the Project Management Office (PMO) in reported project success. This study used website survey instruments based on the original Pinto survey instrument and had a 33% response rate. The study validated 6 of the 10 critical success factors studied by

Pinto as still relevant factors for reported project success. The research also added new information on the role of the Project Management Office in reported project success. Specifically, the research found that while a PMO presence by itself does not ensure project success, the services provided by a PMO are very instrumental in enabling project delivery within the Triple Constraint.

This survey extends the Pinto-Dai-Tarnow dissertation research continuum by exploring the role of specific risk management practices in project execution, and as such it is the first known formal study related to project risk management practices.

Reported Project Success Studies

There have been a number of studies on the success of project implementation, especially in the information technology field. Two of the most frequently cited studies are:

- The 1997 study conducted by J. Davidson Frame. This study surveyed 438 project managers and project workers throughout the United States. The survey results indicate that 55% of projects experience cost overruns, 69% of projects experience schedule slippage and 29% of projects experience a shortfall in meeting specifications. The remaining numbers reflect either completion of project according to or better than the original plan.

- The 1994 study conducted by The Standish Group. This study looked at project success as measured by the Triple Constraint. The study reviewed more than 8,400 information technology projects and found that only 16% of the projects were clear-cut successes, 53% were in a challenged state, and the remaining 31% out right failures. Follow-up studies in 1996 and 1998 have revealed a modest improvement in the above success rate, from 16% in 1994 to 27% in 1996 to 26% in 1998. The outright failure rate has gone from 31% in 1994 to 40% in 1996 to 28% in 1998. Finally, the number of projects in a challenged state has gone from 53% in 1994 to 33% in 1996 to 46% in 1998.[118]

Additional research studies in reported project success include the following studies:

- Raz and Michael (1999) who surveyed project risk management tool use among 400 software project managers in Israel. This was a pilot survey of a larger survey whose results have not been located. The study used a random survey instrument and received a 21% response rate.
- Moynihan (1997) who used structured interviews of 14 Irish Information technology application systems developers on their reported project success rates.
- Shenhar, Levy and Dvir (1997) who studied the dimensions of project success as defined by 127 corporations in Israel. The study used a random survey questionnaire and had a 70% response rate.

- Christensen (1993) who studied a random selection of 64 Department of Defense acquisition projects for reported cost overruns. This number represented 12.8% of the acquisition projects available for study.

This research study provides current data on project success as reported by project management professionals. It also provides data on the reported frequency of project workarounds in projects. The data provided on project workarounds is the first known empirical data of its kind.

Miscellaneous Dissertations

Previous doctoral dissertations in the field of project risk management most relevant to this research are:

- Dai (2002) who studied the role of the Project Management Office and the Pinto Critical Success Factors on reported project success.
- Hecht (2001) who studied risk taking behavior and project success in the California State transportation sector. This study reviewed audit records in order to draw conclusions on the success and failure rates of projects selected for execution in relation to their risk level.
- Bufaid (1987) who studied the construction industry in the United Kingdom. The study scope included project performance as related to various risk variables, *e.g.,* contingency allowances and Triple Constraint delivery.

This doctoral dissertation adds to the existing repository of doctoral research in project risk management. It is the first known dissertation to look at the roles of perceived senior management support for risk management practices, the reported key risk management tools and techniques, and how these correspond with reported project success.

Miscellaneous Anecdotal Studies

Previous anecdotal case studies in the field of project risk management that are most relevant to this research are:

- Royer (2000) who reported on the State of Washington's Year 2000 Risk Assessment Program list of risk management critical success factors. As mentioned above, these factors were used to assess the Y2K efforts of the state government and state university information technology mitigation efforts.
- Gerosa, Cencetti and Sarno (1999) of the Alenia Aerospazio Space Division in Italy who studied the role of senior management support and the adoption of risk management practices in an organization. This study found that promulgation of a risk management policy in an organization is only part of the risk management process. Ensuring the dissemination of this policy and its operationalization in the daily work of the organization is a key issue in successful project risk management.

This research adds to the existing body of knowledge on critical success factors as it looks at risk management in greater detail than the Washington State Y2K and Alenia Aerospazio Space Division Alenia Aerospazio Space Division case studies. In addition, this research surveyed a wider sample of project management professionals on their reported use of key risk management practices and the reported role(s) of these in project success. Finally, the anecdotal data provided by the structured interviews of this research adds to the repository of such data in the field of project risk management.

Additional Contributions Of This Study

This research provides baseline information to researchers, practitioners of project risk management and members of project risk management offices. These results add to the body of knowledge on project risk management practices of project management professionals by:

- Exploring the extent and degree to which risk is considered in the project operations of organizations;
- Describing the types of project risk practices in organizations that execute projects;
- Assessing the dynamics of current project risk management in organizations;
- Learning about the specific risk management tools and techniques used in projects;
- Providing current data on reported project workaround, success and failure rates; and,

- Determining the source of support for project risk management practices in organizations.

Further Lines of Research Related to this study

The results of this research can serve students and researchers in management as a basis for further research into the scope, practices and practical benefits of project risk management practices. Immediate areas for further research include the following possible research areas: doctoral dissertations, professional society surveys, industry-specific surveys, and organization-specific case studies. Some specific research questions are:

- Exploring the pre-conditions for the successful establishment and operation of project risk management practices.
- Identifying the critical success factors for project risk management practices.
- Surveying the most widely used project management tools and techniques.
- Determining the role of project management software in the successful delivery of projects within the triple constraints of time, budget and scope.
- Investigating any statistical correlation between the use of specific project risk management practices and the successful delivery of projects within the triple constraints of time, budget and scope among the wider community of project management professionals (*e.g.*, the general membership of the Project Management Institute, and other professional project management societies).

- Investigating any statistical correlation between the use of specific project risk management practices and customer satisfaction upon completion and hand over of a project among the wider community of project management professionals (*e.g.,* the general membership of the Project Management Institute, and other professional project management societies).

Finally, the researcher plans to extend this initial research in the future by collecting data from a wider sample in order to arrive at more generalizable findings on the state of risk management practices in project management.

Part 3: Summary

In summary, this dissertation continues a number of research streams that directly relate to the four constructs: perceived senior management support for project risk management; risk management planning practice; risk response planning, risk event monitoring and handling; and, reported project success. In addition, this research continues the series of PMI® Risk SIG projects (surveys) on topical issues of interest to its general membership and the progress of the discipline of risk management. Finally, this research takes the critical success factor research continuum of Pinto-Dai-Tarnow to a deeper, more detailed level: that of the implicit critical success factors of project risk management.

Conclusions

The data generated from this research – especially the anecdotal data from the structured interviews - will help identify risk management subject areas and specific respondents for follow-on case studies on actual risk management experiences. Additionally, the anecdotal data could provide valuable insights in how project risk management policies are operationalized in the daily project work of an organization and what role - if any - these policies and practices play in reported project success.

Chapter 3 will discuss in detail the survey methodology, instruments, data collection methods, and data analysis methods of this research.

Table 2-8
Summary of Recent Related Doctoral Research
(Organized chronologically)

Related Construct	Related Construct	Survey Sample	Methodology	Research Variables
Bufaid, 1987	Risk variables Project performance	Construction industry – UK and abroad	Survey questionnaire	Risk variables Project performance
Al-Bahar, 1988	Construction Risk Management System (CRMS) model	Construction Industry	Survey	Construction Risk Management System (CRMS) model
Willmer, 1988	IT Risk Model	Construction Industry	Controlled study	IT Risk Model
Koch, 1994	Use of Charette model	Environmental projects	Survey of projects	Use of Charette model
Atabansi, 1995	Risk assessment software	Software Industry	Literature review Survey Questionnaire	Risk assessment software
Robinson, 1995	Risk Assessment in Requirements Engineering (RARE) model	Software Industry	Literature review Controlled study	Risk Assessment in Requirements Engineering (RARE) model
Miller, 1996	Ten critical Success Factors	Critical Success Factors – North American Steel Industry sector	Detailed Surveys	Ten critical Success Factors
Puckett, 1996	Risk management system	Ohio State Education Dept.	Single Case Study Survey Questionnaire Structured Interviews	Risk management system
Van du Merwe, 1996	Risk management practices Decision-making process	Financial institutions – Holland	Proposal	Risk management practices Decision-making process

Lu, 1997	Quality Function Deployment Risk Assessment Risk Analysis Risk Handling	R & D Projects	Experimental sessions	Quality Function Deployment Risk Assessment Risk Analysis Risk Handling
Rimer, 1997	Environment risks Decision-making model – Janis & Mann	Environment sector	Survey	Environment risks Decision-making model – Janis & Mann
Wang, 1997	Risk behaviors by financial and corporate managers	Corporate risk management Financial trading	Two essays	Risk behaviors by financial and corporate managers
Wang, 1998	Risk Analysis Risk Management	Engineering projects - Canada	Quantitative study	Risk Analysis Risk Management
Deeb, 1999	Risk Management policies Risk Management Programs Cost effectiveness	Public & Private organizations – California	Survey Sample & Analysis	Risk Management policies Risk Management Programs Cost effectiveness
Jyvaskylan, 1999	Risk Management practices	Software Industry – Finland	Survey	Risk Management practices
Attalla, 2000	Management and Control Model	Construction Industry - Canada	Survey Questionnaire	Management and Control Model
Chatterjee, 2000	Risk management instrument	Electric Power sector	Instrument design	Risk management instrument
Dobbins, 2000	Critical Success Factors	Critical Success process model – US DoD	Survey	Critical Success Factors
Houston, 2000	Major risk factors Behavioral characterizations	Software Industry - USA	Survey	Major risk factors Behavioral characterizations
Jackson, 2000	Web-based training Instructor-based training	Bi-lingual studies in USA and Latin America	Controlled Study	Web-based training Instructor-based training

Lingard, 2000	Web-based tools Risk management	Software industry - USA	Survey	Web-based tools Risk management
Hecht, 2001	Risk-taking Project success	Transportation sector – California	Review of audit records	Risk-taking Project success
Dai, 2002	Project Management Office Critical Success Factors Reported Project Success	Critical Success Factors for PMO - USA	Survey Questionnaire	Critical Success Factors Reported Project Success
Tarnow, 2002	Critical Success Factors Reported Project Success	72 information technology projects of a major consulting firm.	Survey questionnaire of project managers	Critical Success Factors Reported Project Success

Table 2-9
Summary of Recent Related Survey Research
(Organized chronologically)

Researcher(s) and Date	Related Construct(s)	Survey Sample(s)	Methodology & Response Rate	Research Variable(s)
Hillmer, La Salle, Medsker, & Welsh, 1991	Risk Identification	30 Expert System Managers	Survey Questionnaire 46% response rate	Risk Identification
McKim, 1992	Risk Risk Behavior Financial Behavior during project bidding	Construction Industry – Canada	Investigation Survey No reported response rate.	Risk Risk Behavior Financial Behavior during project bidding
Christensen, 1993	Cost Overruns	DoD Acquisition projects	Review of Contracts Random selection of 64 completed contracts 12.8% of the total available.	Cost Overruns

Moynihan, 1997	Triple Constraint	14 Irish IT application systems developers	Structured Interviews 100% Response Rate	Triple Constraint
Shenhar, Levy & Dvir, 1997	Dimensions of Project Success	127 Corporate Projects – Israel	Random Survey Questionnaire 70% Response Rate	Dimensions of Project Success
Raz & Michael, 1999	Project Risk Management Tools	400 Software PMgrs.– Israel	Pilot survey Random Survey Questionnaire 84 responses or 21% response rate.	Project Risk Management Tools
The Standish Group, 1994, 1996 and 1998	Triple Constraint	Project Success – General	Survey Questionnaire No reported response rate.	Triple Constraint
Pinto, 1994	Project Succes	Critical Success Factors	Survey Questionnaire No reported response rate.	Project Success
Coppendale, 1995	Risk management practices Triple Constraint Early Project Termination	UK-based companies	Survey Questionnaire No reported response rate.	Risk management practices Triple Constraint Early Project Termination
Kahkonen & Huovila, 1996	Risk Management process	Construction Industry – Russia	Survey of projects	Risk Management process
Rehesaar & Beames, mid-1990s	Software Project Plans Control procedures Time Success	100 IS Project managers – Australia	Mail surveys 37% Response Rate	Software Project Plans Control procedures Time Success
Frame, 1997	Triple Constraint	Project Success – IT sector	Survey Questionnaire No reported response rate.	Triple Constraint

PMI® Risk SIG, 1999	Membership profile and expectations.	1999 PMI® Risk SIG membership	Survey Questionnaire 43 responses or a 10% response rate.	Member demographics, risk management experience, risk management interest, and SIG membership expectations.
Yasin, Martin & Czuchry, 2000	Project Management Success PM Leadership PM Knowledge International experience	Construction Project Managers from USA 'Who's Who in PM, PMI® -USA	Mail Survey 25% Response Rate	Project Management Success PM Leadership PM Knowledge International experience
Zobel & Wearne, 2000	PRM constitutes 3.45% of the papers	633 papers presented at PMI® and IPMA congresses	Content Analysis	PRM constitutes 3.45% of the papers
Jiang Klein, & Means, 2000	Senior Management Support Project Size	500members of the Association of IT Professionals	Mail Survey 20 % Response Rate	Senior Management Support Project Size
Price Waterhouse Coopers – Canada, 2001	Senior Management Support Risk management practices	72 Canadian organizations, public, private & non-profit	Survey Questionnaire No reported response rate.	Senior Management Support Risk management practices
Webb, Peterson, Uttridge, O'Hara, 2001	Risk Attitudes	EDS Corporation	Literature Survey Internal Survey Questionnaire No reported response rate.	Risk Attitudes
Mizuno & Takagi, 2001	Risk Factors Cost & Schedule Durations	Software Industry – Japan	Survey Questionnaire No reported response rate.	Risk Factors Cost & Schedule Durations
PMI® Risk SIG, 2001	Definition of Risk	2000 PMI® , APM, INCOSE Risk SIG members	Survey Questionnaire 186 responses or 9.3% response rate.	Definition of Risk
Tarnow and Frame, 2003	Critical Success Factors Reported Project Success	72 information technology projects of a major consulting firm.	Survey questionnaire of project managers	Critical Success Factors Reported Project Success

Table 2-10
Summary of Recent Related Case Study Research
(Organized chronologically)

Researcher(s) and Date	Related Construct(s)	Survey Sample(s)	Methodology	Research Variable(s)
Stamatis, 1994	TQM *Project Success* Project Management	Ford *Motorola* Hewlett-Packard	Survey	TQM *Project Success* Project Management
Charette, Adams, & White, 1997	Cultural obstacles to PRM use	US Navy software maintenance organization	On-site survey	Cultural obstacles to PRM use
Gerosa, Cencetti & Sarno, 1999	RM Culture RM Methods RM Application	Alenia Aerospazio Space Division – Italy	On-site study	RM Culture RM Methods RM Application
Bedillion & Orr, 1999	ROMPIT team Project Success PRM Process	Honeywell, Inc. Aerospace Center	On-site study	ROMPIT team Project Success PRM Process
Getto & Landes, 1999	RISKIT Godfather Approaches to PRM promotion and adoption	Daimler Chrysler R & T	On-site study	RISKIT Godfather Approaches to PRM promotion and adoption
Artto & Hawk, 1999	PRM process Reported project success	Finnish process plant	On-site study	PRM process Reported project success
Kindinger, 1999	PRM process Time and Cost Analysis	Los Alamos National Laboratory	On-site study	PRM process Time and Cost Analysis
McManus & Grushka, 1999	Project planning Critical Risk Paths	BHP Copper maintenance project	On-site study	Project planning Critical Risk Paths

Thompson, 2000	Risk Management in new product introduction	Motorola semiconductor project	On-site study	Risk Management in new product introduction
Royer, 2000	Project health Potential risks Critical success factors Risk Assessment	Washington State Y2K Program	On-site study	Project health Potential risks Critical success factors Risk Assessment
Schock-Smith, 2000	PRM use	Military battles – Custer's Last Stand & Rorke's Drift and the experiences of ATT & IBM	Literature review Corporate experiences	PRM use
Brugger, Gerrits & Pruitt, 2000	Time Constraint PM Process	Griffiss USAF Base	Document review On-site visit	PM Processes Time Control Quality Control
De Bakker & de Roode, 2001	Risk Driven Project Management PMBOK Risk Process	DOB Agency – Holland	On-site study	Risk Driven Project Management PMBOK Risk Process
Gerosa & Nasini, 2001	ROAM to financing space projects	Alenia Aerospazio Space Division – Italy	On-site study	ROAM to financing space projects
Datta & Mukherjee, 2001	Risk Mgt. Planning	Two (2) steel plants – India	Document review Structured & unstructured interviews Structured questionnaire	External, Financial, Technical, Political, Social, Regulatory, contract, contractor & conceptual risks
Musca, Schenone, & Bonello, 2001	Risk Analysis practices	Chemical plant – KSA	Monte Carlo NPV Pay Back Period Document Review	Resource utilization Future cost trends Profit forecasts
Dey, 2002	PRM Analysis	Petro-industry project – India	ANP, EMV Document review Statistical analysis	Technical, Financial, Economic, Organizational Clearance and Force Majeure risks

End Notes

---

[1] Project Management Institute, *A Guide to the Project Management Body of Knowledge*, Project Management Institute, Newtown Square, Pennsylvania, 2000: page 9

[2] Li Shijun, Yang Xianju, and Qin Jiarui, *"Sun Wu's Art of War" and the Art of Business Management*, (Translated from Chinese by Mou Xudian), Hai Feng Publishing Co., Ltd.Hong Kong, China,1997: 5

[3] Louis E. Boone and Donald D. Bowen, *The Great Writings in Management and Organizational Behavior*, 2nd ed. (New York, New York: McGraw-Hill, Inc., 1987) 1.

[4] Henri Fayol, "Planning." In *The Great Writings in Management and Organizational Behavior*, 2nd ed. Louis E. Boone and Donald D. Bowen, 28. New York, NY: McGraw-Hill, Inc., 1987.

[5] Ibid., 27

[6] Ibid., 23-24

[7] Frederick Winslow Taylor, "The Principles of Scientific Management." In *The Great Writings in Management and Organizational Behavior*, 2nd ed. Louis E. Boone and Donald D. Bowen, 33. New York, NY: McGraw-Hill, Inc., 1987.

[8] Ibid., 41

[9] Ibid.,42

[10] Max Weber, "Legitimate Authority and Bureaucracy." In *The Great Writings in Management and Organizational Behavior*, 2nd ed. Louis E. Boone and Donald D. Bowen, 15. New York, NY: McGraw-Hill, Inc., 1987.

[11] Mary Parker Follett, "The Essentials of Leadership." In *The Great Writings in Management and Organizational Behavior*, 2nd ed. Louis E. Boone and Donald D. Bowen, 56. New York, NY: McGraw-Hill, Inc., 1987.

[12] Toney Sisk http://www.sims.berkeley.edu/courses/is208/s02/History-of-PM.htm

13

http://www.pqa.net/ccpm/W05002001.html#3%20History%20of%20Proje ct

---

[14] Elton Mayo, "Hawthorne and the Western Electric Company." In *The Great Writings in Management and Organizational Behavior*, 2nd ed. Louis E. Boone and Donald D. Bowen, 77-79. New York, NY: McGraw-Hill, Inc., 1987.

[15] Ibid.Ibid.

[16] Oliver Sheldon, "A Professional Creed for Management." In *The Great Writings in Management and Organizational Behavior*, 2nd ed. Louis E. Boone and Donald D. Bowen, 70-71. New York, NY: McGraw-Hill, Inc., 1987.

[17] http://www.asq.org/join/about/history/shewhart.html

[18] http://www.skymark.com/resources/leaders/shewart.asp

[19]

http://www.pqa.net/ccpm/W05002001.html#3%20History%20of%20Project

[20] Peter L. Bernstein, *Against the Gods: The remarkable story of risk*, John Wiley and Sons, Inc., New York, NY, 1998: page 1

[21] Herbert Zim and Robert H. Baker, Reised and Updated by Mark R. Chartrand, *Stars: A Guide to the Constellations, Sun, Moon, Planets, and other features of the Havens*, Golden Press, New York, NY, 1985: page 4.

[22] Bernstein, *Against the Gods: The remarkable story of risk*: page 1

[23] Bernstein, *Against the Gods: The remarkable story of risk*: page 3

[24] Bernstein, *Against the Gods: The remarkable story of risk*: pages 102-106

[25] Bernstein, *Against the Gods: The remarkable story of risk*: pages 130, 132-133

[26] Alan G. Isaac, "Choice Under Risk", The American University, Washington, D.C. located at: http://www.american.edu/econ/notes/risk.pdf

[27] John von Neumann and Oskar Morgenstern, *Theory of Games and Economic Behavior,* Princeton: Princeton University Press, 1944.

[28] http://www.gsu.edu/~dscthw/8350/resnk4-3.htm

[29] http://www.prmia.org/pdf/Hist_of_RM_2002.pdf

[30] Francis M. Webster Jr., PMP, "They Wrote the Book: The Early Literature of Modern Project Management," *PM Network* Volume 13, Number 8 (August 1999): 59-62.

[31] Ibid., 59-60.

[32] Ibid., 59.

[33] Ibid., 60.

[34] Ibid., 62.

[35] Ibid.

[36] Project Management Institute, World Wide Web Home Page located at: www.pmi.org/about/

[37] Project Management Institute, *A Guide to the Project Management Body of Knowledge*: Back inner sleeve.

[38] Ibid.

[39]

http://www.pqa.net/ccpm/W05002001.html#3%20History%20of%20Project

[40] www.pmi.org/about/

[41] Ibid.

[42] www.risksig.com

[43] Ibid.

[44] Ibid.

[45] Christine V. Bullen and John F. Rockart, *A Primer on Critical Success Factors*, working paper, MIT Sloan School of Management, June 1981.

[46] Thomas Tarnow, J. Davidson Frame, "Determinants of Success and Failure on Information Technology Projects", The University of Management and Technology, Arlington, VA, March 2003: pages 9-10.

[47] Xiaoyi (Christine) Dai, "The Role of the Project Management Office in Achieving Project Success", Doctoral Dissertation, The George Washington University, Washington, DC, 2002: pages 35-37.

[48] Paul S. Royer, " How Healthy is Your Project?" Paper presented at the proceedings of the Project Management Institute Annual Seminars and Symposium, September 7-16, 2000, Houston, TX, USA: page1.

[49] Belassi and Tukel, "Seven Lists of Critical Success Factors Developed in the Literature Source: Adapted from A New Framework for Determining Critical Success/Failure Factors in Projects", *International Journal of Project Management*, v14n3, 1996.

[50] The Standish Group International, *Chaos: Charting the Seas of Information Technology*, West Yarmouth, Massachusetts, 1995.

[51]Jeffrey K. Pinto, Dennis P. Slevin, "Critical Success Factors Across The Project Life Cycle," *Project Management Journal*, v19n3, June1988: pages 67-75.

[52] Harold Kerzner, *In Search of Excellence in Project Management: Successful Practices in High Performance Organizations*, (Van Nostrand Reinhold, New York) 1998: pages 30-39,.

[53] Belassi and Tukel, *International Journal of Project Management*, v14n3, 1996.

[54] Jeffrey K. Pinto, Dennis P. Slevin, "Critical Factors in Successful Project Implementation," *IEEE Transactions on Engineering Management*, v34n1, Feb.1987: pages 22-27.

[55] Jeffrey K. Pinto, Project Implementation: A Determination of Its Critical Success Factors, Moderators, and Their Relative Importance Across the Project Life Cycle, Doctoral Dissertation, Univ. of Pittsburgh, Pennsylvania,1986.

[56] Robert Might and William Fischer, "The Role of Structural Factors in Determining Project Management Success," *IEEE Transactions on Engineering Management*, v32n2, May 1985: pages 71-77.

[57] Belassi and Tukel, *International Journal of Project Management*, v14n3, 1996.

[58] Ibid..

[59] Ibid..

[60] Ibid..

[61] Ibid..

[62] Paul S. Royer, " How Healthy is Your Project?": page 2.

[63] Denis F. Cioffi, *Managing Project Integration*, Management Concepts, Vienna, VA; 2002: page 2.

[64] Claude S. George, Jr., *The History of Management Thought*, Englewood Cliffs, NJ, Prentice-Hall; 1972: Pages 3-5

[65] PMI Risk SIG, INCOSE Risk Management Working Group, and the United Kingdom Association for Project Management Risk Specific Interest Group, *Risk Management Maturity Level Development*, April 2002: Appendix 1.

[66] David T. Hulett, "Key Characteristics of a Mature Risk management Process," Paper presented at the Fourth European Project Management Conference, PMI Europe, London, UK, 6-7 June 2001: page 6.

[67] Price Waterhouse Coopers LLP, "Survey of Business Risk Management in Canada", available at www.pwcglobal.com; 2001.

[68] Project Management Institute, *A Guide to the Project Management Body of Knowledge*, Project Management Institute, Pennsylvania, 2000::page 127.

[69] The A*ustralia/New Zealand Joint Risk Management Standard (AS/NZ 4360:1999):* pages 5-7.

[70] Charles W. Bosler, "Risk Management the Corporate "Board Game"", Paper presented at the Proceedings of the 30th Annual Project Management Institute 1999 Seminars and Symposium Philadelphia, PA, USA, Presented October 10 to 16, 1999.

[71] Kelvin Murray, "Risk Management: Beyond the Textbooks," *PM Network*, June 1998: pages 53-54.

[72] Audrey J. Dorofee, Julie A. Walker, Christopher J. Alberts, Ronald P. Higuera, Richard L. Murphy, and Ray C. Williams, *Continuous Risk Management Guidebook*, Software Engineering Institute, Carnegie Mellon University, Hanscom Air Force Base, MA, 1996: Pages 221-222.

[73] Project Management Institute *A Guide to the Project Management Body of Knowledge*: page 127.

[74] Chris Chapman and Stephan Ward, *Project Risk Management: Processes, Techniques and Insights*, John Wiley & Sons, Chichester, UK; 1997: pages 50-51.

[75] Ramprisk, *Risk Analysis and Management for Projects (RAMP)*, available on-line at: www.ramprisk.com/methods/method.htm

[76] Ibid.

[77] Ibid.

[78] Ibid.

[79] Joint Technical Committee OB/7 – Risk Management, Risk Management A/NZS 4360:1999 (Revised): Pages 7-8.

[80] Audrey J. Dorofee, Julie A. Walker, Christopher J. Alberts, Ronald P. Higuera, Richard L. Murphy, and Ray C. Williams, *Continuous Risk Management Guidebook*, Software Engineering Institute, Carnegie Mellon University, Hanscom Air Force Base, MA, 1996: Pages 23.

[81] Kalle Kahkonen and Pekka Huovila: available on the internet at: http://sun7.bham.ac.uk/d.j.crook/lea/iglc4/huovila/risk2.htm

[82] *Appendix B General Risk Management Plan*, Department of Defense, Dated 11/20/00; located at: www.acq.osd.mil/io/se/risk_management/papers_speeches_briefs/generic_risk_man. Section 3.2.1.

[83] *Appendix B General Risk Management Plan*, Department of Defense, Dated 11/20/00; located at: www.acq.osd.mil/io/se/risk_management/papers_speeches_briefs/generic_risk_man. Section 3.3.

[84] *Appendix B General Risk Management Plan*, Department of Defense: www.acq.osd.mil/io/se/risk_management/papers_speeches_briefs/generic_risk_man. Section 3.4.1.

[85] *Appendix B General Risk Management Plan*, Department of Defense, Dated 11/20/00; located at: www.acq.osd.mil/io/se/risk_management/papers_speeches_briefs/generic_risk_man. Section 3.5.1.

[86] *Appendix B General Risk Management Plan*, Department of Defense, Dated 11/20/00; located at: www.acq.osd.mil/io/se/risk_management/papers_speeches_briefs/generic_risk_man. Section 4.1.

[87] United States Environmental Protection Agency: "Integrated Environmental Decision-Making in the 21st Century: A report from the EPA Science Advisory Board's Integrated Risk Project", Peer Review Draft dated 3 May 1999. Located at: www.epa.gov/sab/irp/part1.pdf: Page 19.

[88] Anthony F. Osborne, *Acquisition and Program Risk Management Guidance Volume 1, FAA-P-1810 AIT-1-0494, (Revision 2),* Federal Aviation Administration, Department of Transportation, Washington, DC; December 20, 1996: 4.2.

[89] Osborne, *Acquisition and Program Risk Management Guidance Volume 1, FAA-P-1810 AIT-1-0494, (Revision 2)*: page 4.3.

[90] Ibid.: page 4.4.

[91] Ibid.: page 4.5.

[92] Project Management Institute *A Guide to the Project Management Body of Knowledge*: page 6.

[93] Kerzner, *In Search of Excellence in Project Management: Successful Practices in High Performance Organizations*: page 25.

[94] A.J. Shenhar, O. Levy, and D. Dvir, "Mapping the Dimensions of Project Success", *Project Management Journal*, Volume 28, Number 2, June 1997. pages 11-12.

[95] J.K. Pinto and O.P. Kharbanda, 'Lessons for an Accidental Profession", Reprinted with permission from *Business Horizons*, March –April 1995. Copyright © 1995 by Indiana University Kelly School of Business excepted from the book: Jack R. Meredith and Samuel J. Mantel, Jr. *Project Management A Managerial Approach*, 4th Edition, (John Wiley & Sons: New York, New York) 2000: page 31.

[96] David I. Cleland, Ph.D., *Project Management: Strategic Design and Implementation*, 2nd Edition, McGraw-Hill, Inc. New York; 1994: page 35.

[97] Harold Kerzner, *Project Management: A systems approach to Planning, Scheduling, and Controlling*, (John Wiley & Sons, Inc., New York; 7th Edition) 2000: page 6.

[98] Project Management Institute *A Guide to the Project Management Body of Knowledge*: page 127.

[99] Kerzner, *In Search of Excellence in Project Management: Successful Practices in High Performance Organizations*: page 25.

[100] Kerzner, *Project Management: A systems approach to Planning, Scheduling, and Controlling*: page 6.

[101] Kerzner, *In Search of Excellence in Project Management: Successful Practices in High Performance Organizations*: page 25.

[102] Kerzner, *Project Management: A systems approach to Planning, Scheduling, and Controlling*: page 6.

[103] Kerzner, *In Search of Excellence in Project Management: Successful Practices in High Performance Organizations*: page 25.

[104] Kerzner, *Project Management: A systems approach to Planning, Scheduling, and Controlling*: page 6.

[105] Shenhar, O. Levy, and Dvir, "Mapping the Dimensions of Project Success", *Project Management Journal*: page 12.

[106] Ibid.: page 11.

[107] Ibid..

[108] Ibid..

[109] Pinto and Kharbanda, 'Lessons for an Accidental Profession", excepted from the book: Jack R. Meredith and Samuel J. Mantel, Jr. *Project Management A Managerial Approach*: page 31.

[110] J. Davidson Frame, *Managing Projects in Organization: How to Make the Best Use of Time, Techniques, and People*, (Jossey-Bass Publishers, San Francisco) 1995: page 19.

[111] Cleland, *Project Management: Strategic Design and Implementation*: page 35.

[112] Mark Freeman and Peter Beale. "Measuring Project Success", *Project Management Journal*. Volume XXIII, Number 1, March 1992, Project Management Institute, Darby, PA. USA: page 10.

[113] Tim Lister, "Software Risk Management is Software Project Management for Adults", Oakden Lecture Theatre, Centenary Building, City University, Tuesday 10th March 16:00 - 17:30, Lecture Abstract located at: http://www.cs.york.ac.uk/hise/safety-critical-archive/1998/0052.html

[114] Tarnow and Frame, "Determinants of Success and Failure on Information Technology Projects": pages 9-10.

[115] Project Management Institute *A Guide to the Project Management Body of Knowledge*: page 6.

[116] Price Waterhouse Coopers LLP, "Survey of Business Risk Management in Canada", available at www.pwcglobal.com; 2001.

[117] Thomas Tarnow, *Project Management Techniques that Contribute to Information Technology Project Success in the Finance Industry*, Doctoral Dissertation, The Graduate School, Colorado Technology University, June 2002

[118] The Standish Group, *CHAOS: A Recipe for Success*, The Standish Group International, Inc., 1999: Page 2.

CHAPTER 3
RESEARCH METHODOLOGY

Introduction

As introduced in Chapter 1, the essential question of this research was: Does risk management make a difference? Specifically, do organizations that practice formal project risk management report greater project success than those organizations that do not?

This chapter discusses: the research constructs; the major research questions and their respective supporting hypotheses; how the research constructs were operationalized in the survey instruments; the research methodology used; the pre-tests conducted of the survey instruments; and the limitations of this study.

Finally, for the purposes of this research the phrase *project risk management practices* is used to group together the three risk-management-related research constructs: perceived senior management support, reported risk management planning, and reported risk event monitoring and handling.

Research Description

This was an exploratory descriptive research study on the role of the project risk management practices on reported project success. Additionally, this research assessed the presence of any relationship between perceived senior management support for active and formal project risk management in the operations of their organization, reported risk management planning, reported risk response planning and risk event handling, and reported project success.

As discussed in Chapter 1 and Chapter 2, this research was exploratory due to the dearth of empirical research on project risk management practices (*e.g.,* perceived senior management support, risk management planning, risk response planning and risk event handling) among organizations executing projects and the relationship – if any – between these project risk management practices and reported project success.

The research was descriptive, as it mapped the current project risk management practices and processes used by the surveyed project management professionals with respect to: perceived senior management support, project risk management planning, risk response planning, risk event handling and reported project success. As discussed earlier in Chapter 1 and Chapter 2, project success is defined as delivery of a project within budget, on time, according to specifications and meeting with customer satisfaction and acceptance. Additionally, this project success should be achieved with a minimal number of workarounds.

Procedures for the Study

As briefly described in Chapter 1, the overall methodology followed in this research consisted of five steps summarized in Table 3-1 below:

Table 3-1
Overall Research Methodology Ste

Research Step	Description
Step 1 Explore the current state of risk management practice in organizations.	This step consisted of a comprehensive literature review and interviews with prominent academics and practitioners of project risk management.
Step 2 Explore the key project risk management practices considered essential common practices in the discipline.	This step consisted of a comprehensive literature review of dissertations, published research, academic studies and articles in professional journals, and widely used texts on project management, risk management, and project risk management.
Step 3 Data Collection from the identified sample frame.	This step consisted of a general survey of project management professionals determined to be risk-sensitive through their membership in the Project Management Institute Risk Management Specific Interest Group. 1,572 members of the PMI Risk SIG were invited to complete a website-based survey instrument. 12 PMI Risk SIG members who did not participate in the website survey were surveyed in a structured interview to identify any underlying and emerging themes in the responses.
Step 4 Explore whether organizations that employ systematic risk management practices outperform those that do not.	Based on the data collected from the research sample, an investigation was made to determine the degree to which there is any association between perceived senior management support for risk management, the employment of good risk management planning, risk response planning and risk event handling practice, and reported project success.
Step 5 Draw conclusions from the survey analysis.	Based on the analysis of the research sample data, preliminary conclusions have been made on the efficacy of risk management practices in organizations.

The underlying basis for this research was the lack of comprehensive empirical research to identify the origin, state and impact of risk management practice in organizations that execute projects. This research study represents a first step at identifying the state of risk management practice in organizations by means of conducting a survey of project management professionals interested in risk management practice – *i.e.*, the PMI® Risk SIG membership.

In theory, organizations that go through the effort of identifying potential risk events, examining the impacts of these events, and developing procedures to handle them are better prepared to cope with risk events than those that respond to such events in an unplanned and *ad hoc* fashion. This research study surveyed project risk management practitioners to determine:

- The extent to which the senior managers in their organizations are committed to supporting solid risk management practice;
- The extent to which good risk management practices are actually being employed during project planning, risk response planning and risk event handling; and,
- The extent to which projects in their organizations have successful outcomes.

Once this basic information was obtained, the extent of any association between perceived senior management support for risk management, the use of good risk management practice during project planning and execution (risk response planning and event handling), and reported project success was explored.

Once the analysis of the survey results was complete, it has been possible to draw conclusions about the efficacy of risk management practice in organizations. (Please see Chapters 5 – 7 for details on the statistically significant relationships identified among the variables explored in this research.)

Research Model

The basic model for this research inquiry was introduced in Chapter 1. This section provides a detailed discussion of the research constructs used and how they were operationalized. These constructs were:

- Perceived senior management support for project risk management practice.
- Project risk management planning practices.
- Project risk response planning and risk event-handling practices.
- Reported project success

As introduced in Chapter 1, the research model that serves as the core of this study is captured in the following Figure 3-1:

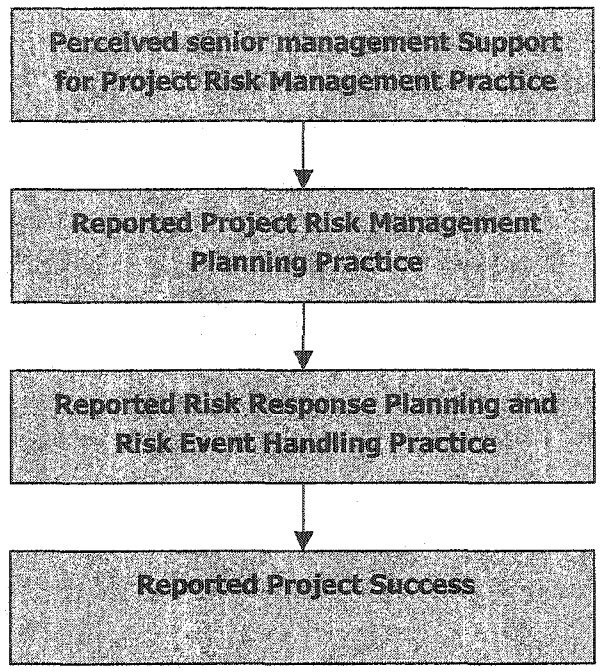


Figure 3-1 Research Construct Dynamic

A conceptual equation for this construct dynamic model is expressed as follows:

Reported Project Success = Function (Perceived Senior Management Support, Reported Risk Management Planning, Reported Risk Response Planning and Risk Event Handling)*

*Considers risk management to be implicit in all critical success factors, (*e.g.*, scope, communication, cost, and time management).

Reported project management success is the dependent variable, with perceived senior management support the independent variable and risk management planning, risk response planning and risk event handling practice the intervening variables. As Figure 3-1 shows, the relationship between reported project success and the independent variables is both direct and indirect in a systematic fashion. When the senior management of an organization is committed to implementing generally accepted project risk management practices, resources are mobilized to enable staff to engage in risk management planning efforts. These planning efforts, coupled with continuing senior management support, enable implementation of best practice risk response planning and risk event-handling practices. Finally, these risk response planning and risk event-handling practices enable organizations to successfully manage risk events, thereby reducing project workarounds and promoting successful project execution.

The two survey instruments used in this research inquiry operationalized each construct in this model. These survey instruments are:

- The 45-question website survey instrument; and,
- The 22-question structured interview survey instrument.

The research constructs operationalized these survey instruments as follows:

1. Perceived senior management support for project risk management practice

This was the independent variable in the research inquiry. Eight website survey questions relate to this research variable. They are:

X_1 Who is the key proponent of project risk management in your organization?

X_2 Does your employing organization have a policy requiring that projects have a risk management plan?

X_3 If yes, in what year did your employing organization initiate a policy requiring that projects have a risk management plan?

X_4 Do you consider your employing organization to be concerned about project risk?

X_5 Does your employing organization work unit have a policy requiring that projects have a risk management plan?

X_6 Does senior management in your organization encourage and reward risk taking in projects?

X_7 Does senior management in your organization discourage the reporting of risks associated with its projects?

X_8 Does senior management in your organization provide adequate money, human resources, and time for the entire process of project risk management (e.g. planning, identification, impact analysis, response planning, and monitoring)?

2. *Reported project risk management planning practice*

This was the first of two intervening variables in the research inquiry. Thirteen survey website questions relate to this research variable. They are:

X_9 Do your project team members obtain training in risk management planning and impact analysis at some point during the project's life?

X_{10} Do your projects use any structured quantitative technique (*e.g.* Monte Carlo simulation, decision trees) when evaluating the merits and demerits of prospective projects?

X_{11} Do your projects use qualitative risk analysis (*e.g.* probability and impact matrix) when evaluating the merits and demerits of prospective projects?

X_{12} During which of the following project phases do your projects prepare contingency plans or strategies for responding to specific risk events?

X_{13} During which of the following project phases do your projects use qualitative risk analysis (*e.g.* probability and impact matrix)?

X_{14} During which of the following project phases do your projects use structured quantitative technique (*e.g.* Monte Carlo simulation, decision trees)?

X_{15} During which of the following project phases do your projects have risk identification sessions?

X_{16} Which of the following types of historical information have your projects used during risk identification?

X_{17} Do you use a risk analysis technique to develop a contingency fund for project costs?

X_{18} If yes, what tool(s) do you use?

X_{19} Do you use a risk analysis technique to develop a contingency fund for project schedule durations?

X_{20} If yes, what tool(s) do you use?

X_{21} Which of the following technical resources does your organization use for conducting project risk management planning and impact analysis?

3. Reported risk response planning and risk event handling practice

This was the second intervening variable in the research inquiry. Six website survey questions relate to this research variable. They are:

X_{22} Do your projects conduct risk reviews?

X_{23} Do your projects experience risk audits?

X_{24} Do your projects experience major workarounds (e.g. >10% cost overrun from the activity's planned budget) in project operations?

X_{25} Does your employing organization have a policy requiring that projects have a risk response plan?

X_{26} If yes, in what year did your employing organization initiate a policy requiring that projects have a risk response plan?

X_{27} Which of the following technical resources does your organization use during risk response planning and risk event handling?

4. Reported project success

This was the dependent variable in the research inquiry. Nine website survey questions relate to this research variable. They are:

Y_1 How often are your projects completed to the satisfaction of your customers?

Y_2 How often are your projects completed within budget?

Y_3 How often are your projects completed on time?

Y_4 How often are your projects completed according to their original statement of work (SOW) specifications?

Y_5 How often are your projects descoped from their original Statement of Work (SOW) specifications?

Y_6 Are your projects terminated early – *i.e.* without completing the original planned deliverables?

Y_7 Do you consider the risk management policies of your organization to make a measurable difference on your project performance?

Y_8 What is the average estimated range of the cost overruns that your projects have experienced from their original cost baseline (Budget-at-Complete)?

Y_9 What is the average estimated range of the schedule overruns that your projects have experienced from their original schedule baseline (Project Duration)?

5. Demographic Questions

Each version of this survey instrument contained 9 questions that asked for information on: Respondent Professional Information and Respondent Employing Organization Information.

These questions were developed using the survey questionnaire used by the Risk SIG in their 1999 Demographic Survey of the PMI® Risk SIG membership. Their purpose was to ensure that the volunteer respondents to the web survey would still be representative of the general membership of the Risk SIG in order to enable use of chi-square analysis, which requires a probability sample. Although the survey respondents were not probability sample, demographic data from the 1999 membership survey would enable confirmation that the volunteer sample was representative of the general membership.

To this end the Respondent Professional Information section asked six questions, these were:

- Question 1: How many projects have you worked on since 1 January 2000 (01/01/00)?
- Question 2: What is the budget range of the projects you have been involved with since 1 January 2000 (01/01/00)?
- Question 3: What was the most recent calendar year in which you were involved in project risk management?
- Question 4: Your role in your employing organization?
- Question 5: Years of project management experience:
- Question 6: What is the highest academic degree that you have earned?

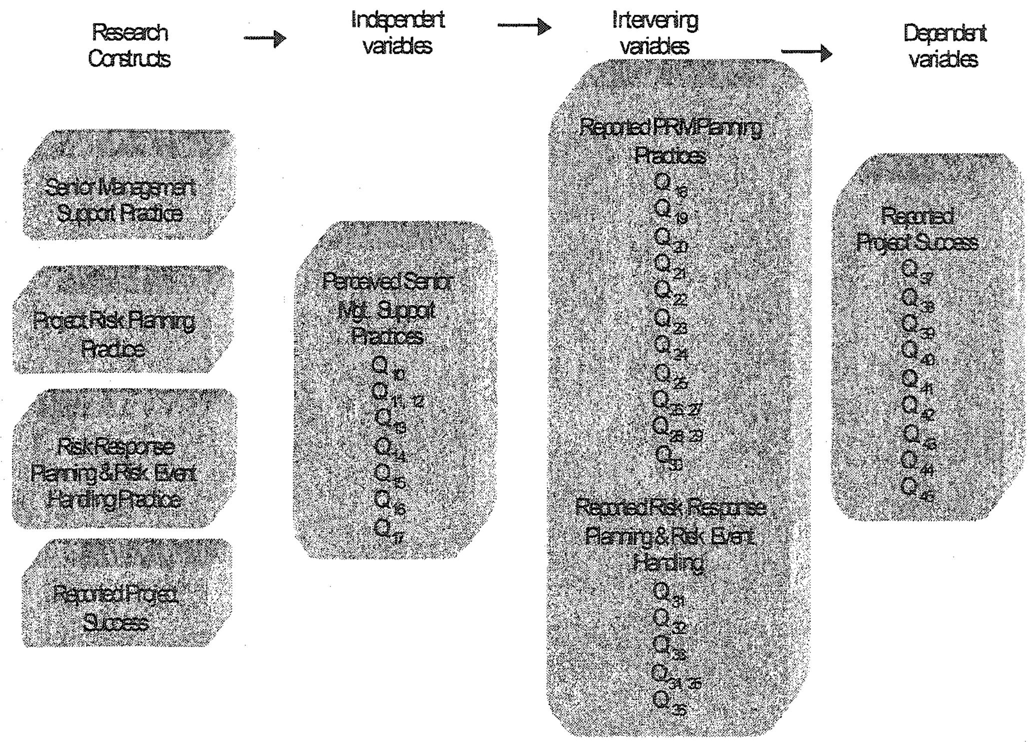
The Respondent Employing Organization Information section asked three questions, these were:

- Question 7: Type of industry.
- Question 8: Annual Revenue (in United States dollars, US$) of your employing organization as a whole (for government respondents, please rate your organization's annual budget).
- Question 9: Geographical regions of your project risk management experiences.

Figure 3-2 below graphically displays the model introduced in Chapter 1. However, in this figure the research constructs are shown as they are operationalized in the website survey instrument.

Figure 3-2

Research Construct Operationalization in Website survey instrument



Research Questions and Hypotheses

As introduced in Chapter 1, the purpose of this research was to explore any statistically significant relationship(s) between the above research constructs. The research questions and hypotheses explored in this research have already been introduced in Chapter 1 and listed in Table 1-3. The following is a discussion of the purpose and justification for these research questions and their supporting hypotheses:

In order to determine the relationship between perceived senior management support for project risk management practice, the implementation of risk planning practice, the execution of risk response planning and risk event handling procedures, and reported project success, this study addressed three major research questions:

Table 3-2 below shows how the website survey instrument questions correspond with the major research questions and supporting hypotheses generated for this research:

Table 3-2 Survey Instrument/Major Research Question and Hypotheses		
Question or Hypothesis	**Hypothesis Description**	**Related Survey Instrument Question No.**
	Major Research Question 1	
RQ 1	***In what ways does perceived senior management support of risk management practice affect implementation of reported project risk planning practices?***	Website: 8-15, 16-28 Interview: 8-13, 14-17
	Supporting Hypotheses	
Ho 1.1	Perceived risk concerned organizations implement the same amount of reported formal risk management processes as those organizations that are not perceived to be risk sensitive.	Website: 11, 18,19, 24, 26 Interview:
Ha 1.1	Perceived risk sensitive organizations implement more reported formal risk management processes than those organizations that are not perceived to be risk sensitive.	Website: 11, 18,19, 24, 26 Interview:
Ho 1.2	Organizations that report senior managers providing adequate resources to implement risk management processes implement the same amount of reported formal risk management processes as those organizations that do not report senior managers providing adequate resources.	Website: 15, 16, 18, 19, 24, 26 Interview:
Ha 1.2	Organizations that report senior managers providing adequate resources to implement risk management processes implement more reported formal risk management processes than those organizations that do not report senior managers providing adequate resources.	Website: 15, 16, 18, 19, 24, 26 Interview:
	Major Research Question 2	
RQ 2	**In what ways do reported risk planning practices affect the implementation of reported risk response planning and risk event handling practices?**	Website: 16-28, 29-34 Interview: 14-17, 18-19
	Supporting Hypotheses	
Ho 2.1	Organizations where reported formal risk planning practices are implemented report monitoring risks the same as those organizations where reported risk-planning practices are weak.	Website: 18, 19, 24, 26, 28, 29 Interview:
Ha 2.1	Organizations where reported formal risk planning practices are implemented report monitoring risks more rigorously than those organizations where reported risk-planning practices are weak.	Website: 18, 19, 24, 26, 28, 29 Interview:

Ho 2.2	Organizations where reported formal risk planning efforts are implemented report experiencing the same number of workarounds as those organizations where reported formal risk planning efforts are weak.	Website: 18, 19, 24, 26, 30 Interview:
Ha 2.2	Organizations where reported formal risk planning efforts are implemented report experiencing fewer workarounds than those organizations where reported formal risk planning efforts are weak.	Website: 18, 19, 24, 26, 30 Interview:
Major Research Question 3		
RQ 3	**How does the implementation of reported risk response planning and risk event handling practices affect reported project success?**	Website: 29-34, 35-43 Interview: 18-19, 20-22
Supporting Hypotheses		
Ho 3.1	Organizations where reported formal risk planning efforts are implemented have the same reported project success rates as those organizations where reported formal risk planning practices are weak.	Website: 18, 19, 24, 26, 31, 32, 33, 34, 35 Interview:
Ha 3.1	Organizations where reported formal risk planning efforts are implemented have higher reported project success rates than those organizations where reported formal risk planning practices are weak.	Website: 18, 19, 24, 26, 31, 32, 33, 34, 35 Interview:
Ho 3.2	Organizations that report monitoring risks rigorously have the same reported project success rates as those organizations that do not.	Website: 28, 29, 31, 32, 33, 34, 35 Interview:
Ha 3.2	Organizations that report monitoring risks rigorously have higher reported project success rates than those organizations that do not.	Website: 28, 29, 31, 32, 33, 34, 35 Interview:

Major Research Question 1 and its supporting hypotheses explore the extent to which the implementation of generally-accepted risk planning practice is dependent upon support and encouragement from senior management and the relationship - if any - between this support and the implementation of effective risk management planning and practice.

Major Research Question 2 and its supporting hypotheses explore the extent to which generally accepted project execution (risk response planning and risk event handling) practice is dependent upon good project execution and the relationship between this and the number of reported project workarounds.

Major Research Question 3 and its supporting hypotheses explore the extent to which generally-accepted risk management practice (risk management planning, risk response planning and risk event handling) is associated with the reported project success rate of an organization as measured by the triple constraint, customer satisfaction and early project termination.

The Interview Process

Fetterman (1989) states, "The interview is the ethnographer's most important data gathering techniques." [1] In this spirit, the structured interviews served as a method to obtain expanded and detailed interview data from respondents. Lincoln and Gupta (1985) and Fetterman (1989) identify twelve (12) procedures for qualitative research interviews. [2] [3]

A list of these procedures and how this research complied with them follows in Table 3-3 below:

Table 3-3 The Interview Process	
Procedure	**How Followed**
Deciding on whom to and whom not to interview	Only Risk SIG members who had not participated in the web survey cohort were interviewed.
Preparing for the interview	An open-ended survey questionnaire prepared and pre-tested.
Initial moves and grand tour questions	A basic grand tour question was asked about the respondents risk management experience.
Respect for the culture of the group under study	As a Risk SIG member the researcher was respectful of the PMI Risk SIG members
Respect for the person being interviewed	Same as above
Acting in a natural manner	The interview was conducted by telephone
Asking the same question in several different ways	This was not attempted due to the limited time available.
Asking the interviewee to repeat the interviewers questions	Same as above
Maintaining control of the direction of the interview	The open-ended survey questionnaire was followed, ensuring control of the interview
Pacing the interview	The researcher directed the interview process to ensure a good pace.
Using silence	This was used occasionally.
Terminating the interview and gaining closure	Once the survey instrument was completed, the process terminated naturally.

Of the twelve (12) procedures described in Table 3-3 above, all but two steps – the repeating of questions by either the researcher or interviewee – was used. Questions were not repeated due to time constraints because the interview needed to be as short as possible for the survey respondents.

The Survey Instruments

This research study used two survey instruments:

- A close-ended question version, which was administered to the sample population at a website. (See Appendix 4 for the instrument and Appendix 5 for the Web Survey Invitation Letters.)
- An open-ended question version, which was administered by structured telephone interviews to a randomly selected group of respondents who did not participate in the website survey.

Each version of this survey instrument was organized into seven sections:

1. Respondent Professional Information
2. Respondent Employing Organization Information
3. Senior Management Support Level for Project Risk Management
4. Project Risk Management Practices
5. Project Risk Response Planning and Risk Event Handling Experiences
6. Project Management Result Experiences
7. Personal Experiences in Project Risk Management (optional)

The respondent professional information and employing organization information questions were identical for each survey instrument both in terms of question wording and sequence.

The purpose of the close-ended website questionnaire was to ask for data on the project risk management constructs listed in the research model section above. The data are in the form of a combined five-point cardinal-ordinal scale. This data made possible analysis on possible statistical correlations between the four research constructs using descriptive statistics, Chi-square and contingency table analysis.

Chi-square analysis was chosen as one of the tools of statistical analysis because most of the variables studied were: nominal scale data, represented as raw data (numbers), independent of each other, and the response numbers adequate in volume. However, as mentioned earlier the sample was not a probability sample as the respondents volunteered to participate in the survey following receipt of an electronic mail invitation. Although it is problematic to use this statistical tool due to the absence of a probability sample, the respondents are representative of the general membership of the Risk SIG. Their composition is comparable to the general membership profile generated in the Risk SIG 1999 membership survey with respect to: years project management experience, education level; project management position; industry background; geographic area of work; and, current membership in the Risk SIG. Finally, chi-square analysis is not the only statistical tool being used in the data analysis.

The purpose of the open-ended structured interview questionnaire version was to allow participants to interpret each question. Thereby creating additional research opportunities for the study through the interview data generated (Fetterman 1989). [4]

This qualitative data was analyzed using content analysis techniques.

These questionnaires were developed over a nine-month period through a series of pre-tests with risk management experts and project management professionals. The specific pretests were:

- Senior officers of the Project Management Institute's Risk Management SIG (Specific Interest Group) and the Association of Project Management-United Kingdom Risk Management Specific Interest Group
- The Dean of the University of Management and Technology located in Virginia, USA
- Three field pre-tests (of the website survey instrument only) with project management professionals participating in graduate-level project management education in China.

The insights gained from this series of pre-tests were significant:

- The original version of the website survey instrument included 96 questions. After substantial criticism by outside experts as well as participants in the pre-testing effort, the questionnaire was reduced in length to only 45 questions.
- The original version of the structured interview survey questionnaire included 26 questions. This survey instrument was 22 questions long out of which the first 13 questions mirror the website survey instrument by asking basic demographic data and the remaining 9 questions are open-ended questions.

As described in Table 3-4 below, there were seven sections of questions in each survey instrument:

Table 3-4
Components of the Survey Instruments

Questionnaire Section	Purpose
Respondent Professional Information	To serve as fixed variables to be held constant for analysis of the responses to other question categories.
Respondent Employing Organization Information	IBID
Senior Management Support Level for Project Risk Management	To assess the role of perceived senior management in organization project risk management practices.
Project Risk Management Practices	To learn what risk management practices organizations are using during project selection, impact analysis and planning.
Project Risk Response Planning and Risk Event Handling Experiences	To learn how well organizations conduct risk response planning and then monitor and handle actual risk events in relation to project performance.
Project Management Result Experiences	To learn what types of success organizations have experienced in relation to the Triple Constraint and customer satisfaction.
Personal Experiences in Project Risk Management (optional)	To allow respondents to provide additional interview data or to expand upon answers made in the earlier six sections.

The Sample Frame

The sample frame for both the survey pre-test and actual data collection were members of the Project Management Institute's Risk Management Specific Interest Group (Risk SIG). In addition, the initial pre-test population sample frame consisted of two categories of project management experts: Senior officers of the PMI® Risk management SIG and a senior officer of the Association for Project Management – United Kingdom Risk Specific Interest Group.

As introduced in Chapter 2, The Project Management Institute (PMI®) was established in 1969 and is headquartered in New Town Square, Pennsylvania – a suburb of Philadelphia. PMI® is the world's leading project management professional association – although it is not the only such project management professional organization in the world. Some of the organizational objectives of PMI® are to foster project management professionalism, advance the quality and scope of project management; and - importantly with respect to this research inquiry - collaborate with universities and other educational institutions to encourage appropriate academic and industrial research in the field of project management.[5]

Specific Interest Groups (SIGs) are an important part of PMI's® attempts to improve on the quality and scope of project management. Because of its important role in learning about and sharing generally accepted best practices in the field of project risk management, the sample frame for this research survey is confined to the PMI® Risk Management Specific Interest Group.[6] The membership of the PMI® Risk SIG represents project management professionals who are interested in and –to the extent that their official duties permit – active in the promotion and sharing of project risk management practices. Thus, this population group was considered to be the best community of project management professionals who could provide valuable data on the state of the discipline of project risk management.

Fetterman (1989) states that there are two approaches in deciding how to sample members of a target population (e.g. practitioners of project risk management):

- Choose who and what not to study. "…[T]he decision is not who [to] admit, but who must [be] reject[ed] – given all the people who qualify. …The researcher must filter out those sources of information that will add little to the study."
- Select who and what to study – that is, the sources who will most help to understand life in a given community.[7]

As discussed in Chapter 2, the operational definition of project risk and the project risk management model are provided by the Project Management Institute publication *A Guide to the Project Management Body of Knowledge*. In view of these operational definitions, the sample population for this study must be aware of and comfortable with the terminology contained in the survey instruments. Otherwise, they would not be able to answer the questions accurately. Given this requirement, the PMI Risk Management Specific Interest Group represented the best source of data on the current state of project risk management practices as related to the *PMBOK® Guide*. As a group of self-selected members of an organization dedicated to studying, understanding and promoting the practice of project risk management; this population was already interested in project risk management issues and practices. What they report in the survey instruments can infer to represent the state of the project risk management discipline.

The Pre-test Survey

The pre-test of the survey instrument and survey website was conducted over three months from December 2001 through June 2002. The sample frame for the pre-test was the current senior leadership of the Project Management Institute Risk Management Specific Interest Group, and the Dean of the University of Management and Technology in Virginia, USA. [8]: The PMI® Risk SIG officers are part of the general survey population and they "...are excellent sources of information and important sounding boards for [the survey instrument]..." (Fetterman 1989). [9] "...on the basis of their expertise in areas relevant to the research..." (Marshall and Rossman 1995). [10] In addition, the PMI® Risk SIG shared the survey instrument with their counterparts in the Association for Project Management- United Kingdom Risk Specific Interest Group.

Fetterman (1989) states that asking the right question is the key to having a valid survey instrument. He adds "The best way to learn how to ask the right questions – beyond the literature search and proposal ideas – is to go into the field and find out what people do day to day." [11] Therefore, pre-testing the senior officers of the Project Management Institute Risk Management Specific Interest Group was done to validate and refine the research questions, the research methodology, the survey instruments and the survey website before conducting the surveys of the general membership. The first pre-test with the PMI® Risk SIG officers was conducted through both the electronic mail transmission of the survey instrument and follow-up electronic mail correspondence to obtain feedback on the research instrument.

The second pre-test conducted by the Dean of the University of Management and Technology (UMT) took place prior to the field-testing of the instrument with UMT students in China.

As a result of these two pre-tests, the website survey instrument length was reduced from 96 questions to 51 questions and then later to 37 questions. This streamlining of the instrument resulted in a more respondent-friendly instrument that encouraged a higher response rate. Additionally, the wording of some of the retained questions was refined and then refined again to more accurately describe the data sought.

Although the original research intention was to conduct a formal pilot test, the nature of the sample frame resulted in this activity occurring as a field test of the survey instrument. The basic constraints of the sample frame for the proposed pilot tests were cultural considerations - no respondents reported any unhappy customers or project failures which is not realistic - and their lack of fluency with project risk management terminology - they were project management students albeit with a great deal of practical project management experience.

This field-test (final pre-test) was conducted by the researcher in-person – with a Chinese language interpreter to clarify the survey questions and instruction – to three groups of Chinese project managers who were students of UMT: one in Beijing and the other two groups in Shanghai. Twenty-one persons completed the survey instrument in Beijing and another fifty-two persons completed the instrument in Shanghai for seventy-three respondents. The field tests took place at the end of project management training courses conducted by the researcher.

The respondents were invited to participate in the survey and told that their participation was entirely optional, voluntary and anonymous. The field-test methodology consisted of the researcher reading the questions to the sample population in English followed by the Chinese translation. A minute or two of silence followed during which time the respondents recorded their reply to the question.

The result of this field test was improved construction of the website survey instrument with respect to both question sequence and wording.

The website that holds the survey instrument were pre-tested a third time by senior PMI® Risk SIG officer Dr. David Hulett following the China field tests. This final pre-test ensured well-worded questions and answer options to control for biased responses and inconsistency between *PMBOK® Guide* terminology and the terminology used in questionnaires, as well as to ensure survey data useful to both this research and the Risk Management SIG.

Survey Administration

As indicated above, the sample population for this research was the general membership of the Project Management Institute Risk Management Specific Interest Group members (PMI® Risk SIG). The survey process consisted of two separate phases each with its own survey instrument:

- A website survey of the entire membership of the PMI® Risk SIG 1,572 persons;
- A structured telephone interview survey of 12 PMI® Risk SIG members who did not participate in the website survey.

A more detailed description of these survey phases follows:

- **Website Survey:** The website administered survey used the web survey site of George Washington University. The survey instrument was uploaded onto this web site and a hyperlink web address generated for communication to the sample frame. The responses were compiled by the web site and the results exported to *MS Excel* for further statistical analysis in *SPSS™*. (See Appendix 5 for survey invitation letter). This online website based survey instrument consisted of pre and field-tested close-ended questions and was made available to 100 per cent of the 1,572 members of the PMI® Risk SIG. (See Appendix 4 for survey instrument)

- **Structured Interview Survey:** A structured telephone interview of 12 PMI® Risk SIG members who did not participate in the website survey in order to obtain more detailed interview data. (See Appendix 8 for survey instrument) (See Appendix 7 for survey invitation letter).

Survey responses to the website survey were accepted during a four-month period commencing in early October 2002 and closing in early February 2003. The structured interviews commenced in early December 2002 and ended in late March 2003.

Data Collection

During this research inquiry, data was collected in the following ways:

- Electronic forwarding of the survey cover letter directing survey participants to either the online survey instrument or inviting them to participate in the telephone survey.
- Tabulation of the results in a spreadsheet format
- Structured telephone interviews of 12 SIG members not participating in the web survey.
- Tape recording of the interviews
- Submission of the recordings to *Beta Court Reporters,* for professional transcription.
- Receipt of the hard (paper) and electronic copies of the interview transcripts
- Programming of the electronic interview transcripts into a file using the *Ethnograph* ™ software application to identify the emerging themes from the interview data.
- Cross analysis of the qualitative data generated from the website survey and the *Ethnograph* ™ software.
- Descriptive statistical reports using frequency charts and tables.
- Chi-square and contingency table analysis of the research questions and supporting hypotheses based on website survey data using the *SPSS* ™ statistical software application.

Data Analysis

This was not a probability sample since the respondents were self-selected as opposed to randomly selected. Therefore, initial data analysis consisted of descriptive statistics using frequency charts and tables to ensure that the sample was representative of the overall Risk SIG membership population. Criteria used to determine representativeness included data on respondent personal, professional and industry background traits aside from current membership in the Risk SIG. (See Chapter 4 Survey Demographics for more information on these results.) *Pearson's Chi-square analysis* was used to test the statistical significance of the relationship between any two pair wise variable combinations examined. The decision rule was set at the 95% confidence level in order to test the null hypotheses of this research. Thus, any Chi-square probability of $\leq .05$ led to a rejection of the null hypothesis. This level of significance was chosen as most social scientists use 5% to balance the likelihood of Type I and Type II errors. [12]

However, chi-square analysis was only one of a series of analytical tools used to explore and analyze the data generated by the web survey. The other analytical tools used were:

- Basic descriptive statistics using histograms and tables to profile the individual respondents and their organizations as per the data generated in survey sections I and II (See samples below);

- Contingency table analysis to analyze how the responses to specific questions correlate to other questions with respect to the three research questions and their supporting hypotheses;
- Content analysis of the structured interview transcripts using *Ethnograph*™ in order to identify underlying and emerging themes in the responses. (Specifically, content analysis relies on classified 'sign-vehicles', which are defined by Janis (1965) as being any word or phrase that signifies some meaning in the context of an interview.) [13]

In summary, a number of analytical tools were used to identify correlation among the variables studied. Because using chi-square statistical significance rules only was problematic due to external validity concerns, substantive decision rules were used to decide on what conclusions to draw from the research. As examples, the presence of a positive or inverse relationship between pair wise variable combinations, and the comparison of frequency rates between different variables.

As indicated in Table 3-5 below, the web survey questionnaire will collect nominal, cardinal-ordinal and interval data with the majority data being nominal – thus, the use of chi-square and contingency table analysis for the initial exploratory data analysis.

Table 3-5 Data Category Types				
Survey Section		Data Category Types		
Part	Title	Interval	Cardinal-Ordinal	Nominal
I	Respondent Professional Information	3	0	3
II	Respondent Employing Organization Information	0	1	2
III	Senior Management Support Level for Project Risk Management	0	3	5
IV	Project Risk Management Practices	0	3	10
V	Project Risk Response Planning and Risk Event Handling Experiences	0	3	3
VI	Project Management Result Experiences	0	9	0
VII	Personal experiences in Project Risk Management	0	0	0
Total	**Four (4) sections**	**3**	**19**	**23**

Computer Use in Data Analysis

As introduced in Chapter 1, the data generated from the website survey were analyzed using the SPSS™ software; and, the data from the structured interviews were analyzed using the *Ethnograph*™ software. The *SPSS* ™ statistical software application was used to conduct statistical analysis of the generated research question and supporting hypotheses. The software produced all the chi-square results, contingency tables, and histograms needed to illustrate any statistical relationships found in the research data. The software application *Ethnograph*™ was used to assess the frequency of the responses provided by the survey respondents in order to assess what underlying themes emerge from the data collected. Additional reporting devices such as charts and graphs are also possible with this software application. In this research these charts and graphs have been used to show the cross-sectional relationships between the fixed variables used (*e.g.,* demographic data on the individual respondent and the respondent's organization) and the questions asked on risk management and risk handling.

Limitations of the Study

The limitations of the study consist of two main categories of threats either of which had the potential to question the findings of a research study and make difficult any general conclusions. These threat categories are internal validity threats and external validity threats (Campbell and Stanley 1963). [14] The next two sections discuss how these two categories of validity threats relate to this research.

Internal Validity of the Study

Internal validity of a research study is described as the effect of research procedures and tools on the generation of valid and reliable results from the population surveyed or tested (Campbell and Stanley 1963), (Lincoln and Gupta 1985), (Patton 1990), and (Fraenkel and Wallen 1993). [15] [16] [17] The above authors have identified thirteen variables or factors by that can adversely affect the generation of valid and reliable research data. These variables, (threats), and how they relate to this research inquiry are discussed in descending order of their threat level.

- *Selection*, Various bias threats that result from the differential selection of respondents for the comparison groups (Campbell and Stanley 1963). [18] These include: selection bias or subject characteristics could be a problem, as this research inquiry used the purposeful sampling of PMI® Risk Management Specific Interest Group members (PMI® Risk SIG) as its sample frame. This was a threat as the people who responded to the survey already had an automatic interest in the subject matter given their membership in the PMI® Risk SIG.
- *Recall*, this validity threat refers to how valid and confirmable is the data obtained from the respondents (Lincoln and Gupta 1985). [19] The threat of respondent recall was considered a problem for survey participants who have not had much recent project risk management experience.
- *Response bias* for the website administered survey was potentially an issue if only a few PMI® Risk SIG members responded to the invitation to participate in the survey.
- *Reactivity* that is also referred to as the *Observer Effect, Observer Bias*, and *Observer Expectations* threats that refer to the effect of the observer, his ideas and expectations on the study subject behavior and interpretation of study subject responses (Fraenkel and Wallen 1993). [20]. These threats include reactivity or the attitude of respondents to the survey both in terms of its importance to them personally, professionally or otherwise (personal convenience or inconvenience in participating in the survey. [21]) This was a possible threat in so far as the role of the PMI® Risk SIG in endorsing the survey and encouraging participation from the

SIG membership could affect participant responses as the research may be seen as a SIG activity – which is not entirely true.

- Location threat [22] is a potential problem since the PMI® Risk SIG has endorsed this survey and encouraged participation from the Risk SIG membership.

External Validity of the Study

External validity of research is defined as how representative (generalizable) the research results and conclusions are of the wider general population (Campbell and Stanley 1963) [23], and as how transferable the conclusions of the study are to other operational settings (Lincoln and Gupta 1985) [24]. Additionally, Fraenkel and Wallen (1993) argue that generalizations by the researcher are the chief external validity threat to the credibility and reliability of a qualitative research study as it is the practitioner, not the researcher, who determines the relevance of the study's findings and conclusions. [25]

This study is potentially affected by the external threat of generalizability or transferability of the information collected from members of the Project Management Institute Risk Management Specific Interest Group (PMI Risk SIG). There are two dimensions to this threat:

The primary dimension is: how representative of the general project management profession are the project risk management experiences of a population group already interested and sensitive to risk in a project management setting? Or, to put it another way: how would project managers not so interested in project risk management respond to the same survey? This latter question is a good field for further follow-on research and is being seriously considered by the researcher.

The secondary dimension is: How representative of the general membership of the Risk SIG are the respondents to the web site and structured interview surveys? Or, to be more precise, what would the non-responding Risk SIG members report if they had answered the survey questionnaire?

Control Measures Taken

The researcher undertook a number of control measures to control for the validity threats described and discussed above. However, in the case of a few threats, *e.g.*, selection and generalizability the threat was accepted given the nature of the sample frame being used in this research. The specific control measures taken follow below.

- *Selection Bias* was the most serious threat as the respondents were all self-selected as members of the PMI® Risk Management SIG. This threat was accepted as unavoidable.
- *Recall* was potentially a threat, as some respondents may not remember the details of their most recent risk experiences. Limiting reporting of project risk experiences to the period since January 1, 2000 greatly reduced the probability and impact of this threat.

- *Response Bias* was controlled for in two ways: sending out three reminder invitations and extending the survey duration from 2 to 4 months.
- *Reactivity* was a threat to the extent the respondents saw this survey as an exclusively Risk SIG activity. This threat was controlled by clearly identifying this as a doctoral dissertation-related research study that the Risk SIG had endorsed.
- *Location threat* was controlled by clearly identifying this as a doctoral dissertation-related research study that the Risk SIG had endorsed. Hyperlinks to The George Washington University's survey web site and the research advocate web site were inserted in the invitation electronic mail messages and on the Risk SIG World Wide Web Home Page.
- *Interaction-selection-experimental variable or, transferability*, given the nature of the pre-selected sample frame, it was not possible to control for this external validity threat.

Table 3-6 below provides an overview of the threats to this research and what specific measures were taken to control for these threats.

Table 3-6 Control Measures for all Relevant Internal and External Validity Threats		
Validity Threat		**Control Measure(s) Taken in this research inquiry**
Internal Threat to Validity		
Selection Bias	This threat was accepted as unavoidable.	
Recall	Limiting reporting of project risk experiences to the period since January 1, 2000 controlled this threat.	
Response Bias	Sending out three reminder invitations and extending the survey duration from 2 to 4 months controlled for this threat.	
Reactivity	This threat was controlled by clearly identifying this as a doctoral dissertation-related research study that the Risk SIG had endorsed.	
Location threat	This threat was controlled by clearly identifying this as a doctoral dissertation-related research study that the Risk SIG had endorsed via hyperlinks.	
External Threat to Validity		
Interaction-selection-experimental variable or, transferability		This threat was accepted as unavoidable.

The telephone interview survey respondents served as a means for identifying any underlying and emerging themes in the responses. The interview data obtained from these interviews further knowledge on actual project risk management experiences.

Reliability of the Study

This research used two survey instruments that were pre-tested and field-tested. The pre-tests were conducted with a small group of experts in the field of project risk management. These experts provided quality feedback on both the content and structure of the instruments. Results from the final field-test in China indicate that this expert opinion feedback improved the reliability of the survey instrument in collecting accurate data on the risk management practices of the sample population – the general membership of the PMI® Risk Management Specific Interest Group.

Conclusions

To summarize, the following points can be made about this research study: This was an exploratory descriptive cross-sectional survey to determine the existence of any statistical correlation between the four constructs related to the Project Risk Management dynamic studied.

The membership of the Project Management Institute Risk Management Specific Interest Group was used as the sample population. The research consisted of two interrelated surveys: a website survey using close-ended questions; and, structured interviews using open-ended questions. The pre-test survey phase provided quality feedback on both the survey instrument and survey protocol to refine each before the actual surveys commenced.

Statistical correlations between the major research questions and the supporting hypotheses were analyzed using Chi-square, contingency table, and content analysis.

The researcher controlled for most of the identified internal and external validity threats by following the research and interview protocols discussed above, namely, to ensure a standardized and disciplined approach to the website survey and telephone interview surveys.

Given the nature of the pre-selected sample frame, it was not possible to control for the external validity threat. However, the findings simply cannot be interpreted to represent the risk management experiences and practices of the wider project management professional community. However, the data can be used to discern the likely experiences of the general Risk SIG membership given the 14% response rate, which is slightly above normal for such voluntary surveys of a professional society membership. (See Chapter 4 for a further discussion of this point.)

Chapter 4 describes and discusses the profile of the individual respondents and their organizations in both the website and telephone surveys.

Endnotes

---

[1] Fetterman, "Ethnography: Step-by-Step," *Applied Social Research Methods Series* Volume 17: page 47.

[2] Yvonna S. Lincoln and Egon G. Gupta, *Naturalistic Inquiry*, Sage Publications, Beverly Hills, CA, 1985: pages 269-271.

[3] Fetterman: pages 55-57.

[4] IBID: page 54.

[5] William R. Duncan, Director of Standards, The Project Management Institute Standards Committee, *A Guide to the Project Management Body of Knowledge*, Project Management Institute, Newtown Square, Pennsylvania, 2000: Back inner sleeve.

[6] www.pmi.org/about/

[7] Fetterman: page 42.

[8] www.risksig.com/officers/hulett.htm

[9] Fetterman: pages 58-59.

[10] Catherine Marshall and Gretchen B. Rossman, *Designing Qualitative Research*, Second Edition, Sage Publications, Thousand Oaks, CA, 1995: page 83.

[11] Fetterman: page 43.

[12] North Carolina State University Raleigh, North Carolina. Syllabus for PA 765: Quantitative Research in Public Administration G. David Garson, Instructor. Located at: http://www2.chass.ncsu.edu/garson/pa765/signif.htm

[13] I.L. Janis, "The Problem of Validating Content Analysis." In *Language of Politics*, ed. H.D. Lasswell, N. Leites, and Associates, 42-67. Cambridge: MIT Press, 1965: page 55.

[14] Donald T. Campbell and Julian C. Stanley, *Experimental and Quasi-Experimental Designs for Research*, Houghton Mifflin Company, Boston, MA; 1963: page 5.

[15] Campbell and Stanley, *Experimental and Quasi-Experimental Designs for Research*: page 5.

[16] Lincoln and Gupta, *Naturalistic Inquiry*: pages 295-296, and 300.

[17] Fraenkel, Jack R., and Wallen, Norman E., *How to design and evaluate research in education*, McGraw-Hill, Incorporated, New York, New York, Second Edition, 1993: pages 401-402.

[18] Campbell and Stanley, *Experimental and Quasi-Experimental Designs for Research*: page 5.

[19] Lincoln and Gupta, *Naturalistic Inquiry*: page 300.

[20] Fraenkel and Wallen, *How to design and evaluate research in education*: pages 401-402.

[21] IBID: pages 228-229.

[22] Fraenkel and Wallen, *How to design and evaluate research in education*: pages 224-225.

[23] Campbell and Stanley, *Experimental and Quasi-Experimental Designs for Research*: pages 5 - 6.

[24] Lincoln and Gupta, *Naturalistic Inquiry*: pages 297-298.

[25] Fraenkel and Wallen, *How to design and evaluate research in education*: pages 402-403.

CHAPTER 4
SURVEY DEMOGRAPHICS

Introduction

As introduced in Chapter 1 and Chapter 3, this chapter discusses the demographics for both the web survey and the telephone survey. Included is a description of how each survey was administered, the profiles of both the individual respondents and their organizations for each survey and a comparative analysis of both survey samples using descriptive statistical analysis to determine if the demographic profiles of the two samples are compatible with each other.

Web Survey Administration

As introduced in Chapter 3, the website administered survey used the web survey site of The George Washington University. The survey instrument was uploaded onto this web site and a hyperlink web address generated for communication to the sample frame in the electronic invitation message. The survey commenced on 10 October 2002 and closed on 9 February 2003. After the initial electronic mail invitation message to participate in the survey was sent out on 10 October, there were three follow-up electronic mail reminder messages: October 31, November 24, and January 15, 2003. Each message discussed the purpose, confidentiality and duration of the survey. Included in each message were hyperlinks to the survey website and a biographical brief on the researcher located on the home page of the dissertation advocate. (See Appendix Number 5 for copies of all electronic mail invitations and Appendix Number 9 for the researcher biographic brief.) Thus, each recipient could immediately access information on the researcher, his research director and the actual survey questionnaire. In order to further publicize the research survey, the Risk SIG Home Page included a link to brief description of the survey and hyperlinks to the researcher biographical brief and survey web site. (See Appendix number 9 for copies of these Risk SIG website pages). This home page link was uploaded on 24 November 2002.

Respondent feedback indicated that completion of the survey questionnaire required on average 15 to 20 minutes per respondent. This figure was consistent with the field test results generated by the researcher during the field test phase of the research inquiry.

After the close of the 120-day survey data collection period, a total of 176 responses had been received. The monthly response breakdown is found in Table 4-1 below:

Table 4-1

Web Survey Sample Responses

(By month)

Month/Year	October 2002	November 2002	December 2002	January 2003	February 2003
Number of Responses	64	65	7	39	1

The peak month for responses was November 2002. The largest number of responses was received after the first reminder message on 31 October 2002. The second reminder message on November 24 did not generate many responses due, perhaps, to the Thanksgiving holidays in the United States and the upcoming Christmas and New Years holidays in North America, Australasia and Europe. The third reminder message, on January 15, 2003, was very productive, with 40 responses.

Although a total of 176 responses were received over the course of the survey, one response could not be accepted. This lone rejection was an anonymous respondent who did not agree to the informed consent question at the beginning of the survey. (This response was received in December 2002.) Thus, 175 web survey responses are available for data analysis.

Finally, the researcher sent personal thank you messages to all respondents who left an electronic mail address. Of the 175 survey respondents, a total of 103 persons left their name and a contact address. At the close of the web survey data collection period, the researcher sent out a final message to the Risk SIG membership thanking all respondents for their time, responses and any anecdotal data, advice or suggestions received. (See Appendix number 10 for a copy of this message.)

Web Survey Response Rate

The overall membership of the Project Management Institute Risk Specific Interest Group (PMI® Risk SIG) as of 1 January 2002 was 1,572 persons. [1] At the beginning of January 2003, the new SIG membership total stood at 1,485 persons representing both new and renewed members. [2] However, this new membership total was not reflected in the SIG electronic mail address list serve until early February 2003 - after all the electronic mail communication between the researcher and the Risk SIG membership had ended.

According to the SIG electronic mail address list-serve administrator, approximately 90 percent of the overall membership was on the list serve. (The actual number cannot be provided due to proprietary reasons.) Thus, the estimated number of electronic mail addresses receiving the initial invitation and follow-up reminder messages is approximately 1,415 persons – or 90% of the 1,572 members of record at the survey commencement.

The University of Michigan Survey Research Institute reports that a typical electronic mail address list can expect a defunct address rate of 10 percent for addresses younger than six months and 15 percent for addresses one year or older. . [3] On the basis of a 15% defunct rate, approximately 212 electronic mail addresses were defunct at the time of the initial invitation and all three follow-up reminder messages. Thus, a total of 1,203 Risk SIG members, (85% of the estimated 1,415 members on the electronic list serve), are estimated to have actually received the electronic communication inviting them to participate in the web survey.

In view of the above population sample stratification from overall membership list to list serve to actual active e-mail addresses; the overall web survey response rate was 14.5% (or, 175 actual responses out of 1,203 possible responses). According to the University of Michigan Survey Research Institute, a typical voluntary web survey of a professional society can expect a response rate of 10 percent. [4] Thus, the web survey met and exceeded this expected response rate.

Two factors emerged during administration of the web survey that can explain why more responses were not received: incompatible respondent professional experiences, and web site technical problems.

Four electronic messages were received from Risk SIG members who concluded that their professional experiences as project risk management consultants, trainers or educators made it difficult, if not impossible, for them to answer the survey questionnaire. As a result these Risk SIG members did not participate in the web survey. It is not known how many other Risk SIG members did not complete the survey questionnaire for the same reason.

Three electronic mail messages were received from members describing technical difficulty in completing the web survey questionnaire. Specifically, they reported that when they tried to submit their survey questionnaire, the survey web site would send an error message communicating that their survey was incomplete. Upon browsing back from that message, these respondents found the survey instrument blank, requiring them to complete the entire questionnaire a second time. Although the three respondents reporting this technical problem eventually did successfully submit completed questionnaires, it is not known how many other SIG members gave up trying to submit their questionnaires due to this technical issue.

Telephone Survey Administration

The telephone survey commenced on 10 October 2002 and closed on 28 February 2003. Each electronic mail message inviting and reminding the Risk SIG membership to participate in the web survey included an information on and invitation to participate in the telephone survey. SIG members were invited to send an electronic mail message to the researcher identifying them and indicating their interest in the telephone survey. In reply the researcher sent each prospective interviewee a message that discussed the purpose, confidentiality and need to tape record the telephone interview. (Permission to tape record each interview was a requirement under Maryland State law, the home state and the location of the respondent during all 12 interviews.) Attached to each electronic message was a folder that contained both the survey informed consent form and the survey questionnaire. Finally, the electronic message asked every prospective interviewee to confirm his consent to participate in the survey, have the interview tape recorded and provide a date, time and telephone number for conducting the interview. (See Appendix Number 6 for the informed consent form Appendix Number 7 and for copies of the generic electronic mail invitation.)

A total of 12 telephone interviews were conducted. Table 4-2 displays the monthly response breakdown.

Table 4-2
Telephone Survey Sample Responses
(By month)

Month/Year	October 2002	November 2002	December 2002	January 2003	February 2003
Number of Responses	0	0	2	6	4

Comparative Analysis of the Survey Respondents

The sample populations from the web survey and the telephone survey were analyzed using descriptive statistics. Descriptive statistics were used to show how each sample population compared to one another in terms of their statistical mean, mode, median and range as related to the following data categories: number of (respondent) project experiences, number of (respondent) years project management experience, project budget range, and organization revenue (or annual budget) level. Finally, these data are comparable with the same for the 1999 Risk membership survey.

Respondent Description

As introduced in Chapter 2 and discussed in Chapter 3, both survey instruments used in this research had identical questions on respondent background. These questions were identified from the 1999 membership survey conducted by the Risk SIG. (See Appendixes number 4 and 8 for copies of each survey instrument.) Six questions asked for data on the professional background of the respondent:

- Question 1: How many projects have you worked on since 1 January 2000 (01/01/00)?
- Question 2: What is the budget range of the projects you have been involved with since 1 January 2000 (01/01/00)?
- Question 3: What was the most recent calendar year in which you were involved in project risk management?
- Question 4: Your role in your employing organization?
- Question 5: Years of project management experience:
- Question 6: What is the highest academic degree that you have earned?

The breakdown of the respondents to the web survey by each question follows:

Question 1: How many projects have you worked on since 1 January 2000 (01/01/00)?

A review of the data for question number 1 concerning the number of projects worked on since 1 January 2000 indicates a close resemblance in the basic descriptive statistics between the web and telephone surveys. As indicated in Table 4-3 below, the Mean, Mode and Minimum data points are very close to one another: The means telephone/web are 16 versus 17.2 projects; the modes 3 versus 5 projects and the minimums 3 versus 5 projects. With respect to the Median and Maximum points, there is greater contrast: 12 versus 6 projects in the case of the median number of project and, 100 versus 500 projects in the case of the maximum. This gap can be explained by the fact that the size of the two data sets is vastly different: 12 data points for the telephone survey versus 175 data points for the web survey.

Table 4-3
Number of Projects worked on since 01/01/00

Telephone Survey	Statistical Parameter	Web Survey
16	**Mean**	17.22285714
100	**Maximum**	500
6	**Median**	12
6	**Minimum**	1
3	**Mode**	5
3 - 100	**Data Range**	1 - 500

Question 2: What is the budget range of the projects you have been involved with since 1 January 2000 (01/01/00)?

Web survey responses were provided in a number of currencies: United States Dollars, Australian Dollars, New Zealand Dollars, Canadian Dollars, British Pounds Sterling, Euros, and Swiss Francs.

The data range for annual project or budget levels was between US $10,000 and British Pound 4.5 billion. However, due to the difficulty in exchange rate conversion, this data will not be discussed in further detail.

Telephone survey responses were provided in either United States Dollars or Euros. The data range was between US $10,000 and British Pound 4.5 billion. Due to the difficulty in exchange rate conversion, this data will not be discussed in further detail.

Question 3: What was the most recent calendar year in which you were involved in project risk management?

With respect to question 3 on the most recent year of project risk management experience, all telephone survey respondents reported having experience within a month prior to the interview – regardless of calendar year 2002 or 2003. With respect to the web survey 142 respondents (81.1%) reported experiences within 12 months of the survey. The remaining 33 respondents fell into the following response categories: 2001 12 respondents or 6.85%; 2000 5 respondents or 2.8%; before 2000 14 respondents or 8%. One respondent did not indicate the most recent year of their project risk management experience. This data confirms that the reported project risk management practices and reported project outcomes are current for both survey samples, making any conclusions valid at least in terms of time. Table 4-4 below provides more detail on data for this survey variable.

Table 4-4 Most recent year of Project Management Experience		
Telephone Survey	**Year**	**Web Survey**
0	**Before 2000**	14
0	**2000**	5
0	**2001**	12
3	**2002**	138
9	**2003**	4
0	**Not indicated**	1

Question 4: Your role in your employing organization?

With respect to question 4 regarding the role of the respondent in their employing organization, Table 4-5 indicates the following key points: The web survey respondents were more than half project managers whereas none of the telephone survey respondents were. However, all of the respondents in the telephone survey were engaged in project management work. Therefore, although they were not *de jeure* project managers, they were *de facto* project managers. Only 15% of the web survey respondents reported being senior executives in their organizations. Thus, the preponderance of respondents to the web survey (129 web survey respondents or 73.7%) were actually engaged in the management of projects. A total of 3 web survey respondents (2% of the total) reported being risk managers.

Therefore, the respondents in both samples held similar professional positions making their actual project risk management experiences compatible and comparable with one another and the 1999 Risk SIG general membership survey results with a little over 50% of the respondents holding the title project manager in both surveys. [5]

Table 4-5 Official role in Employing Organization		
Telephone Survey Number of Respondents (Percentage of Total)	**Official Role**	**Web survey Number of Respondents (Percentage of Total)**
0	**Project Manager**	96 55%
0	**Project Team Member**	11 6%
5 41.6%	**Other Manager**	19 11%
5 41.6%	**Senior Executive**	26 15%
0	**Risk Manager**	3 2%
0	**Consultant**	7 4%
2 16.8%	**Miscellaneous**	13 7%

Question 5: Years of project management experience:

A review of the data for question number 5 concerning the number of years of project management experience indicates a close resemblance in the basic descriptive statistics between the web and telephone surveys. As indicated in Table 4-6 below, the Mode for both surveys is 20 years of project management experience. The Minimum data points (telephone/web) are close to one another 5 years versus 1 year of project management experience. The means telephone/web are 16 versus 12.8 years of experience. With respect to the Medians and Maximum points, there is greater contrast (telephone/web): Medians of 18 versus 12 years experience and, maximums of 25 versus 35 projects. Once again, this gap can be explained by the fact that the size of the two data sets is vastly different: 12 data points for the telephone survey versus 175 data points for the web survey. These figures are also comparable with the 1999 Risk SIG general membership survey results with both the mean and median parameters being slightly more than 10 years in both surveys. [6]

Table 4-6
Years of Project Management Experience

Telephone Survey	Statistical Parameter	Web Survey
16	**Mean**	12.85714286
18	**Median**	12
5	**Minimum**	1
25	**Maximum**	35
20	**Mode**	20
5 - 25	**Data Range**	1 - 35

Question 6: What is the highest academic degree that you have earned?

With respect to question 6 concerning highest level of academic degree attained, the two survey samples are very similar. As indicated in Table 4-7 below, all telephone survey respondents and an overwhelming majority (95%) of web survey respondents had a higher academic degree. Specific totals varied: 11 web survey respondents had a doctorate whereas no telephone survey respondents had attained that academic degree; 66% (8 respondents) of the telephone survey respondents had a Master's degree whereas only 45% (79 respondents) of web survey respondents had attained this academic degree level. At the Bachelor's level, the two samples were more similar: 34% (4 respondents) of the telephone survey versus 42% (73 respondents) of the web survey had had a bachelor's degree. Finally 8 web survey respondents (5% of the total) had a different educational degree. The responses included technical and high school equivalency degrees. These figures are comparable with the 1999 Risk SIG general membership survey results with over 90% of the respondents having some college education in both surveys. [7]

Table 4-7
Highest Academic Degree attained

Telephone Survey Number of Respondents (Percentage of Total)	Academic Degree	Web survey Number of Respondents (Percentage of Total)
0	Doctorate	11 6%
8 66%	Masters	79 45%
4 34%	Bachelors	73 42%
0	Associate	4 2%
0	Other	8 5%

Organization Description

As discussed in Chapter 2 and Chapter 3, both survey instruments used in this research had identical questions on organization background. These questions were partially identified from the 1999 membership survey conducted by the Risk SIG. (See Appendixes number 4 and 8 for copies of each survey instrument.) Three questions asked for data on the organization background of the respondent's employer. These questions were:

- Question 7: Type of industry.
- Question 8: Annual Revenue (in United States dollars, US$) of your employing organization as a whole (for government respondents, please rate your organization's annual budget).
- Question 9: Geographical regions of your project risk management experiences.

The breakdown of respondent employing organizations to the web survey by each question follows:

Question 7: Type of industry:

With respect to question 7 concerning type of industry for the respondent's organization, the two survey samples are similar. As indicated in Table 4-8 below, all but one of the telephone survey respondents were employed in the private sector. With respect to the web survey respondents, approximately 72% of the respondents were employed in the private sector and 17% in the pubic or international organization sector. A little over 3% of the respondents were employed in the military. The single largest industrial sector was the information and communication industrial sector where 45% of the web survey respondents reported employment. 16% of the web survey respondents reported employment in the manufacturing sector. Finally, 10% of the respondents reported being consultants – this is in contrast to 50% of the respondents to the 1999 Risk SIG membership survey reporting the same. These figures are also comparable with the 1999 Risk SIG general membership survey results with the information and communications sector being the most highly represented (45.1% in this survey versus 50% in 1999). [8]

Table 4-8 Employing Organization Industry (Totals include multiple options)		
Telephone Survey Number of Respondents (Percentage of Total)	Industrial Sector	Web survey Number of Respondents (Percentage of Total)
	Academic Institution	10 5.7%
1 8.33%	Consultant	18 10.3%
	Construction	5 2.8%
	Energy	11 6.3%
	Engineering	11 6.3%
	Environmental	2 1.1%
3 25%	Financial Services	7 4%
1 8.33%	Government	28 16%
	International Organization	2 1.1%
3 25%	Information and Communications	79 45.1%
3 25%	Manufacturing	28 16%
	Logistics	1 .5%
	Marketing	1 .5%
	Medical	2 1.1%
	Military	6 3.4%
	Mining	1 .5%
	Not for Profit, non-academic	1 .5%
	Petroleum	6 3.6%
	Pharmaceuticals	7 4%
	Professional Services	1 .5%
1 8.33%	Social Services	4 2.2%
	Transportation	4 2.2%
12	TOTAL	224 responses from 175 respondents

Question 8: Annual Revenue (in United States dollars, US$) of your employing organization as a whole (for government respondents, please rate your organization's annual budget).

With respect to question 8 concerning annual revenue levels for the respondent's organization, the two survey samples are similar. As indicated in Table 4-9 below, 50% of the telephone survey respondents were employed in organizations that had annual revenues or an annual budget in excess of United States dollars $1 million compared to over 72% (103 respondents). With respect to the web survey respondents, nearly 50% of the respondents (86 respondents) were employed in organizations that had annual revenues or an annual budget in excess of United States dollars $100 million. Four telephone survey respondents (33% of the total) did not report the annual revenue level of their employing organization for proprietary reasons.

Table 4-9 Employing Organization Annual Revenues (or Budget)		
Telephone Survey Number of Respondents (Percentage of Total)	**Annual Revenues (Or Budget) Range**	**Web survey Number of Respondents (Percentage of Total)**
0	**Up to $100,000**	2 1%
1 8.25%	**$101,000 – 500,000**	10 6%
1 8.25%	**$501,000 – $1 million**	21 12%
1 8.25%	**$1.1 – 100 million**	46 26%
1 8.25%	**$101 – 500 million**	22 13%
4 33%	**$1 billion or more**	64 36%
0	**Non-profit without revenue**	2 1%
4 33%	**No answer given**	5 3%
0	**Do Not Know**	3 2%

Question 9: Geographical regions of your project risk management experiences.

With respect to question 9 concerning the geographical regions of the respondents' project risk management experience, the two survey samples are very similar. As indicated in Table 4-10 below, all of the telephone survey respondents had North America and European Union based project risk management experiences. With respect to the web survey respondents, the two geographical regions with the highest number of responses (both combined and exclusive) were also North America and the European Union. This is not surprising since historically, the overwhelming majority of members in the Risk SIG are based in these two regions due to the maturity level of PMI in these parts of the world. Other geographical regions with notable figures (both combined and exclusive) are: Latin America and the Caribbean with 26 responses; Australasia with 21 responses; the Middle East and North Africa 19 responses; South Asia with 16 responses; Sub-Saharan Africa with 11 responses; and, China with 9 responses. Every listed geographical region had at least 2 responses. These figures are also comparable with the 1999 Risk SIG general membership survey results with the overwhelming majority of the respondents having risk management experience in the industrialized world (96.6% in this survey versus almost 100% in 1999). [9]

Table 4-10 Geographical Regions of Project Risk Management Experience (Totals include multiple options)		
Telephone Survey Number of Respondents (All Combined)	Geographical Region	Web survey Number of Respondents (Exclusive/Combined)
	Africa (sub-Saharan)	0/11
	Australasia (Australia, New Zealand, South Pacific)	6/15
	China	0/9
1	East Asia/ASEAN	2/23
	Europe (non EU/CIS)	2/0
8	European Union	16/44
	Former USSR (CIS)	0/7
	Latin America/Caribbean	4/22
	Middle East/North Africa	2/17
11	NAFTA Countries	74/47
	South Asia	0/16
2	Worldwide	2/0
(21)	TOTAL	(108/211)

Conclusions

In conclusion, the two survey samples are compatible with each other. The key determinant factor for participation in either survey was membership in the Project Management Institute Risk Management Specific Interest Group as of the date the survey response was received. All survey respondents met this crucial respondent profile factor. More importantly, the two samples are representative of the general membership of the Risk SIG based on number of years project management experience, professional position, educational background, industry of employment, and geographical area of professional experience – thereby enabling use of chi-square analysis to test statistical significance between the various research variables.

The response rate for the web survey is comparable with other voluntary surveys of professional societies. Therefore, the conclusions reached by this research are made with the caveat that they only represent the reported project risk management practices and project management results of those Risk SIG members both interested in and able to participate in this research.

Finally, in terms of specific data responses, the following points can be made: Nearly all of the respondents were from developed countries and possessed project risk management experience within the previous 12 months of their response. Nearly all respondents had a university degree. The largest group of respondents was employed in the Information and Communications sector. The overwhelming majority of the respondents had project risk management experience in the industrialized world. The median number of respondents had at least 12 years of project management experience. Over 75% of the respondents were employed in organizations that had annual revenues or an annual budget in excess of United States dollars $100 million. Finally, approximately 72% of the respondents were employed in the private sector and 45% of the respondents were employed in the information and communication industrial sector.

The overall profile of the respondents to both surveys is that of private sector project management professionals working in projects located in the industrialized world. Thus, the data they report represents a valuable insight into the current state and impact of project risk management on overall project management results.

Endnotes

---

[1] Project Management Institute, *November 2002 PMI SIG Statistics*, Project Management Institute, Newtown Square, Pennsylvania, 2002.

[2] Project Management Institute, *November 2002 PMI Potential SIG Statistics*, Project Management Institute, Newtown Square, Pennsylvania, 2002.

[3] Terry Adams, Senior Research Associate, Survey Research Institute, University of Michigan, Ann Arbor. Telephone interview conducted by Robert James Voetsch on February 10, 2003.

[4] Adams, Telephone interview conducted by Robert James Voetsch on February 10, 2003.

[5] Risk Management Specific Interest Group, *Demographic Survey of the PMI Risk SIG*, Project Management Institute, Newtown Square, Pennsylvania, October 1999.

[6] Ibid.

[7] Ibid.

[8] Ibid.

[9] Ibid.

CHAPTER 5
WEB SURVEY DATA ANALYSIS

INTRODUCTION

As introduced in Chapter 1 and Chapter 3, this chapter discusses the exploratory data analysis performed on the web site survey sample set. Chi-square analysis was used to identify all statistically significant variables and variable relationships related to the major research questions and their respective supporting hypotheses. The chapter is divided into three parts: Part 1 analyzes the variables related to Major Research Question 1 and its supporting hypotheses; Part 2 analyzes the variables related to Major Research Question 2 and its supporting hypotheses; and, Part 3 analyzes the variables related to Major Research Question 3 and its supporting hypotheses. An interpretation of the results related to research questions 1, 2 and 3 and their supporting hypotheses are found in Chapter 7.

PART 1: RESEARCH QUESTION NO. 1

Introduction

This part discusses the statistical significance of the variables related to research question number 1 and its supporting hypotheses. Major Research Question Number 1 asks: Is there an association between perceived senior management support of risk management practice and implementation of reported project risk planning practices?

The independent variable Perceived Senior Management Support and the intervening variable Reported Project Risk Management Practices relate to Major Research Question Number 1 and its two supporting hypotheses.

Eight survey questions related to the Perceived Senior Management Support variable were included in this analysis. They were:

X_1 Who is the key proponent of project risk management in your organization?

X_2 Does your employing organization have a policy requiring that projects have a risk management plan?

X_3 If yes, in what year did your employing organization initiate a policy requiring that projects have a risk management plan?

X_4 Do you consider your employing organization to be concerned about project risk?

X_5 Does your employing organization work unit have a policy requiring that projects have a risk management plan?

X_6 Does senior management in your organization encourage and reward risk taking in projects?

X_7 Does senior management in your organization discourage the reporting of risks associated with its projects?

X_8 Does senior management in your organization provide adequate money, human resources, and time for the entire process of project risk management (e.g. planning, identification, impact analysis, response planning, and monitoring)?

Nine web site survey questions related to the Reported Project Risk Management Practices (especially planning) intervening variable were included in this analysis. They were:

X_9 Do your project team members obtain training in risk management planning and impact analysis at some point during the project's life?

X_{10} Do your projects use any structured quantitative technique (*e.g.* Monte Carlo simulation, decision trees) when evaluating the merits and demerits of prospective projects?

X_{11} Do your projects use qualitative risk analysis (*e.g.* probability and impact matrix) when evaluating the merits and demerits of prospective projects?

X_{15} During which of the following project phases do your projects have risk identification sessions?

X_{17} Do you use a risk analysis technique to develop a contingency fund for project costs?

X_{19} Do you use a risk analysis technique to develop a contingency fund for project schedule durations?

Chi-square Analysis Decision Rule

Chi square analysis was performed on the data set for the independent variable Senior Management support for Project Risk Management and the intervening variable Project Risk Management Practices. The decision rule was set at 95% confidence interval. Thus, any significance $\leq .05$ will allow a rejection of the null hypothesis.

Supporting Hypothesis 1.1

The first supporting hypotheses for research question 1 are:

- Null Hypothesis (Ho) 1.1: Perceived risk sensitive organizations implement the same amount of reported formal risk management processes as those organizations that are not perceived to be risk sensitive.
- Alternative Hypothesis (Ha) 1.1: Perceived risk sensitive organizations implement more reported formal risk management processes than those organizations that are not perceived to be risk sensitive.

Senior Management Support and Project Risk Management Practices

The results from the analysis of Senior Management Support and Project Risk Management Practices (especially planning) as related to supporting hypothesis number 1.1 is found in Table 5-1 below: All shaded cells represent a statistical significance $\leq .05$ enabling rejection of the null hypothesis with a 95% level of confidence.

Table 5-1
Summary Table of Statistically Significant Chi-square Relationships between Perceived Senior Management Support and Project Risk Management Practices.
(The number in each box is the significance level.)

Dependent Variables	Independent Variables				
	Organization PRM Policy	Organization Concern for PRM	Work Unit PRM Policy	Encourage PRM	Discourage PRM
PRM Training	0.000	0 .000	0 .000	0 .002	0 .146
Use of Quantitative Technique	0 .089	0 .143	0 .343	0 .001	0.074
Qualitative Risk Analysis	0.001	0.000	0.001	0.638	0 .003
Risk ID Sessions during the PLC	0.126	0.099	0.624	0.060	0 .006
Risk Technique for Contingency Costs	0.000	0.025	0.000	0.690	0 .099
Risk Tool for *Contingency Time*	0.000	0.279	0.008	0.154	0 .044

Statistically Significant Relationship	Notable Statistical Relationship	NOT Statistically Significant Relationship

Based on the sample, we can be at least 95% confident that there is a statistically significant relationship between perceived risk sensitive organizations and reported formal risk management practices (especially planning). As indicated in Table 5-1 above, every independent variable has at least two statistically significant relationships with a dependent variable. Similarly, every dependent variable has at least one statistically significant relationship with an independent variable. The following list ranks the independent variables on the basis of the greatest number of statistically significant relationships: Organization project risk management policy, which is statistically significant with four dependent variables; Organization concern for project risk management policy, which is statistically significant with four dependent variables; Work unit project risk management policy, which is statistically significant with three dependent variables; Senior management discouragement for project risk management, which is statistically significant with three dependent variables; and, Senior management encouragement for project risk management, which is statistically significant with two dependent variables.

Thus, the null hypothesis should be rejected and the alternative hypothesis accepted that perceived risk sensitive organizations implement more reported formal risk management processes than those organizations that are not perceived to be risk sensitive. (An analysis of the implications of this alternative hypothesis is found in Chapter 8, Part I.)

Supporting Hypothesis 1.2

The second supporting hypotheses for research question 1 are:

- Null Hypothesis (Ho) 1.2: Organizations that report senior managers providing adequate resources to implement risk management processes implement the same amount of reported formal risk management processes as those organizations that do not report senior managers providing adequate resources.
- Alternative Hypothesis (Ha) 1.2: Organizations that report senior managers providing adequate resources to implement risk management processes implement more reported formal risk management processes than those organizations that do not report senior managers providing adequate resources.

Adequate Resources for Project Risk Management and Project Risk Management Practices

The results from the analysis of Senior Management Support and Adequate Resources for Project Risk Management Practices (especially planning) as related to supporting hypothesis number 1.2 are found in Table 5-2 below. All shaded cells represent a statistical significance $\leq .05$ enabling rejection of the null hypothesis with a 95% level of confidence.

Table 5-2 Summary Table of Statistically Significant Chi-square Relationships between Perceived Adequate Resources for PRM and Project Risk Management Practices (The number in each box is the significance level.)	
Dependent Variables	Independent Variables
	Adequate Resources for PRM
PRM Training	0.000
Use of Quantitative Technique	0.000
Qualitative Risk Analysis	0.000
Risk ID Sessions during the PLC	0.002
Risk Technique for Contingency Costs	0.025
Risk Technique for Contingency Time	0.006

Statistically Significant Relationship	Notable Statistical Relationship	NOT Statistically Significant Relationship

Based on the sample, we can be at least 95% confident that there is a statistically significant relationship between organizations where senior managers provide adequate resources to implement risk management practices (especially planning) and reported implementation of formal risk management practices (especially planning). As indicated in Table 5-2 above, the independent variable Adequate Resources for Project Risk Management has a statistically significant relationship with all six dependent variables.

Thus, the null hypothesis should be rejected and the alternative hypothesis accepted that organizations that report senior managers providing adequate resources to implement risk management processes implement more reported formal risk management processes than those organizations that do not report senior managers providing adequate resources. (An analysis of the implications of this alternative hypothesis is found in Chapter 8, Part I.)

Part 1 Summary

Chi-square contingency analysis indicates that both null hypotheses related to major research question 1 can be rejected and the alternative hypotheses accepted. The sample data indicate that there are statistically significant relationships between perceived senior management support for and the allocation of adequate resources to carry out project risk management and the use of formal project risk management practices (especially planning). All of the independent variables considered have at least one statistically significant relationship with the dependent variables considered. Finally, the following variables were used in factor analysis since they are key variables that best represent the construct variable and are also the ordinal (metric) data most suitable for factor analysis (Hair 2001):

- ***Perceived senior management support for project risk management practice***

  X_6 Does senior management in your organization encourage and reward risk taking in projects?

  X_7 Does senior management in your organization discourage the reporting of risks associated with its projects?

  X_8 Does senior management in your organization provide adequate money, human resources, and time for the entire process of project risk management (e.g. planning, identification, impact analysis, response planning, and monitoring)?

- ***Reported project risk management planning practice***

  X_9 Do your project team members obtain training in risk management planning and impact analysis at some point during the project's life?

  X_{10} Do your projects use any structured quantitative technique (*e.g.* Monte Carlo simulation, decision trees) when evaluating the merits and demerits of prospective projects?

  X_{11} Do your projects use qualitative risk analysis (*e.g.* probability and impact matrix) when evaluating the merits and demerits of prospective projects?

PART 2: RESEARCH QUESTION NO. 2

Introduction

This part discusses the statistical significance of the variables related to research question number 2 and its supporting hypotheses. Major Research Question Number 2 asks: Is there an association between reported risk practices (especially planning) and the implementation of reported risk event monitoring and handling practices?

The two intervening variables of this research relate to Major Research Question Number 2 and its supporting hypotheses. They are: Reported Project Risk Management Practices; and, Reported Risk Event Monitoring and Handling.

Nine web site survey questions relate to the Reported Project Risk Management Practices (especially planning) intervening variable. They were:

X_9 Do your project team members obtain training in risk management planning and impact analysis at some point during the project's life?

X_{10} Do your projects use any structured quantitative technique (*e.g.* Monte Carlo simulation, decision trees) when evaluating the merits and demerits of prospective projects?

X_{11} Do your projects use qualitative risk analysis (*e.g.* probability and impact matrix) when evaluating the merits and demerits of prospective projects?

X_{15} During which of the following project phases do your projects have risk identification sessions?

X_{17} Do you use a risk analysis technique to develop a contingency fund for project costs?

X_{19} Do you use a risk analysis technique to develop a contingency fund for project schedule durations?

Four website survey questions related to Reported Risk Event Monitoring and Handling variable were included in this analysis. They are:

X_{22} Do your projects conduct risk reviews?

X_{23} Do your projects experience risk audits?

X_{24} Do your projects experience major workarounds (e.g. >10% cost overrun from the activity's planned budget) in project operations?

X_{25} Does your employing organization have a policy requiring that projects have a risk response plan?

Chi-square analysis was used to explore the above supporting hypotheses of Major Research Question Number 2. The statistical results of this analysis follow:

Chi-square Analysis Decision Rule

Chi square analysis was performed on the data set for the intervening variables Risk Event Monitoring and Handling itself and Project Risk Management Practices and Reported Risk Event Monitoring and Handling. The decision rule was set at 95% confidence interval. Thus, any significance $\leq .05$ will allow a rejection of the null hypothesis.

Supporting Hypothesis 2.1

The first supporting hypotheses for research question 2 are:

- Null Hypothesis (Ho) 2.1: Organizations where reported formal risk planning practices are implemented report monitoring risks the same as those organizations where reported risk-planning practices are weak.
- Alternative Hypothesis (Ha) 2.1: Organizations where reported formal risk planning practices are implemented report monitoring risks more rigorously than those organizations where reported risk-planning practices are weak.

Project Risk Management Practices and Risk Response Planning and Risk Event Monitoring and Handling

The results from the analysis of Project Risk Management Practices and Risk Event Monitoring and Handling as related to hypothesis 2.1 can be found in Table 5-3 below. All shaded cells represent a statistical significance $\leq .05$ enabling rejection of the null hypothesis with a 95% level of confidence.

Table 5-3
Summary Table of Statistically Significant Chi-square Relationships between Project Risk Management Practices and Risk Response Planning and Risk Event Monitoring and Handling
(The number in each box is the significance level.)

Dependent Variables	Independent Variables					
	PRM Training	Use of Quantitative Technique	Qualitative Risk Analysis	Risk ID Sessions during the PLC	Risk Technique for Contingency Costs	Risk Technique for Contingency Time
Risk Reviews	0.000	0.018	0.000	0.000	0.013	0.003
Risk Audits	0.000	0.000	0.005	0.041	0.274	0.023
Risk Response Plan	0.000	0.472	0.000	0.039	0.000	0.000

Statistically Significant Relationship	*Notable* Statistical Relationship	NOT Statistically Significant Relationship

Based on the sample, we can be at least 95% confident that there is a statistically significant relationship between reported formal risk planning practices and reported risk event monitoring. As indicated in Table 5-3 above, every independent variable has at least two statistically significant relationships with a dependent variable. Similarly, every dependent variable has at least five statistically significant relationships with the six independent variables. The following list ranks the independent variables on the basis of the greatest number of statistically significant relationships: Project risk management training, Risk Identification Sessions during the Project-life Cycle, Qualitative Risk Analysis, and Risk Technique for Contingency Time, which are statistically significant with three dependent variables each; and, Use of Quantitative Technique and Risk Technique for Contingency Costs, which are statistically significant with three dependent variables each.

Thus, the null hypothesis should be rejected and the alternative hypothesis accepted that organizations where reported formal risk planning practices are implemented also report monitoring risks more rigorously than those organizations where reported risk-planning practices are weak. (An analysis of the implications of this alternative hypothesis is found in Chapter 8, Part II.)

Supporting Hypothesis 2.2

The second supporting hypotheses for research question 2 are:

- Null Hypothesis (Ho) 2.2: Organizations where reported formal risk planning efforts are implemented report experiencing the same number of workarounds as those organizations where reported formal risk planning efforts are weak.

- Alternative Hypothesis (Ha) 2.2: Organizations where reported formal risk planning efforts are implemented report experiencing fewer workarounds than those organizations where reported formal risk planning efforts are weak.

Project Risk Management Practices and Reported Workarounds

The results from the analysis of Project Risk Management Practices (especially planning) and reported Workarounds as related to supporting hypothesis number 2.2 can be found in Table 5-4 below:

Table 5-4
Summary Table of Statistically Significant Chi Square Relationships between Project Risk Management Practices and Reported Project Workarounds
(The number in each box is the significance level.)

Dependent Variables	Independent Variables						
	PRM Training	Use of Quantitative Technique	Qualitative Risk Analysis	Risk ID Sessions during the PLC	Risk Technique for Contingency Costs	Risk Technique for Contingency Time	Risk Response Plan
Reported Workarounds	0.595	0.028	0.1	0.085	0.714	0.664	0.856

Statistically Significant Relationship	Notable Statistical Relationship	NOT Statistically Significant Relationship

Based on the sample, we can be at least 95% confident that there is a statistically significant relationship between reported formal risk planning practices and reported workarounds. As indicated in Table 5-4 above, only two independent variables have a statistically significant relationships with the dependent variable: Reported Workarounds. These independent variables are: Risk Identification Sessions during the Project Life cycle and Use of Quantitative Technique.

Thus, the null hypothesis should be rejected and the alternative hypothesis accepted that organizations where reported formal risk planning efforts are implemented report experiencing fewer workarounds than those organizations where reported formal risk planning efforts are weak. (An analysis of the implications of this alternative hypothesis is found in Chapter 8, Part II.)

Part 2 Summary

Chi-square contingency analysis indicates that both null hypotheses related to major research question 2 can be rejected and the alternative hypotheses accepted. The sample data indicate that there are statistically significant relationships between the use of formal project risk management practices (especially planning) and the rigor of risk monitoring and the frequency of project workarounds. All of the independent variables considered have at least one statistically significant relationship with the dependent variables considered. Finally, the following variables – not already identified in Part I – can be used in factor analysis as they are key variables that best represent the overall construct variable and are also the ordinal (metric) scale data suitable for factor analysis (Hair 2002):

- ***Reported risk response planning and risk event handling practice***

  X_{22} Do your projects conduct risk reviews?

  X_{23} Do your projects experience risk audits?

  X_{24} Do your projects experience major workarounds (e.g. >10% cost overrun from the activity's planned budget) in project operations?

PART 3: RESEARCH QUESTION NO. 3

Introduction

This part discusses the statistical significance of the variables related to research question number 3 and its supporting hypotheses. Major Research Question Number 3 asks: Is there an association between the implementation of reported risk monitoring and handling practices and reported project success?

The independent variable Perceived senior management support for project risk management practice, both intervening variables Reported Project Risk Management Practices and Reported Risk Event Monitoring and Handling and, the dependent variable Reported Project Success all relate to Major Research Question Number 3 and its supporting hypotheses.

Seven website survey questions related to the Perceived senior management support for project risk management practice variable were included in this analysis. They were:

X_1 Who is the key proponent of project risk management in your organization?

X_2 Does your employing organization have a policy requiring that projects have a risk management plan?

X_4 Do you consider your employing organization to be concerned about project risk?

X_5 Does your employing organization work unit have a policy requiring that projects have a risk management plan?

X_6 Does senior management in your organization encourage and reward risk taking in projects?

X_7 Does senior management in your organization discourage the reporting of risks associated with its projects?

X_8 Does senior management in your organization provide adequate money, human resources, and time for the entire process of project risk management (e.g. planning, identification, impact analysis, response planning, and monitoring)?

Five website survey questions related to the Reported Project Risk Management Practices variable were included in this analysis. They were:

X_9 Do your project team members obtain training in risk management planning and impact analysis at some point during the project's life?

X_{10} Do your projects use any structured quantitative technique (*e.g.* Monte Carlo simulation, decision trees) when evaluating the merits and demerits of prospective projects?

X_{11} Do your projects use qualitative risk analysis (*e.g.* probability and impact matrix) when evaluating the merits and demerits of prospective projects?

X_{12} During which of the following project phases do your projects prepare contingency plans or strategies for responding to specific risk events?

X_{15} During which of the following project phases do your projects have risk identification sessions?

Four website survey questions related to the Reported Risk Event Monitoring and Handling variable were included in this analysis. They were:

X_{22} Do your projects conduct risk reviews?

X_{23} Do your projects experience risk audits?

X_{24} Do your projects experience major workarounds (e.g. >10% cost overrun from the activity's planned budget) in project operations?

X_{25} Does your employing organization have a policy requiring that projects have a risk response plan?

Seven web site survey questions related to the Reported Project Success variable were included in this analysis. They were:

Y_1 How often are your projects completed to the satisfaction of your customers?

Y_2 How often are your projects completed within budget?

Y_3 How often are your projects completed on time?

Y_4 How often are your projects completed according to their original statement of work (SOW) specifications?

Y_5 How often are your projects descoped from their original Statement of Work (SOW) specifications?

Y_6 Are your projects terminated early – *i.e.,* without completing the original planned deliverables?

Y_7 Do you consider the risk management policies of your organization to make a measurable difference on your project performance?

Chi-square analysis was used to explore the supporting hypotheses of Major Research Question Number 3. The statistical results of this analysis follow.

Chi-square Analysis Decision Rule

Chi square analysis was performed on the data sets for the two intervening variables Senior Management Support and Risk Event Monitoring and Handling and the dependent variable Reported Project Management Success. The decision rule was set at 95% confidence interval. Thus, any significance $\leq .05$ will allow a rejection of the null hypothesis.

Supporting Hypothesis 3.1

The first supporting hypotheses for research question 3 are:

- Null Hypothesis (Ho) 3.1: Organizations where reported formal risk planning efforts are implemented have the same reported project success rates as those organizations where reported formal risk planning practices are weak.
- Alternative Hypothesis (Ha) 3.1: Organizations where reported formal risk planning efforts are implemented have higher reported project success rates than those organizations where reported formal risk planning practices are weak.

Project Risk Management Practices and Reported Project Success

The results from the analysis of Project Risk Management Practices (especially planning) and reported project management success as related to supporting hypothesis number 3.1 can be found in Table 5-5 below. All shaded cells represent a statistical significance $\leq .05$ enabling rejection of the null hypothesis with a 95% level of confidence.

Table 5-5
Summary Table of Statically Significant Chi Square Relationships between Project Risk Management Practices and Reported Project Success
(The number in each box is the significance level.)

Dependent Variables	Independent Variables						
	PRM Training	Use of Quantitative Technique	Qualitative Risk Analysis	Contingency Planning during PLC	Risk ID Sessions during PLC	Risk Technique for Contingency Costs	Risk Technique for Contingency Time
Customer Satisfaction	0.377	0.576	0.222	0.283	0.037	0.510	0.804
Within Budget Delivery	0.344	0.741	0.073	0.065	0.189	0.632	0.898
On-time Delivery	0.006	0.075	0.079	0.180	0.009	0.351	0.359
According to original SOW Delivery	0.092	0.149	0.362	0.946	0.310	0.530	0.864
Delivery within descoped SOW	0.317	0.764	0.182	0.008	0.041	0.838	0.642
Early Terminated Project	0.839	0.408	0.494	0.303	0.613	0.065	0.370
Overall Impact of PRM on PM Performance	0.000	0.041	0.000	0.030	0.003	0.009	0.046

Statistically Significant Relationship	Notable Statistical Relationship	NOT Statistically Significant Relationship

Based on the sample, we can be at least 95% confident that there is a statistically significant relationship between reported formal risk planning practices and reported project success. As indicated in Table 5-5 above, every independent variable has at least one statistically significant relationship with a dependent variable. Four out of the seven dependent variables have at least one statistically significant relationship with an independent variable. The following list ranks the independent variables on the basis of the greatest number of statistically significant relationships: Risk Identification Sessions, which is statistically significant with four dependent variables; Contingency Planning during the Project Life-cycle, and Project risk management training, which are statistically significant with two dependent variables each; and, Use of Quantitative Technique, Qualitative Risk Analysis, Risk Technique for Contingency Costs, and Risk Technique for Contingency Time which are all statistically significant with the same dependent variable: Overall Impact of Project Risk Management on project performance.

Thus, the null hypothesis should be rejected and the alternative hypothesis accepted that organizations where reported formal risk planning efforts are implemented have higher reported project success rates than those organizations where reported formal risk planning practices are weak. (An analysis of the implications of this alternative hypothesis is found in Chapter 8, Part III.)

Supporting Hypothesis 3.2

The second supporting hypotheses for research question 3 are:

- Null Hypothesis (Ho) 3.2: Organizations that report monitoring risks rigorously have the same reported project success rates as those organizations that do not.

- Alternative Hypothesis (Ha) 3.2: Organizations that report monitoring risks rigorously have higher reported project success rates than those organizations that do not.

Risk Event Monitoring and Handling and Reported Project Success

The results from the analysis of reported Risk Event Monitoring and Handling and reported Project Management Success as related to supporting hypothesis number 3.2 can be found in Table 5-6 below. All shaded cells represent a statistical significance $\leq .05$ enabling rejection of the null hypothesis with a 95% level of confidence.

Table 5-6
Summary Table of Chi Square Relationships between Reported Project Risk Response Planning and Risk Event Monitoring and Handling and Reported Project Success
(The number in each box is the significance level.)

Dependent Variables	Independent Variables		
	Risk Reviews	Risk Audits	Risk Response Plan
Customer Satisfaction	0.066	0.154	0.235
Within Budget Delivery	0.005	0.389	0.341
On-time Delivery	0.001	0.131	0.122
According to original SOW Delivery	0.084	0.470	0.544
Delivery within descoped SOW	0.460	0.080	0.427
Early Terminated Project	0.095	0.139	0.256
Overall Impact of PRM on PM Performance	0.000	0.031	0.000

Statistically Significant Relationship	Notable Relationship	NOT Statistically Significant Relationship

Based on the sample, we can be at least 95% confident that there is a statistically significant relationship between reported formal risk practices (especially planning) and reported project management success. As indicated in Table 5-6 above, every independent variable has at least one statistically significant relationship with a dependent variable. Six out of the seven dependent variables have at least one statistically significant relationship with an independent variable. The following list ranks the independent variables on the basis of the greatest number of statistically significant relationships: Risk Reviews which is statistically significant with three dependent variables; and, Risk Response Planning and Risk Audits, which are statistically significant with the same dependent variable: Overall Impact of Project Risk Management on project performance.

The only dependent variable that does not have a statistically significant relationship with the three independent variables is Early Terminated Projects. (This phenomenon will be discussed in greater detail in Chapter 8.)

Thus, the null hypothesis should be rejected and the alternative hypothesis accepted that Organizations that report monitoring risks rigorously have higher reported project success rates than those organizations that do not. (An analysis of the implications of this alternative hypothesis is found in Chapter 8, Part III.)

Supplemental Supporting Hypothesis 3.3

Although not depicted in the research model found in Figure 1-2 or the research construct dynamic found in Figure 3-1, an analysis was conducted between the Perceived Senior Management Support and the Reported Project Success construct variables. This analysis was conducted to explore any possible direct and significant statistical relationship between these two variables beyond the indirect relationship depicted in the research model and construct dynamic. The additional supporting hypotheses for Major Research Question 3 are:

- Null Hypothesis (Ho) 3.3: Perceived risk sensitive organizations have the same reported project success rates as those organizations that are not perceived to be risk sensitive.
- Alternative Hypothesis (Ha) 3.3: Perceived risk sensitive organizations have higher reported project success rates than those organizations that are not perceived to be risk sensitive.

Senior Management Support and Reported Project Success

The results from the analysis of Senior Management Support and reported project management success as related to the supplemental supporting hypothesis number 1 can be found in Table 5-7 below. All shaded cells represent a statistical significance $\leq .05$ enabling rejection of the null hypothesis with a 95% level of confidence.

Table 5-7
Summary Table of Chi Square Relationships between Perceived Senior Management Support and Reported Project Management Success
(The number in each box is the significance level.)

Dependent Variables	Independent Variables					
	Organization PRM Policy	Organization Concern for PRM	Work Unit PRM Policy	Encourage PRM	Discourage PRM	Adequate Resources for PRM
Customer Satisfaction	0.324	0.001	0.417	0.345	0.002	0.166
Within Budget Delivery	0.663	0.180	0.348	0.100	0.070	0.005
On-time Delivery	0.137	0.083	0.212	0.212	0.233	0.012
According to original SOW Delivery	0.639	0.050	0.544	0.260	0.087	0.628
Delivery within descoped SOW	0.118	0.004	0.162	0.637	0.002	0.086
Early Terminated Project	0.507	0.081	0.187	0.256	0.793	0.756
Overall Impact of PRM on PM Performance	0.000	0.000	0.000	0.013	0.043	0.000

Statistically Significant Relationship	Notable Relationship	NOT Statistically Significant *Relationship*

Based on the sample, we can be at least 95% confident that there is a statistically significant relationship between perceived risk sensitive organizations and reported project management success. As indicated in Table 5-7 above, every independent variable has at least one statistically significant relationship with a dependent variable. Similarly all seven dependent variables have at least one statistically significant relationship with an independent variable. The following list ranks the independent variables on the basis of the greatest number of statistically significant relationships: Organization concern for project risk management, which is statistically significant with four dependent variables; Senior management discouragement for project risk management and Adequate resources for project risk management, which are statistically significant with three dependent variables each; Organization project risk management policy, which is statistically significant with two dependent variables; and, Work unit project risk management policy and Senior management encouragement for project risk management, which are statistically significant with the same dependent variable: Overall Impact of Project Risk Management on project performance.

Thus, the null hypothesis should be rejected and the alternative hypothesis accepted that perceived risk sensitive organizations have higher reported project success rates than those organizations that are not perceived to be risk sensitive. (An analysis of the implications of this alternative hypothesis is found in Chapter 8, Part III.)

Part 3 Summary

Chi-square contingency analysis indicates that both null hypotheses related to major research question 3 can be rejected and the alternative hypotheses accepted. The sample data indicate that there are statistically significant relationships between: perceived senior management support for and the allocation of adequate resources to carry out project risk management and reported project management results; the use of formal project risk management practices and reported project management results; the rigor of risk monitoring and reported project management results; and, the frequency of reported project workarounds and reported project management results. All of the independent variables considered have at least one statistically significant relationship with the dependent variables considered. Finally, the following variables – not already identified in either Part I or Part II – have been used in ancillary data analysis found in Appendix 12. They were selected because they are key variables that best represent the overall construct variable and are also the ordinal (metric) scale data suitable for factor analysis:

- ***Perceived senior management support for project risk management practice***

  X_6 Does senior management in your organization encourage and reward risk taking in projects?

  X_7 Does senior management in your organization discourage the reporting of risks associated with its projects?

  X_8 Does senior management in your organization provide adequate money, human resources, and time for the entire process of project risk management (e.g. planning, identification, impact analysis, response planning, and monitoring)?

- ***Reported risk response planning and risk event handling practice***

  X_{22} Do your projects conduct risk reviews?

  X_{23} Do your projects experience risk audits?

  X_{24} Do your projects experience major workarounds (e.g. >10% cost overrun from the activity's planned budget) in project operations?

- ***Reported project success***

  Y_1 How often are your projects completed to the satisfaction of your customers?

  Y_2 How often are your projects completed within budget?

  Y_3 How often are your projects completed on time?

  Y_4 How often are your projects completed according to their original Statement of Work (SOW) specifications?

Y_5 How often are your projects descoped from their original Statement of Work (SOW) specifications?

Y_6 Are your projects terminated early – *i.e.* without completing the original planned deliverables?

Y_7 Do you consider the risk management policies of your organization to make a measurable difference on your project performance?

CONCLUSION

Chi-square analysis indicates that all of the null supporting hypotheses can be rejected and the corresponding alternative hypotheses accepted. The research model depicted in Chapter 1 and explored in this research is supported: Senior management support and resource allocation are associated with the use of formal project risk management practices; the use of formal project risk management practices are associated with the use of formal risk response planning and better risk event monitoring and handling; and, reported project results that are in compliance with the triple constraint of project management are more likely when senior management supports the use of formal project risk management practices throughout the project lifecycle.

Chapter 6 will discuss the results of the telephone survey and Chapter 7 will discuss in greater detail the actual findings of this research and their implications on the use of project risk management practices and reported project management results.

CHAPTER 6
TELEPHONE SURVEY DATA ANALYSIS

Introduction

As introduced in Chapter 1 and Chapter 3, this chapter discusses the qualitative data analysis conducted on the interview data collected during the telephone survey. Content analysis was conducted on the structured interview transcripts using *Ethnograph™*. The purpose of the content analysis was to identify underlying and emerging themes in the responses. Specifically content analysis relies on classified 'sign-vehicles', which are defined by Janis (1965) as being any word or phrase that signifies some meaning in the context of an interview. [1]

A discussion of the identified themes as related to research questions 1, 2 and 3 and their supporting hypotheses are found in Chapter 7. A discussion of potential follow-on research for the identified emerging themes is found in Chapter 8.

Data Collected

As discussed in Chapter 3 and 4, the telephone survey questionnaire consisted of 23 questions divided between two sections: a close ended question section and an open-ended section. The fourteen questions in the close-ended section were identical to their counterparts in the web survey: The first nine questions concerned the respondents' professional and employing organization background. (See Chapter 4 for a discussion of the telephone survey respondent and respondent organization profiles). The next five questions asked about the senior management support level for project risk management. The remaining nine questions of the open-ended section questions concerned project risk management practices – 4 questions – risk response planning and risk event monitoring and handling experiences – 2 questions – and, reported project management success – 3 questions. The specific open-ended questions can be found in Tables 6-1, 6-2, and 6-3 below. This chapter primarily covers the qualitative analysis of the nine open-ended survey instrument questions.

Close-ended Data

As discussed above, the survey questionnaire asked 9 close-ended questions, of these 5 questions concerned senior management support for project risk management in the respondent's employing organization. (See Appendix 8 for the survey instrument).

Based on the 12 case telephone survey sample, the profile of senior management support that emerges from the data is as follows:

- Key Project Risk Management Proponent (Question 10): As with the web survey, respondents could report more than one proponent for project risk management in their organization. Out of the sample population, 9 respondents (75%) reported that senior management as the key proponent for project risk management in their organization. A total of 6 (50%) respondents reported project managers as the key proponent with 1 respondent each (8% each) reporting customers or outside consultants as the project risk management proponent.

- Presence of a Formal Organization Project Risk Management Policy (Question 11): Out of the sample population, 9 respondents (75%) reported their organizations had a formal project risk management policy. Out of these 9 affirmative responses, 2 were due to federal or state government requirements for their sector of work and one reported that the policy was only formal and not rigorously enforced. Finally, 2 respondents (17%) reported no formal organization risk management policy and 1 respondent (8%) was not certain if such a policy existed.
- Year Project Risk Management Began (Question 12): This follow-up to Question 11 revealed 5 (42%) respondent organizations began their formal project risk management policy before 2000, 2 (17%) in 2001, and 1 in 2002 (8%). 3 respondents (25%) reported not applicable and 1 respondent (8%) did not know when the policy began.
- Presence of a Formal Work Unit Project Risk Management Policy (Question 13): A total of 8 respondents (67%) reported their work units had a formal project risk management policy, 2 respondents (17%) answered there was no such work unit policy. Of the remaining

respondents (17%), 1 respondent did not know and the other reported not applicable.

- Perceived Concern for Project Risk Management (Question 14): In response to this bell-weather question, 10 respondents (83%) reported their organizations were concerned with project risk management with 1 respondent (8%) reporting no interest and the last respondent reporting he did not know.

In conclusion, the sample frame overwhelmingly reported the presence of a formal project risk management policy at some level in their organization. They also reported that senior management was the key proponent for this policy and was concerned with project risk management as a discipline.

Open-ended Data

Content analysis was conducted on the open-ended data collected in the second part of the telephone survey transcripts using the *Ethnograph*™ software. All key project risk management terms included in the glossary (See Appendix 1) were coded for frequency counting in the interview transcripts by the software. The discrete response category labels represent the relevant project risk management terms.

The following section discusses the findings from this analysis. Due to the confidentiality agreement with the telephone interview survey participants, no respondent will be directly or indirectly identified or quoted.

Major Research Question 1

Major Research Question 1 asked: *In what ways does perceived senior management support of risk management practice affect implementation of reported project risk planning practices?*

Four survey questions asked respondents to describe the attitude and the process of project risk management in their organization. Those specific questions and their relationship to the two supporting hypotheses are found in Table 6-1 below. Table 6-1 shows the discrete response categories, (with the number of respondents in brackets), from the telephone survey respondents with respect to Major Research Question 1 and its supporting hypotheses.

Table 6-1 **Response Categories Generated from Major Research Question 1 and its Related Survey Questions**		
Supporting Hypothesis **Alternative Hypothesis No. 1.1**	**Survey Questions**	**Response Categories** (No. Respondents)
Perceived risk sensitive organizations implement more reported formal risk management processes than those organizations that are not perceived to be risk sensitive.	Please describe the attitude of your company's senior management to risk and the reporting of risk throughout the life of a typical project?	Risk is bad: 5 Financial risk oriented: 3 Risk Aware: 3 No idea: 1 Risk good & bad: 1
	Please describe how risk is addressed (e.g. specific risks are identified and response plans prepared for) in the projects you have been involved with:	Risk interviewing: 4 Risk ID Sessions: 10 Qualitative Tools: 7 Quantitative tools: 2 Spreadsheet software: 6
Alternative Hypothesis No. 1.2	**Survey Questions**	**Response Categories**
Organizations that report senior managers providing adequate resources to implement risk management processes implement more reported formal risk management processes than those organizations that do not report senior managers providing adequate resources.	Please describe any formal risk management processes or offices that exist in your organization:	No formal RAG, PMO: 9 Risk Committee.: 2 Formal Process: 5 Informal process: 4
	Please describe how your organization supports project risk management planning (e.g. resources, priority status)?	Resources for Risk Training: 3 Resources for Process: 7 No specific resources: 2

Based on the sample, 11 respondents (92%) report that risk is a known phenomenon in their organizations project operations. Risk identification sessions (10 respondents or 83%) are widely used as a first step in project risk management and qualitative risk analysis (7 respondents or 58%) is conducted as part of these sessions. Spreadsheet software is the most widely used tool for electronically managing risks (6 respondents or 50%). No formal risk assessment group or project management offices are used for project risk management (9 respondents or 75%) However, a formal project risk management process is a part of project team operations (7 respondents or 58%). Resources are allocated for project risk management activities either directly or indirectly in the form of risk management training (10 respondents or 83%). Since a clear majority of the sample report that their organizations are risk sensitive, supportive of and actively practicing project risk management, the alternative hypotheses of major research question 1 are valid for the telephone survey sample. Namely, that risk sensitive organizations that support and allocate resources for project risk management report more formal risk management processes than do those organizations where such sensitivity and practices are not reported.

Major Research Question 2

Major Research Question 2 asked: *In what ways do reported risk planning practices affect the implementation of reported risk response planning and risk event handling practices?*

Three survey questions asked respondents to describe the role of risk management planning practices on risk monitoring, handling and reported workarounds in their organization. Those specific questions and their relationship to the two supporting hypotheses are found in Table 6-2 below. Table 6-2 shows the response categories, (with the number of respondents in brackets), from the telephone survey respondents with respect to Major Research Question 2 and its supporting hypotheses.

Table 6-2
Response Categories Generated from Major Research Question 2 and its Related Survey Questions

Supporting Hypothesis Alternative Hypothesis No. 2.1	Survey Questions	Response Categories
Organizations where reported formal risk planning practices are implemented report monitoring risks more rigorously than those organizations where reported risk-planning practices are weak.	Please describe how your organization supports project risk management planning (e.g. resources, priority status)?	Risk Mitigation Plans: 8 Pre-planning: 2 No real Risk Planning: 2
	Please describe how your organization supports project risk response planning and risk event handling:	Regular meetings: 7 Sporadic meetings: 1 Regular Reporting: 2 No real monitoring: 2
Alternative Hypothesis No. 2.2	**Survey Questions**	**Response Categories**
Organizations where reported formal risk planning efforts are implemented report experiencing fewer workarounds than those organizations where reported formal risk planning efforts are weak.	Please describe how your organization monitors and handles risk during project execution: Please describe how your organization supports project risk response planning and risk event handling:	Workarounds: 4 Lessons Learned Databases: 4 Formal process: 10 Ad Hoc process: 2 Poorly Executed process: 3 Unclear: 2

Based on the sample, a majority of the respondents (10 respondents or 83%) report that risk mitigation planning and risk response planning are widely practiced. Regular meetings or reports are used to review and monitor risk management activities (10 respondents or 83%). Workarounds were reported by some respondents (4 respondents or 33%) mainly because as consultants their technical expertise represented the workaround the project they were engaged with was experiencing. Resources are allocated – in some fashion – for project risk monitoring and response planning (10 respondents or 83%). Since a clear majority of the sample report that their organizations actively practice project risk management and do not report experiencing major workarounds, the alternative hypotheses of major research question 2 are valid for the telephone survey sample. Namely, that organizations reporting formal risk planning practices monitor risks more rigorously and experience fewer workarounds than do those organizations where such practices are not reported.

Major Research Question 3

Major Research Question 3 asked: *How does the implementation of reported risk response planning and risk event handling practices affect reported project success?*

Four survey questions asked respondents to describe the impact of formal project risk management planning and monitoring on reported project success in their organization. Those specific questions and their relationship to the two supporting hypotheses are found in Table 6-3 below. Table 6-3 shows the response categories (with the number of respondents in brackets), from the telephone survey respondents with respect to Major Research Question 3 and its supporting hypotheses.

Table 6-3
Response Categories Generated from Major Research Question 3 and its Related Survey Questions

Supporting Hypothesis Alternative Hypothesis No. 3.1	Survey Questions	Response Categories
Organizations where reported formal risk planning efforts are implemented have higher reported project success rates than those organizations where reported formal risk planning practices are weak.	Please describe how your organization supports project risk response planning and risk event handling?	100% Completion: 3 Within PM Triple Constraint • ≥85%: 5 • ≥50-85%: 1 • ≤50%: 3
	Please discuss how often your projects are completed successfully	
	Please discuss what you consider successful project management to be:	PM Triple Constraint: 11 Customer Satisfaction: 2 Stakeholder Satisfaction: 2 Early Termination of failures: 1 Payment for work: 3
	Please describe your opinion on how the risk management policies of your organization affect its project performance (i.e. does it have any meaningful impact):	
Alternative Hypothesis No. 3.2	**Survey Questions**	**Response Categories**
Organizations that report monitoring risks rigorously have higher reported project success rates than those organizations that do not.	Please describe how your organization supports project risk response planning and risk event handling?	Same as above.
	Please discuss how often your projects are completed successfully	
	Please discuss what you consider successful project management to be:	Same as above.
	Please describe your opinion on how the risk management policies of your organization affect its project performance (i.e. does it have any meaningful impact):	Positive impact: 10 No real impact: 2

Based on the sample, a majority of the respondents (10 respondents or 83%) report that risk monitoring planning and risk response planning are widely practiced and have a positive impact on project management performance (10 respondents or 83%). Project management success is overwhelmingly defined as delivery of projects within budget, on time and according to the original scope of the project (11 respondents or 92%). Additional factors include: customer and stakeholder satisfaction (2 respondents each or 33%), the early termination of projects destined to fail before additional resources are lost in their execution (1 respondent or 8%), and simple receipt of payment for services rendered (3 respondents or 25%). Since a clear majority of the sample report that their organizations actively plan for and monitor project risk and experience a great deal of project success, the alternative hypotheses of major research question 3 are valid for the telephone survey sample. Namely, those organizations that report rigorous risk monitoring experience greater project management success than do those organizations where such monitoring is not reported.

Underlying Themes

The interview data indicate nine underlying themes or points of commonality between the telephone survey respondents:

1. Senior management is the primary driver of project risk management in the reporting organizations.
2. The respondents themselves were largely responsible for the project risk management practices in their organization's project operations.
3. Most organizations have a policy – formalized to some extent - requiring project risk management consideration in project operations.
4. Risk management is a widely known concept but not always implemented as a completely structured and systematic project management practice.
5. The reliance on qualitative risk analysis (*e.g.*, probability and impact matrixes) is more widespread than are quantitative risk tools.
6. Risk management is often perceived as being related to project failures – even though the PMBOK® Guide emphasizes both the upside (opportunity) dimension of risk with the downside (threat) dimension.
7. The larger the organization, the more visible and structured the project risk management practices. Conversely, the smaller the organization, the more limited the scope and structure of project risk management practices.

8. The more mature the project management processes of an organization, (*e.g.*, the Software Engineering Institute Maturity Index), the more prevalent and visible project risk management.
9. Risk management does have a positive impact on project performance and perceived project success. However, the actual scope of the risk management and the specific definition of project performance and success, (*e.g.,* cost, schedule, contract compliance and customer satisfaction), varies.

A more extensive discussion of these underlying themes and how they correspond to the data generated from the web survey can be found in Chapter 7. The next section identifies the themes that emerged from the analysis of the telephone survey data with respect to the project risk management experiences of the respondents.

Emerging Themes

The interview data from the telephone survey respondents indicate eight emerging themes in the field of project risk management:

1. In some sectors and jurisdictions (e.g., federal contracts, state regulations), risk management is a legal requirement for businesses engaged in commercial activity.
2. Project risk management software does not appear to be widely used.
3. Spreadsheet software is widely used to manage risks.

4. To succeed in an organization, project risk management needs a powerful, persistent and patient proponent. Otherwise, all project risk management efforts will be sporadic and unsystematic and therefore, unsustainable.
5. In some businesses, risk management is only relevant in the highest business sense: getting compensated for work rendered.
6. Detailed and extensive risk management is not relevant due to resource availability and ability.
7. Project planners increasingly use databases of lessons learned accumulated from previous projects.
8. Since the September 11 terror attacks, company concern for risk management in general and project risk management in particular has increased measurably – even in those organizations already having a formal policy requiring risk management in project operations.

These emerging themes are discussed in light of the data generated from the web survey can be found in Chapter 7. However, these themes do not clearly fall within the scope of the major research questions or supporting hypotheses of this research. As a result, these themes are identified as good subject areas for follow-on research, which is discussed in Chapter 8.

Conclusions

In conclusion, the qualitative data analysis of the telephone survey responses has revealed that there are nine key underlying themes and eight emerging themes in project risk management. The nine underlying themes reveal that project risk management is: senior management-driven, widely known but not widely implemented; enunciated by a formal policy directive; usually implemented with qualitative risk analysis; often equated with project failure; more prevalent in project management mature organizations; more formal in larger organizations; and, a positive impact on project performance and perceived project success. The eight emerging themes reveal that project risk management: is sometimes a legal requirement for businesses engaged in certain commercial activities; risk software applications do not appear to be widely used but, spreadsheet software is widely used; a powerful, persistent and patient proponent is needed for its adoption in an organization; sometimes only relevant in the highest business sense of being compensated for work rendered; databases of lessons learned from previous projects are increasingly used; and, company concern for risk management in general and project risk management in particular has increased measurably since the September 11 terror attacks.

Endnotes

---

1 I.L. Janis, "The Problem of Validating Content Analysis." In *Language of Politics*, ed. H.D. Lasswell, N. Leites, and Associates, 42-67. Cambridge: MIT Press, 1965: Page 55.

CHAPTER 7
RESEARCH CONCLUSIONS

Introduction

This chapter is divided into four parts: Part 1 discusses the research conclusions related to Research Question 1 and its supporting hypotheses; Part 2 discusses the research conclusions related to Research Question 2 and its supporting hypotheses; Part 3 discusses the research conclusions related to Research Question 3 and its supporting hypotheses; and, Part 4 discusses the significance of this research for the various research streams identified and discussed in 'The Research Continuums of this Dissertation' found in Chapter 2, Figure 2-4 on page 64. The chapter discusses the implications of the research conclusions for the original research model and construct dynamic and addresses the overall question of this research: *Do organizations that employ formal risk management practices outperform those that do not?*

Before addressing the detailed conclusions of this research, a brief review of the research model and methodology is provided. As shown in, Figure 1-2 'Research Model' on page 6 and again in Chapter 3 'Research Methodology' Figure 3-1 'Overall Research Methodology Steps' on page 89, the constructs investigated were:

- Perceived Senior Management Support For Project Risk Management
- Reported Project Risk Management Planning Practice

- Reported Project Risk Response Planning and Risk Event Monitoring and Handling Practice
- Reported Project Success

These four research constructs were operationalized as independent, intervening and dependent variables. A conceptual equation for this construct dynamic model was expressed as follows:

Reported Project Success = **Function (Perceived Senior Management Support, Reported Risk Management Planning, Reported Risk Response Planning and Risk Event Handling)***

*Considers risk management to be implicit in all critical success factors, (*e.g.*, scope, communication, cost, and time management).

Thus, this research was an exploratory descriptive cross-sectional study to determine the existence of any statistical correlation between the above four constructs.

As discussed in Chapter 3 'Research Methodology', this research consisted of five steps:

1. Assessing current risk management practice in organizations
2. Identifying essential project risk management practices
3. Collecting data from the Project Management Institute Risk Management Specific Interest Group

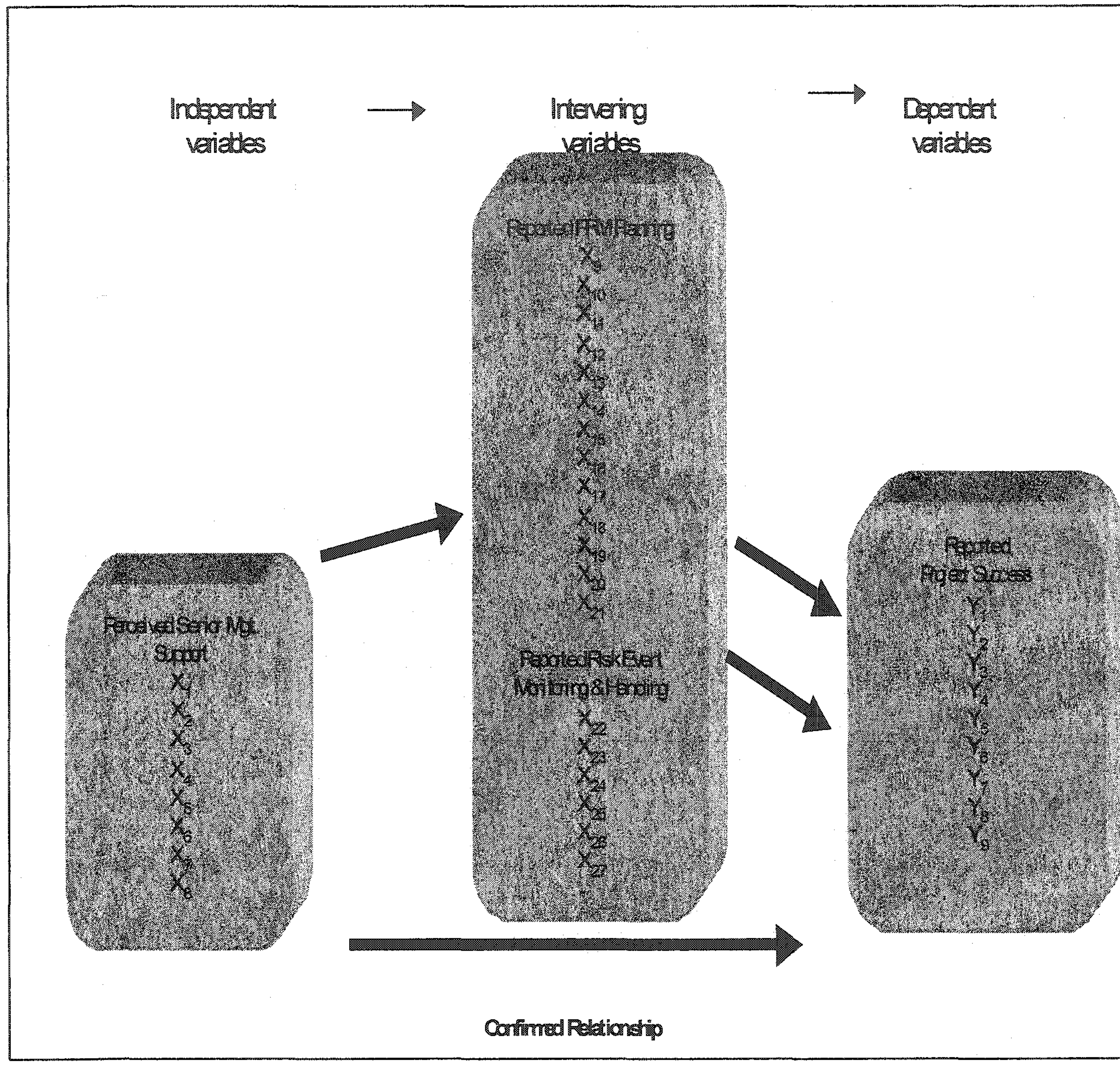
4. Analyzing the survey data using Chi-square, contingency table, and Content analysis
5. Drawing conclusions from the survey analysis to determine whether organizations that employ systematic risk management practices outperform those that do not

The major purpose of this research was to add information and practical suggestions on the state and impact of risk management practices in organizations that execute projects. The research included two interrelated surveys: (1) a website survey using close-ended questions; and, (2) structured interviews using, in part, open-ended questions. Between October 2002 and early February 2003, a total of 176 web survey questionnaires were collected at a web-site hosted by The George Washington University. Of these 176 responses, 175 were usable as respondent informed consent was received for use of the data collected – representing a respectable response rate of 14.5%. A total of 12 telephone interviews were conducted between October 2002 and the end of February 2003 to identify any underlying and emerging themes. All survey respondents were members of the Project Management Institute Risk Management Specific Interest Group as of the date the survey response was received.

Most of the identified internal and external validity threats were controlled through a standardized and disciplined approach to the website survey and telephone interview surveys. The overriding validity threat to this research is the potential generalizability of the research findings given the nature of the pre-selected sample frame. The findings cannot automatically be interpreted to represent the risk management experiences and practices of the wider project management professional community.

Nevertheless, it is reasonable to suggest that the research findings may serve as guidelines or points to consider for the wider project management community. Such an extension is at least modestly supported by the fact that the data analyses used in this research confirm that there are statistically significant relationships as depicted in the research model found in Figure 7-1 below. (See Chapters 5-6 for additional details on the results of these data analysis techniques.)

Figure 7-1: Research Model



All six null hypotheses examined in this research – and a seventh supplemental null hypothesis discussed in Part 3 of this chapter – can be rejected and the respective alternative hypotheses accepted. *In short, reported project success is affected in a statistically significant manner by the presence in an organization of all three independent variables: perceived senior management support for* *project risk management, reported project risk management planning practice, and reported project risk response planning, risk event monitoring and handling practice.*

Thus, in addressing the findings here suggest that the overall research question of this research it is possible to say: *Yes, risk management does make a difference and organizations that employ formal risk management practices do outperform those that do not employ such practices.*

This chapter will now discuss in detail the conclusions of this research as related to the three major research questions and their related hypotheses shown below:

- Major Research Question 1: Is there an association between perceived senior management support of risk management practice and implementation of reported project risk planning practices?
- Major Research Question 2: Is there an association between reported risk planning practices and the implementation of reported risk event monitoring and handling practices?
- Major Research Question 3: Is there an association between the implementation of reported risk monitoring and handling practices and reported project success?

PART 1: MAJOR RESEARCH QUESTION 1

Introduction

As introduced in Chapter 1 and discussed in Chapter 3, Major Research Question 1 and its supporting hypotheses explore the extent to which the implementation of generally accepted risk planning practice is dependent upon support and encouragement from senior management

Research question 1: In what ways does perceived senior management support of risk management practice affect implementation of reported project risk planning practices?

Chi-square analyses revealed statistically significant relationships between the independent and dependent variables analyzed for each supporting hypothesis. The null hypotheses were rejected and the alternative hypotheses accepted at a 95% level of confidence. The following conclusions are based on the statistical implications of the data analyses discussed in Chapters 5and 6 respectively.

Supporting Hypothesis 1.1a

Alternate Supporting Hypothesis 1.1.a is:

Ha 1.1: Perceived risk sensitive organizations implement more reported formal risk management processes than those organizations that are not perceived to be risk sensitive.

As indicated in Table 5-1 found on page 180, Chi-square analysis was performed on 30 pair-wise variable combinations between the 5 Senior Management Support independent variables and the 6 Project Risk Management Practices dependent variables. This analysis indicated 17 statistically significant variable relationships: all 5 independent variables have at least two statistically significant relationships with the dependent variables and all 6 dependent variables have at least one statistically significant relationship with an independent variable. These statistically significant relationships support the following conclusion: *organizations reporting senior management sensitivity to project risk management also report use of various project risk management practices during the life of their projects.*

The independent senior management support variables showing the strongest correlation with the dependent risk management practice variables are:

- **Organization Risk Management Policy:** those organizations requiring project risk management plans are also more likely than those that do not to report "Almost Always" (80-100% of the time) training project teams in risk management, using qualitative risk analysis during project evaluation and, using risk analysis techniques to develop contingency costs and contingency time. Conversely, those organizations not requiring such plans are also more likely to report not engaging in those project risk management practices. The exceptions are use of risk analysis techniques to develop contingency time and costs where most respondents report not using these tools regardless of whether or not their organization requires risk management plans in projects. (See Appendix 14 Tables 14-1 through 4, pages 1-4 for these contingency tables.)

- **Organization Concern for Project Risk Management:** those organizations considered to be concerned about project risk management also are more likely than those that do not to report "Almost Always" training project teams in risk management, using qualitative risk analysis during project evaluation, holding risk identification sessions and, using risk techniques to develop contingency costs. Conversely, those organizations not requiring such plans also are more likely to report not engaging in those project risk management practices. (See Appendix 14 Tables 14-5 through 8, pages 5-8 for these contingency tables.)
- **Work Unit Risk Management Policy:** work units requiring project risk management plans also are more likely than those that do not those with the requirement to also report "Almost Always" training project teams in risk management, using qualitative risk analysis during project evaluation and, using risk analysis techniques to develop contingency costs and contingency

time. Conversely, those organizations not requiring such plans also are more likely to report not engaging in those project risk management practices. The exception is using a risk analysis technique to develop contingency time where most respondents report not using these tools regardless of whether or not their work unit requires risk management plans in projects. (See Appendix 14 Tables 14-9 through 12, pages 9-12 for these contingency tables.)

- **Senior Management Discouragement for risk reporting:** organizations "Almost Always" discouraging risk reporting also report "Rarely" using qualitative risk analysis during project evaluation, holding risk identification sessions, or using a risk technique to develop contingency costs. Conversely, those organizations "Rarely" discouraging risk-reporting in projects are more likely to engage in these project risk management practices. (See Appendix 14 Tables 14-15 through 17, pages 15-17 for these contingency tables.)

The independent variable not showing a strong statistical relationship with risk management practice is:

- **Senior Management Encouragement for Risk-taking:** the percentage of respondents who report "Almost Always" using structured quantitative and qualitative techniques during project evaluation is very small, (respectfully 6.3% and 7% of the overall total), so the relationship between encouragement for risk-taking and practice is too weak to draw any major conclusions. Nevertheless, those organizations considered to encourage risk taking are still more likely than those that do not to report "Almost Always" using these techniques. (See Appendix 14 Tables 14-13 and 14, pages 13-14 for these contingency tables.)

Thus, based on the web survey sample, the more sensitive senior management is to project risk management, the more frequently formal risk management practices are reported during project selection, planning and execution. The low reported use of some risk management practices (e.g., risk training and quantitative risk tool use), suggests use of sophisticated risk tools – and the training to use these tools – will be very rare without senior management support.

Qualitative data analysis of the telephone survey data also shows a positive relationship between perceived senior management support for project risk management and the reported frequency of formal project risk management practices. For example, 10 respondents (83%) reported senior management support for project risk management activities either directly in the form of a formal risk management policy for the organization of for specific customers or projects. At the same time, 7 respondents (58%) reported that a formal project risk management process is a part of project team operations; and, 10 respondents (83%) reported that regular meetings or reports are used to review and monitor risk management activities. (See Chapter 7 "Qualitative Data Analysis' for details.)

Therefore, based on both samples, the following conclusion can be made: *the more risk sensitive an organization is, the more often specific project risk management practices will be used.* This outcome supports Alternative Hypothesis 1.1a: *Organizations where senior management is perceived to support project risk management also implement more reported formal risk management processes than those organizations where senior management is not perceived to be risk sensitive and vice versa.*

Supporting Hypothesis 1.2a

Alternate Supporting Hypothesis 1.2.a. is:

> ***Ha 1.2: Organizations that report senior managers providing adequate resources to implement risk management processes implement more reported formal risk management processes than those organizations that do not report senior managers providing adequate resources.***

As indicated in Table 5-2 found on page 183, Chi-square analysis was performed on the six pair-wise variable combinations all of which show statistically significant relationships between the independent variable Adequate Resources for Project Risk Management (PRM) Practices and the five project risk management practice dependent variables. These statistically significant relationships support the following conclusion: *organizations where senior managers provide adequate resources to implement risk management processes also report more frequent implementation of formal risk management processes.*

A review of the data found in contingency tables 14-18 through 14-23 in Appendix 14 reveals that only approximately 11% of the overall respondents report that they "Almost Always" (80-100%) receive adequate resources for project risk management during the life of their projects. At the same time, the overall reported use of the six analyzed dependent variables indicate only one variable is practiced by a clear majority of the respondents: holding risk identification sessions during the project life cycle which is practiced in at least one project phase by 99.4% of the respondents. The next two most widely reported project risk management practices are: use of a risk analysis technique to develop contingency costs and use of a risk analysis technique to develop contingency time with reported frequencies of 48.8% and 41.8% respectively. The remaining three dependent variables -- as reported by the respondents at the "Almost Always" (80-100%) – frequency are: 25.4% for use of qualitative risk analysis, 6.5% for quantitative technique use, and 7.1% for training in project risk management.

At the cell level, data for the three least reported risk management practices consistently show a positive relationship between organizations where senior managers provide adequate resources to implement risk management processes and reported implementation of formal risk management processes. Although the specific cell counts are low, organizations "Almost Always" allocating adequate resources for risk management are more likely than those that do not to engage in these practices: training project teams in risk management, and using a structured quantitative and qualitative technique during project selection. (See Appendix 14 tables 14-18 through 20, pages 18-20 for these contingency tables.)

Thus, the web survey data clearly show a positive trend between the reported frequency at which adequate resources are allocated for project risk management and the reported frequency of formal project risk management practice.

Qualitative data analysis of the telephone survey respondents also shows a positive relationship between reported senior management allocation of resources for project risk management and the reported frequency of formal project risk management practices. For example, 10 respondents (83%) reported resources are allocated for project risk management activities either directly or indirectly in the form of risk management training. At the same time, 7 respondents (58%) reported that a formal project risk management process is a part of project team operations; and, 10 respondents (83%) reported that regular meetings or reports are used to review and monitor risk management activities. (See Chapter 7 'Qualitative Data Analysis' for details.)

Based on both samples, one can conclude that the more often adequate resources are allocated for risk management, the more often specific risk practices will be used. This outcome supports the alternative hypothesis 1.2a that organizations that report senior managers providing adequate resources to implement risk management processes also implement more reported formal risk management processes than those organizations that do not report senior managers providing adequate resources and *vice versa*. However, the data also show that the number of organizations "Almost Always" allocating adequate resources for risk management is still very low – around 11% of the web survey sample. Possible reasons for this low level of support include:

- Inadequate appreciation of how time consuming yet, long-term cost effective, many risk management practices are – *e.g.,* quantitative risk tools – for cost and schedule estimating and control.
- Subsuming of budget allocations for project risk management into other project planning and monitoring budget lines, thus forcing project teams to try to fund risk management practices from other budget line items. This competition for resources may force project teams to prioritize planning and monitoring activities at the expense of project risk management.

Finally, of the many comments received from web survey respondents, the following quotation best summarizes and supplements the data analysis conclusions related to Major Research Question 1:

Few formal policies are in place prescribing specific risk analysis processes, yet all projects are expected to identify, evaluate, and communicate its risks and how it will manage those risks. Even fewer recommendations regarding specific risk analysis approaches are made. The level of sophistication in risk analysis is often driven by individual training and experience, but the bias is toward fairly simple and qualitative approaches. This is all expected to change within the next 10 years, as management begins to better appreciate the dollar cost of mismanaging, or of not detecting, project risks.

Part 1 Summary

In summary, the two survey data samples – web survey and telephone survey – reveal that the alternative hypotheses related to Major Research Question 1 are supported. *Namely, those organizations where perceived senior management support and adequate resource allocation are high tend to practice formal risk planning practices more than those organizations where such support is lower.*

Based on the data, one also can conclude that only serious – *e.g.,* on an "Almost Always" basis – senior management support for project risk management will result in more frequent use of formal risk management practices during project selection, planning or execution. In order for this support to lead to greater project risk management practice, it must be sustained and supported not only formal policy but, also adequate resource allocation. The low reporting of specific risk management tools and techniques use and adequate resource allocation suggests one or more of the following:

- Senior management interest in project risk management is either superficial, (formal policy statements not backed by daily enforcement), or, tenuous as they remain unconvinced of its actual bottom-line value to organization project operations;

- Inadequate training in project risk management due to inadequate cost, schedule and resource allocation;
- Project risk practices are subsumed into general project control activities (and budget lines) – *e.g.*, cost and schedule estimation and operational monitoring – and are not identified as risk activities *per se*; or,
- Organization and project personnel perceive project risk in terms of negative surprises or operational developments and not as actual cost or schedule duration variation. Thus, they may identify cost and schedule control practices as ordinary project management control mechanisms and not project risk management mechanisms.

In short, the data indicate reported actual project risk management practice is less pronounced than perceived senior management interest and support for the practice. (More is said about organization project risk management culture in Appendix 12.)

PART 2: MAJOR RESEARCH QUESTION 2

Introduction

As introduced in Chapter 1 and discussed in Chapter 3, Major Research Question 2 and its supporting hypotheses explore the extent to which generally accepted project execution (risk response planning and risk event handling) practice is dependent upon good project execution and the relationship between this and the number of reported project workarounds.

Research question 2: In what ways do reported risk planning practices affect the implementation of reported risk response planning and risk event handling practices?

Chi-square analysis revealed statistically significant relationships between the independent and dependent variables analyzed for each supporting hypothesis of Major Research Question 2. Both null hypotheses were rejected and the alternative hypotheses accepted at a 95% level of confidence. The following conclusions are based on the statistical implications of the data analyses discussed in Chapters 5and 6, respectively.

Supporting Hypothesis 2.1a

Alternate Supporting Hypothesis 2.1.a is:

Ha 2.1: Organizations where reported formal risk planning practices are implemented report monitoring risks more rigorously than those organizations where reported risk-planning practices are weak.

As indicated in Table 5-3 found on page 189, Chi-square analysis was performed on the 18 pair-wise variable combinations between the 6 independent project risk management variables and the 3 dependent risk response planning and risk event monitoring and handling practices variables. This analysis indicates 16 statistically significant variable relationships with the most prominent dependent variable being reported risk reviews, which was statistically significant with all 6 independent variables. The remaining 2 dependent variables – Reported risk audits and reported risk response planning – were statistically significant with 6 independent variables each. These statistically significant relationships support the following conclusion: *organizations reporting formal risk planning efforts also report monitoring risks more frequently than those organizations where reported risk planning efforts are less pronounced.*

A review of contingency tables 15-1 through 15-16 in Appendix 15 reveal *the more frequently specific risk planning tools and practices are reported the more frequently reported risk reviews and audits are reported and vice versa.*

The independent project risk management practice variables showing the strongest correlation with the dependent response planning and risk event monitoring and handling practices variables are:

- **Project Risk Management Training:** those organizations "Almost Always" providing training project teams in risk management also are more likely than those that do not to report engaging in risk reviews, risk audits, and risk response planning. Conversely, those organizations not providing such training are more likely not to engage in these risk response planning and risk event monitoring and handling practices. The exception is risk response planning where the number of respondents reporting "Almost Always" obtaining risk management training is very low (7.4% of the overall total) regardless of whether or not their organization requires risk response plans in projects. (See Appendix 15 Tables 15-1 through 3, pages 1-3 for these contingency tables.)
- **Use of a Quantitative Technique:** those organizations "Almost Always" using a structured quantitative technique during project evaluation also are more likely than those that do not to report engaging in risk reviews and risk audits. Conversely, those organizations not providing such training are more likely to not engage in these risk event monitoring and handling practices variables. In the case of reported risk reviews, the number of respondents

who report "Rarely" using quantitative techniques is greater than those "Almost Always" using these techniques. However, this is due to the fact that very few respondents (6.3%) report "Almost Always" using these techniques. (See Appendix 15 Tables 15-4 and 5, pages 4-5 for these contingency tables.)

- **Use of Qualitative Risk Analysis:** those organizations "Almost Always" using qualitative risk analysis during project selection also are more likely than those that do not to report engaging in risk reviews, risk audits, and risk response planning. Conversely, those organizations not providing such training are more likely not to engage in these risk response planning and risk event monitoring and handling practices variables. (See Appendix 15 Tables 15-6 through 8, pages 6-8 for these contingency tables.)
- **Holding Risk Identification Sessions:** those organizations holding such sessions at some point in the project life cycle also report engaging in risk reviews, risk audits and risk response planning. In fact, only one respondent reported never holding such sessions and this individual also reported rarely or never engaging in any risk response planning and risk event monitoring and handling practices. . (See Appendix 15 Tables 15-9 through 11, pages 9-11 for these contingency tables.)

- **Use of a Qualitative Risk Technique for Contingency Costs:** those organizations using a qualitative risk technique to develop contingency costs also are more likely than those that do not to report engaging in risk reviews and risk response planning. Conversely, those organizations not using such a technique are more likely not to engage in these risk response planning and risk event monitoring and handling practices variables. (See Appendix 15 Tables 15-12 and 13, pages 12-13 for these contingency tables.)
- **Use of a Qualitative Risk Technique for Contingency Time:** those organizations using a qualitative risk technique to develop contingency time also are more likely than those that do not to report engaging in risk reviews and risk response planning. Conversely, those organizations not using such a technique are more likely not to engage in these risk response planning and risk event monitoring and handling practices variables. The exception is engaging in risk audits where the number of respondents reporting "Almost Always" using risk audits is extremely low (8.3%) regardless of whether or not their organization uses a risk technique to develop contingency time. (See Appendix 15 Tables 15-14 through 16, pages 14-16 for these contingency tables.)

Thus, the weight of the above data show the less frequently a specific risk management practice (especially a planning tool) is used, the less frequently risk response planning and risk event monitoring and handling practices will be conducted.

Qualitative data analysis of the telephone survey respondents also shows a positive relationship between the reported frequency of formal risk planning practice and the reported frequency of reported risk monitoring. For example, 10 respondents (83%) reported some form of risk mitigation planning and the same number 10 respondents (83%) reported that regular meetings or reports are used to review and monitor risk management activities. (See Chapter 7 'Qualitative Data Analysis' for details.) This is interesting in that an overwhelming number of respondents report using formal risk planning practices and also report regular risk monitoring – although they did not specify risk reviews or risk audits *per se*. *Nevertheless, this inherent positive relationship remains: the more frequently risk planning practices are reported, the more frequently risk monitoring practices are reported and vice versa.*

Therefore, based on both samples, one can conclude that the more frequently a specific risk planning tool is used, the more frequently risk monitoring will take place. This outcome supports the alternative hypothesis 2.1a that organizations where reported formal risk planning practices are implemented report monitoring *risks more rigorously than those organizations where reported risk-planning practices are weak.*

Supporting Hypothesis 2.2a

Alternate Supporting Hypothesis 2.2.a is:

Ha 2.2: Organizations where reported formal risk planning efforts are implemented report experiencing fewer workarounds than those organizations where reported formal risk planning efforts are weak.

As indicated in Table 5-4 found on page 191, Chi-square analysis was performed on 7 pair-wise variable combinations between the 7 independent project risk management practice (especially planning practices) variables and the dependent reported project workarounds variable. This analysis indicated 2 statistically significant variable relationships with reported workarounds: Use of a Quantitative Technique during project selection and Conducting Risk Identification Sessions during the Project Life cycle. *These statistically significant relationships support the following conclusion: organizations reporting formal risk planning efforts also report experiencing fewer workarounds than those organizations where reported risk planning efforts are less pronounced.*

Analysis of the data found in Appendix 15, contingency tables 15-16 and 15-17 on pages 16-17, reveal these two relationships are both statistically inverse in nature. The (*independent*) project risk management practice variables showing the strongest correlation with reported major workarounds are:

- **Use of a Quantitative Technique:** those organizations "Almost Always" using a structured quantitative technique during project evaluation also are just as likely as those that do not to report experiencing major workarounds. However, those organizations reporting they "Rarely" us quantitative techniques are also more likely to report "Rarely" experiencing major workarounds. This unexpected result is most likely due to these factors: very few respondents (6.3%) reporting "Almost Always" use of quantitative techniques during project selection; almost 60% of the respondents reporting "Rarely" or "Occasionally" experiencing major workarounds; and, the use of other project selection and control methods to avoid major workarounds. (See Appendix 15 Table 15-17, page 17 for this contingency table.)
- **Holding Risk Identification Sessions:** a total of 99.4% of the respondents report holding risk identification sessions at least once during the project life cycle with 55.4% of the overall respondents reporting such sessions in more than 3 of the 5 project phases. As expected, the more risk identification sessions are held, the less frequently respondents report experiencing major workarounds. The high reported frequency of these sessions may explain why the other risk management practices do not correlate statistically with reported major workarounds: those other practices have been subsumed – at least in relation to workarounds – into risk identification sessions. (See Appendix 15 Table 15-18, page 18 for this contingency table.)

Therefore, the sample data indicate reported major workarounds are infrequent. However, the sample data also show that while quantitative risk tools are not used very often, risk identification sessions are almost universally held.

Qualitative data analysis of the telephone survey respondents indicates the more risk planning takes place, the less often workarounds are reported. For example, 10 respondents (83%) reported some form of risk mitigation planning and only 4 respondents (33%) reported experiencing workarounds, as their presence in the project was the workaround. In addition, 7 respondents (58%) reported that a formal project risk management process is a part of project team operations; and, 10 respondents (83%) reported that regular meetings or reports are used to review and monitor risk management activities. (See Chapter 7 'Qualitative Data Analysis' for details.)

Therefore, based on both samples, one can be conclude that the more frequently risk planning practices are implemented — especially risk identification and monitoring sessions — the less frequently workarounds are reported. This conclusion supports the alternative hypothesis 2.2a that organizations where reported formal risk planning efforts are implemented report experiencing fewer workarounds than those organizations where reported formal risk planning efforts are weak and *vice versa*.

Finally, the following comment received from a web survey respondent best summarizes and supplements the data analysis conclusions related to Major Research Question 2:

Risk Management is viewed by Project Managers and by Senior Management as a good thing and essential to have in Project Plans and when presenting Business Plans [and] Business Approvals. However....!!! The majority of activity [and] effort is spent in the identification, qualitative assessment, and risk response planning stages. There is very little effort done in quantitative assessment and Risk Monitoring [and] Control activities. The reasons for this are; Quantitative Assessment is seen as too difficult. Risk Monitoring [and] Control is too time consuming. However, the reason people don't have time to perform this function is that they are too busy fighting fires... sometimes the fires that they have previously identified!!! Sounds crazy, but this is the case. In essence, formal risk registers are created, however the information is only used by some people. Typically only the good Project Managers, about 25% of them. The top Project Managers, who do use it, actually use it to drive their activities.

Part 2 Summary

In summary, the two survey data samples – web survey and telephone survey – reveal that *the alternative hypotheses related to Major Research Question 2 are valid and operative. Namely, those organizations where reported formal risk planning practices are implemented report monitoring risks more rigorously and report experiencing fewer workarounds than do those organizations where such reported formal risk planning and monitoring efforts are weak.*

Based on the data, one can also be conclude that the low reported use of risk reviews and risk audits could be due to one or more of the following reasons:

- Risk monitoring practices maybe subsumed into general project control activities and not identified as risk monitoring practices *per se*;
- Instead of formal risk reviews *per se*, regular project team monitoring

meetings and reports could be used to manage and monitor project risk; or,

- Other project audit mechanisms – not directly associated with risk management such as financial audits – could be used to audit project risk management practices.

For the web survey sample, one can be conclude that *the low rate of reported major workarounds is most likely a function of continuous risk identification as opposed to the use of quantitative tools to deselect high-risk projects.* As mentioned in Part 1, ordinary project cost and schedule control activities may account for the low reported use of project risk reviews and risk audits. Especially, if the organizations and respondents do not perceive these activities to be project risk management-related *per se*.

PART 3: MAJOR RESEARCH QUESTION 3

Introduction

As introduced in Chapter 1 and discussed in Chapter 3, Major Research Question 3 and its supporting hypotheses explore the extent to which generally accepted risk management practice (risk management planning, risk response planning and risk event handling) is associated with the reported project success rate of an organization as measured by the triple constraint, customer satisfaction and early project termination (before meeting project scope).

Major Research question 3: How does the implementation of reported risk response planning and risk event handling practices affect reported project success?

Chi-square analysis revealed statistically significant relationships between the independent and dependent variables analyzed for all three supporting hypotheses of Major Research Question 3. All null hypotheses were rejected and the alternative hypotheses accepted at a 95% level of confidence. The following conclusions are based on the statistical implications of the data analyses discussed in Chapters 5 and 6, respectively. Since reported project success is the ultimate dependent variable and the focus of the overall question of this research, the analyses in Part 3 are oriented towards the seven dependent variables of Reported Project Success.

Supporting Hypothesis 3.1a

Alternate Supporting Hypothesis 3.1.a is:

Ha 3.1: Organizations where reported formal risk planning efforts are implemented have higher reported project success rates than those organizations where reported formal risk planning practices are weak.

As indicated in Table 5-5 found on page 198, Chi-square analysis was performed on 49 pair-wise variable combinations. Of these variable combinations, 12 combinations show statistically significant relationships between the 7 independent Project Risk Management (PRM) Practices variables and 4 of the 7 dependent Reported Project Success variables. *These statistically significant relationships support the following conclusion: organizations reporting frequent implementation of formal risk planning efforts also report more frequent project success.*

A review of contingency tables 16-1 through 16-12 in Appendix 16 reveal the more frequently specific risk planning tools and practices are reported the more frequently reported project success is and *vice versa*. Four project success variables show statistically significant relationships with reported project risk management practice. These variables along with an analysis of the correlation their with project risk management practice are:

- **Customer Satisfaction:** the only variable with a significant relationship with conducting risk identification sessions during the project life cycle. The data show that the more frequently these sessions are held – *i.e.,* three or more projects phases –during the project life cycle, the more satisfied customer satisfaction is reported on an "Almost Always" basis as the largest cell counts are in these pair-wise cells. (See Appendix 16 Table 16-7, page 7 for this contingency table.)

- **On-time project delivery:** had a statistically significant relationship with project risk management training and conducting risk identification sessions during the project life cycle. Interestingly, only risk identification sessions shows a clear positive relationship with on time project delivery. As with customer satisfaction, the largest cell counts are in the "Almost Always" and three project phases or more pair-wise cells. Project risk management training shows a slight inverse relationship with reported "Almost Always" on time delivery. This is probably due to the low reported presence of this practice among the sample. However, no respondents who report "Almost Always" receiving risk training also report "Rarely" or "Occasionally" completing project on time. (See Appendix 16 Tables 16-1 and 8, pages 1 and 8 for these contingency tables.)
- **Delivery of projects within a Descoped statement of work:** had a statistically significant relationship with contingency planning during the project life cycle and conducting risk identification sessions during the project life cycle. The data show that the more frequently risk identification sessions and contingency planning take place during the project life cycle, the less frequent descoped project delivery is reported. The largest pair-wise cell

counts are between the "Rarely" and "Occasionally" and three project phases or more response categories. (See Appendix 16 Tables 16-5 and 8, pages 5 and 8 for these contingency tables.)

- **Perceived overall impact of project risk management on project management performance:** had a statistically significant relationship with all 7 independent variables. The data indicate that the more risk management practice is reported on an "Almost Always" basis, the more the reported "almost Always" impact of organization risk management policies on project performance. The inverse is true for the respective "Rarely" response categories: the less a practice is reported, the less frequently the reported impact of organization risk policy is on project performance. (See Appendix 16 Tables 16-2-4, 6, 10-12, pages 2-4,6,10-12 for these contingency tables.)

Based on the sample, a positive relationship exists between the frequency of reported formal risk management practices during project selection, planning and execution and the reported frequency of project management success. The fact that only one of the traditional triple constraint variables – on time delivery – is statistically significant with reported project management practice suggests that cost and scope performance is not very good for the web survey sample. (It is worth mentioning the two other traditional triple constraint variables, (project delivery within budget and according to the original statement of work), are notably significant – at the 90% confidence level – with independent project risk management practice variables.) Possibilities for this outcome include:

- Projects where schedule performance is more important to customers than cost or scope control;
- Projects whose scope increases during the course of project life cycle;
- Project cost and scope control activities not identified as risk practices *per se* or,
- Reported project success being the result of other variables either unrelated to or perceived as project risk-related.

Qualitative data analysis of the telephone survey respondents also shows a positive relationship between the two research constructs. For example, 10 respondents (83%) reported that regular meetings or reports are used to review and monitor risk management activities. The exact same number of respondents reported that their project risk monitoring practices have a positive impact on project performance. (See Chapter 7 'Qualitative Data Analysis' for details.)

Therefore, based on both samples, one can be conclude that the more frequently risk management practices are implemented the more frequently project management success is reported. This conclusion supports the alternative hypothesis 3.1a that organizations where reported formal risk planning efforts are implemented have higher reported project success rates than those organizations where such practices are weak and *vice versa*.
In conclusion, the data indicate that overall reported project success is positively

affected by the frequency of actual project risk management planning practice even though the prevalence of such practice lags behind the professed interest and support for the practice by senior management of organizations. Only one of the traditional triple constraint variables – on time delivery – is statistically significant with project risk management practice variables, which suggests poor overall triple constraint performance by this sample. It may also indicate other project control practices – not identified as risk-related – are used to control project cost and scope.

Supporting Hypothesis 3.2a

Alternative hypothesis 3.2a is:

Ha 3.2: Organizations that report monitoring risks rigorously have higher reported project success rates than those organizations that do not.

As indicated in Table 5-6 found on page 201, Chi-square analysis was performed on 21 pair-wise variable combinations. Of these variable combinations, 5 combinations show statistically significant relationships between the 3 independent Project Risk Event Monitoring and Handling variables and 3 of the 7 dependent Reported Project Success variables. *These statistically significant relationships support the following conclusion: organizations reporting frequent implementation of formal risk event monitoring and handling practices also report more frequent project success.*

A review of contingency tables 16-13 through 16-17 in Appendix 16 reveal the more frequently formal risk response planning and risk event monitoring and handling practices are reported the more frequently project success is also reported and *vice versa*. Analyses of the correlation between these variable combinations (by dependent variable) are:

- **Within budget delivery:** was the only variable with a statistically significant relationship with conducting risk reviews. The data show that the more frequently these reviews are conducted on an "Almost Always" basis, the more "Almost Always" project delivery within budget is also reported. Conversely, the more these reviews are reported to be conducted "Rarely" or "Occasionally", within budget project delivery is also reported to be less frequent. (See Appendix 16 Table 16-13, page 13 for this contingency table.)
- **On-time project delivery:** was only statistically significant with conducting risk reviews. The data show that the more frequently these reviews are conducted on an "Almost Always" basis, the more "Almost Always" on time project delivery is also reported. Conversely, the more these reviews are reported to be conducted "Rarely" or "Occasionally", on time project delivery is also reported to be less frequent. (See Appendix 16 Table 16-14, page 14 for this contingency table.)
- **Perceived overall impact of project risk management on project management performance:** had a statistically significant relationship with all three independent variables. The data indicate the more risk response planning and risk event monitoring and handling practices are reported on an

"Almost Always" basis, the more the impact of organization risk management policies are reported to "Almost Always" have a measurable impact on project performance. The inverse is true for the respective "Rarely" response categories: the less a practice is reported, the less frequently the reported impact of organization risk policy is on project performance. (See Appendix 16 Tables 16-15 through 17, pages 15-17 for these contingency tables.)

Qualitative data analysis of the telephone survey respondents shows a positive relationship between these two research constructs. For example, 10 respondents (83%) reported that regular meetings or reports are used to review and monitor risk management activities. The exact same number of respondents reported that their project risk monitoring practices have a positive impact on project performance. (See Chapter 7 'Qualitative Data Analysis' for details.)

Based on both sample data sets, one can be conclude that the more often project risks are monitored the higher the reported project management success rates and vice versa. As mentioned above, the low reported rate of risk reviews and risk audits could be due to one or more of the following reasons:

- Risk monitoring practices maybe subsumed into general project control activities and not identified as risk monitoring practices *per se*.
- Instead of formal risk reviews *per se*, regular project team monitoring meetings and reports – e.g., risk identification sessions – may be used to

manage and monitor project risk.

- Other project control mechanisms – *e.g.,* financial audits – could be used to monitor and control project management outcomes related to budget, schedule and scope of work.

Supplemental Supporting Hypothesis 3.3a

Supplemental Alternative hypothesis 3.3a is:

Alternative Hypothesis (Ha) 3.3: Perceived risk sensitive organizations have higher reported project success rates than those organizations that are not perceived to be risk sensitive.

As indicated in Table 5-7 found on page 204, Chi-square analysis was performed on 42 pair-wise variable combinations. Of these variable combinations, 15 combinations show statistically significant relationships between the 6 independent Perceived Senior Management Support variables and the 7 dependent Reported Project Success variables. These statistically significant relationships support the following conclusion: organizations reporting strong senior management support for project risk management also report more frequent project success.

A review of the contingency tables 16-18 through 30 in Appendix 16 reveals an overall positive relationship between senior management support, (or, the lack of discouragement), for risk management and the reported frequency of project management success. Analyses of the correlation between these variable combinations (by dependent variable) are:

- **Customer Satisfaction:** had a statistically significant relationship with organization concern for project risk and organization discouragement for project risk reporting. The data overwhelming show a high correlation between organizations considered to be risk-concerned and "Rarely" discouraging of risk reporting, and "Almost Always" reporting project completion to customer satisfaction. (See Appendix 16 Tables 16-19 and 25, pages 19 and 25 for these contingency tables.)
- **Within budget delivery:** was the only variable with a statistically significant relationship with adequate resource allocation for project risk management. The data show that the more frequently adequate resources are allocated on an "Almost Always" basis, the more "Almost Always" project delivery within budget is also reported. Conversely, the more frequently adequate resources are reported to be allocated "Rarely" or "Occasionally", within budget project delivery is also reported to be less frequent. (See Appendix 16 Table 16-28, page 28 for this contingency table.)
- **On-time project delivery:** was the only variable with a statistically significant relationship with adequate resource allocation for project risk management. The data show that the more frequently adequate resources are allocated on an "Almost Always" basis, the more "Almost Always" on time project delivery is also reported. Conversely, the more frequently adequate resources are reported to be allocated "Rarely" or "Occasionally", within budget project delivery is also reported to be less frequent. (See Appendix 16 Table 16-29,

page 29 for this contingency table.)

- **Delivery of projects within the original statement of work:** was the only variable with a statistically significant relationship with reported organization concern for project risk. The data show organizations considered to be risk-concerned on an unqualified basis are more likely to also report completing projects "Almost Always" within the original statement of work. (See Appendix 16 Table 16-20, page 20 for this contingency table.)
- **Delivery of projects within a descoped statement of work:** was the only variable with a statistically significant relationship with organization concern for project risk and organization discouragement for project risk reporting. The data overwhelming show a high correlation between organizations considered to be risk-concerned and "Rarely" discouraging of risk reporting, and "Rarely" reporting project completion within a descoped statement of work. However, the numbers of respondents reporting their organization is not risk-concerned, "Almost Always" discouraging risk-reporting or, "Almost Always" descoping projects are very low (4.7%, 3.1% and 4.7% respectively). Thus, the weight of the responses naturally gravitates towards "Rarely" completing projects within a descoped statement of work. (See Appendix 16 Tables 16-21 and 26, pages 21 and 26 for these contingency tables.)

- **Perceived overall impact of project risk management on project management performance:** was statistically significant with all six independent variables. The data overwhelming indicate the more frequently senior management support for risk management is reported, (or the less risk-reporting is discouraged), the more the impact of organization risk management policies are reported to "Almost Always" have a measurable impact on project performance. (See Appendix 16 Tables 16-18, 22-24, 27, and 30, pages 18, 22-24, 27, and 30 for these contingency tables.)

Qualitative data analysis of the telephone survey respondents also shows a positive relationship between perceived risk sensitive organizations and the reported frequency of project management success. For example, 11 respondents (92%) reported that project risk is a known and important factor in their organization. The exact same number of respondents – 11 persons (92%) - reported that their projects are "usually" completed successfully and that project risk management has a positive impact on project performance. (See Chapter 7 'Qualitative Data Analysis' for details.)

Based on both sample data sets, one can be conclude that perceived risk sensitive organizations do report greater project success than do those organizations not perceived to be risk-sensitive. This outcome supports the supplemental Alternative Hypothesis 3.3a that there is a statistical relationship between risk sensitivity and project management performance.

Finally, the following comment received from a web survey respondent best summarizes and supplements the data analysis conclusions related to Major Research Question 3:

> For over twenty years I have applied the 5 P's of risk management: Prevention and Preparation Precede Project Profits. We profitably completed over 800 Projects on Time, on Budget for clients in 65 Countries ranging from small businesses to the worlds' largest industries and Organizations. None of those project experienced any at fault claims and all deviations from original plan where covered by contingency allowances or Insurance. We start all projects by setting benchmarks with which we interpret and translate: Local Operational Constraints; support Infrastructure: Finance, Banking, Administrative, Utilities, Roads, Government [and] Regulatory Compliance; Availability, location [and] Cost of: Resources, Personnel, Materials, [and] Subcontractors etc. We map our starting basis and proceed with an assessment of Strategic [and] Tactical Risks, Impact, Security, Safety, Threat assessment. Having ordered contingencies by probability and impact we then write the project specific "Change Responses, Emergency –disaster response plan" a parallel subset of the overall project execution plan. During the execution of the project we continuously engage in "Looking for bombs" by verifying status of plan against original benchmarks and assumptions. Our findings dictate if and how we may adjust the Work Breakdown Structure, reorder Budgeting, Scheduling [and] Project Plan. This sounds very tenuous but it simply involves answering: What is the prime Objective? Where did we start from? Where are we? What has changed? And the subsidiary questions how to minimize impact and remain within our contingent budget/schedule/plan? How can the change be turned into an advantage? One of our specialties is Mitigating Emergencies and disaster recovery. To this effect we apply the lessons learned from others mistakes.

Part 3 Summary

In summary, the two survey data samples – web survey and telephone survey – reveal that the alternative hypotheses related to Major Research Question 3 are valid and operative. Namely, those organizations reporting strong senior management support for formal risk planning practices, their actual practice, and risk monitoring also report experiencing greater project success than those organizations where reported formal risk planning and monitoring efforts are weak.

These data indicate that a clear majority of projects are completed within their original statement of work. This suggests that most projects implemented by Risk SIG members have an original statement of work that is either achievable or that has been altered (*e.g.*, increased or extended) to accommodate work change orders.

As mentioned above, ordinary project cost, resource and schedule practices – *e.g.*, estimating, monitoring and control activities – may account for the levels of reported project management success, especially if the organizations and respondents do not perceive these activities to be project risk management-related *per se*.

PART 4: SIGNIFICANCE OF THIS RESEARCH

Introduction

Based on what the sample data reveal, the key significance of this research on the field of project risk management is nine-fold:

- *First*, organizations that report more senior management support for project risk management also report more use of project risk management practices and greater project management success;
- *Second*, organizations that report using project risk management practices regularly also report more risk monitoring and greater project management success;
- *Third*, organizations that report more risk monitoring also report fewer workarounds and greater project management success;
- *Fourth*, the gap between expressed organization support for project risk management and actual resource allocation for daily project operations suggests such expressed support maybe superficial or tenuous.
- *Fifth*, high-impact quantitative risk management tools are not widely used. This suggests project personnel lack the technical knowledge, historical data, or time allocation needed to use these tools during actual project selection, planning, execution and control.

- *Sixth*, many project risk management practices may be subsumed into either general project control activities and not identified as risk practices *per se* or, included in risk identification sessions – the only almost universally reported project risk management technique.
- *Seventh*, reported project completion within budget, on time and according to the original statement of work specifications – the traditional project management triple constraint –remains very low.
- *Eighth*, overall organization project risk management culture appears to be a crucial factor in the scope and degree of project risk management practice.
- *Ninth*, if a community of project risk management professionals – in this case the PMI Risk SIG membership – report actual risk management practice lags behind expressed official support for the practice, then practice of the discipline is highly likely to be worse among risk-averse or risk-insensitive project professionals.

As discussed in Chapter 2 (Literature Review) and represented by Figure 2-4 (The Research Continuums of this Dissertation), this research contributes to four major research streams:

- General surveys in risk management
- Project Management Institute Risk SIG Projects (Surveys)
- Critical Success Factor research surveys
- Reported Project Success research surveys

A more detailed overview of how this research adds to the four key research streams follows.

General Surveys in Risk Management

This research continues a stream of general project risk management surveys that began in 1991. This study adds to this research stream by considering the relationship between the use of specific project risk management practices and reported project management success. The survey methodology, sample frame, questionnaires, findings, and conclusions can serve as a point of departure for future researchers preparing new research in these areas: project planning, project execution, project success, and senior management support for risk management in organization operations.

Project Management Institute Risk SIG (Projects) Surveys

This research adds to the continuum of PMI Risk SIG projects (surveys) of its membership in the following specific areas:

- The current demographic profile of the Risk SIG membership;
- The frequency of actual risk management practices and technical assistance sources; and,

- Data that can be used to determine the overall Risk Management Maturity Model (RMMM) level of the Risk SIG members who participated in the survey.

A series of specific reports on the above subject areas are underdevelopment. When completed, I will transmit these reports to the Risk SIG for approval and dissemination to the general Risk SIG membership.

Critical Success Factor Research Surveys

This research represents the first known attempt at understanding the role of risk as a practice in all project management critical success factors. Consequently, it can be considered a direct descendent of Pinto and Slevin's 1980s research on Critical Success Factors. It also builds on the work of Dai (2002) and Tarnow and Frame (2003). Although this research inquiry did not specifically seek to identify critical success factors, its findings have identified some factors that merit further research. The factors identified by their statistically significant relationship with reported project management success variables (Major Research Question 3) are:

- Senior management support for project risk management
- Issuance of a formal risk management policy covering all organization projects
- Training in project risk management for project personnel
- Use of specific project risk management planning practices

- Issuance of a formal policy requiring formal risk response plans for all identified high priority risks
- Risk event monitoring and handling practices

Reported Project Success Research Surveys

Finally, this research provides a survey of current reported project management success as reported by project management professionals concerned with project risk. The study clearly indicates that the more project risk management is carried out in a formal and systematic manner, the greater project delivery falls within the Triple Constraint. The data contained in Table 7-5 above will be the subject of a follow-on article that develops a Triple Constraint Index for evaluating overall project performance in conjunction with reported customer satisfaction.

Part 4 Summary

In summary, the two survey data samples – web survey and telephone survey – add to current data on the reported allocation of resources for project risk management, the use of specific project risk management tools and techniques, amplified the role of these risk tools and techniques in project success, reported project success rates within the traditional project management triple constraint, and updated the profile of the membership of the PMI Risk SIG membership.

A series of reports – currently under development - will address the following additional areas of risk management – not directly related to the research questions and hypotheses of this research: use of specific risk management tools and techniques in various phases of the project life-cycle; types of historical information used to identify potential risk events and prepare risk response plans for the same; an update on the profile of the Risk SIG membership; and, the types of technical resources used to assist organizations in planning for, monitoring and handling risk events during project execution.

Conclusion

To summarize, the sample data indicate that in addressing the overall research question of this study it is possible to state: *Project risk management does make a difference in overall reported project success – if not in actual daily project operations and practice then, at least, in the visibility the risk management receives through formal organization risk policies and procedures*. The data also indicate that organizations employing formal risk management practices outperform those that do not employ such formal risk management practices. However, a gap exists between the recognition of project risk management as a positive addition to organization operations and the actual daily employment of project risk management practices.

Based on the sample data, the following specific conclusions can be made about the findings generated by this research inquiry:

- *First,* a clear positive statistical correlation exists between reported senior management support for project risk management practices, the presence of those practices and reported impact of those practices on positive project management outcomes – *e.g.,* project completion within budget, on time and according to specifications.
- *Second,* the impact of project risk management practices on reported project management success is positive but, its extent is less than overwhelming as most Risk SIG members participating in this research report more project failure than clear cut project success – *i.e.*, simultaneous project completion within all three project constraints.
- *Third,* a vast majority of the survey respondents report a formal organization-wide or work unit-specific policy for project risk management.
- *Fourth,* risk management as an integrated and systematic series of practices in project operations lags behind its visibility in organization policymaking and expressed concern.
- *Fifth,* formal allocation of resources for project risk management practices does not appear to be as pronounced as expressed concern for project risk.
- *Sixth,* the use of high-impact quantitative risk management tools is very low, suggesting project personnel lack the technical knowledge, historical data, or time allocation needed to use these tools.

- *Seventh,* training in project risk management is not wide spread and may be a cause for the infrequent use of sophisticated risk quantitative and qualitative tools and techniques.
- *Eighth,* the use of risk identification sessions is almost universally reported as the most widely used risk management practice by the survey sample. It is very possible that many other risk management and risk monitoring practices are subsumed into this activity.
- *Ninth,* risk practices maybe subsumed into general project control activities and not identified as risk practices *per se.* Thus, other project control mechanisms may explain why respondents frequently reported a higher frequency of project management success in relation to their reported use of project risk management tools and techniques.
- *Tenth,* respondents may be equating project success with project management success when the two are different. Namely, customer satisfaction may be interpreted as a project success when in fact it may represent either customer relief that their requested project was finally completed or, customer politesse in not reporting their dissatisfaction to project contractors. (On this point, follow-on research should survey organizations that regularly employ project contractors on how they distinguish between relief, politesse, and real satisfaction in project completion.)

- *Eleventh,* there is a greater awareness of project risk and an intellectual agreement that project risk management practices are good for and valuable for projects. However, the actual allocation of resources and insistence on actual execution of specific project risk management tools and techniques lags behind the expressed or implied acknowledgement of the value of project risk management.
- *Twelfth,* overall organization project risk management culture appears to be a crucial factor in the scope and degree of project risk management practice.
- *Thirteenth,* if a community of project risk management professionals – the PMI Risk SIG membership – report actual risk management practice lags behind expressed official support for the practice, it is probable that the state of project risk management beyond this community is highly likely to be worse. This necessitates development of practical guidelines on when and how to implement project risk management practices.

However, in order for more definitive conclusions to be drawn on the role of project risk management in reported project success, additional research is needed from other project management professionals in order to compare their reported experiences with project risk management and project success with those of the Risk SIG members participating in this research.

Future research on project risk management could focus on the organizational behavior and development aspects of risk, risk management, and the organizational change needed to address and manage risk successfully.

In this vein, future research needs to investigate what organization policies, procedures and practices optimize risk--taking without punishing unsuccessful risk-taking (RMMM 2002) [1] through an organization culture of forgiveness (Harvey 1996). [2] In his book *The Abilene Paradox and Other Meditations on Management*, Harvey writes '…cautious inactivity occurs in virtually all-formal organizations, because [they] generally have no processes, procedures, or policies for granting forgiveness. This is particularly unfortunate, since the ancillary effects of [forgiveness] are risk taking, innovation, reality testing, and community building.' [3] Essentially, Harvey argues that successful risk management requires risk taking, forgiveness and honesty. To achieve this larger risk organizational culture, considered and systematic implementation of project risk management policies, procedures and practices is necessary. In order to accomplish this goal, the *Risk Management Maturity Level Development* report suggests the following: '… Organizations attempting to implement a formal structured approach to risk management need to treat the implementation itself as a project, requiring clear objectives, and success criteria, proper planning and resourcing, and effective monitoring and control'. [4]

Thus, among other areas, future project risk management research needs to focus on how the role of senior management attitude towards risk in project operations can be reflected in an organization culture of forgiveness that embodies risk policies and procedures that do not punish unsuccessful risk-taking.

Chapter 8 reviews areas where future research can refine, update and improve on the understanding of project risk management planning, project risk event monitoring and handling and how these correlate with reported project management success in specific operational contexts.

End Notes

[1] Risk Management Research and Development Program Collaboration, *Risk Management Maturity Level Development*: page 1.

[2] Harvey, Jerry B. *The Abilene Paradox and Other Meditations on Management,* San Francisco, Jossey-Bass Publishers, 1996: page 60.

[3] Harvey, *The Abilene Paradox and Other Meditations on Management*: page 60.

[4] Risk Management Research and Development Program Collaboration, *Risk Management Maturity Level Development*: page 4.

CHAPTER 8
FOLLOW-ON RESEARCH

Introduction

This chapter discusses areas for follow-on research related to this dissertation.

Follow-on Research Sectors

As introduced in Chapter 2 and discussed further in Chapters 5, 6, and 7, this dissertation can serve as the basis for further research into the scope, practices and practical benefits of project risk management. Immediate follow-on research falls into four general sectors: doctoral dissertations, professional society surveys, industry-specific surveys, and organization-specific case studies. In each sector four possible research streams are possible: Risk perceptions and behavior in executive decision-making; the pre-conditions for successfully implementing project risk management practices; prevalence surveys on the use of specific risk tools and techniques in project selection, planning, monitoring and risk-event response; and, additional studies – similar to this research – on the association between senior management support for project risk management-project risk management practices and the reported frequency of project success.

A brief discussion of these four research sectors and the specific potential research studies in each follow.

Doctoral Dissertations

Some research subjects or questions in this area might be:

- How can a risk management culture be fostered in an organization?
- What are the characteristics and contexts for risk-taking and risk-averse behavior in executive decision-making?
- What are the specific critical success factors among project risk management planning practices that correlate with reported project management success?
- What are the preconditions for the successful institution of project risk management policies, procedures and practices in an organization?
- Replication of this research inquiry on a larger sample set of project management professionals (*e.g.,* the general membership of the Project Management Institute, and other professional project management societies).
- What are appropriate mixes of qualitative and quantitative risk management techniques under various circumstances?
- Replication of this research inquiry using ratio scale data on the survey instrument thereby enabling multiple regression and factor analysis for more variables than those used in this research (*e.g.,* most of the data

collected in this research was nominal whereas ratio-convertible cardinal-ordinal or actual ratio data is needed to conduct regression and factor analysis).

- Surveys of targeted organizations or industries to explore and understand the specific mechanisms that can be used to foster an organizational culture that simultaneously rewards successful risk-taking, forgives unsuccessful risk-taking without inhibiting the degree and prevalence of risk-taking in organization operations.
- Another area of related follow-on research would be of organizations to survey the differences between customer relief, customer politesse, and real customer satisfaction.
- In addition to the above possible subject areas, doctoral dissertations could also address any of the following research possibilities in the areas of professional society surveys, industry-specific surveys, and organization-specific case studies.

Professional Society Surveys

Some research questions in this research area might be:

- What are the most widely used project management tools and techniques?
- What role does the use of project management software play in the successful delivery of projects within the triple constraints of time, budget and scope?
- Is there a correlation between the use of specific project risk management practices and the successful delivery of projects within the triple constraints of time, budget and scope among the wider community of project management professionals (*e.g.,* the general membership of the Project Management Institute, and other professional project management societies)?
- Is there a correlation between the use of specific project risk management practices and customer satisfaction upon completion and hand over of a project among the wider community of project management professionals?

Industry-specific surveys

Some research questions in this research area might be:

- As discussed in the Conclusion of Chapter 8, what industries require risk-taking in company decision-making and operations in order to remain competitive? Conversely, what industries tend to require risk-averse in company decision-making and operations in order to remain competitive?
- As discussed in Chapter 7, what is the prevalence of proactive project risk management in various industries – *e.g.,* health care, environmental, information technology?
- As discussed in Chapter 6, what are the most important project risk management processes that correlate with reported project success?
- To obtain greater validation on some limited studies linking high project failure rates to the absence of any significant risk analysis.
- To investigate the differences in the value of specific project risk management tools and techniques in project success as perceived by different sample populations (*e.g.,* random surveys of managers, senior executives versus a target sample of the same).

- To investigate the types of project risk management consulting services and the frequency of their use in different industrial sectors and the perceived impact of this technical expertise as perceived by different sample populations (*e.g.*, random surveys of managers, senior executives versus a target sample of the same).
- To investigate in greater detail the correlation between specific project risk management tools and techniques and the services provided by various project management offices.
- To investigate the extent to which Risk Assessment Groups or Risk Assessment Teams are employed in project management offices or as stand-alone entities in various organizations – public and private.
- To investigate the role of risk in project (bid) selection criteria, contract negotiation and finalization.
- To investigate which industries are populated by organizations that tend to foster an organizational culture that simultaneously rewards successful risk-taking, forgives unsuccessful risk-taking without inhibiting the degree and prevalence of risk-taking in organization operations.

Organization-specific case studies

Some research questions in this research area might be:

- What are the pre-conditions for the successful establishment and operation of project risk management practices?
- What are the best approaches – protocol – for successfully implementing a risk-aware and proactive risk management culture in an organization?
- What are the best methods for monitoring emerging risks during actual project execution?
- To investigate in greater detail the correlation between specific project risk management tools and techniques and the services provided by various project management offices.
- To investigate the extent to which Risk Assessment Groups or Risk Assessment Teams are employed in project management offices or as stand-alone entities in various organizations – public and private.
- To investigate the role of risk in project (bid) selection criteria, contract negotiation and finalization.
- To explore the existence of policies on risk-taking and the repercussions of unsuccessful risk-taking or project failure.
- To explore and understand the specific mechanisms that can be used to foster an organizational culture that simultaneously rewards successful

risk-taking, forgives unsuccessful risk-taking without inhibiting the degree and prevalence of risk-taking in organization operations.

- To determine what organization changes are required in order to successfully address and manage risk.

Additional Research Work

Additional subsequent research work may include a prescriptive approach on how to integrate and embed risk management into a project risk management office. Some areas of additional research into the phenomenon of risk might be:

- How might an organization take a business risk and convert it into a technical requirement?
- How might an organization close the gap between the *PMBOK Guide* © defined risk management process areas and the actual risk response of handling?
- How might an organization close the gap between the identified potential risk events and actual risk event encountered?
- How might an organization close the gap between risk assessment and what it implies – *e.g.* the impact from a fire or a flood on a project – for risk preparation and ultimately actual risk management?

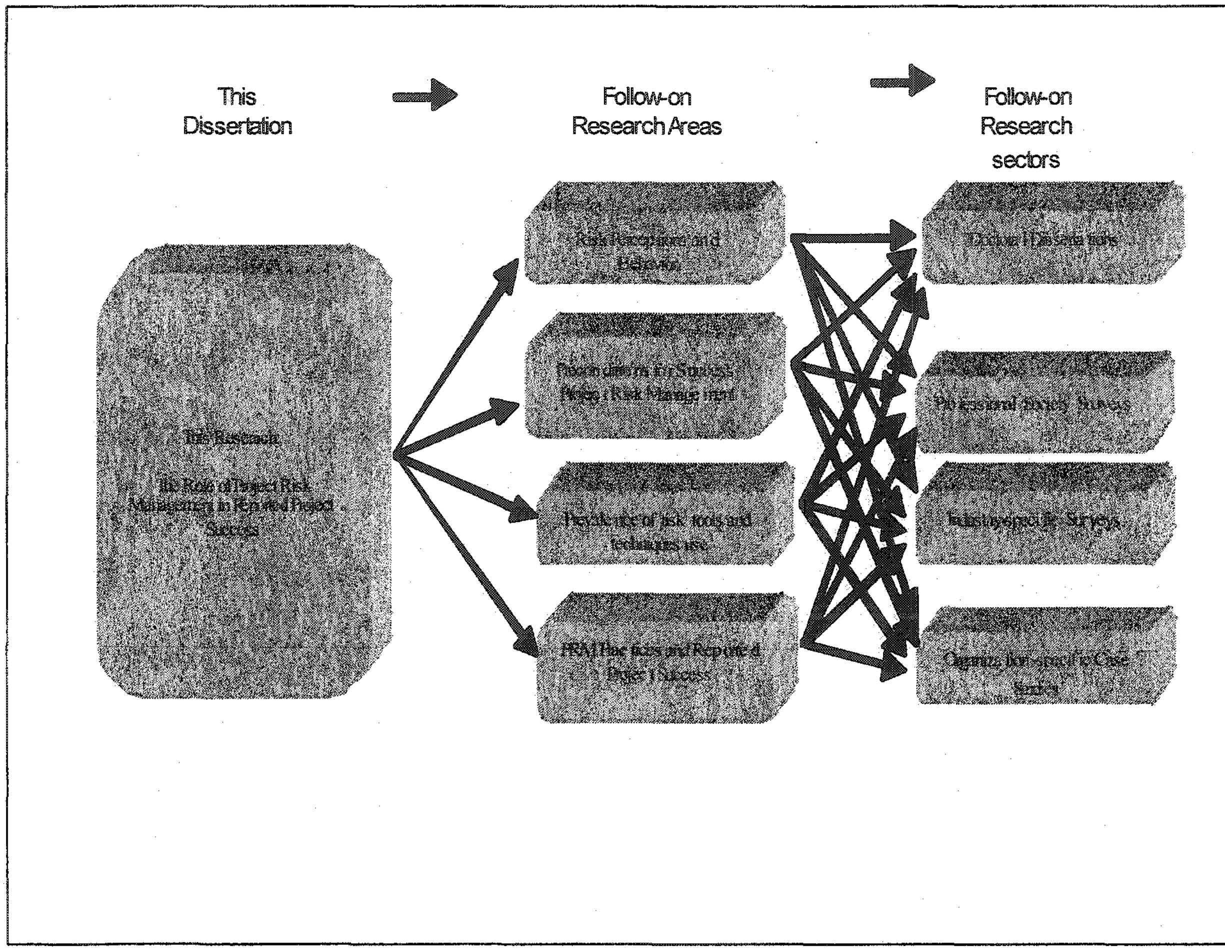
- The extent to which companies using an explicit and rigorous risk management process, are more profitable and successful than their competition? And,
- The extent to which the emerging use of project management offices (PMOs) should posses substantial capabilities for risk management. (Please refer to Xiaoyi Dai Dissertation from The George Washington University dated 2002 and an upcoming article for additional information on this dimension of project risk management.)

Conclusion

In conclusion, four research sectors for follow-on research exist: doctoral dissertations, professional society surveys, industry-specific surveys, and organization-specific case studies. Each research sector includes four research areas: Risk perceptions and behavior in executive decision-making; the pre-conditions for successful project risk management; prevalence specific risk tool and technique use in project selection, planning, monitoring and risk-event handling; and, studies – similar to this research – on the association between senior management support for project risk management-project risk management practices and the reported frequency of project success.

Figure 8-1 below displays the research streams by category and sector that can follow this dissertation:

Figure 8-1: Follow-on Research Streams



Finally, I hope to extend this initial research by studying some of the above areas and topics, thereby enabling more generalizable findings on the state of risk management practices in project management and reported project success.

CHAPTER 9
FINAL THOUGHTS

Introduction

A number of interesting issues emerged during the course of this doctoral research effort. These issues fall into five general areas: research field issues, research survey instrumentation issues, subject matter issues, technology issues, and implementation issues. A brief discussion of these five areas follows:

1. Research Field Issues

Due to the dearth of project management research at the doctoral dissertation level, there were not many dissertations that could be reviewed in order to identify reliable research methods. The advantage this lack of doctoral research in project management provided was a wide-open field of research opportunities to choose from – a great blessing.

2. Research Survey Instrumentation Issues

As discussed in Chapter 4, the use of the internet to publicize the dissertation and invite members of the sample frame to participate was a double-edged sword. On the one hand it was convenient, fast, and inexpensive. On the other hand, it limited the number of potential respondents due to the issues of internet access and interest in unsolicited mail. In short, many potential respondents may not have learned of the survey due to changes in their electronic mail addresses and others may have ignored or deleted the electronic invitation by considering it to be spam mail. The above facts almost certainly had an adverse impact on the overall response rate from the Risk SIG membership.

3. Subject Matter Issues

The fact that project risk management focuses on the threats and opportunities embedded in the operations of a company raises the possibility that many Risk SIG members were reticent to participate in either the web survey or the telephone survey. Such reticence could flow from a fear of compromising proprietary risk management processes, protocols and experiences. This may have been especially relevant to the telephone interviews that were tape-recorded.

4. Technology Issues

As discussed in Chapter 4 and closely related to the Research Survey Instrumentation issues discussed above, the technical glitches and inconveniences of the web survey site of The George Washington University may have contributed to a lack of responses. The specific technical glitch was the inability of respondents to back browse to the survey instrument and complete unanswered questions only. Instead, the software required respondents to re-answer the entire questionnaire – even if only one required question had not been answered. Hopefully, future versions of the GW Survey software will improve on some of the technical shortcomings experienced in this research survey.

5. Implementation Issues

In the end, while a major purpose of research is to enhance our body of knowledge, another is to improve actual practice. In this research work, a major purpose – both implicit and explicit – has been to improve performance in project management. More specifically, this means how to enhance the quality and number of successful project outcomes.

THE CURRENT STATE OF PROJECT RISK MANAGEMENT PRACTICES AMONG RISK SENSITIVE PROJECT MANAGEMENT PROFESSIONALS

(GWU Medical Center Office of Human Research IRB Number U090201ER)

by

Robert James Voetsch

B.A., The American University, 1978
M.P.A., The American University, 1979
M.S.P.M., The George Washington University, 1997

A Dissertation Submitted to the School of Business and Public Management of The George Washington University in Partial Fulfillment of the Requirement for The Degree of Doctor of Philosophy

Washington, D.C.
November 2003

Dissertation directed by:

Professor Denis F. Cioffi
Department of Management Science

List of Appendixes

Appendix Number 1

Glossary of Project Risk Management Terms

Definitions of Key Terms

The following definitions are used in this study (all courtesy of either the 2000 PMBOK Guide® or the Risk SIG website risk lexicon):

Contingency Allowance: A provision in the project plan to mitigate cost and/or schedule risk.

Contingency Planning: The development of a management plan that identifies alternative strategies to be used to ensure project success if specified risk events occur.

De-scope(d): This is a reduction in the original scope or specifications of a project as indicated in the Statement of Work (SOW).

Definitive Cost Estimate: This is the same as a Bottom-Up cost estimate – the most accurate cost estimate. Costs are estimated for each work package and then summed to the project level.

Project Management: The application of knowledge, skills, tools, and techniques to project activities in order to meet project requirements.

Project Risk Management: Project Risk Management is the systematic process of identifying, analyzing, and responding to project risk.

Qualitative Risk Analysis: Involves assessing the probability and impact of project risk(s) and using methods such as the probability and impact matrix to classify risks into categories of high, moderate, and low for prioritized risk response planning.

Quantitative Risk Analysis: Measuring the probability and consequences of risks and estimating their implications for project objectives. Risk are characterized by probability distributions of possible outcomes.

Residual Risk: A risk that remains after risk responses have been implemented.

Risk: An uncertain event or condition that, if it occurs, has a positive or negative effect on a project's objectives.

Risk Audit: Risk management practice that seeks to determine if a risk management plan is in place and is being followed by the project team.

Risk Event: A discrete occurrence that may affect the project for better or worse.

Risk Event Handling: This refers to the monitoring and response to a major negative risk event.

Risk Identification: Determining which risks might affect the project and documenting their characteristics.

Risk Management Plan: Documents how the risk processes will be carried out during the project.

Risk Management Planning: Deciding how to approach and plan risk management activities for a project.

Risk Monitoring and Control: Monitoring residual risks, identifying new risks, executing risk reduction plans, and evaluating their effectiveness throughout a project's life.

Risk Response Plan: A document detailing all identified risks< including description< cause< probability of occurring< impact(s) on objectives, proposed responses, owners, and current status.

Risk Response Planning: Developing procedures and techniques to enhance opportunities and reduce threats to the project's objectives.

Risk Review: Risk management practice to determine if any changes are required in the risk management plan, identified risks and risk mitigation strategies..

Schedule Baseline: This is the original project schedule

Triple Constraint: Triple Constraint refers to the constraints of on time, within budget, and according to the specifications project delivery.

Workaround: *This is any unplanned response to a negative risk event (i.e. not part of the project contingency plan).*

Appendix Number 2

Summaries of various project risk management models

Appendix 2:
Risk Management Process Models

This section includes a description and discussion of the various project risk management processes currently used in the project management profession. Please note that this list is not exhaustive as there may be many proprietary project risk management process protocols or models in use. However, the following list includes the most widely used and publicly available project management models. It should also be stated that these models are so widely used by project management professionals that any proprietary model, protocol or process for risk management is probably based to a greater or lesser extent on one or more of the following models. These risk management models are:

1. The Project Management Institute (PMI®) chapter on Project Risk Management from the 2000 version of A Guide to the Project Management Body of Knowledge.
2. Project Risk Analysis and Management for Projects (RAMP) A Guide, prepared by The Association for Project Management (United Kingdom) Specific Interest Group on Risk Management.
3. Risk Management AS/NZ 4360:1999, a Joint Australia/New Zealand Standard prepared by the Joint Technical Committee OB/7 – Risk Management.
4. ISO Standard 10006 from the International Organization for Standardization;
5. British standard BS 6079-3:2000 from the British Standard Institute, 2000;
6. Risk Management Process (RMP) as described in the book "Project Risk Management: Processes, Techniques and Insights", written by C. Chapman and S. Ward in 1997 and published by John Wiley & Sons.
7. The Temper Risk Management Methodology as described in the paper "A Holistic Principle for Applying Project Risk Management Methods and Tools", by K. Kahkonen, a paper presented at the XV International Cost Engineering Congress, International Cost Engineering Council, in Rotterdam, The Netherlands, April, 1998.
8. The Software Engineering Institute Continuous Risk Management Guidebook prepared and published by the Carnegie Mellon Software Engineering Institute and updated in 2001.
9. The United States Department of Defense (DoD) Generic Risk Management Plan
10. The United States Federal Aviation Administration (FAA) Acquisition and Program Risk Management Guidance
11. The United States Environmental Protection Agency (EPA) Integrated Environment Decision-making Framework

1. The Project Management Institute (PMI®) chapter on Project Risk Management from the 2000 version of A Guide to the Project Management Body of Knowledge.

The premier model that will be considered in this research inquiry is the risk management model provided by the Project Management Institute in its 2000 version of A Guide to the Project Management Body of Knowledge (PMBOK). The reasón for this is that it is the baseline document for project risk management practices in North America (United States and Canada).

The **origin** of the PMI PMBOK chapter on project risk is due to the fact that uncertainty holds sway in project operations and the threat to the 'Triple Constraint' that all projects face – e.g. to be completed on-time, within budget and according to specifications – necessitates an examination of how, when, how often and to what impact on a project risk events can occur. Only in this manner can project be successful in their execution.[1]

The **scope** of the PMI PMBOK chapter of risk is confined to project risk in terms of the Triple Constraint items of time, cost and specifications – e.g. the objectives of successful project execution.[2]

The PMI PMBOK **defines risk** as follows:

> "**Risk** is the possibility of a future event, should it occur will have an effect on project objectives including cost, schedule or technical. They effect could be positive, in which the case the project manager has an opportunity to improve project performance or mitigate risk. Often, however, the effect is adverse to the objectives. The source of the risk can be identified and often its likelihood of occurring and impact on the project objectives quantified. The process of risk identification and assessment is to turn "unknown unknowns" (uncertainty) into known risks for the purpose of better managing the project."[3]

> The PMI PMBOK **describes risk management** as follows:

>> "**Risk management** is the systematic process of identifying, analyzing and responding to potential project risk. It includes maximizing the probability and impact of positive events and minimizing the probability and consequences of events adverse to project objectives."[4]

There are six aspects to the PMBOK risk management process:

> **11.1 Risk Management Planning**—deciding how to approach and plan the risk management activities for a project.
>
> **11.2 Risk Identification**—determining which risks might affect the project and documenting their characteristics.
>
> **11.3 Qualitative Risk Analysis**—performing a qualitative analysis of risks and conditions to prioritize their effects on project objectives.
>
> **11.4 Quantitative Risk Analysis**—measuring the probability and impact of risks and estimating their implications for project objectives.
>
> **11.5 Risk Response Planning**—developing procedures and techniques to enhance opportunities and to reduce threats to the project's objectives.
>
> **11.6 Risk Monitoring and Control**—monitoring residual risks, identifying new risks, executing risk reduction plans and evaluating their effectiveness through the project life cycle.[5]

2. Project Risk Analysis and Management for Projects (PRAM) A Guide, prepared by The Association for Project Management (APM - United Kingdom) Special Interest Group on Risk Management.

The **origin** of the AMP PRAM Guide on project risk is in the risk management methods, techniques and processes used in a number of industries since the early 1970's. Historically, Project Risk Analysis and Management has been associated with very large, high capital projects in specific industries such as defense, oil and gas, aerospace and civil engineering.[6]

The **scope** of the AMO PRAM Guide on risk is confined to project risk in terms of achieving project or business objectives as an integral part of project or business management and not just as a set of tools or techniques.[7]

The **definition of risk** that the APM RAMP uses for risk is:

> "**Risk** is the likelihood of variation in the occurrence of an event, which may have either positive or negative consequences." [8]

The **description of risk management** that the APM RAMP uses for risk is:

> "**Risk Management** is the process of managing risks identified in the risk review using the risk mitigation strategy and the risk response plan." [9]

The Project Risk Analysis and Management for Projects (RAMP) is a comprehensive and systematic process for identifying, evaluating and managing risks in capital investment projects. It covers the entire life of a project from inception to closedown, not just the construction stage. The process consists of four activities:[10]

1. **Process launch**

   The first activity launches the RAMP process. An individual specialist or, if the investment is large, a team is appointed to implement the RAMP process. The 'baseline' objectives, scope and plans for the project are defined, as well as the underlying assumptions on which these are based.[11]

2. **Risk review**

   The next activity is a risk review, which is repeated at key stages or decision points throughout the life of the investment. This involves systematically identifying risks and entering them in a risk register. Next the risks are evaluated to determine their likelihood and impact, and any relationships between them. Where appropriate, mitigation measures are identified to avoid, reduce or transfer risks. These measures are incorporated in a risk mitigation strategy. For those risks, which remain, an investment model is used to estimate the overall riskiness and viability of the project. Assuming the project is not aborted, a risk response plan is then prepared.[12]

3. **Risk management**

   The third activity, risk management, is conducted between risk reviews as part of the mainstream management of each stage in the life of the investment. This involves implementing the risk mitigation strategy and risk response plan developed during the preceding risk review. Activities and events during the progress of the project are monitored to identify new or changing risks. Then appropriate measures are taken to deal with them. Designated individuals, called risk custodians, are charged with managing the risks, which fall within their areas of responsibility.[13]

4. **Process closedown.**

   The last activity is the closing down of the RAMP process, when a retrospective review is made of the investment in terms of its success in meeting its objectives, and the effectiveness of RAMP in contributing to the outcome.[14]

3. Risk Management AS/NZ 4360:1999, a Joint Australia/New Zealand Standard prepared by the Joint Technical Committee OB/7 – Risk Management.

The origin of the Risk Management AS/NZ 4360:1999, a Joint Australia/New Zealand Standard on project risk is in the Closer Economic Relations (CER) Agreement of Australia and New Zealand. As part of this Agreement, both countries seek to maintain up-to-date standards regarding the progress of industrial practices and techniques in both countries.[15] This Joint Australia/New Zealand Standard was prepared by Joint Technical Committee OB/7 – Risk Management. It was approved on behalf of the Council of Standards Australia on 2 April 19999 and on behalf of the Council of Standards New Zealand on 22 March 1999. It was published on 12 April 1999. [16]

The **scope** of the Risk Management AS/NZ 4360:1999, a Joint Australia/New Zealand Standard on risk is to provide a generic guide for the establishment and implementation of the risk management process involving establishing the context and the identification, analysis, evaluation, treatment, communication and ongoing monitoring of risks.[17]It can be used by a wide range of organizations be they public, commercial or voluntary in nature. The standard can also be applied in fields ranging from asset management to construction activity to environmental issues to security to treasury and finance.[18]

The **definition of risk** that the Australia/New Zealand Joint Standard uses is:

> "The chance of something happening that will have an impact upon objectives. It is measured in terms of consequences and likelihood."[19]

'Consequence(s)' is/are defined as:

> "The outcome of an event expressed qualitatively or quantitatively, being a loss, injury, disadvantage or gain. There may be a range of possible outcomes associated with an event."[20]

The **definition of risk management** that the Australia/New Zealand Joint Standard uses is:

> "The culture, processes and structures that are directed towards the effective management of potential opportunities and adverse effects."[21]

The Australia/New Zealand Joint Risk Management Standard (AS/NZ 4360:1999) uses a seven (7)-phase risk management process. This process is as follows:

- **Establish the Context** – This phase consists of establishing the strategic, organizational and risk management contexts in which risk management is to be applied. In addition, criteria must be developed and the structure of the analysis defined.
- **Risk Identification** – In this phase it is necessary to identify what why and how things (risks) can arise as the basis for further analysis.
- **Risk Analysis** – In this phase, identified risk are analyzed in order to determine the existing risk controls and analyze risks in terms of consequence and likelihood in the context of those controls. The analysis should consider the range of potential consequences and how likely those consequences are to occur. Consequence and likelihood may be combined to produce an estimated level of risk.
- **Risk Evaluation** – In this phase, risk estimate levels are compared against the pre-established criteria. This enables risks to be ranked so as to identify management priorities. If the levels of risk established are low, then risks may fall into an acceptable category and treatment may not be required.
- **Risk Treatment** – For those risk events that are not accepted, the risk treatment phase entails the following activities:
    a. Identifying treatment options
    b. Evaluating treatment options
    c. Selecting treatment options
    d. Preparing treatment plans
    e. Implementing treatment plans.
- **Monitoring and Review** – This phase (activity) involves monitoring and reviewing the performance of the risk management system and changes, which might affect it.
- **Communication and consultation**: This phase (activity) involves communicating and consulting with internal and external project stakeholders as appropriate at each stage of the risk management process and concerning the process as a whole.[22]

4. ISO Standard 10006 from the International Organization for Standardization;

The **origin** of the ISO 10006 essentially comprises guidelines to help ensure the quality of project processes and the project products. It was originally developed from the PMI PMBOK Guide. Its sister standard, ISO 10007 provides guidelines to help ensure that a complex product continues to function when individual components are changed. It is important to understand, however, that ISO 10006 is not a guide to project management itself (ditto ISO 10007). .[23]

The **scope** of ISO 10006 is "...applicable to projects of varying complexity, small or large, of short or long duration, in different environments, and irrespective of the kind of project product (including hardware, software, processed material, service or combination thereof)." [24]

The **definition of risk** that ISO 10006 uses for risk is:

> **Risk** is "...to minimize the impact of potential negative events and to take full advantage of opportunities for improvement. In this International Standard the term risk covers both aspects." [25]

The **descriptions of risk management** that the ISO 10006 uses for risk is:

> "Risk management is a process that includes the phases of risk: identification, estimation, response development, and processes for controlling risk in these activities." [26]
>
> And,
>
> "*Risk Analysis* includes identifying risks, their likelihood, their timing, their impact, and developing responses as contingency plans." [27]

This international project management standard is largely based on the *PMBOK Guide* of the Project Management Institute. It includes four processes for project risk management:

- *Risk Identification:* The identification and management planning of risks.
- *Risk Assessment:* Assessing the probability of the occurrence and impact of identified risks.
- *Risk Response Development: Determining the* techniques to use in the project to prioritize, manage and record the identified risks and their resolutions. Maintaining separate risk portfolios according to time schedules or project budget.
- *Risk Control:* Developing contingency plans and regular reporting protocols for identified risks. [28] [29]

5. British standard BS 6079-3:2000 from the British Standard Institute, 1996;

The **origin** of the British Standard-3: 2000 from the British Standard Institute is very similar to that of thon project risk is in the risk management methods, techniques and processes used in a number of industries since the early 1970's. Historically, Project Risk Analysis and Management has been associated with very large, high capital projects in specific industries such as defense, oil and gas, aerospace and civil engineering.[30]

The **scope** of the BS 6079-3:2000 encompasses "...generic guidance on the identification and control of business related risks encountered when undertaking projects. The standard is applicable to a wide range of project organizations operating in the industrial, commercial and public or voluntary sectors. [31]

The **definition of risk** that the British Standard 6079-3 uses for risk is:

> **Risk** is "Uncertainty... that can affect the prospects of achieving... goals." [32]

The **description of risk management** that the BS 6079-3:2000 uses is:

> "Risk Management is "...a core process within any business or organization, regardless of size, activity or sector" that "...can make a significant contribution to the economic and general welfare of society." [33]

This British standard for project management calls for a structured risk management process that includes the following steps:

- *Risk Identification*
- *Risk Categorization*
- *Risk Assessment* (probability and impact)
  Risk Response Planning (and subsequent actions).

6. **Project Risk Management; Processes, Techniques and Insights, a book written by Christopher Chapman and Stephen Ward in 1997 and published by John Wiley & Sons.**

The **origin** of the Chapman and Ward Generic Risk Management Process (RMP) on project risk is a distillation of the experience of a large number of organizations which have used RMPs successfully for a number of years, as understood by a working party of more than twenty people drawn from an Association of Project Managers (APM) Specific Interest Group (SIG) of more than a hundred who reviewed working party drafts representing a wide spectrum of organizations in the UK.[34]

The **scope** of the Chapman and Ward Risk Management Process is to provide a generic guide for the establishment and implementation of the risk management process to improve project performance. [35] It seeks to do so through the use of a "6 W" framework that asks these questions:

1. Who: who are the parties ultimately involved?
2. Why: What do the parties want to achieve?
3. What: What is it the parties are interested in?
4. Whichway: How is it to be done?
5. Wherewithal: What resources are required?
6. When: When does it have to be done?[36]

The **definition of risk** that the Chapman and Ward use is:

> "...[T]he implications of the existence of significant uncertainty about the level of project performance achievable."[37]

The **definition of risk management** that Chapman and Ward use is:

> "The essential purpose of risk management is to improve project performance via systematic identification, appraisal and management of project-related risk."[38] It is an "ad-in" to the project management process and not an 'add-on' to this process.[39]

The Chapman and Ward Risk Management Process consists of nine (9)-phases:

1. **Define** – This phase consists of consolidating relevant existing information about the project. Filling in any gaps uncovered in the consolidation process.
2. **Focus** –This phase consists of scoping and providing both a strategic and operational plan for the RMP.
3. **Identify** –this phase consists of identifying where risk might arise, what might be done about this risk, in proactive and reactive responses terms and what might go wrong with these responses.
4. **Structure** –this phase consists of testing and simplifying assumptions and providing a more complex RMP structure when appropriate.
5. **Ownership** – this phase consists of determining client/contractor allocation of ownership and management of risks and risk responses.
6. **Estimate** – This phase consists of identifying areas of clear significant uncertainty and areas of possible significant uncertainty.
7. **Evaluate**: This phase involves synthesizing and evaluating the results of the estimate phase.
8. **Plan** – This phase consists of readying the overall project and risk management plans for implementation.
9. **Manage** – This phase consists of monitoring and controlling project operations and performance and developing risk response plans for immediate implementation.[40]

7. A Holistic Principle for Applying Project Risk Management Methods and Tools, by K. Kahkonen, a paper presented at the XV International Cost Engineering Congress, International Cost Engineering Council, in Rotterdam, The Netherlands, April, 1998.

The Temper Risk Management Methodology in construction projects was developed by Kalle Kahkonen and P. Huovila.[41]

The **origins** of the Temper Risk Management Methodology was in a project to develop a tool for systematic risk management of construction projects in Russia. This tool was developed in the 1994-95 time period by six Finnish main construction contractors and researchers from VTT Building Technology with funding from the Technology Development Centre of Finland, the Finnish Ministry for Trade and Industry. The risk management tool development project consisted of the following phases: literature study of risk management concepts and existing tools, data collection from six live projects in Russia, and development of the systematic risk management tool, based on analysis of the collected data and end-user requirements.[42]

The **scope** of the Temper Risk Management Methodology is in construction project risk management.[43]

The **definition of risk management** that the Temper Risk Management Methodology uses is the Webster Dictionary definition:

> "Systematic Project **Risk** Management means advanced preparation and decision making for minimizing the consequences of possible adverse events and, on the contrary, to maximize the benefits of positive future events."[44]

The Temper Risk Management Methodology consists of five steps:

- **Definition of the risk management plan** – define risk management tasks and responsibilities.
- **Risk Identification** – Identify risks to the project based on relevant technical knowledge and prepare checklists (risk lists) for further fine-tuning and updating.
- **Risk Analysis** – Prioritize risk list items by defining the probability and the consequences for each item given a PERT analysis of three possible scenarios: Optimistic, Most Likely and Pessimistic.
- **Definition of Risk Handling Strategy** – Determining which risk list items to accept, mitigate or avoid altogether.
- **Response Planning** – Prepare a response for the selected risk items, define proposed actions with respect to identifying the action, costing it and estimating its effect on the risk item.[45]

8. Risk Opportunity and Assessment Model (ROAM) prepared and published by Educational Services International, in July 1998.

The Educational Services Institute (ESI) Risk Opportunity and Assessment Model **definition of risk** is:

"**Risk** is the possibility of both suffering loss and enjoying gain."[46]

The Educational Services Institute (ESI) Risk Opportunity and Assessment Model consists of three steps:

- **Evaluating the Risk** – A series of ten (10) questions is asked to assess the risk associated with the project. The risk scores are calculated by multiplying the raw score [Risk Probability (P)] times the pre-established Risk Impact (I). The total risk score is then calculated and entered on the space provided at the bottom of the page for Risk Question 10.[47]
- **Evaluating the Opportunity** – A series of ten (10) questions within the models is to be answered and a score for each question is calculated. The questions have been weighted on a scale of 1 (low) to 5 (high) in terms of their relative importance to each other. This score is calculated by multiplying the raw score [Possible Opportunity Factor (P)] times the pre-established weighted value. After each question has been scored, a total opportunity score is calculated by summing each of the individual question scores. The total is then written in the space provided at the bottom of the page for Opportunity Question 10.[48]
- **Mapping the opportunity and risk scores to the model** – The total scores for the opportunity and risk are to be used as coordinates on the matrix provided within the model. The opportunity score is placed on the vertical axis and the risk score is placed on the horizontal axis. Where the scores intersect determines the final scoring of the opportunity assessment. The location of this score on the matrix helps determine the quality of an opportunity and serves as an indicator of the level of risk that will need to be managed to ensure project success.[49]

9. The Software Engineering Institute Risk Management Paradigm prepared and published by the Carnegie Mellon Software Engineering Institute and updated in 2001.

The **origins** of the Software Engineering Institute Risk Management Paradigm are a result of:

- The Congressional Information Technology Acquisition Reform act of 1996 (known as the Clinger-Cohen Act) which calls on "…the head of each executive agency [to] design and implement in the executive agency a process for maximizing the value and assessing and managing the risks of the information technology acquisitions of the executive agency."[50]; and,
- Department of Defense Directive 5000.1 "Defense Acquisition" (March 1996, incorporating Change 1, May 21, 1999) which requires among other things

that "...PMs [Program Managers] and other acquisition managers shall continually assess program risks. Risks must be well understood, and risk management approaches developed, before decision authorities can authorize a program to proceed into the next phase of the acquisition process."[51]

The **scope** of the Software Engineering Institute Risk Management Paradigm is limited to software engineering project acquisition and management.[52]

The Software Engineering Institute Risk Management Paradigm **definition of risk** uses is the Webster Dictionary definition:

"**Risk** is the possibility of suffering loss"[53]

The SEI Risk Management Paradigm **describes risk management** as a practice with processes, methods, and tools for managing risks in a project. It provides a disciplined environment for proactive decision making to :

- Assess continuously what could go wrong (risks)
- Determine which risks are important to deal with
- Implement strategies to deal with those risks[54]

This continuous risk management process that entails the following seven principles:

1. Global perspective
2. Forward-looking view
3. Open communications
4. Integrated management
5. Continuous process
6. Shared product vision
7. Teamwork [55]

The Carnegie Mellon Software Engineering Institute Risk Management Paradigm consists of six steps:

- **Identify** – search for and locate risks before they become problems
- **Analyze** – Transform risk data into decision-making information. Evaluate impact, probability, and timeframe, classify risks, and prioritize risks.

- **Plan** – Translate risk information into decisions and mitigating actions (both present and future) and implement those actions.
- **Track** – Monitor risk indicators and mitigation actions.
- **Control** – Correct for deviations from the risk mitigation plans.
- **Communicate** – Provide information and feedback internal and external to the project on the risk activities, current risks, and emerging risks.[56]

10. The United States Department of Defense (DoD)

The **origins** of the Department of Defense Generic Risk Management Plan are a result of: Department of Defense Directive 5000.1 "Defense Acquisition" (March 1996, incorporating Change 1, May 21, 1999) which requires among other things that "...PMs [Program Managers] and other acquisition managers shall continually assess program risks. Risks must be well understood, and risk management approaches developed, before decision authorities can authorize a program to proceed into the next phase of the acquisition process."[57]

The **scope** of the Department of Defense Generic Risk Management Plan is limited "...to identify[ing] critical areas and risk events, both technical and non-technical, and [to] take necessary action to handle them before they can become problems, causing serious cost, schedule, or performance impacts."[58]

The Department of Defense Generic Risk Management Plan **definition of risk** is:

> "**Risk** is a measure of the inability to achieve overall program objectives within defined cost, schedule, and technical constraints and has two components: (1) the probability of failing to achieve a particular outcome and (2) the consequences of failing to achieve that outcome. For processes, risk is a measure of the difference between actual performance of a process and the known best practice for performing that process."[59]

The Department of Defense Generic Risk Management Plan **describes risk management** as "*...the act or practice of controlling risk. It includes risk planning,* assessing risk areas, developing risk-handling options, monitoring risks to determine how risks have changed, and documenting the overall risk management program."[60]

The Department of Defense Generic Risk Management Plan consists of five (5) phases:

- **Risk Planning** – this phase of the plan consists of the up-front activities necessary to execute a successful risk management program. This is an integral part of the normal program planning and management. The planning should address each of the other risk management functions, resulting in an organized and thorough approach to assess, handle, and monitor risks. It also assign responsibilities for specific risk management actions and establish risk reporting and documentation requirements.[61]
- **Risk Assessment** – This phase of the plan includes the identification of critical risk events/processes, which could have an adverse impact on the program, and the analyses of these events/processes to determine the likelihood of occurrence/process variance and consequences. It is the most demanding and time-consuming activity in the risk management process.[62]
- **Risk Handling** – This phase of the plan consists of four techniques or options for handling risks: avoidance, control, transfer, and assumption. For all identified risks, the various handling techniques should be evaluated in terms of feasibility, expected effectiveness, cost and schedule implications, and the effect on the system's technical performance, and the most suitable technique selected.[63]
- **Risk Monitoring** – This phase of the plan "...systematically tracks and evaluates the performance of risk-handling actions. It is part of the PMO [Program Management Office] function and responsibility and will not become a separate discipline. Essentially, it compares predicted results of planned actions with the results actually achieved to determine status and the need for any change in risk-handling actions.[64]
- **Risk Management Information System and Documentation** – This aspect of the plan stores and allows retrieval of risk-related data. It provides data for creating reports and serves as the repository for all current and historical information related to risk.[65]

11. The Federal Aviation Administration (FAA)

The **origins** of the Federal Aviation Administration (FAA) Acquisition and Program Risk Management Guidance was in response to the United States General Accounting Office (GAO) Report GAO/RCED-93-55 dated January 1993 in which the GAO cites the "FAA for not being attentive to risk management as it otherwise should be."[66] The FAA Risk Management Guide (RMG) draws heavily from the Defense

Systems Management College's Risk Management Concepts and Guidance guidebook.[67]

The **scope** of the Federal Aviation Administration (FAA) Acquisition and Program Risk Management Guidance is limited to "acquisition" and "program" risk management as it relates to the FAA programs and projects. It does not cover "security," "insurance," "safety," or "accident" risks, which are generally considered to be outside of the FAA acquisition management realm.[68]

The **definition of risk** that the FAA Acquisition and Program Risk Management Guidance uses is this:

> "**Risk** is defined as the probability of an undesirable event occurring and the significance of the consequence of the occurrence. This is different than uncertainty, as described below. It is also different from the traditional (statistical) view of risk, which defines risk as a situation in which an outcome is subject to an uncontrollable random event stemming from a "known" probability distribution."[69]

Uncertainty (or possibility) considers only the likelihood of occurrence of an event."[70]

The **description of risk management** that the FAA Acquisition and Program Risk Management Guidance uses is this:

> "**Risk Management** is a method of managing that concentrates on identifying and controlling the areas or events that have a potential of causing unwanted change or impacts. It is informed management."[71]

The FAA Risk Management Guidance emphasizes that risk management is a continuous process that entails the following five principles:

1. Risk management is required by policy
2. Risk management should be formal and systematic
3. Risk management is an integral part of decision making
4. Greater pressure on the FAA requires more effective risk management, and
5. Almost all programs should have some level of documented risk management activity.[72]

The Federal Aviation Administration (FAA) Acquisition and Program Risk Management Guidance process consists of six steps:

- **Risk Planning** – The purpose of the risk management-planning phase is to force organized purposeful thought to the subject of eliminating, minimizing, or containing the effects of undesirable occurrences.[73]
- **Risk Assessment** – This phase consists of two aspects: Identifying and describing risks; and, conducting preliminary quantification of risk in order to organize and stratify the priority of identified risks.[74]
- **Risk Analysis** – This phase involves an examination of the change in consequences caused by changes in the risk input variables. Sensitivity and "what-if" analysis are examples of the activities that should take place during risk analysis.[75]
- **Risk Handling** – This phase is the last critical element in the risk management process. It is the action taken to address the risk issues identified and evaluated in the risk assessment and risk analysis efforts. Generally, these actions fall into one of the following categories: Avoidance, Control and Assumption.[76]

In summary, the ten (10) project risk management process models reviewed are essentially consistent with one another. All the models have at least five (5) phases or steps in the process: risk planning, identification, assessment, response development and actual handling. The origins of the various process models are external in nature. That is to say that external pressure – political, commercial, operational – compelled these organizations to devise and design a risk management system that would assist them to better serve the interests of their respective organizational missions. Half of the reviewed process models operates under a dual definition of risk: risk is both a danger and an opportunity to meet or exceed the goals and objectives of the project executed. The other half define project risk as having only a negative connotation with respect to a project – i.e. a risk event can only be defined as hurting or hindering the ability of a project team to deliver and complete their project within the operative parameters of scope, time, cost and deliverable specifications.

END NOTES

[1] Project Management Institute, *The Project Management Body of Knowledge*, (Darby, PA, USA. 2000.) Pages 127 - 129.

[2] Project Management Institute, *The Project Management Body of Knowledge*, (Darby, PA, USA. 2000.) Page 127.

[3] Risk Management Special Interest Group, *Risk Management Lexicon Version 1.0* (Dated 6/1/9); Available on line at: www.risksig.com/resource/lexicon.htm.

[4] Project Management Institute, *The Project Management Body of Knowledge*, (Darby, PA, USA. 2000.) Page. 127.

[5] Project Management Institute, *The Project Management Body of Knowledge*, (Darby, PA, USA. 2000.) Page. 127.

[6] Catriona Norris, John Perry, and Peter Simon, The Association for Project Management, *Project Risk Analysis and Management (PRAM),: A Guide by APM (A Mini Guide);* The Association for Project Management (High Wycombe, Buckinghamshire, UK. 2000.) Page 10.

[7] Catriona Norris, John Perry, and Peter Simon, The Association for Project Management, *Project Risk Analysis and Management (PRAM),: A Guide by APM (A Mini Guide);* The Association for Project Management (High Wycombe, Buckinghamshire, UK. 2000.) Page 3.

[8] Ramprisk, *Risk Analysis and Management for Projects (RAMP)*, available on-line at: www.ramprisk.com/concepts.htm

[9] Ramprisk, *Risk Analysis and Management for Projects (RAMP)*, available on-line at: www.ramprisk.com/concepts.htm

[10] Ramprisk, *Risk Analysis and Management for Projects (RAMP)*, available on-line at: www.ramprisk.com/methods/method.htm

[11] Ramprisk, *Risk Analysis and Management for Projects (RAMP)*, available on-line at: www.ramprisk.com/methods/method.htm

[12] Ramprisk, *Risk Analysis and Management for Projects (RAMP)*, available on-line at: www.ramprisk.com/methods/method.htm

[13] Ramprisk, *Risk Analysis and Management for Projects (RAMP)*, available on-line at: www.ramprisk.com/methods/method.htm

[14] Ramprisk, *Risk Analysis and Management for Projects (RAMP)*, available on-line at: www.ramprisk.com/methods/method.htm

[15] http://www.standards.com.au/STANDARDS/INFO/SAIOVERVIEW/SAIOVERVIEW.HTM

[16] Joint Technical Committee OB/7 – Risk Management, Risk Management A/NZS 4360:1999 (Revised); Standards Association of Australia, Strathfield, NSW, 1999: Inner Front Cover.

[17] Joint Technical Committee OB/7 – Risk Management, Risk Management A/NZS 4360:1999 (Revised); Standards Association of Australia, Strathfield, NSW, 1999: Page 1.

[18] Joint Technical Committee OB/7 – Risk Management, Risk Management A/NZS 4360:1999 (Revised); Standards Association of Australia, Strathfield, NSW, 1999: Pages 23 – 24.

[19] Joint Technical Committee OB/7 – Risk Management, Risk Management A/NZS 4360:1999 (Revised); Standards Association of Australia, Strathfield, NSW, 1999: Page 3.

[20] Joint Technical Committee OB/7 – Risk Management, Risk Management A/NZS 4360:1999 (Revised); Standards Association of Australia, Strathfield, NSW, 1999: Page 2.

[21] Joint Technical Committee OB/7 – Risk Management, Risk Management A/NZS 4360:1999 (Revised); Standards Association of Australia, Strathfield, NSW, 1999: Page 4.

[22] Joint Technical Committee OB/7 – Risk Management, Risk Management A/NZS 4360:1999 (Revised); Standards Association of Australia, Strathfield, NSW, 1999: Pages 7-8.

[23] http://www.standardshop.com/iso10006.htm.

[24] http://www.sfs.fi/standard/scope10006.pdf.

[25] Dr. David Hillson, *What is "risk"?*. A presentation to APM Risk Specific Interest Group, 11 April 2002. Slides located at: http://www.eurolog.co.uk/apmrisksig/meetings/RiskDefinition%2011Apr02.pdf

[26] http://www.estiem.org/vision/visionofrisk/Content2.htm

[27] http://www.whittingtonassociates.com/v2/newsletter/back_issues/e2000_07.shtml

[28] http://www.sfs.fi/standard/scope10006.pdf.

[29] http://www.auditnet.org/docs/_Toc529162659

[30] Catriona Norris, John Perry, and Peter Simon, The Association for Project Management, *Project Risk Analysis and Management (PRAM),: A Guide by APM (A Mini Guide);* The Association for Project Management (High Wycombe, Buckinghamshire, UK. 2000.) Page 10.

[31] http://www.bsitraining.com/standards_project.asp#1

[32] Hillson, *What is "risk"?*. A presentation to APM Risk Specific Interest Group, 11 April 2002. Slides located at: http://www.eurolog.co.uk/apmrisksig/meetings/RiskDefinition%2011Apr02.pdf

[33] Felix Kloman, Editor Risk Management Standards Risk Management Reports located at: http://www.riskreports.com/standards.html

[34] Chris Chapman and Stephan Ward, *Project Risk Management: Processes, Techniques and Insights*, John Wiley & Sons, Chichester, UK; 1997): Page 47.

[35] Chris Chapman and Stephan Ward, *Project Risk Management: Processes, Techniques and Insights*, John Wiley & Sons, Chichester, UK; 1997): Page 9.

[36] Chris Chapman and Stephan Ward, *Project Risk Management: Processes, Techniques and Insights*, John Wiley & Sons, Chichester, UK; 1997): Page 4.

[37] Chris Chapman and Stephan Ward, *Project Risk Management: Processes, Techniques and Insights*, John Wiley & Sons, Chichester, UK; 1997): Page 7.

[38] Chris Chapman and Stephan Ward, *Project Risk Management: Processes, Techniques and Insights*, John Wiley & Sons, Chichester, UK; 1997): Page 9.

[39] Chris Chapman and Stephan Ward, *Project Risk Management: Processes, Techniques and Insights*, John Wiley & Sons, Chichester, UK; 1997): Page xvi.

[40] Chris Chapman and Stephan Ward, *Project Risk Management: Processes, Techniques and Insights*, John Wiley & Sons, Chichester, UK; 1997): Pages 50-51.

[41] Kalle Kahkonen and Pekka Huovila, "Systematic Risk Management in Construction Projects", available on the internet at: http://sun7.bham.ac.uk/d.j.crook/lea/iglc4/huovila/risk2.htm

[42] Kalle Kahkonen and Pekka Huovila, "Systematic Risk Management in Construction Projects", available on the internet at: http://sun7.bham.ac.uk/d.j.crook/lea/iglc4/huovila/risk2.htm

[43] Kalle Kahkonen and Pekka Huovila, "Systematic Risk Management in Construction Projects", available on the internet at: http://sun7.bham.ac.uk/d.j.crook/lea/iglc4/huovila/risk2.htm

[44] Kalle Kahkonen and Pekka Huovila, "Systematic Risk Management in Construction Projects", available on the internet at: http://sun7.bham.ac.uk/d.j.crook/lea/iglc4/huovila/risk2.htm

[45] Kalle Kahkonen and Pekka Huovila, "Systematic Risk Management in Construction Projects", available on the internet at: http://sun7.bham.ac.uk/d.j.crook/lea/iglc4/huovila/risk2.htm

[46] Educational Services International, *Tool 1: Risk and Opportunity Assessment Model (ROAM)*, Educational Services International, Arlington, VA., July 1998: T1-1.

[47] Educational Services International, *Tool 1: Risk and Opportunity Assessment Model (ROAM)*, Educational Services International, Arlington, VA., July 1998: T1-1.

[48] Educational Services International, *Tool 1: Risk and Opportunity Assessment Model (ROAM)*, Educational Services International, Arlington, VA., July 1998: T1-1.

[49] Educational Services International, *Tool 1: Risk and Opportunity Assessment Model (ROAM)*, Educational Services International, Arlington, VA., July 1998: T1-1.

[50] Carnegie Mellon Software Engineering Institute, *Software Engineering Risk Management FAQ: Frequently Asked Questions*, Carnegie Mellon University, Pittsburgh, PA, Spring 2001: Page 1.

[51] Carnegie Mellon Software Engineering Institute, *Software Engineering Risk Management FAQ: Frequently Asked Questions*, Carnegie Mellon University, Pittsburgh, PA, Spring 2001: Page 1.

[52] Carnegie Mellon Software Engineering Institute, *Software Engineering Risk Management FAQ: Frequently Asked Questions*, Carnegie Mellon University, Pittsburgh, PA, Spring 2001: Page 1.

[53] Carnegie Mellon Software Engineering Institute, *Software Engineering Risk Management Risk Management Overview*, Carnegie Mellon University, Pittsburgh, PA, last modified 8 March 2001: located at: www.sei.cmu.edu/programs/sepm/risk/risk.mgmt.overview.html.

[54] Carnegie Mellon Software Engineering Institute, *Software Engineering Risk Management FAQ: Frequently Asked Questions*, Carnegie Mellon University, Pittsburgh, PA, Spring 2001: Page 1.

[55] Carnegie Mellon Software Engineering Institute, *Software Engineering Risk Management Risk Management Overview*, Carnegie Mellon University, Pittsburgh, PA, last modified 8 March 2001: located at: www.sei.cmu.edu/programs/sepm/risk/risk.mgmt.overview.html.

[56] Carnegie Mellon Software Engineering Institute, *Software Engineering Risk Management Risk Management Overview*, Carnegie Mellon University, Pittsburgh, PA, last modified 8 March 2001: located at: www.sei.cmu.edu/programs/sepm/risk/risk.mgmt.overview.html.

[57] *Appendix B General Risk Management Plan*, Department of Defense, Dated 11/20/00; located at: www.acq.osd.mil/io/se/risk management/papers speeches briefs/generic risk man. Preface.

[58] *Appendix B General Risk Management Plan*, Department of Defense, Dated 11/20/00; located at: www.acq.osd.mil/io/se/risk management/papers speeches briefs/generic risk man. Section 2.2.

[59] *Appendix B General Risk Management Plan*, Department of Defense, Dated 11/20/00; located at: www.acq.osd.mil/io/se/risk management/papers speeches briefs/generic risk man. Section 1.3.1.

[60] *Appendix B General Risk Management Plan*, Department of Defense, Dated 11/20/00; located at: www.acq.osd.mil/io/se/risk management/papers speeches briefs/generic risk man. Section 3.1.

[61] *Appendix B General Risk Management Plan*, Department of Defense, Dated 11/20/00; located at: www.acq.osd.mil/io/se/risk management/papers speeches briefs/generic risk man. Section 3.2.1.

[62] *Appendix B General Risk Management Plan*, Department of Defense, Dated 11/20/00; located at: www.acq.osd.mil/io/se/risk management/papers speeches briefs/generic risk man. Section 3.3.

[63] *Appendix B General Risk Management Plan*, Department of Defense, Dated 11/20/00; located at: www.acq.osd.mil/io/se/risk management/papers speeches briefs/generic risk man. Section 3.4.1.

[64] *Appendix B General Risk Management Plan*, Department of Defense, Dated 11/20/00; located at: www.acq.osd.mil/io/se/risk management/papers speeches briefs/generic risk man. Section 3.5.1.

[65] *Appendix B General Risk Management Plan*, Department of Defense, Dated 11/20/00; located at: www.acq.osd.mil/io/se/risk management/papers speeches briefs/generic risk man. Section 4.1.

[66] Anthony F. Osborne, *Acquisition and Program Risk Management Guidance Volume 1, FAA-P-1810 AIT-1-0494, (Revision 2),* Federal Aviation Administration, Department of Transportation, Washington, DC; December 20, 1996: Preface.

[67] Anthony F. Osborne, *Acquisition and Program Risk Management Guidance Volume 1, FAA-P-1810 AIT-1-0494, (Revision 2),* Federal Aviation Administration, Department of Transportation, Washington, DC; December 20, 1996: Preface.

[68] Anthony F. Osborne, *Acquisition and Program Risk Management Guidance Volume 1, FAA-P-1810 AIT-1-0494, (Revision 2),* Federal Aviation Administration, Department of Transportation, Washington, DC; December 20, 1996: 1.1.

[69] Anthony F. Osborne, *Acquisition and Program Risk Management Guidance Volume 1, FAA-P-1810 AIT-1-0494, (Revision 2),* Federal Aviation Administration, Department of Transportation, Washington, DC; December 20, 1996: 3.1.2.

[70] Anthony F. Osborne, *Acquisition and Program Risk Management Guidance Volume 1, FAA-P-1810 AIT-1-0494, (Revision 2),* Federal Aviation Administration, Department of Transportation, Washington, DC; December 20, 1996: 3.1.3.

[71] Anthony F. Osborne, *Acquisition and Program Risk Management Guidance Volume 1, FAA-P-1810 AIT-1-0494, (Revision 2),* Federal Aviation Administration, Department of Transportation, Washington, DC; December 20, 1996: 1.1.

[72] Anthony F. Osborne, *Acquisition and Program Risk Management Guidance Volume 1, FAA-P-1810 AIT-1-0494, (Revision 2),* Federal Aviation Administration, Department of Transportation, Washington, DC; December 20, 1996: 2.3.

[73] Anthony F. Osborne, *Acquisition and Program Risk Management Guidance Volume 1, FAA-P-1810 AIT-1-0494, (Revision 2),* Federal Aviation Administration, Department of Transportation, Washington, DC; December 20, 1996: 4.2.

[74] Anthony F. Osborne, *Acquisition and Program Risk Management Guidance Volume 1, FAA-P-1810 AIT-1-0494, (Revision 2),* Federal Aviation Administration, Department of Transportation, Washington, DC; December 20, 1996: 4.3.

[75] Anthony F. Osborne, *Acquisition and Program Risk Management Guidance Volume 1, FAA-P-1810 AIT-1-0494, (Revision 2),* Federal Aviation Administration, Department of Transportation, Washington, DC; December 20, 1996: 4.4.

[76] Anthony F. Osborne, *Acquisition and Program Risk Management Guidance Volume 1, FAA-P-1810 AIT-1-0494, (Revision 2),* Federal Aviation Administration, Department of Transportation, Washington, DC; December 20, 1996: 4.5.

Appendix Number 3

Web survey Letter of Intent

IRB #: U090201ER

THE GEORGE WASHINGTON UNIVERSITY
COMMITTEE ON HUMAN RESEARCH
INSTITUTIONAL REVIEW BOARD

July 2, 2003

Robert James Voetsch
Management Science

Your research project entitled **The Current State of Project Risk Management Practice Among Risk Sensitive Project Management Professionals (Sponsor: Department)**" is due for renewal by the **Expiration Date: 08/31/03.** If a response to this notice is not received by OHR and reviewed/re-approved by the IRB by the expiration date noted above, your research project will automatically expire. If your research project expires as a result of a lapse in continuing review, your project must stop unless the IRB finds that it is in the best interest of individual subjects to continue participating in the research. Moreover, enrollment of new subjects in the above referenced project must cease. Lastly, the project cannot proceed until the protocol and informed consent form and/or assent form (if applicable) are re-reviewed and re-approved by the IRB. In order to avoid expiration of IRB approval for your research, please provide the information requested on the following pages. **In addition, please provide a clean (unstamped copy) of your most current approved Informed Consent Form, Assent Form, and Research Subject Authorization Form (as applicable), but only if you are still enrolling subjects. Please return to 613 Ross Hall by August 1, 2003**. The information of the following pages must still be submitted even if your project has closed or terminated since last continuing review.

NOTE: THIS FORM MUST BE ATTACHED TO THE DATA COLLECTION FORM FOR THIS STUDY

FOR OFFICE USE ONLY:

DATE RECEIVED IN OHR: ______________

DATE REVIEWED BY FULL COMMITTEE OR IRB CHAIR/DESIGNEE: 7/22/03

REVIEWER'S RECOMMENDATIONS:

1. **Approve for** 12 **months** 2. **Terminated (explain below):** ______________

Comments: ______________

Informed Consent/Assent/Research Subject Authorization Form Reviewed and Approved:

- ☐ **Yes (ICF version date** ________ **Assent Form version date** ________ **RSAF version date** ________ **)**
- ☑ **No Closed to Enrollment**
- ☐ **No Study Approved with Waiver of ICF/Assent/RSAF**

Robert Tuttle	[signature]	7/22/03
Chair/IRB Designee Name	**Signature**	**Final Approval Date**

STAMPED APPROVAL:

APPROVED 7/22/03 FOR USE THROUGH 6/30/04 GWU IRB

You may send a copy of this document to the sponsor as verification of Continuing Review Approval, Closure or Termination of study.

The George Washington University
WASHINGTON DC
MEDICAL CENTER

OFFICE OF HUMAN RESEARCH

September 18, 2002

MEMORANDUM TO: Robert James Voetsch (Doctoral Candidate)
Management Science Department

Dennis F. Cioffi (Faculty Sponsor)
Management Science Department

FROM: Robert Tuttle, JD, Ph.D.
Deputy Chair, Non-Medical Committee on Human Research
Institutional Review Board (IRB), MPA #M-1125-01

STUDY REFERENCE: The Current State of Project Risk Management Practices Among Risk Sensitive Project Management Professionals (Sponsor: Department), IRB#U090201ER

IRB ACTION: **IRB Approval, Expedited Review**

The above referenced study was reviewed and approved via expedited review procedures as defined by federal regulations [21 CFR 56.110 and/or 46.110, category 7]. The following documents were approved for a period of one year:

1. Protocol Summary (dated 17 September 2002)
2. Informed Consent form for Structured Interviews (dated 17 September 2002)
3. Informed Consent form for Anonymous Survey in hard-copy format and in site text format (dated 17 September 2002)
4. 22 Question Survey to be used in Structured Interviews (dated 16 August 2002)
5. 44 Question Survey to be mailed or accessed online (dated 16 August 2002)

This study will be presented to the Committee on Human Research at the October 18, meeting. If the Committee raises issues, you will be notified.

Please note that all projects are automatically terminated after one year unless reviewed and re-approved by the Committee. Renewal notices will be sent at least sixty (60) days prior to the time of renewal. However, it is the investigator's responsibility to make sure that the project is reapproved at the appropriate time.

Your renewal date is August 31, 2003

SCHOOL OF MEDICINE AND HEALTH SCIENCES
2300 EYE STREET, N.W. • WASHINGTON, DC 20037 • (202) 994-2995

The George Washington University
WASHINGTON DC

Anonymous Survey Informed Consent Form
For Members of the PMI-Risk Specific Interest Group
Participating in the doctoral research study:
The Current State of Project Risk Management Practices Among Risk Sensitive Project Management Professionals
IRB# U090201ER

Investigator : Robert James Voetsch
Telephone Number : (202) 994-6145
Faculty Sponsor : Dr. Denis F. Cioffi
Telephone Number : (202) 994-6145

I. INTRODUCTION
You are invited to take part in a research study. Before you decide to be a part of this study, you need to understand the risks and benefits. This consent form provides information about the research study. A staff member of the research study will be available to answer your questions and provide further explanations. If you agree to take part in the research study, you will be asked to sign this consent form. This process is known as informed consent.

Your decision to take part in the study is voluntary. You are free to choose whether or not you will take part in the study.

II. PURPOSE
The Department of Management Science of The George Washington University and the Program on Project Management are carrying out a research study to find out The Current State of Project Risk Management Practices Among Risk Sensitive Project Management Professionals. The investigator (person in charge of this research study) is Robert James Voetsch.

III. PROCEDURES
The research will be conducted at http://survey.gwu.edu/survey/index.cfm?SURVEY_ID=2028. You will need to visit this web site one time during the study. Completion of the survey will take about 20 minutes. If you prefer, you may also complete the survey via either an attached e-mail survey form or a paper copy received through the general post.

IV. POSSIBLE RISKS
To the best of our knowledge, the questions you will be asked have no risk to you either personally or professionally.

VI. POSSIBLE BENEFITS
You will not get any personal benefit from taking part in this study. However, the PMI-Risk SIG will benefit from the data you will provide on the current state of project risk management practices in your professional work.

VII. COSTS
There are no costs associated with taking part in this study.

VIII. COMPENSATION
You will not receive compensation for participating in this study.

IX. RIGHT TO WITHDRAW FROM THE STUDY
Your participation in this research study is voluntary. You may decide not to begin or to stop this study at any time. You will be told of any new information about the research study that may cause you to change your mind about participation.

X. CONFIDENTIALITY OF RESEARCH RECORDS
Your records will be anonymous and confidential. You will not be identified (e.g., name, social security number) in any reports or publications of this study.

XI. QUESTIONS
If you have questions about the procedures of this research study, please contact either Robert James Voetsch by telephoning (202) 994-6145 during the workday or, the senior officers of the PMI-Risk SIG through their home page. If you have any questions about the informed consent process or any other rights as a research subject, please contact the Assistant Vice President, Office of Health Research, Compliance, and Technology Transfer at The George Washington University, at (202) 994-2995.

XII. SIGNATURES
By signing this consent form, you affirm that you have read this informed consent form; the study has been explained to you, your questions have been answered, and you agree to take part in this study. You do not give up any of your legal rights by signing this informed consent form. You will receive a copy of this consent form.

____
Participant (Print Name)

____
Signature

____
Date

XIII. INVESTIGATOR STATEMENT (please include the following)
I certify that the research study has been explained to the above individual by me or my research staff including the purpose, the procedures, the possible risks and the potential benefits associated with participation in this research study. Any questions raised have been answered to the individual's satisfaction.

_Robert James Voetsch__
Investigator (Print or type name)

____
Signature

____
Date

Appendix Number 4

Web survey questionnaire

Project Risk Management Practices (Web Site)

by Robert James Voetsch
Doctoral Candidate
SPBM
The George Washington University

Dissertation Research On Current Project Risk Management Practices Among Risk-Sensitive Project Management Professionals

Dear fellow PMI Risk Specific Interest Group member:

This research survey consists of 45 questions and should take no more than 20 minutes of your time. The key objectives of this survey are to:
1. Explore the extent and degree to which risk is considered in the project operations of organizations.
2. Describe the source of support for project risk management practices in organizations.
3. Describe the types of project risk management practices in organizations.
4. Learn how frequently specific risk management tools and techniques are used on projects.
5. Provide current data on reported project success in relation to on-time, within budget, according to specifications project delivery

The senior officers of the Project Management Institute Risk Specific Interest Group have endorsed this survey. They have also pre-tested this survey instrument. The findings of this research will be partially published by the PMI Risk Specific Interest Group on their World Wide Web home page.
Dr. Denis F. Cioffi, Assistant Professor of Management and Director of the Project Management Program, Department of Management Science, School of Business and Public Management, The George Washington University, Washington, D.C., is directing this research effort.

Your participation in the research study is greatly appreciated.

With sincere thanks for your time and contribution,

Robert James Voetsch, PMP
202-994-6145
Risk-PM@gwu.edu

Definitions of Terms in the Questionnaire

The definitions used in this study are courtesy of either the 2000 PMBOK Guide® or the Risk SIG website risk lexicon. Some key definitions for your easy reference are:

Contingency Allowance: A provision in the project plan to mitigate cost and/or schedule risk.

De-scope(d): This is a reduction in the original scope or specifications of a project as indicated in the Statement of Work (SOW).

Risk: An uncertain event or condition that, if it occurs, has a positive or negative effect on a project's objectives.

Risk Event: A discrete occurrence that may affect the project for better or worse.

Risk Event Handling: This refers to the monitoring and response to a major negative risk event.

Schedule Baseline: This is the original project schedule

Triple Constraint: Triple Constraint refers to the constraints of on time, within budget, and according to the specifications project delivery.

Workaround: This is any unplanned response to a negative risk event (i.e. not part of the project contingency plan).

Introduction: Respondent Informed Consent

Informed Consent Form
For Members of the PMI-Risk Specific Interest Group
Participating in the doctoral research study:
The Current State of Project Risk Management Practices Among Risk Sensitive Project Management Professionals
IRB# V090201ER

Investigator : Robert James Voetsch
Telephone Number : (202) 994-6145
Faculty Sponsor : Dr. Denis F. Cioffi
Telephone Number : (202) 994-6145

---

1. I.PURPOSE

Robert James Voetsch wants to explore and describe the current state of project risk management practices by the membership of the Project Management Institute Risk Management Specific Interest Group. If you want to be in the study, please answer yes to this question. You do not have to be in the study. If you do not want to be in the study, please answer no.

II.PROCEDURES

You will be asked to do one thing:
(1) Answer to the best of your ability the 45 questions included in this structured interview.

If you do not feel comfortable, you can stop at any time.

III.ASSENT

By answering yes to this question, you confirm that you understand what you have read and you want to be in the study.

Robert James Voetsch
Investigator
12 September 2002

- ○ Yes
- ○ No

Part I: Respondent Professional Information

1. How many projects have you worked on since 1 January 2000 (01/01/00)?

2. What is the budget range of the projects you have worked on since 1 January 2000 (01/01/00)?

3. What was the most recent calendar year in which you were involved in project risk management?
   - Before 2000
   - 2000
   - 2001
   - 2002
   - Other

4. What is your role in your employing organization: (Check one only)
   - Senior Executive
   - Project Manager
   - Project team member
   - Other Manager
   - Other

5. How many years of project management experience do you have?

6. What is the highest academic degree that you have earned? (Check one only)
   - Ph. D./Dsc.
   - Masters Degree
   - Bachelors Degree
   - Associate Degree
   - Other

Part II: Respondent Employing Organization Information

1. Type of Industry (Check all that are applicable)
   - ☐ Manufacturing
   - ☐ Information and communications
   - ☐ Government
   - ☐ Academic Institution
   - ☐ Military
   - ☐ Social Services (e.g. education, health care)
   - ☐ International Organization (e.g. United Nations)
   - ☐ Not for Profit, non-academic
   - ☐ Other
2. Annual Revenue of your organization (in United States dollars, US$)of your employing organization as a whole (for government respondents, please rate your organization's annual budget):
   (Check one only)
   - ○ Up to $100,000
   - ○ $101,000 - 500,000
   - ○ $501,000 - $1 million
   - ○ $1.1 - 100 million
   - ○ $101 - 500 million
   - ○ $501 million - 999 million
   - ○ $1 billion or more
   - ○ non-profit organization w/o revenue
   - ○ Other

3. Geographical Regions of your project risk management experiences (Check all that are applicable)

- ☐ Africa (sub-Saharan)
- ☐ Australasia/South Pacific
- ☐ China
- ☐ East Asia/ASEAN
- ☐ European Union
- ☐ CIS (Former USSR)
- ☐ Latin America/Caribbean
- ☐ Middle East/North Africa
- ☐ North America (NAFTA countries)
- ☐ South Asia
- ☐ Other

Part III: Senior Management Support Level for Project Risk Management

The following questions seek information on the current level of senior management support in your employing organization for project risk management since 1 January 2000 or 01/01/00.

---

1. Who is the key proponent of project risk management in your organization? (Check all that are applicable)
   - ☐ Senior Management
   - ☐ Project Managers
   - ☐ Customers
   - ☐ No One
   - ☐ Do Not Know
   - ☐ Other ____
2. Does your employing organization have a policy requiring that projects have a risk management plan? (Check one only)
   - ○ Yes
   - ○ No
   - ○ Do Not Know
   - ○ Other ____
3. If you answered yes to the previous question, in what year did your company initiate a policy requiring that projects have a risk management plan? (Check one only)
   - ○ Before 2000
   - ○ 2000
   - ○ 2001
   - ○ 2002
4. Do you consider your employing organization to be concerned about project risk? (Check one only)
   - ○ Yes
   - ○ No
   - ○ Sometimes
   - ○ Do Not Know
   - ○ Other ____

5. Does your employing organization work unit have a policy requiring that projects have a risk management plan? (Check one only)
   - Yes
   - No
   - Do Not Know
   - Other
6. Does senior management in your organization encourage and reward risk taking in projects? (Check one only)
   - Rarely 0-19%
   - Occasionally 20-39%
   - Frequently 40-59%
   - Usually 60-79%
   - Almost Always 80-100%
   - Do not Know
7. Does senior management in your organization discourage the reporting of risks associated with its projects? (Check one only)
   - Rarely 0-19%
   - Occasionally 20-39%
   - Frequently 40-59%
   - Usually 60-79%
   - Almost Always 80-100%
   - Do not Know
8. Does senior management in your organization provide adequate money, human resources, and time for the entire process of project risk management (e.g. planning, identification, impact analysis, response planning, and monitoring)? (Check one only)
   - Rarely 0-19%
   - Occasionally 20-39%
   - Frequently 40-59%
   - Usually 60-79%
   - Almost Always 80-100%
   - Do not Know

Part IV: Project Risk Management Practices

The following questions seek information on the current project risk management practices of your projects since 1 January 2000 or 01/01/00.

---

1. Do your project team members obtain training in risk management planning and impact analysis at some point during the project's life? (Check one only)
   - Rarely 0-19%
   - Occasionally 20-39%
   - Frequently 40-59%
   - Usually 60-79%
   - Almost Always 80-100%
   - Do not Know
2. Do your projects use any structured quantitative technique (e.g. Monte Carlo simulation, decision trees) when evaluating the merits and demerits of prospective projects? (Check one only)
   - Rarely 0-19%
   - Occasionally 20-39%
   - Frequently 40-59%
   - Usually 60-79%
   - Almost Always 80-100%
   - Do not Know
3. Do your projects use qualitative risk analysis (e.g. probability and impact matrix) when evaluating the merits and demerits of prospective projects? (Check one only)
   - Rarely 0-19%
   - Occasionally 20-39%
   - Frequently 40-59%
   - Usually 60-79%
   - Almost Always 80-100%
   - Do not Know

4. During which of the following project phases do your projects prepare contingency plans or strategies for responding to specific risk events? (Check as many as apply)
   - [ ] Initiating
   - [ ] Planning
   - [ ] Executing & Controlling
   - [ ] Closing
   - [ ] Do not Know
5. During which of the following project phases do your projects use qualitative risk analysis (e.g. probability and impact matrix)? (Check as many as apply)
   - [ ] Initiating
   - [ ] Planning
   - [ ] Executing & Controlling
   - [ ] Closing
   - [ ] Do not Know
6. During which of the following project phases do your projects use structured quantitative technique (e.g. Monte Carlo simulation, decision trees)? (Check as many as apply)
   - [ ] Initiating
   - [ ] Planning
   - [ ] Executing & Controlling
   - [ ] Closing
   - [ ] Do not Know
7. During which of the following project phases do your projects have risk identification sessions? (Check as many as apply)
   - [ ] Initiating
   - [ ] Planning
   - [ ] Executing & Controlling
   - [ ] Closing
   - [ ] Do not Know

8. Which of the following types of historical information have your projects used during risk identification? (Check as many as apply)

- Organization Archives
- Team member knowledge
- Reports on Industry Practices
- Do not know
- Other

9. Do you use a risk analysis technique to develop a contingency fund for project costs? (Check one only)

- Yes
- No
- Do not Know
- Other

10. If you answered yes to the previous question, what tool(s) do you use?(Check as many as apply)

  - PERT Expected Cost
  - Expected Value
  - Monte Carlo Simulation
  - Other

11. Do you use a risk analysis technique to develop a contingency fund for project schedule durations? (Check one only)

- Yes
- No
- Do not Know
- Other

12. If you answered yes to the previous question, what tool(s) do you use (Check as many as apply)

  - PERT Expected Time
  - Monte Carlo Simulation
  - Other

13. Which of the following technical resources does your organization use for conducting project risk management planning and impact analysis? (Check as many as apply)

- ☐ Risk Assessment Groups or Teams
- ☐ Project Management Office
- ☐ Outside Consultants
- ☐ Outside Accounting Companies (e.g. big 5 firms)
- ☐ Do not know
- ☐ Other

Part V: Project Risk Response Planning and Risk Event Handling Experiences

The following questions seek information on the recent project risk response planning and risk event handling experiences of your projects since 1 January 2000 or 01/01/00.

---

1. Do your projects conduct risk reviews? (Check one only)
   - ○ Rarely 0-19%
   - ○ Occasionally 20-39%
   - ○ Frequently 40-59%
   - ○ Usually 60-79%
   - ○ Almost Always 80-100%
   - ○ Do not Know
2. Do your projects experience risk audits? (Check one only)
   - ○ Rarely 0-19%
   - ○ Occasionally 20-39%
   - ○ Frequently 40-59%
   - ○ Usually 60-79%
   - ○ Almost Always 80-100%
   - ○ Do not Know

3. Do your projects experience major workarounds (e.g. >10% cost overrun from the activity's planned budget) in project operations? (Check one only)
   - Rarely 0-19%
   - Occasionally 20-39%
   - Frequently 40-59%
   - Usually 60-79%
   - Almost Always 80-100%
   - Do not Know
4. Does your employing organization have a policy requiring that projects have a risk response plan? (Check one only)
   - Yes
   - No
   - Do not Know
   - Other
5. If you answered yes to the previous question, in what year did your employing organization initiate a policy requiring that projects have a risk response plan? (Check one only)
   - Before 2000
   - 2000
   - 2001
   - 2002
6. Which of the following technical resources does your organization use during risk response planning and risk event handling? (Check as many as apply)
   - Risk Assessment Groups or Teams
   - Project Management Office
   - Outside Consultants
   - Outside Accounting Companies (e.g. big 5 firms)
   - Do not know
   - Other

Part VI: Project Management Result Experiences

The following questions seek information on the recent project management result experiences of your projects since 1 January 2000 or 01/01/00.

---

1. How often are your projects completed to the satisfaction of your customers? (Check one only)
   - Rarely 0-19%
   - Occasionally 20-39%
   - Frequently 40-59%
   - Usually 60-79%
   - Almost Always 80-100%
   - Do not Know
2. How often are your projects completed within budget? (Check one only)
   - Rarely 0-19%
   - Occasionally 20-39%
   - Frequently 40-59%
   - Usually 60-79%
   - Almost Always 80-100%
   - Do not Know
3. How often are your projects completed on time? (Check one only)
   - Rarely 0-19%
   - Occasionally 20-39%
   - Frequently 40-59%
   - Usually 60-79%
   - Almost Always 80-100%
   - Do not Know

4. How often are your projects completed according to their original Statement of Work (SOW) specifications? (Check one only)
   - Rarely 0-19%
   - Occasionally 20-39%
   - Frequently 40-59%
   - Usually 60-79%
   - Almost Always 80-100%
   - Do not Know
5. How often are your projects descoped from their original Statement of Work (SOW) specifications? (Check one only)
   - Rarely 0-19%
   - Occasionally 20-39%
   - Frequently 40-59%
   - Usually 60-79%
   - Almost Always 80-100%
   - Do not Know
6. How often are your projects terminated early – i.e. without completing the original planned deliverables? (Check one only)
   - Rarely 0-19%
   - Occasionally 20-39%
   - Frequently 40-59%
   - Usually 60-79%
   - Almost Always 80-100%
   - Do not Know
7. Do you consider the risk management policies of your organization to make a measurable difference on your project performance? (Check one only)
   - Rarely 0-19%
   - Occasionally 20-39%
   - Frequently 40-59%
   - Usually 60-79%
   - Almost Always 80-100%
   - Do not Know
8. What is the average estimated range of the cost overruns that your projects have experienced from their original cost baseline (Budget-at-Complete)? (Check only one)

- 0 - 10%
- 10 - 20%
- 20 - 30%
- 30 - 40%
- 40 - 50%
- 50 - 60%
- 60 - 70%
- 70 - 80%
- 80 - 90%
- 90 - 100%
- Over 100%
- Do not Know
- Other

9. What is the average estimated range of the schedule overruns that your projects have experienced from their original schedule baseline (Project Duration)? (Check only one)
   - 0 - 10%
   - 10 - 20%
   - 20 - 30%
   - 30 - 40%
   - 40 - 50%
   - 50 - 60%
   - 60 - 70%
   - 70 - 80%
   - 80 - 90%
   - 90 - 100%
   - Over 100%
   - Do not Know
   - Other

Personal experiences in Project Risk Management

1. Please use this space to make any additional comments about your personal and organizational project risk management practices and experiences:

   2000 chars. max.

Post Script

1. Are you interested in receiving a copy of the dissertation abstract?

   Yes

   No

2. If you are interested in receiving a copy of the dissertation abstract, please provide the following contact information.
   Name:
   E-mail Address:

   Thank you for taking the time to complete this survey.
   Sincerely,

Robert James Voetsch, PMP
Doctoral Candidate, School of Business and Public Management
Department of Management Science
Project Management Program
Management Science Department
The George Washington University
2115 G Street, NW, Ste. 302
Washington, DC 20052
U. S. A.

Submit Survey

Appendix Number 5

Invitation letters for the web survey participants

RISK SIG INITIAL INVITATION

(SENT 11 OCTOBER 2002)

Dear Fellow PMI Risk Specific Interest Group Member:

Greetings! My name is Robert Voetsch and I am both a Risk SIG member and a doctoral candidate in Management and Technology at the George Washington University in Washington, DC. My doctoral dissertation research is on the current risk management practices of Risk SIG members. To complete my doctorate I will conduct two surveys:

- A web survey of 45 questions to be completed by as many Risk SIG members as possible; and,
- A structured interview telephone survey of 22 questions to be completed by a select group of Risk SIG members **not completing the web survey.**

Either survey should take no more than 20 minutes of your time.

If you are interested in participating in the web survey, the questionnaire can be access at: http://survey.gwu.edu/survey/index.cfm?SURVEY_ID=2028

However, if you are willing to participate in the structured interview survey, you may e-mail me at Risk-PM@gwu.edu to arrange a date and time convenient to you.

The key objectives of these surveys are to:

1. Explore the extent and degree to which risk is considered in the project operations of organizations.
2. Describe the source of support for project risk management practices in organizations.
3. Describe the types of project risk management practices in organizations.
4. Learn how frequently specific risk management tools and techniques are used on projects.
5. Provide current data on reported project success in relation to on-time, within budget, according to specifications project delivery

The senior officers of the Project Management Institute Risk Specific Interest Group have approved this survey in the interest of promoting research on project risk management. They have also pre-tested this survey instrument. The findings of this research will be partially published by the PMI Risk Specific Interest Group on their World Wide Web home page.

Dr. Denis F. Cioffi, Assistant Professor of Management and Director of the Project Management Program, Department of Management Science, School of Business and Public Management, The George Washington University, Washington, D.C., is directing this research effort.

Your participation in the research study is greatly appreciated.

With sincere thanks for your time and contribution,

Robert James Voetsch, PMP
202-994-6145
Risk-PM@gwu.edu

RISK SIG FOLLOW-UP INVITATION No. 1

(SENT 31 OCTOBER 2002)

Dear Fellow PMI Risk Specific Interest Group Member:

Greetings again. I am sending this message to ask for your help with my doctoral dissertation research on the current risk management practices of Risk SIG members. To complete my studies I am conducting two surveys: a web survey, and a telephone survey of members not participating in the web survey.

Neither survey will take more than 10 - 15 minutes of your time. (One respondent reported completing the web survey in little more than 5 minutes).

If you are interested in participating in the web survey, the questionnaire can be accessed at:

http://survey.gwu.edu/survey/index.cfm?SURVEY_ID=2028

However, if you would prefer the telephone survey, you may e-mail me at DAKRJ@aol.com to arrange a date and time convenient to you.

The senior officers of the Project Management Institute Risk Specific Interest Group have approved this survey in the interest of promoting research on project risk management. They have also pre-tested the survey instruments. The findings of this research will be partially published by the PMI Risk Specific Interest Group on their World Wide Web home page.

Dr. Denis F. Cioffi, Assistant Professor of Management and Director of the Project Management Program, Department of Management Science, School of Business and Public Management, The George Washington University, Washington, D.C., is directing this research effort. My personal bio-data and a brief description of my research can be found on Dr. Cioffi's web site at:

http://voetsch.cioffi.us

Your participation in my research study is greatly appreciated.

With sincere thanks for your time and contribution,

Robert James Voetsch, PMP
202-994-6145
DAKRJ@aol.com

RISK SIG FOLLOW-UP INVITATION No. 2

(SENT 23 NOVEMBER 2002)

Dear Fellow PMI Risk Specific Interest Group Member:

Greetings again. I am sending this message to ask for your help with my doctoral dissertation research on the current risk management practices of Risk SIG members. To complete my studies I am conducting two surveys: a web survey, and a telephone survey of members not *participating in the web survey.*

Neither survey will take more than 10 - 15 minutes of your time. (One respondent reported completing the web survey in little more than 5 minutes).

If you are interested in participating in the web survey, the questionnaire can be accessed at:

http://survey.gwu.edu/survey/index.cfm?SURVEY_ID=2028

However, if you would prefer the telephone survey, you may e-mail me at DAKRJ@aol.com to arrange a date and time convenient to you.

The senior officers of the Project Management Institute Risk Specific Interest Group have approved this survey in the interest of promoting research on project risk management. They have also pre-tested the survey instruments. The findings of this research will be partially published by the PMI Risk Specific Interest Group on their World Wide Web home page.

Dr. Denis F. Cioffi, Assistant Professor of Management and Director of the Project Management Program, Department of Management Science, School of Business and Public Management, The George Washington University, Washington, D.C., is directing this research effort. My personal bio-data and a brief description of my research can be found on Dr. Cioffi's web site at:

http://voetsch.cioffi.us

Your participation in my research study is greatly appreciated.

With sincere thanks for your time and contribution,

Robert James Voetsch, PMP
202-994-6145
DAKRJ@aol.com

RISK SIG FOLLOW-UP INVITATION No. 3

(SENT 13 JANUARY 2003)

Dear Fellow PMI Risk Specific Interest Group Member:

Greetings again. I am sending this message to ask for your help with my doctoral dissertation research on the current risk management practices of Risk SIG members. To complete my studies I am conducting two surveys: a web survey, and a telephone survey of members not participating in the web survey.

I would like to thank everyone who has already participated in one of my research surveys for doing so -- your support has been a great help to me. If you have not had the opportunity to participate in one of my surveys, I would be very grateful if you could do so. **Neither survey will take more than 10 - 15 minutes of your time.** (One respondent reported completing the web survey in little more than 5 minutes.) **I will send an abstract of my research results to everyone who indicates their interest and leaves a contact address at the end of the questionnaire.**

If you are interested in participating in the web survey, the questionnaire can be accessed at: http://survey.gwu.edu/survey/index.cfm?SURVEY_ID=2028

However, if you would prefer the telephone survey, you may e-mail me at DAKRJ@aol.com to arrange a date and time convenient to you.

The senior officers of the Project Management Institute Risk Specific Interest Group have approved this survey in the interest of promoting research on project risk management. They have also pre-tested the survey instruments. The findings of this research will be partially published by the PMI Risk Specific Interest Group on their World Wide Web home page.

Dr. Denis F. Cioffi, Assistant Professor of Management and Director of the Project Management Program, Department of Management Science, School of Business and Public Management, The George Washington University, Washington, D.C., is directing this research effort. My personal bio-data and a brief description of my research can be found on Dr. Cioffi's web site at: http://voetsch.cioffi.us/

Your participation in my research study is greatly appreciated.

With sincere thanks for your time and contribution,

Robert James Voetsch, PMP
202-994-6145
DAKRJ@aol.com

RISK SIG WEB SURVEY PARTICIPANT THANK YOU MESSAGE

(SENT TO ALL WEB SURVEY RESPONDENTS INDIVIDUALLY)

Dear :

I would like to thank you very much for taking the time to complete my survey. I will send the results to you as soon as they are ready -- this will be sometime in early 2003.

If you know of any Risk SIG members who have not had the opportunity to complete my survey, I would be grateful to you for putting in a word of encouragement for them to participate.

In closing, thank you once again for your time and support to me in my dissertation research.

Sincerely,

Robert Voetsch

Appendix Number 6

Telephone survey Letter of Intent

The George Washington University
WASHINGTON DC

Structured Interview Informed Consent Form
For Members of the PMI-Risk Specific Interest Group
Participating in the doctoral research study:
The Current State of Project Risk Management Practices Among Risk Sensitive Project Management Professionals
IRB# U090201ER

Investigator: Robert James Voetsch
Telephone Number: (202) 994-6145
Faculty Sponsor: Dr. Denis F. Cioffi
Telephone Number: (202) 994-6145

I. INTRODUCTION
You are invited to take part in a research study. Before you decide to be a part of this study, you need to understand the risks and benefits. This consent form provides information about the research study. A staff member of the research study will be available to answer your questions and provide further explanations. If you agree to take part in the research study, you will be asked to sign this consent form. This process is known as informed consent.

Your decision to take part in the study is voluntary. You are free to choose whether or not you will take part in the study.

II. PURPOSE
The Department of Management Science of The George Washington University and the Program on Project Management are carrying out a research study to find out The Current State of Project Risk Management Practices Among Risk Sensitive Project Management Professionals. The investigator (person in charge of this research study) is Robert James Voetsch.

III. PROCEDURES
The research will be conducted via a structured interview. As a respondent you can choose from one of three possible interview methods: via telephone, in a face-to-face meeting or, as an e-mail attached survey form. Completion of the survey will take about 30 minutes.

IV. POSSIBLE RISKS
To the best of our knowledge, the questions you will be asked have no risk to you either personally or professionally.

VI. POSSIBLE BENEFITS
You will not get any personal benefit from taking part in this study. However, the PMI-Risk SIG will benefit from the data you will provide on the current state of project risk management practices in your professional work.
VII. COSTS
There are no costs associated with taking part in this study.

VIII. COMPENSATION
You will not receive compensation for participating in this study.

IX. RIGHT TO WITHDRAW FROM THE STUDY
Your participation in this research study is voluntary. You may decide not to begin or to stop this study at any time. You will be told of any new information about the research study that may cause you to change your mind about participation.

X. CONFIDENTIALITY OF RESEARCH RECORDS
Your records will be anonymous and confidential. You will not be identified (e.g., name, social security number) in any reports or publications of this study.

XI. QUESTIONS
If you have questions about the procedures of this research study, please contact either Robert James Voetsch by telephoning (202) 994-6145 during the workday or, the senior officers of the PMI-Risk SIG through their home page. If you have any questions about the informed consent process or any other rights as a research subject, please contact the Assistant Vice President, Office of Health Research, Compliance, and Technology Transfer at The George Washington University, at (202) 994-2995.

XII. SIGNATURES
By signing this consent form, you affirm that you have read this informed consent form; the study has been explained to you, your questions have been answered, and you agree to take part in this study. You do not give up any of your legal rights by signing this informed consent form. You will receive a copy of this consent form.

____
Participant (Print Name)

____
Signature

____
Date

XIII. INVESTIGATOR STATEMENT (please include the following)
I certify that the research study has been explained to the above individual by me or my research staff including the purpose, the procedures, the possible risks and the potential benefits associated with participation in this research study. Any questions raised have been answered to the individual's satisfaction.

Robert James Voetsch
Investigator (Print or type name)

____
Signature

____
Date

If you do not feel comfortable, you can stop at any time.

XIV. SIGNATURE

I understand what ______________________ has told me and I want to be in the study.

____
PMI-Risk SIG Member Printed Name

PMI-Risk SIG Member Signature/Date __________________________

Appendix Number 7

Invitation letter for the telephone survey participants

TELEPHONE SURVEY PARTICIPANT INVITATION MESSAGE

Dear.:

Thank you very much for your response and interest in my dissertation survey.

For your convenience, I attach the following documents: informed consent form and the survey questionnaire.

If you are able to participate in this survey, please let me know. I will need to tape record the interview in order to ensure an accurate record of your responses. The tape of your interview will be transcribed and the data aggregated with all the other interview transcripts. I want to assure you that neither you nor your organization will be identified in any way.

Finally, I will need to know the date, time and telephone number that will work best for the interview.

In closing, I thank you very much for your time and consideration.

Sincerely,

Robert Voetsch

TELEPHONE SURVEY PARTICIPANT THANK YOU MESSAGE

Dear :

I would like to thank you once again for setting aside the time to speak with me on the phone this morning. I enjoyed and learned from the interview. I also want to reassure you that I will not identify you or your company in my dissertation. The information you provided will be aggregated with the transcripts from all the other interviews and analyzed using the Ethnograph software application.

Once the interview tapes are transcribed, I will send you an MS Word version for your records. I will send you the electronic transcripts as soon as they are ready -- most likely in early March.

With kind regards and thanks,

Sincerely,

Robert Voetsch

TELEPHONE SURVEY TRANSCRIPTS COVER MESSAGE

Dear :

As promised I attach a folder containing the interview transcripts and the survey instrument. If there are any interruptions in the transcripts they are due to the technical difficulties I was experiencing with my tape recorder.

In closing, I thank you once again for your time and support to me in my dissertation research.

Sincerely,

Robert

Appendix Number 8

Telephone survey questionnaire

Structured Interview Survey Questionnaire

Part I:	Respondent Professional Information

1. **How many projects have you worked on since 1 January 2000 (01/01/00)?** ____________________

2. **What is the budget range of the projects you have been involved with since 1 January 2000 (01/01/00)?** ____________________

3. **What was the most recent calendar year in which you were involved in project risk management?**

   Before 2000 2000 2001 2002

4. **Your role in your employing organization?** (Check one only)

   Project Manager Senior Executive

   Project Team member Other Manager, (please specify) ____________________

   Other non-manager, (please specify): ____________________

5. **How many years of project management experience do you have?** ____________________

6. **What is the highest academic degree that you have earned?**

   Ph.d./Dsc. Masters

   Bachelors Associate Other(please specify): __________

Part II:	Respondent Employing Organization Information

7. **Type of Industry** (Check all that are applicable)

   Manufacturing Military

   Information and communications Social Services (e.g. education, health care)

   Government International Organization (*e.g.* United Nations)

   Academic Institution Not for Profit, non-academic

   Other, (please specify): ____________________

8. **Annual Revenue (in United States dollars, US$) of your employing organization as a whole (for government respondents, please rate your organization's annual budget):** (Check one only)

   Up to $100,000 $101 – 500 million

   $101,000 – 500,000 $501 million – 999 million

   $501,000 – $1 million $1 billion or more

   $1.1 – 100 million non-profit organization w/o revenue

9. **Geographical Regions of your project risk management experiences** (Check all that are applicable)

   Africa (sub-Saharan) Australasia (Australia, New Zealand, South Pacific)

   China East Asia/ASEAN

   European Union Former USSR (CIS)

Latin America/Caribbean | Middle East/North Africa

North America (NAFTA countries) | South Asia

Part III: Senior Management Support Level for Project Risk Management

The following questions seek information on the current level of senior management support in your employing organization for project risk management **since 1 January 2000 or 01/01/00.**

10. Who is the key proponent of project risk management in your organization? (Check all that are applicable)

Senior Management | Project Managers | Customers | No One

Others: ________________________________

11. Does your employing organization have a policy requiring that projects have a risk management plan? (Check one only)

Yes | No | Do not know | Other, (please specify):___________

12. If yes, in what year did your employing organization initiate a policy requiring that projects have a risk management plan? (Check one only)

Before 2000 | 2000 | 2001 | 2002

13. Does your employing organization work unit have a policy requiring that projects have a risk management plan? (Check one only)

Yes | No | Do not know | Other, (please specify):___________

14. *Do you consider your employing organization to be concerned about project risk?*

(Check one only)

Yes | No | Do not know | Other, (please specify):___________

Part IV: Project Risk Management Practices

The following questions seek information on the current project risk management practices of your projects **since 1 January 2000 or 01/01/00.**

15. Please describe the attitude of your company's senior management to risk and the reporting of risk throughout the life of a typical project?

16 Please describe how risk is addressed (e.g. specific risks are identified and response plans prepared for) in the projects you have been involved with:

17. Please describe any formal risk management processes or offices that exist in your organization:

18. Please describe how your organization supports project risk management planning (e.g. resources, priority status)?

Part V:	Project Risk Response Planning and Risk Event Handling Experiences

The following questions seek information on the recent project risk response planning and risk event handling experiences of your projects **since 1 January 2000 or 01/01/00.**

19. Please describe how your organization monitors and handles risk during project execution:

20. Please describe how your organization supports project risk response planning and risk event handling?

Part VI:	Project Management Result Experiences

The following questions seek information on the recent project management result experiences of your projects **since 1 January 2000 or 01/01/00.**

21. Please discuss how often your projects are completed successfully

22. Please discuss what you consider successful project management to be:

23. Please describe your opinion on how the risk management policies of your organization affect its project performance (i.e. does it have any meaningful impact):

If you are interested in receiving a copy of the dissertation abstract, please provide the following contact information.

Name: ______________________________

E-mail Address: ______________________________

Thank you for taking the time to complete this survey.

Sincerely,

Robert James Voetsch, PMP
Doctoral Candidate, School of Business and Public Management
Department of Management Science
Project Management Program
Management Science Department
The George Washington University
2115 G Street, NW, Ste. 302
Washington, DC 20052; U. S. A.

Appendix Number 9

Risk Management Special Interest Group Home Page announcements

Risk Management Specific Interest Group

Newsletters | By-Laws | Projects | Articles | Re

Enter Member's Area

help | contact us

Not a Member? Click here to register • Forgot your password?

Benefits

Officers

Join

Contact

NEWS FLASH!

RiskSIG Member in the spotlight

Recommended Webinars - 2002

Risk SIG Endorsed Research Project!

The PMI Risk Management SIG offers forum professional exchange of ideas on a myriad related to the management of risks in projec and practitioners from Public and Private se their knowledge and experience.

The Risk Management SIG is in the forefron developing concepts and ideas. Members sl "Lessons Learned," practical ideas and real that you can take back to your organization.

The Risk Management SIG will help you gai new perspectives for implementing risk man your projects. Interchange with professional industries will broaden your view of risk man serve to improve your management of proje

Practical Implementation of Risk Management
29 November 2002
One Great George Street
Westminster, London U.K.
Click here for more...

Web Page Sponsorship

MISSION

- Establish and promote the principles of Risk Management as the foun effective Project Management.
- Increase the knowledge of Risk Management and promote Risk Mana and techniques through communication, education and networking
- Involve the RM SIG membership in the improvement of the tenets for Management
- Promote the exchange of current project management information on techniques among the Risk Management Specific Interest Group (RM SIG) members.

OBJECTIVES

- Establish a worldwide network of risk management professionals in bc and Private sectors.
- Demonstrate and promote risk management principles as the most eff for planning and managing projects.
- Create forums for the free exchange of risk management ideas, solutic experience and applications.
- Develop and disseminate consistent standards of project managemen communications and practice among Risk Management professionals.
- Provide project management information and education to RM SIG prc industry, government and academia.
- Achieve the RM SIG goal of improving the delivery of processes and s well as the quality and value of completed projects.

Recommended Webinars - 2002

6th Annual Conference on Risk

NEWSLETTERS | CONSTITUTION | PROJECTS | ARTICLES | RESOURCES | MEMBER'S AREA
BENEFITS | OFFICERS | JOIN | CONTACT

For information on project risk activities in your local area or PMI chapter, send an e-mail to our Risk SIG Liaison.

THE GEORGE
WASHINGTON
UNIVERSITY
WASHINGTON DC

The Risk SIG has endorsed a doctoral research project on r
practices of Risk SIG members conducted by SIG member
Voetsch, PMP.

More information on Mr. Voetsch and his research can be a
at http://voetsch.cioffi.us

The survey can be accessed directly at
http://survey.gwu.edu/survey/index.cfm?SURVEY_ID=2028

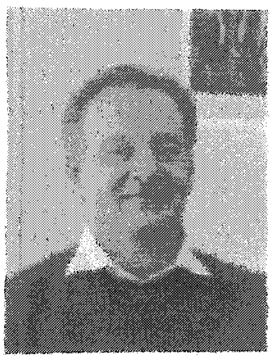
Return to the Risk SIG Home Page

Dr. Denis F. Cioffi

Professor@Cioffi.us

JOYFUL INVOLVEMENT WITH DOCTORAL STUDENTS:
1)Voetsch; 2) George; 3) Anantatmula; 4) Mills

1) Following the initial guidance by my predecessor, Dr. Parviz Rad, former head of the GW Project Management Program, I now direct the thesis of Robert James Voetsch.



Mr. Robert Voetsch, now a certified Project Management Professional, was a member of the first graduation class of M.S. PM students in December 1997. He has also earned an M.A. in Public Administration from American University and a B.A. in Political Science from American University.

Professionally, Voetsch has extensive experience in the management of diverse projects around the globe. He has worked as a project manager with the World Health Organization, the United Nations Volunteers, and the United States Peace Corps. His areas of expertise include project management design, development and implementation; strategic planning; startup program organization and integration; and management of multidisciplinary and multicultural projects. Voetsch has worked as a consultant and trainer at The George Washington University; the Florida Institute of Technology; the Project Management Service Bureau; the Yankee Clipper Group; and Louis Berger International.

Voetsch's dissertation focuses on examining the state of project risk management among risk-sensitive project management professionals; these professionals are pre-selected by their membership in the Project Management Institute's Risk Special Interest Group. Voetsch will first obtain data on the current practices of these project professionals and their organizations. He will then add to existing information about project risk management practices, tools, and techniques in various organizations by:

1. Exploring the extent and degree to which risk is considered in the project operations of organizations.
2. Describing the source of support for project risk management practices in organizations.
3. Describing the types of project risk management practices in organizations.
4. Learning how frequently specific risk management tools and techniques are used on projects.
5. Providing current data on reported project success in relation to on-time, within budget, according to specifications project delivery

The senior officers of PMI's Risk SIG have endorsed the survey and pre-tested the research instrument. The sample population for the research is the general membership of the Risk SIG, which represents more than 2000 project professionals in more than 80 countries. As a group, they span the entire spectrum of project risk management application areas.

The Risk SIG will publish some of the findings of this research on its World Wide Web home page. Risk SIG members may access the web survey at: http://survey.gwu.edu/survey/index.cfm?SURVEY_ID=2028

Mr. Voetsch can be contacted at: DAKRJ@aol.com

Appendix Number 10

Thank you letter to PMI Risk Management Special Interest Group membership

RISK SIG WEB SURVEY THANK YOU MESSAGE

Dear Fellow Risk SIG Members:

I write to thank you all for your time and support to me during my dissertation research. My web survey closed on 31 January with a total of 175 responses.

I especially want to thank all of you who made the effort to encourage your fellow members to participate in my survey. Your help was instrumental in enabling me to achieve such a high response rate.

The various suggestions and comments provided by many of you have been both instructive and educational. I thank you all for this advice and information.

As promised, my dissertation abstract will be sent to everyone who has requested it. At this time, I anticipate that I will be able to do this by late spring. I also plan to prepare a series of short reports on various aspects of the collected data for transmission to the SIG.

Finally, anyone who did not participate in the web survey can still participate in my telephone survey. If interested, please contact me at DAKRJ@aol.com in order to arrange a telephone interview.

In closing, thank you all for your time and support. Without you, my research would have been impossible to complete.

Sincerely,

Robert Voetsch, PMP

Appendix Number 11

SPSS 11.5™ Chi-Square Results for Tables 5-1 to 5-7

Chapter 5

Chi-Square Data Analysis Results
(By Table)

Table 5-1

X_2 Organization PRM Policy - X_9 PRM Training

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	28.572[a]	8	.000
Likelihood Ratio	31.008	8	.000
Linear-by-Linear Association	18.607	1	.000
N of Valid Cases	170		

a. 7 cells (46.7%) have expected count less than 5. The minimum expected count is .42.

X_2 Organization PRM Policy - X_{10} Use of Quantitative Technique

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.742[a]	8	.089
Likelihood Ratio	14.505	8	.070
Linear-by-Linear Association	5.398	1	.020
N of Valid Cases	170		

a. 8 cells (53.3%) have expected count less than 5. The minimum expected count is .28.

X_2 Organization PRM Policy - X_{11} Use of Qualitative Technique

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	25.194[a]	8	.001
Likelihood Ratio	27.419	8	.001
Linear-by-Linear Association	18.207	1	.000
N of Valid Cases	171		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .77.

X_2 Organization PRM Policy - X_{15} Risk ID Sessions during the PLC

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	20.143[a]	14	.126
Likelihood Ratio	19.488	14	.147
Linear-by-Linear Association	1.622	1	.203
N of Valid Cases	162		

a. 11 cells (45.8%) have expected count less than 5. The minimum expected count is .03.

X_2 Organization PRM Policy - X_{17} Risk Tool for Contingency Costs

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	25.958[a]	4	.000
Likelihood Ratio	16.617	4	.002
Linear-by-Linear Association	9.779	1	.002
N of Valid Cases	169		

a. 5 cells (55.6%) have expected count less than 5. The minimum expected count is .21.

X_2 Organization PRM Policy - X_{19} Risk Tool for Contingency Time

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	21.724[a]	4	.000
Likelihood Ratio	12.625	4	.013
Linear-by-Linear Association	9.871	1	.002
N of Valid Cases	168		

a. 5 cells (55.6%) have expected count less than 5. The minimum expected count is .21.

X_4 Organization Concern for PRM - X_9 PRM Training

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	30.626[a]	8	.000
Likelihood Ratio	37.505	8	.000
Linear-by-Linear Association	26.005	1	.000
N of Valid Cases	172		

a. 6 cells (40.0%) have expected count less than 5. The minimum expected count is .56.

X_4 **Organization Concern for PRM - X_{10} Use of Quantitative Technique**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.186[a]	8	.143
Likelihood Ratio	15.819	8	.045
Linear-by-Linear Association	7.260	1	.007
N of Valid Cases	173		

a. 8 cells (53.3%) have expected count less than 5. The minimum expected count is .37.

X_4 **Organization Concern for PRM - X_{11} Use of Qualitative Technique**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	30.606[a]	8	.000
Likelihood Ratio	34.531	8	.000
Linear-by-Linear Association	19.069	1	.000
N of Valid Cases	174		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is 1.01.

X_4 **Organization Concern for PRM - X_{15} Risk ID Sessions during the PLC**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	21.120[a]	14	.099
Likelihood Ratio	22.865	14	.063
Linear-by-Linear Association	3.973	1	.046
N of Valid Cases	165		

a. 11 cells (45.8%) have expected count less than 5. The minimum expected count is .04.

X_4 **Organization Concern for PRM - X_{17} Risk Tool for Contingency Costs**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.188[a]	4	.025
Likelihood Ratio	11.631	4	.020
Linear-by-Linear Association	7.053	1	.008
N of Valid Cases	170		

a. 5 cells (55.6%) have expected count less than 5. The minimum expected count is .28.

X_4 **Organization Concern for PRM** - X_{19} **Risk Tool for Contingency Time**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.082[a]	4	.279
Likelihood Ratio	5.412	4	.248
Linear-by-Linear Association	3.855	1	.050
N of Valid Cases	169		

a. 5 cells (55.6%) have expected count less than 5. The minimum expected count is .28.

X_5 **Work Unit PRM Policy** - X_9 **PRM Training**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	28.875[a]	8	.000
Likelihood Ratio	31.896	8	.000
Linear-by-Linear Association	22.309	1	.000
N of Valid Cases	168		

a. 7 cells (46.7%) have expected count less than 5. The minimum expected count is .36.

X_5 **Work Unit PRM Policy** - X_{10} **Use of Quantitative Technique**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.996[a]	8	.343
Likelihood Ratio	10.132	8	.256
Linear-by-Linear Association	6.567	1	.010
N of Valid Cases	168		

a. 8 cells (53.3%) have expected count less than 5. The minimum expected count is .24.

X_5 **Work Unit PRM Policy** - X_{11} **Use of Qualitative Technique**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	25.487[a]	8	.001
Likelihood Ratio	27.371	8	.001
Linear-by-Linear Association	15.741	1	.000
N of Valid Cases	169		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .65.

X_5 **Work Unit PRM Policy -** X_{15} **Risk ID Sessions during the PLC**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.783[a]	14	.624
Likelihood Ratio	13.426	14	.493
Linear-by-Linear Association	.872	1	.350
N of Valid Cases	161		

a. 11 cells (45.8%) have expected count less than 5. The minimum expected count is .02.

X_5 **Work Unit PRM Policy -** X_{17} **Risk Tool for Contingency Costs**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	20.833[a]	4	.000
Likelihood Ratio	21.330	4	.000
Linear-by-Linear Association	13.518	1	.000
N of Valid Cases	167		

a. 5 cells (55.6%) have expected count less than 5. The minimum expected count is .18.

X_5 **Work Unit PRM Policy -** X_{19} **Risk Tool for Contingency Time**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.698[a]	4	.008
Likelihood Ratio	13.754	4	.008
Linear-by-Linear Association	10.688	1	.001
N of Valid Cases	166		

a. 5 cells (55.6%) have expected count less than 5. The minimum expected count is .18.

X_6 **Encourage PRM -** X_9 **PRM Training**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	36.673[a]	16	.002
Likelihood Ratio	35.212	16	.004
Linear-by-Linear Association	10.192	1	.001
N of Valid Cases	158		

a. 16 cells (64.0%) have expected count less than 5. The minimum expected count is .63.

X_6 **Encourage PRM -** X_{10} **Use of Quantitative Technique**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	38.948[a]	16	.001
Likelihood Ratio	36.282	16	.003
Linear-by-Linear Association	5.917	1	.015
N of Valid Cases	158		

a. 17 cells (68.0%) have expected count less than 5. The minimum expected count is .56.

X_6 **Encourage PRM -** X_{11} **Use of Qualitative Technique**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.465[a]	16	.638
Likelihood Ratio	14.959	16	.528
Linear-by-Linear Association	5.474	1	.019
N of Valid Cases	159		

a. 14 cells (56.0%) have expected count less than 5. The minimum expected count is 1.38.

X_6 **Encourage PRM -** X_{15} **Risk ID Sessions during the PLC**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	40.476[a]	28	.060
Likelihood Ratio	41.978	28	.044
Linear-by-Linear Association	.148	1	.700
N of Valid Cases	153		

a. 28 cells (70.0%) have expected count less than 5. The minimum expected count is .07.

X_6 **Encourage PRM -** X_{17} **Risk Tool for Contingency Costs**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.615[a]	8	.690
Likelihood Ratio	6.775	8	.561
Linear-by-Linear Association	.591	1	.442
N of Valid Cases	156		

a. 6 cells (40.0%) have expected count less than 5. The minimum expected count is .35.

X_6 **Encourage PRM -** X_{19} **Risk Tool for Contingency Time**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.938[a]	8	.154
Likelihood Ratio	13.206	8	.105
Linear-by-Linear Association	7.163	1	.007
N of Valid Cases	155		

a. 6 cells (40.0%) have expected count less than 5. The minimum expected count is .35.

X_7 **Discourage PRM -** X_9 **PRM Training**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	21.906[a]	16	.146
Likelihood Ratio	28.842	16	.025
Linear-by-Linear Association	5.991	1	.014
N of Valid Cases	166		

a. 16 cells (64.0%) have expected count less than 5. The minimum expected count is .36.

X_7**Discourage PRM -** X_{10} **Use of Quantitative Technique**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.781[a]	16	.074
Likelihood Ratio	30.557	16	.015
Linear-by-Linear Association	2.104	1	.147
N of Valid Cases	167		

a. 17 cells (68.0%) have expected count less than 5. The minimum expected count is .24.

X_7 **Discourage PRM -** X_{11} **Use of Qualitative Technique**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	36.144[a]	16	.003
Likelihood Ratio	37.888	16	.002
Linear-by-Linear Association	7.182	1	.007
N of Valid Cases	167		

a. 16 cells (64.0%) have expected count less than 5. The minimum expected count is .66.

X_7 **Discourage PRM - X_{15} Risk ID Sessions during the PLC**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	50.471[a]	28	.006
Likelihood Ratio	50.853	28	.005
Linear-by-Linear Association	4.597	1	.032
N of Valid Cases	161		

a. 32 cells (80.0%) have expected count less than 5. The minimum expected count is .02.

X_7 **Discourage PRM - X_{17} Risk Tool for Contingency Costs**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.405[a]	8	.099
Likelihood Ratio	15.306	8	.053
Linear-by-Linear Association	.741	1	.389
N of Valid Cases	165		

a. 7 cells (46.7%) have expected count less than 5. The minimum expected count is .18.

X_7 **Discourage PRM - X_{19} Risk Tool for Contingency Time**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.893[a]	8	.044
Likelihood Ratio	16.253	8	.039
Linear-by-Linear Association	3.387	1	.066
N of Valid Cases	165		

a. 8 cells (53.3%) have expected count less than 5. The minimum expected count is .18.

Table 5-2

X_8 Adequate Resources for PRM - X_9 PRM Training

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	72.684[a]	16	.000
Likelihood Ratio	71.206	16	.000
Linear-by-Linear Association	43.808	1	.000
N of Valid Cases	168		

a. 14 cells (56.0%) have expected count less than 5. The minimum expected count is 1.29.

X_8 Adequate Resources for PRM - X_{10} Use of Quantitative Technique

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	43.974[a]	16	.000
Likelihood Ratio	39.563	16	.001
Linear-by-Linear Association	17.296	1	.000
N of Valid Cases	168		

a. 16 cells (64.0%) have expected count less than 5. The minimum expected count is .90.

X_8 Adequate Resources for PRM - X_{11} Use of Qualitative Technique

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	57.195[a]	16	.000
Likelihood Ratio	57.093	16	.000
Linear-by-Linear Association	39.113	1	.000
N of Valid Cases	169		

a. 13 cells (52.0%) have expected count less than 5. The minimum expected count is 2.47.

X_8 Adequate Resources for PRM - X_{15} Risk ID Sessions during the PLC

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	54.632[a]	28	.002
Likelihood Ratio	54.358	28	.002
Linear-by-Linear Association	10.056	1	.002
N of Valid Cases	162		

a. 27 cells (67.5%) have expected count less than 5. The minimum expected count is .12.

X_8 Adequate Resources for PRM - X_{17} Risk Tool for Contingency Costs

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.561[a]	8	.025
Likelihood Ratio	18.150	8	.020
Linear-by-Linear Association	6.848	1	.009
N of Valid Cases	166		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .69.

X_8 Adequate Resources for PRM - X_{19} Risk Tool for *Contingency Time*

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	21.384[a]	8	.006
Likelihood Ratio	22.211	8	.005
Linear-by-Linear Association	17.370	1	.000
N of Valid Cases	165		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .69.

Table 5-3

X_9 PRM Training - X_{22} Risk Reviews

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	78.576[a]	16	.000
Likelihood Ratio	72.441	16	.000
Linear-by-Linear Association	45.899	1	.000
N of Valid Cases	173		

a. 15 cells (60.0%) have expected count less than 5. The minimum expected count is 1.39.

X_9 PRM Training - X_{23} Risk Audits

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	73.551[a]	16	.000
Likelihood Ratio	58.271	16	.000
Linear-by-Linear Association	33.889	1	.000
N of Valid Cases	172		

a. 17 cells (68.0%) have expected count less than 5. The minimum expected count is .49.

X_9 PRM Training - X_{25} Risk Response Plan

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	36.797[a]	8	.000
Likelihood Ratio	39.581	8	.000
Linear-by-Linear Association	29.436	1	.000
N of Valid Cases	162		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .30.

X_{10} **Use of Quantitative Technique -** X_{22} **Risk Reviews**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	30.042[a]	16	.018
Likelihood Ratio	29.775	16	.019
Linear-by-Linear Association	25.343	1	.000
N of Valid Cases	174		

a. 16 cells (64.0%) have expected count less than 5. The minimum expected count is .92.

X_{10} **Use of Quantitative Technique -** X_{23} **Risk Audits**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	62.575[a]	16	.000
Likelihood Ratio	42.429	16	.000
Linear-by-Linear Association	23.984	1	.000
N of Valid Cases	172		

a. 17 cells (68.0%) have expected count less than 5. The minimum expected count is .33.

X_{10} **Use of Quantitative Technique -** X_{25} **Risk Response Plan**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.614[a]	8	.472
Likelihood Ratio	7.871	8	.446
Linear-by-Linear Association	4.645	1	.031
N of Valid Cases	162		

a. 7 cells (46.7%) have expected count less than 5. The minimum expected count is .17.

X_{11} **Use of Qualitative Technique - X_{22} Risk Reviews**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	86.726[a]	16	.000
Likelihood Ratio	85.699	16	.000
Linear-by-Linear Association	47.409	1	.000
N of Valid Cases	175		

a. 7 cells (28.0%) have expected count less than 5. The minimum expected count is 2.51.

X_{11} **Use of Qualitative Technique - X_{23} Risk Audits**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	34.098[a]	16	.005
Likelihood Ratio	39.019	16	.001
Linear-by-Linear Association	21.494	1	.000
N of Valid Cases	173		

a. 16 cells (64.0%) have expected count less than 5. The minimum expected count is .89.

X_{11} **Use of Qualitative Technique - X_{25} Risk Response Plan**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	42.381[a]	8	.000
Likelihood Ratio	42.578	8	.000
Linear-by-Linear Association	25.417	1	.000
N of Valid Cases	163		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .49.

X_{15} Risk ID Sessions during the PLC - X_{22} Risk Reviews

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	64.177[a]	28	.000
Likelihood Ratio	74.276	28	.000
Linear-by-Linear Association	4.773	1	.029
N of Valid Cases	166		

a. 29 cells (72.5%) have expected count less than 5. The minimum expected count is .11.

X_{15} Risk ID Sessions during the PLC - X_{23} Risk Audits

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	42.291[a]	28	.041
Likelihood Ratio	42.068	28	.043
Linear-by-Linear Association	.108	1	.742
N of Valid Cases	164		

a. 32 cells (80.0%) have expected count less than 5. The minimum expected count is .04.

X_{15} Risk ID Sessions during the PLC - X_{25} Risk Response Plan

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.614[a]	14	.039
Likelihood Ratio	26.172	14	.025
Linear-by-Linear Association	1.243	1	.265
N of Valid Cases	156		

a. 12 cells (50.0%) have expected count less than 5. The minimum expected count is .03.

X_{17} **Risk Tool for Contingency Costs** - X_{22} **Risk Reviews**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.349[a]	8	.013
Likelihood Ratio	21.232	8	.007
Linear-by-Linear Association	5.672	1	.017
N of Valid Cases	171		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .70.

X_{17} **Risk Tool for Contingency Costs** - X_{23} **Risk Audits**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.871[a]	8	.274
Likelihood Ratio	10.354	8	.241
Linear-by-Linear Association	4.340	1	.037
N of Valid Cases	170		

a. 8 cells (53.3%) have expected count less than 5. The minimum expected count is .25.

X_{17} **Risk Tool for Contingency Costs** - X_{25} **Risk Response Plan**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	35.624[a]	4	.000
Likelihood Ratio	24.143	4	.000
Linear-by-Linear Association	3.960	1	.047
N of Valid Cases	161		

a. 5 cells (55.6%) have expected count less than 5. The minimum expected count is .15.

X_{19} **Risk Tool for Contingency Time -** X_{22} **Risk Reviews**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	22.976[a]	8	.003
Likelihood Ratio	25.698	8	.001
Linear-by-Linear Association	6.898	1	.009
N of Valid Cases	170		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .67.

X_{19} **Risk Tool for Contingency Time -** X_{23} **Risk Audits**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.796[a]	8	.023
Likelihood Ratio	18.121	8	.020
Linear-by-Linear Association	7.892	1	.005
N of Valid Cases	169		

a. 8 cells (53.3%) have expected count less than 5. The minimum expected count is .25.

X_{19} **Risk Tool for Contingency Time -** X_{25} **Risk Response Plan**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	32.491[a]	4	.000
Likelihood Ratio	19.044	4	.001
Linear-by-Linear Association	4.375	1	.036
N of Valid Cases	160		

a. 5 cells (55.6%) have expected count less than 5. The minimum expected count is .15.

Table 5-4

X_9 PRM Training - X_{24} Workarounds

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.044[a]	16	.595
Likelihood Ratio	16.677	16	.407
Linear-by-Linear Association	5.519	1	.019
N of Valid Cases	170		

a. 15 cells (60.0%) have expected count less than 5. The minimum expected count is .71.

X_{10} Use of Quantitative Technique - X_{24} Workarounds

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	28.379[a]	16	.028
Likelihood Ratio	31.476	16	.012
Linear-by-Linear Association	.036	1	.849
N of Valid Cases	171		

a. 16 cells (64.0%) have expected count less than 5. The minimum expected count is .56.

X_{11} Use of Qualitative Technique - X_{24} Workarounds

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	23.552[a]	16	.100
Likelihood Ratio	25.722	16	.058
Linear-by-Linear Association	6.257	1	.012
N of Valid Cases	172		

a. 11 cells (44.0%) have expected count less than 5. The minimum expected count is 1.47.

X_{15} **Risk ID Sessions during the PLC - X_{24} Workarounds**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	51.307[a]	28	.005
Likelihood Ratio	49.913	28	.007
Linear-by-Linear Association	1.468	1	.226
N of Valid Cases	164		

a. 30 cells (75.0%) have expected count less than 5. The minimum expected count is .07.

X_{17} **Risk Tool for Contingency Costs - X_{24} Workarounds**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.403[a]	8	.714
Likelihood Ratio	6.047	8	.642
Linear-by-Linear Association	.014	1	.905
N of Valid Cases	168		

a. 6 cells (40.0%) have expected count less than 5. The minimum expected count is .33.

X_{19} **Risk Tool for Contingency Time - X_{24} Workarounds**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.848[a]	8	.664
Likelihood Ratio	6.502	8	.591
Linear-by-Linear Association	.000	1	.988
N of Valid Cases	167		

a. 6 cells (40.0%) have expected count less than 5. The minimum expected count is .33.

X_{25} **Risk Response Plan - X_{24} Workarounds**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.009[a]	8	.856
Likelihood Ratio	4.627	8	.797
Linear-by-Linear Association	1.004	1	.316
N of Valid Cases	160		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .28.

Table 5-5

X_9 **PRM Training** - Y_1 **Customer Satisfaction**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.136[a]	16	.377
Likelihood Ratio	19.066	16	.265
Linear-by-Linear Association	9.811	1	.002
N of Valid Cases	170		

a. 15 cells (60.0%) have expected count less than 5. The minimum expected count is .19.

X_9 **PRM Training** - Y_2 **Within Budget Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.658[a]	16	.344
Likelihood Ratio	21.554	16	.158
Linear-by-Linear Association	7.845	1	.005
N of Valid Cases	166		

a. 16 cells (64.0%) have expected count less than 5. The minimum expected count is .80.

X_9 **PRM Training** - Y_3 **On-time Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	33.760[a]	16	.006
Likelihood Ratio	35.837	16	.003
Linear-by-Linear Association	17.818	1	.000
N of Valid Cases	170		

a. 15 cells (60.0%) have expected count less than 5. The minimum expected count is .78.

X_9 **PRM Training** - Y_4 **According to original SOW Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	23.892[a]	16	.092
Likelihood Ratio	26.517	16	.047
Linear-by-Linear Association	7.716	1	.005
N of Valid Cases	170		

a. 15 cells (60.0%) have expected count less than 5. The minimum expected count is 1.84.

X_9 **PRM Training** - Y_5 **Delivery within descoped SOW**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	18.115[a]	16	.317
Likelihood Ratio	21.650	16	.155
Linear-by-Linear Association	4.440	1	.035
N of Valid Cases	168		

a. 15 cells (60.0%) have expected count less than 5. The minimum expected count is .50.

X_9 **PRM Training** - Y_6 **Early Terminated Project**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.199[a]	8	.839
Likelihood Ratio	5.999	8	.647
Linear-by-Linear Association	1.826	1	.177
N of Valid Cases	172		

a. 8 cells (53.3%) have expected count less than 5. The minimum expected count is .70.

X_9 **PRM Training** - Y_7 **Overall Impact of PRM on PM Performance**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	52.387[a]	16	.000
Likelihood Ratio	56.163	16	.000
Linear-by-Linear Association	23.124	1	.000
N of Valid Cases	161		

a. 15 cells (60.0%) have expected count less than 5. The minimum expected count is 1.79.

X_{10} **Use of Quantitative Technique** - Y_1 **Customer Satisfaction**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.308[a]	16	.576
Likelihood Ratio	14.725	16	.545
Linear-by-Linear Association	3.213	1	.073
N of Valid Cases	171		

a. 16 cells (64.0%) have expected count less than 5. The minimum expected count is .14.

X_{10} **Use of Quantitative Technique** - Y_2 **Within Budget Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.043[a]	16	.741
Likelihood Ratio	15.280	16	.504
Linear-by-Linear Association	5.849	1	.016
N of Valid Cases	167		

a. 16 cells (64.0%) have expected count less than 5. The minimum expected count is .62.

X_{10} **Use of Quantitative Technique** - Y_3 **On-time Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.698[a]	16	.075
Likelihood Ratio	31.073	16	.013
Linear-by-Linear Association	12.999	1	.000
N of Valid Cases	171		

a. 15 cells (60.0%) have expected count less than 5. The minimum expected count is .61.

X_{10} **Use of Quantitative Technique** - Y_4 **According to original SOW Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	21.808[a]	16	.149
Likelihood Ratio	25.401	16	.063
Linear-by-Linear Association	11.171	1	.001
N of Valid Cases	171		

a. 15 cells (60.0%) have expected count less than 5. The minimum expected count is 1.11.

X_{10} **Use of Quantitative Technique** - Y_5 **Delivery within descoped SOW**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.706[a]	16	.764
Likelihood Ratio	15.576	16	.483
Linear-by-Linear Association	2.985	1	.084
N of Valid Cases	169		

a. 16 cells (64.0%) have expected count less than 5. The minimum expected count is .28.

X_{10} **Use of Quantitative Technique** - Y_6 **Early Terminated Project**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.268[a]	8	.408
Likelihood Ratio	10.760	8	.216
Linear-by-Linear Association	1.411	1	.235
N of Valid Cases	173		

a. 7 cells (46.7%) have expected count less than 5. The minimum expected count is .51.

X_{10} **Use of Quantitative Technique** - Y_7 **Overall Impact of PRM on PM Performance**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	27.027[a]	16	.041
Likelihood Ratio	27.705	16	.034
Linear-by-Linear Association	11.175	1	.001
N of Valid Cases	161		

a. 15 cells (60.0%) have expected count less than 5. The minimum expected count is 1.19.

X_{11} **Use of Qualitative Technique** - Y_1 **Customer Satisfaction**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.968[a]	16	.222
Likelihood Ratio	21.049	16	.177
Linear-by-Linear Association	8.057	1	.005
N of Valid Cases	172		

a. 12 cells (48.0%) have expected count less than 5. The minimum expected count is .38.

X_{11} **Use of Qualitative Technique** - Y_2 **Within Budget Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.814[a]	16	.073
Likelihood Ratio	26.816	16	.044
Linear-by-Linear Association	10.730	1	.001
N of Valid Cases	168		

a. 7 cells (28.0%) have expected count less than 5. The minimum expected count is 1.63.

X_{11} **Use of Qualitative Technique** - Y_3 **On-time Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.492[a]	16	.079
Likelihood Ratio	28.784	16	.025
Linear-by-Linear Association	14.314	1	.000
N of Valid Cases	172		

a. 8 cells (32.0%) have expected count less than 5. The minimum expected count is 1.66.

X_{11} **Use of Qualitative Technique** - Y_4 **According to original SOW Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.373[a]	16	.362
Likelihood Ratio	16.474	16	.420
Linear-by-Linear Association	1.544	1	.214
N of Valid Cases	172		

a. 6 cells (24.0%) have expected count less than 5. The minimum expected count is 3.30.

X_{11} **Use of Qualitative Technique** - Y_5 **Delivery within descoped SOW**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	20.912[a]	16	.182
Likelihood Ratio	20.553	16	.196
Linear-by-Linear Association	4.312	1	.038
N of Valid Cases	170		

a. 12 cells (48.0%) have expected count less than 5. The minimum expected count is .99.

X_{11} **Use of Qualitative Technique** - Y_6 **Early Terminated Project**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.404[a]	8	.494
Likelihood Ratio	7.450	8	.489
Linear-by-Linear Association	1.372	1	.242
N of Valid Cases	174		

a. 6 cells (40.0%) have expected count less than 5. The minimum expected count is 1.39.

X_{11} **Use of Qualitative Technique** - Y_7 **Overall Impact of PRM on PM Performance**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	44.782[a]	16	.000
Likelihood Ratio	43.809	16	.000
Linear-by-Linear Association	23.857	1	.000
N of Valid Cases	162		

a. 6 cells (24.0%) have expected count less than 5. The minimum expected count is 2.96.

X_{12} **Contingency Planning during PLC - Y_1 Customer Satisfaction**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	48.896[a]	44	.283
Likelihood Ratio	44.294	44	.459
Linear-by-Linear Association	.035	1	.851
N of Valid Cases	169		

a. 47 cells (78.3%) have expected count less than 5. The minimum expected count is .01.

X_{12} **Contingency Planning during PLC - Y_2 Within Budget Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	59.001[a]	44	.065
Likelihood Ratio	47.853	44	.319
Linear-by-Linear Association	.007	1	.934
N of Valid Cases	165		

a. 48 cells (80.0%) have expected count less than 5. The minimum expected count is .07.

X_{12} **Contingency Planning during PLC - Y_3 On-time Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	52.399[a]	44	.180
Likelihood Ratio	51.987	44	.191
Linear-by-Linear Association	.134	1	.714
N of Valid Cases	169		

a. 49 cells (81.7%) have expected count less than 5. The minimum expected count is .07.

X_{12} **Contingency Planning during PLC - Y_4 According to original SOW Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	30.077[a]	44	.946
Likelihood Ratio	30.152	44	.945
Linear-by-Linear Association	.225	1	.636
N of Valid Cases	169		

a. 50 cells (83.3%) have expected count less than 5. The minimum expected count is .15.

X_{12} **Contingency Planning during PLC - Y_5 Delivery within descoped SOW**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	88.256[a]	44	.000
Likelihood Ratio	64.023	44	.026
Linear-by-Linear Association	.283	1	.595
N of Valid Cases	166		

a. 48 cells (80.0%) have expected count less than 5. The minimum expected count is .04.

X_{12} **Contingency Planning during PLC - Y_6 Early Terminated Project**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.885[a]	22	.303
Likelihood Ratio	25.207	22	.287
Linear-by-Linear Association	.704	1	.402
N of Valid Cases	170		

a. 27 cells (75.0%) have expected count less than 5. The minimum expected count is .05.

X_{12} **Contingency Planning during PLC - Y_7 Overall Impact of PRM on PM Performance**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	58.351[a]	40	.030
Likelihood Ratio	58.809	40	.028
Linear-by-Linear Association	.022	1	.881
N of Valid Cases	159		

a. 41 cells (74.5%) have expected count less than 5. The minimum expected count is .15.

X_{15} Risk ID Sessions during the PLC - Y_1 Customer Satisfaction

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	42.728[a]	28	.037
Likelihood Ratio	42.257	28	.041
Linear-by-Linear Association	.191	1	.662
N of Valid Cases	164		

a. 28 cells (70.0%) have expected count less than 5. The minimum expected count is .02.

X_{15} Risk ID Sessions during the PLC - Y_2 Within Budget Delivery

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	34.381[a]	28	.189
Likelihood Ratio	35.026	28	.169
Linear-by-Linear Association	.345	1	.557
N of Valid Cases	160		

a. 30 cells (75.0%) have expected count less than 5. The minimum expected count is .08.

X_{15} Risk ID Sessions during the PLC - Y_3 On-time Delivery

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	48.703[a]	28	.009
Likelihood Ratio	49.111	28	.008
Linear-by-Linear Association	2.390	1	.122
N of Valid Cases	164		

a. 31 cells (77.5%) have expected count less than 5. The minimum expected count is .07.

X_{15} Risk ID Sessions during the PLC - Y_4 According to original SOW Delivery

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	31.157[a]	28	.310
Likelihood Ratio	37.608	28	.106
Linear-by-Linear Association	.588	1	.443
N of Valid Cases	164		

a. 34 cells (85.0%) have expected count less than 5. The minimum expected count is .16.

X_{15} Risk ID Sessions during the PLC - Y_5 Delivery within descoped SOW

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	42.203[a]	28	.041
Likelihood Ratio	41.694	28	.046
Linear-by-Linear Association	2.087	1	.149
N of Valid Cases	161		

a. 28 cells (70.0%) have expected count less than 5. The minimum expected count is .05.

X_{15} Risk ID Sessions during the PLC - Y_6 Early Terminated Project

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.913[a]	14	.613
Likelihood Ratio	12.705	14	.550
Linear-by-Linear Association	.421	1	.516
N of Valid Cases	165		

a. 16 cells (66.7%) have expected count less than 5. The minimum expected count is .06.

X_{15} Risk ID Sessions during the PLC - Y_7 Overall Impact of PRM on PM Performance

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	52.415[a]	28	.003
Likelihood Ratio	64.418	28	.000
Linear-by-Linear Association	10.663	1	.001
N of Valid Cases	155		

a. 29 cells (72.5%) have expected count less than 5. The minimum expected count is .15.

X_{17} Risk Tool for Contingency Costs - Y_1 Customer Satisfaction

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.247[a]	8	.510
Likelihood Ratio	7.593	8	.474
Linear-by-Linear Association	.232	1	.630
N of Valid Cases	168		

a. 7 cells (46.7%) have expected count less than 5. The minimum expected count is .09.

X_{17} Risk Tool for Contingency Costs - Y_2 Within Budget Delivery

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.137[a]	8	.632
Likelihood Ratio	7.353	8	.499
Linear-by-Linear Association	2.360	1	.124
N of Valid Cases	164		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .29.

X_{17} **Risk Tool for Contingency Costs** - Y_3 **On-time Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.902[a]	8	.351
Likelihood Ratio	9.230	8	.323
Linear-by-Linear Association	3.170	1	.075
N of Valid Cases	168		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .36.

X_{17} **Risk Tool for Contingency Costs** - Y_4 **According to original SOW Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.058[a]	8	.530
Likelihood Ratio	7.969	8	.436
Linear-by-Linear Association	.843	1	.358
N of Valid Cases	168		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .93.

X_{17} **Risk Tool for Contingency Costs** - Y_5 **Delivery within descoped SOW**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.212[a]	8	.838
Likelihood Ratio	5.595	8	.692
Linear-by-Linear Association	.216	1	.642
N of Valid Cases	166		

a. 7 cells (46.7%) have expected count less than 5. The minimum expected count is .21.

X_{17} **Risk Tool for Contingency Costs** - Y_6 **Early Terminated Project**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.839[a]	4	.065
Likelihood Ratio	7.052	4	.133
Linear-by-Linear Association	.703	1	.402
N of Valid Cases	170		

a. 4 cells (44.4%) have expected count less than 5. The minimum expected count is .35.

X_{17} **Risk Tool for Contingency Costs** - Y_7 **Overall Impact of PRM on PM Performance**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	20.528[a]	8	.009
Likelihood Ratio	22.020	8	.005
Linear-by-Linear Association	4.944	1	.026
N of Valid Cases	160		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .90.

X_{19} **Risk Tool for Contingency Time** - Y_1 **Customer Satisfaction**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.553[a]	8	.804
Likelihood Ratio	4.787	8	.780
Linear-by-Linear Association	.345	1	.557
N of Valid Cases	167		

a. 7 cells (46.7%) have expected count less than 5. The minimum expected count is .09.

X_{19} **Risk Tool for Contingency Time** - Y_2 **Within Budget Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.516[a]	8	.898
Likelihood Ratio	3.828	8	.872
Linear-by-Linear Association	1.853	1	.173
N of Valid Cases	163		

a. 6 cells (40.0%) have expected count less than 5. The minimum expected count is .29.

X_{19} **Risk Tool for Contingency Time** - Y_3 **On-time Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.805[a]	8	.359
Likelihood Ratio	9.095	8	.334
Linear-by-Linear Association	5.559	1	.018
N of Valid Cases	167		

a. 6 cells (40.0%) have expected count less than 5. The minimum expected count is .36.

X_{19} **Risk Tool for Contingency Time** - Y_4 **According to original SOW Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.924[a]	8	.864
Likelihood Ratio	4.761	8	.783
Linear-by-Linear Association	.278	1	.598
N of Valid Cases	167		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .93.

X_{19} **Risk Tool for Contingency Time** - Y_5 **Delivery within descoped SOW**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.048[a]	8	.642
Likelihood Ratio	7.853	8	.448
Linear-by-Linear Association	.031	1	.861
N of Valid Cases	165		

a. 7 cells (46.7%) have expected count less than 5. The minimum expected count is .25.

X_{19} **Risk Tool for Contingency Time** - Y_6 **Early Terminated Project**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.278[a]	4	.370
Likelihood Ratio	3.832	4	.429
Linear-by-Linear Association	.899	1	.343
N of Valid Cases	169		

a. 4 cells (44.4%) have expected count less than 5. The minimum expected count is .36.

X_{19} **Risk Tool for Contingency Time** - Y_7 **Overall Impact of PRM on PM Performance**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	20.143[a]	8	.010
Likelihood Ratio	20.502	8	.009
Linear-by-Linear Association	9.143	1	.002
N of Valid Cases	159		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .91.

X_{25} **Risk Response Plan** - Y_1 **Customer Satisfaction**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.444[a]	8	.235
Likelihood Ratio	11.477	8	.176
Linear-by-Linear Association	3.670	1	.055
N of Valid Cases	160		

a. 7 cells (46.7%) have expected count less than 5. The minimum expected count is .08.

X_{25} **Risk Response Plan** - Y_2 **Within Budget Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.018[a]	8	.341
Likelihood Ratio	10.393	8	.238
Linear-by-Linear Association	2.125	1	.145
N of Valid Cases	156		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .28.

X_{25} **Risk Response Plan** - Y_3 **On-time Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.729[a]	8	.122
Likelihood Ratio	14.220	8	.076
Linear-by-Linear Association	4.787	1	.029
N of Valid Cases	160		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .30.

X_{25} **Risk Response Plan** - Y_4 **According to original SOW Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.931[a]	8	.544
Likelihood Ratio	7.927	8	.441
Linear-by-Linear Association	.489	1	.484
N of Valid Cases	161		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .60.

X_{25} **Risk Response Plan** - Y_5 **Delivery within descoped SOW**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.065[a]	8	.427
Likelihood Ratio	8.886	8	.352
Linear-by-Linear Association	3.543	1	.060
N of Valid Cases	159		

a. 7 cells (46.7%) have expected count less than 5. The minimum expected count is .18.

X_{25} **Risk Response Plan** - Y_6 **Early Terminated Project**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.322[a]	4	.256
Likelihood Ratio	5.075	4	.280
Linear-by-Linear Association	2.750	1	.097
N of Valid Cases	162		

a. 3 cells (33.3%) have expected count less than 5. The minimum expected count is .27.

X_{25} **Risk Response Plan** - Y_7 **Overall Impact of PRM on PM Performance**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	47.164[a]	8	.000
Likelihood Ratio	47.847	8	.000
Linear-by-Linear Association	23.746	1	.000
N of Valid Cases	152		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .61.

Table 5-6

X_{22} **Risk Reviews** - Y_1 **Customer Satisfaction**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	33.678[a]	16	.006
Likelihood Ratio	36.256	16	.003
Linear-by-Linear Association	21.974	1	.000
N of Valid Cases	172		

a. 12 cells (48.0%) have expected count less than 5. The minimum expected count is .35.

X_{22} **Risk Reviews** - Y_2 **Within Budget Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	34.149[a]	16	.005
Likelihood Ratio	39.285	16	.001
Linear-by-Linear Association	24.387	1	.000
N of Valid Cases	168		

a. 9 cells (36.0%) have expected count less than 5. The minimum expected count is 1.55.

X_{22} **Risk Reviews** - Y_3 **On-time Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	43.938[a]	16	.000
Likelihood Ratio	48.218	16	.000
Linear-by-Linear Association	27.445	1	.000
N of Valid Cases	172		

a. 9 cells (36.0%) have expected count less than 5. The minimum expected count is 1.51.

X_{22} **Risk Reviews** - Y_4 **According to original SOW Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.253[a]	16	.084
Likelihood Ratio	24.768	16	.074
Linear-by-Linear Association	8.888	1	.003
N of Valid Cases	172		

a. 7 cells (28.0%) have expected count less than 5. The minimum expected count is 3.14.

X_{22} **Risk Reviews** - Y_5 **Delivery within descoped SOW**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.905[a]	16	.460
Likelihood Ratio	15.753	16	.470
Linear-by-Linear Association	7.207	1	.007
N of Valid Cases	170		

a. 11 cells (44.0%) have expected count less than 5. The minimum expected count is .94.

X_{22} **Risk Reviews** - Y_6 **Early Terminated Project**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.520[a]	8	.095
Likelihood Ratio	13.885	8	.085
Linear-by-Linear Association	1.202	1	.273
N of Valid Cases	174		

a. 7 cells (46.7%) have expected count less than 5. The minimum expected count is 1.26.

X_{22} **Risk Reviews** - Y_7 **Overall Impact of PRM on PM Performance**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	72.184[a]	16	.000
Likelihood Ratio	68.307	16	.000
Linear-by-Linear Association	43.771	1	.000
N of Valid Cases	162		

a. 8 cells (32.0%) have expected count less than 5. The minimum expected count is 2.52.

X_{23} **Risk Audits** - Y_1 **Customer Satisfaction**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	21.689[a]	16	.154
Likelihood Ratio	26.969	16	.042
Linear-by-Linear Association	6.082	1	.014
N of Valid Cases	170		

a. 17 cells (68.0%) have expected count less than 5. The minimum expected count is .12.

X_{23} **Risk Audits** - Y_2 **Within Budget Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	16.950[a]	16	.389
Likelihood Ratio	18.181	16	.313
Linear-by-Linear Association	6.188	1	.013
N of Valid Cases	166		

a. 16 cells (64.0%) have expected count less than 5. The minimum expected count is .51.

X_{23} **Risk Audits** - Y_3 **On-time Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	22.395[a]	16	.131
Likelihood Ratio	28.796	16	.025
Linear-by-Linear Association	13.134	1	.000
N of Valid Cases	170		

a. 16 cells (64.0%) have expected count less than 5. The minimum expected count is .49.

X_{23} **Risk Audits** - Y_4 **According to original SOW Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.755[a]	16	.470
Likelihood Ratio	16.642	16	.409
Linear-by-Linear Association	1.342	1	.247
N of Valid Cases	170		

a. 15 cells (60.0%) have expected count less than 5. The minimum expected count is 1.07.

X_{23} **Risk Audits** - Y_5 **Delivery within descoped SOW**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.452[a]	16	.080
Likelihood Ratio	31.720	16	.011
Linear-by-Linear Association	.907	1	.341
N of Valid Cases	168		

a. 18 cells (72.0%) have expected count less than 5. The minimum expected count is .29.

X_{23} **Risk Audits** - Y_6 **Early Terminated Project**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.294[a]	8	.139
Likelihood Ratio	17.029	8	.030
Linear-by-Linear Association	3.655	1	.056
N of Valid Cases	172		

a. 7 cells (46.7%) have expected count less than 5. The minimum expected count is .45.

X_{23} **Risk Audits** - Y_7 **Overall Impact of PRM on PM Performance**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	28.041[a]	16	.031
Likelihood Ratio	31.747	16	.011
Linear-by-Linear Association	15.130	1	.000
N of Valid Cases	161		

a. 16 cells (64.0%) have expected count less than 5. The minimum expected count is 1.04.

X_{24} **Workarounds** - Y_1 **Customer Satisfaction**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	86.334[a]	16	.000
Likelihood Ratio	63.385	16	.000
Linear-by-Linear Association	39.311	1	.000
N of Valid Cases	171		

a. 14 cells (56.0%) have expected count less than 5. The minimum expected count is .21.

X_{24} **Workarounds** - Y_2 **Within Budget Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	78.703[a]	16	.000
Likelihood Ratio	77.031	16	.000
Linear-by-Linear Association	49.475	1	.000
N of Valid Cases	168		

a. 12 cells (48.0%) have expected count less than 5. The minimum expected count is .85.

X_{24} **Workarounds** - Y_3 **On-time Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	85.673[a]	16	.000
Likelihood Ratio	81.598	16	.000
Linear-by-Linear Association	46.076	1	.000
N of Valid Cases	171		

a. 13 cells (52.0%) have expected count less than 5. The minimum expected count is .91.

X_{24} **Workarounds** - Y_4 **According to original SOW Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	42.115[a]	16	.000
Likelihood Ratio	42.421	16	.000
Linear-by-Linear Association	24.299	1	.000
N of Valid Cases	170		

a. 10 cells (40.0%) have expected count less than 5. The minimum expected count is 1.91.

X_{24} **Workarounds** - Y_5 **Delivery within descoped SOW**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	58.480[a]	16	.000
Likelihood Ratio	63.354	16	.000
Linear-by-Linear Association	22.553	1	.000
N of Valid Cases	167		

a. 14 cells (56.0%) have expected count less than 5. The minimum expected count is .57.

X_{24} **Workarounds** - Y_6 **Early Terminated Project**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.567[a]	8	.128
Likelihood Ratio	9.852	8	.276
Linear-by-Linear Association	4.960	1	.026
N of Valid Cases	171		

a. 7 cells (46.7%) have expected count less than 5. The minimum expected count is .70.

X_{24} **Workarounds** - Y_7 **Overall Impact of PRM on PM Performance**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	27.694[a]	16	.034
Likelihood Ratio	28.120	16	.031
Linear-by-Linear Association	7.489	1	.006
N of Valid Cases	160		

a. 10 cells (40.0%) have expected count less than 5. The minimum expected count is 1.65.

Table 5-7

X_2 **Organization PRM Policy** - Y_1 **Customer Satisfaction**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.220[a]	8	.324
Likelihood Ratio	10.545	8	.229
Linear-by-Linear Association	.963	1	.326
N of Valid Cases	168		

a. 7 cells (46.7%) have expected count less than 5. The minimum expected count is .07.

X_2 **Organization PRM Policy** - Y_2 **Within Budget Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.863[a]	8	.663
Likelihood Ratio	6.141	8	.631
Linear-by-Linear Association	.930	1	.335
N of Valid Cases	164		

a. 6 cells (40.0%) have expected count less than 5. The minimum expected count is .34.

X_2 **Organization PRM Policy** - Y_3 **On-time Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.321[a]	8	.137
Likelihood Ratio	12.766	8	.120
Linear-by-Linear Association	3.428	1	.064
N of Valid Cases	168		

a. 6 cells (40.0%) have expected count less than 5. The minimum expected count is .39.

X_2 **Organization PRM Policy** - Y_4 **According to original SOW Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.076[a]	8	.639
Likelihood Ratio	7.250	8	.510
Linear-by-Linear Association	.052	1	.820
N of Valid Cases	168		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .89.

X_2 **Organization PRM Policy** - Y_5 **Delivery within descoped SOW**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.824[a]	8	.118
Likelihood Ratio	13.949	8	.083
Linear-by-Linear Association	1.996	1	.158
N of Valid Cases	166		

a. 7 cells (46.7%) have expected count less than 5. The minimum expected count is .25.

X_2 **Organization PRM Policy** - Y_6 **Early Terminated Project**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.313[a]	4	.507
Likelihood Ratio	2.948	4	.567
Linear-by-Linear Association	2.571	1	.109
N of Valid Cases	170		

a. 4 cells (44.4%) have expected count less than 5. The minimum expected count is .35.

X_2 **Organization PRM Policy** - Y_7 **Overall Impact of PRM on PM Performance**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	39.953[a]	8	.000
Likelihood Ratio	41.535	8	.000
Linear-by-Linear Association	23.754	1	.000
N of Valid Cases	159		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .91.

X_4 **Organization Concern for PRM** - Y_1 ***Customer Satisfaction***

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	25.101[a]	8	.001
Likelihood Ratio	23.747	8	.003
Linear-by-Linear Association	16.606	1	.000
N of Valid Cases	171		

a. 7 cells (46.7%) have expected count less than 5. The minimum expected count is .12.

X_4 **Organization Concern for PRM** - Y_2 **Within Budget Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.398[a]	8	.180
Likelihood Ratio	11.259	8	.187
Linear-by-Linear Association	5.924	1	.015
N of Valid Cases	167		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .54.

X_4 **Organization Concern for PRM** - Y_3 **On-time Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.960[a]	8	.083
Likelihood Ratio	13.694	8	.090
Linear-by-Linear Association	9.330	1	.002
N of Valid Cases	171		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .53.

X_4 **Organization Concern for PRM** - Y_4 **According to original SOW Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.516[a]	8	.050
Likelihood Ratio	17.057	8	.030
Linear-by-Linear Association	7.187	1	.007
N of Valid Cases	171		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is 1.11.

X_4 **Organization Concern for PRM** - Y_5 **Delivery within descoped SOW**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	22.651[a]	8	.004
Likelihood Ratio	20.892	8	.007
Linear-by-Linear Association	11.180	1	.001
N of Valid Cases	169		

a. 7 cells (46.7%) have expected count less than 5. The minimum expected count is .38.

X_4 **Organization Concern for PRM** - Y_6 **Early Terminated Project**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.295[a]	4	.081
Likelihood Ratio	6.572	4	.160
Linear-by-Linear Association	.892	1	.345
N of Valid Cases	173		

a. 3 cells (33.3%) have expected count less than 5. The minimum expected count is .51.

X_4 **Organization Concern for PRM** - Y_7 **Overall Impact of PRM on PM Performance**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	38.839[a]	8	.000
Likelihood Ratio	42.303	8	.000
Linear-by-Linear Association	28.673	1	.000
N of Valid Cases	161		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is 1.19.

X_5 **Work Unit PRM Policy** - Y_1 **Customer Satisfaction**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.172[a]	8	.417
Likelihood Ratio	9.297	8	.318
Linear-by-Linear Association	1.121	1	.290
N of Valid Cases	166		

a. 7 cells (46.7%) have expected count less than 5. The minimum expected count is .09.

X_5 **Work Unit PRM Policy** - Y_2 **Within Budget Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.930[a]	8	.348
Likelihood Ratio	10.135	8	.256
Linear-by-Linear Association	1.959	1	.162
N of Valid Cases	162		

a. 6 cells (40.0%) have expected count less than 5. The minimum expected count is .34.

X_5 **Work Unit PRM Policy** - Y_3 **On-time Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.819[a]	8	.212
Likelihood Ratio	12.040	8	.149
Linear-by-Linear Association	3.103	1	.078
N of Valid Cases	166		

a. 6 cells (40.0%) have expected count less than 5. The minimum expected count is .36.

X_5 **Work Unit PRM Policy** - Y_4 **According to original SOW Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.934[a]	8	.544
Likelihood Ratio	8.430	8	.393
Linear-by-Linear Association	.481	1	.488
N of Valid Cases	166		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .75.

X_5 **Work Unit PRM Policy** - Y_5 **Delivery within descoped SOW**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.758[a]	8	.162
Likelihood Ratio	12.158	8	.144
Linear-by-Linear Association	2.539	1	.111
N of Valid Cases	164		

a. 7 cells (46.7%) have expected count less than 5. The minimum expected count is .21.

X_5 **Work Unit PRM Policy** - Y_6 **Early Terminated Project**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.174[a]	4	.187
Likelihood Ratio	6.072	4	.194
Linear-by-Linear Association	3.833	1	.050
N of Valid Cases	168		

a. 4 cells (44.4%) have expected count less than 5. The minimum expected count is .33.

X_5 **Work Unit PRM Policy** - Y_7 **Overall Impact of PRM on PM Performance**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	31.926[a]	8	.000
Likelihood Ratio	33.185	8	.000
Linear-by-Linear Association	15.626	1	.000
N of Valid Cases	158		

a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is .61.

X_6 **Encourage PRM** - Y_1 **Customer Satisfaction**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.652[a]	16	.345
Likelihood Ratio	18.808	16	.279
Linear-by-Linear Association	4.885	1	.027
N of Valid Cases	159		

a. 14 cells (56.0%) have expected count less than 5. The minimum expected count is .21.

X_6 **Encourage PRM** - Y_2 **Within Budget Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	23.532[a]	16	.100
Likelihood Ratio	23.659	16	.097
Linear-by-Linear Association	7.533	1	.006
N of Valid Cases	156		

a. 16 cells (64.0%) have expected count less than 5. The minimum expected count is .85.

X_6 **Encourage PRM** - Y_3 **On-time Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	20.186[a]	16	.212
Likelihood Ratio	24.284	16	.083
Linear-by-Linear Association	5.491	1	.019
N of Valid Cases	159		

a. 16 cells (64.0%) have expected count less than 5. The minimum expected count is .83.

X_6 **Encourage PRM** - Y_4 **According to original SOW Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.173[a]	16	.260
Likelihood Ratio	21.281	16	.168
Linear-by-Linear Association	6.694	1	.010
N of Valid Cases	158		

a. 15 cells (60.0%) have expected count less than 5. The minimum expected count is 1.65.

X_6 **Encourage PRM** - Y_5 **Delivery within descoped SOW**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.486[a]	16	.637
Likelihood Ratio	17.010	16	.385
Linear-by-Linear Association	.207	1	.649
N of Valid Cases	155		

a. 13 cells (52.0%) have expected count less than 5. The minimum expected count is .45.

X_6 **Encourage PRM** - Y_6 ***Early Terminated Project***

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.123[a]	8	.256
Likelihood Ratio	11.327	8	.184
Linear-by-Linear Association	.249	1	.617
N of Valid Cases	159		

a. 8 cells (53.3%) have expected count less than 5. The minimum expected count is .69.

X_6 **Encourage PRM** - Y_7 **Overall Impact of PRM on PM Performance**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	31.081[a]	16	.013
Likelihood Ratio	29.963	16	.018
Linear-by-Linear Association	8.755	1	.003
N of Valid Cases	148		

a. 15 cells (60.0%) have expected count less than 5. The minimum expected count is 1.71.

X_7 **Discourage PRM** - Y_1 **Customer Satisfaction**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	37.041[a]	16	.002
Likelihood Ratio	30.923	16	.014
Linear-by-Linear Association	8.983	1	.003
N of Valid Cases	165		

a. 16 cells (64.0%) have expected count less than 5. The minimum expected count is .09.

X_7 **Discourage PRM** - Y_2 **Within Budget Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.994[a]	16	.070
Likelihood Ratio	24.187	16	.086
Linear-by-Linear Association	5.825	1	.016
N of Valid Cases	161		

a. 16 cells (64.0%) have expected count less than 5. The minimum expected count is .34.

X_7 **Discourage PRM** - Y_3 **On-time Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.731[a]	16	.233
Likelihood Ratio	17.933	16	.328
Linear-by-Linear Association	7.224	1	.007
N of Valid Cases	165		

a. 16 cells (64.0%) have expected count less than 5. The minimum expected count is .36.

X_7 **Discourage PRM** - Y_4 **According to original SOW Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.138[a]	16	.087
Likelihood Ratio	26.613	16	.046
Linear-by-Linear Association	3.916	1	.048
N of Valid Cases	165		

a. 16 cells (64.0%) have expected count less than 5. The minimum expected count is .73.

X_7 **Discourage PRM** - Y_5 **Delivery within descoped SOW**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	36.595[a]	16	.002
Likelihood Ratio	36.217	16	.003
Linear-by-Linear Association	17.984	1	.000
N of Valid Cases	162		

a. 18 cells (72.0%) have expected count less than 5. The minimum expected count is .19.

X_7 **Discourage PRM** - Y_6 **Early Terminated Project**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.659[a]	8	.793
Likelihood Ratio	4.430	8	.816
Linear-by-Linear Association	.226	1	.634
N of Valid Cases	166		

a. 8 cells (53.3%) have expected count less than 5. The minimum expected count is .27.

X_7 **Discourage PRM** - Y_7 **Overall Impact of PRM on PM Performance**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	26.876[a]	16	.043
Likelihood Ratio	31.116	16	.013
Linear-by-Linear Association	6.598	1	.010
N of Valid Cases	157		

a. 16 cells (64.0%) have expected count less than 5. The minimum expected count is .73.

X_8 **Adequate Resources for PRM** - Y_1 **Customer Satisfaction**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	21.328[a]	16	.166
Likelihood Ratio	27.272	16	.039
Linear-by-Linear Association	8.300	1	.004
N of Valid Cases	167		

a. 12 cells (48.0%) have expected count less than 5. The minimum expected count is .34.

X_8 **Adequate Resources for PRM** - Y_2 **Within Budget Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	33.631[a]	16	.006
Likelihood Ratio	34.601	16	.005
Linear-by-Linear Association	14.211	1	.000
N of Valid Cases	163		

a. 14 cells (56.0%) have expected count less than 5. The minimum expected count is 1.40.

X_8 **Adequate Resources for PRM** - Y_3 **On-time Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	35.974[a]	16	.003
Likelihood Ratio	38.337	16	.001
Linear-by-Linear Association	21.721	1	.000
N of Valid Cases	167		

a. 13 cells (52.0%) have expected count less than 5. The minimum expected count is 1.37.

X_8 **Adequate Resources for PRM** - Y_4 **According to original SOW Delivery**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.608[a]	16	.628
Likelihood Ratio	13.899	16	.606
Linear-by-Linear Association	4.531	1	.033
N of Valid Cases	167		

a. 15 cells (60.0%) have expected count less than 5. The minimum expected count is 2.96.

X_8 **Adequate Resources for PRM** - Y_5 **Delivery within descoped SOW**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.164[a]	16	.086
Likelihood Ratio	27.919	16	.032
Linear-by-Linear Association	8.546	1	.003
N of Valid Cases	164		

a. 12 cells (48.0%) have expected count less than 5. The minimum expected count is .81.

X_8 **Adequate Resources for PRM** - Y_6 **Early Terminated Project**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.014[a]	8	.756
Likelihood Ratio	6.210	8	.624
Linear-by-Linear Association	1.107	1	.293
N of Valid Cases	168		

a. 8 cells (53.3%) have expected count less than 5. The minimum expected count is 1.13.

X_8 **Adequate Resources for PRM** - Y_7 **Overall Impact of PRM on PM Performance**

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	73.026[a]	16	.000
Likelihood Ratio	72.909	16	.000
Linear-by-Linear Association	45.483	1	.000
N of Valid Cases	157		

a. 11 cells (44.0%) have expected count less than 5. The minimum expected count is 2.90.

Appendix Number 12

Ancillary Data Analysis

Table of Contents

APPENDIX 12
ANCILLARY DATA ANALYSIS

Introduction

As mentioned in the Conclusions section of Chapter 5, this appendix discusses ancillary data analysis conducted on a select group of variables.

Factor Analysis

Variable selection for the factor analysis was made on the basis of three factors:

1. Chi-square analysis results showing a statistically significant relation at the level ≤ 0.05 (see Chapter 5)
2. Variables that best represented the construct variable they were meant to measure
3. Cardinal-ordinal scale data that could be converted easily, accurately, and reliably to a numeric (metric) scale, which is best suited for such analysis

The role of factor analysis in this research was to: determine the level of multi-colinearity (the extent to which one factor can be explained by the other factors extracted in the analysis); obtain insights into how the question responses cluster and correlate with one another; confirm the results of the Chi-square analysis; correlate the profile of all responses received; look for the statistical distribution of the responses for each question; gain insights on how the different questions cluster and correlate with one another; and, identify factors for averaging and further Chi-square analysis. [1] Oblimin factor analysis in the Oblique factor rotation that was used since the factors were derived from variables already assumed to be correlated due to the initial statistically significant Chi-square results. [2]

Decision Rule

Oblique rotation squares of loadings were used to report on the statistical relationships between the above variables. Rotation squares were used as these factor loadings provide a more even distribution among all identified factors –not just within the first factor identified. [3] The decision rules were:

- Only a factor component with an Eigenvalue greater than1.00 would be extracted for analysis.
- Only factor loadings greater than 0.500 would be considered as a component item for any factors identified during the analysis.

Such high cut-off points means that the extracted factors would explain a significant amount of the variance among the variables analyzed and the specific surrogate variables for each factor were close to the maximum loading possible – 1.00 – than if the loading was less than .500.

Finally, all specific items with a factor loading $\geq$ .500 were averaged under their overall factor in order to perform additional Chi-square analysis to test the statistical significance between the various identified factors.

Data Set

The data generated in the web survey questionnaire was either nominal or cardinal-ordinal in nature. However, some of this data could be converted to a numeric scale. As numeric scale data, the survey responses for these variables could be analyzed in factor analysis. The 'Do Not Know' response category was given the numeric value zero and treated as a system missing value in the analysis. The cardinal-ordinal scale data conversion scale is found in Table 12-1 below:

Table 12-1
Factor Analysis Scale Origins

Questionnaire Cardinal-Ordinal Scale	Factor Analysis Numeric Scale
Rarely (0-19%)	1.0
Occasionally (20-39%)	2.0
Frequently (40-59%)	3.0
Usually (60-79%)	4.0
Almost Always (80-100%)	5.0
Do Not Know	0.00 (system missing value)

By research construct, the variables analyzed in factor analysis were:

1. ***Perceived senior management support for project risk management practice***

X_6 Does senior management in your organization encourage and reward risk taking in projects?

X_7 Does senior management in your organization discourage the reporting of risks associated with its projects?

X_8 Does senior management in your organization provide adequate money, human resources, and time for the entire process of project risk management (e.g. planning, identification, impact analysis, response planning, and monitoring)?

2. ***Reported project risk management planning practice***

   X_9 Do your project team members obtain training in risk management planning and impact analysis at some point during the project's life?

   X_{10} Do your projects use any structured quantitative technique (*e.g.* Monte Carlo simulation, decision trees) when evaluating the merits and demerits of prospective projects?

   X_{11} Do your projects use qualitative risk analysis (*e.g.* probability and impact matrix) when evaluating the merits and demerits of prospective projects?

3. ***Reported risk response planning and risk event handling practice***

X_{22} Do your projects conduct risk reviews?

X_{23} Do your projects experience risk audits?

X_{24} Do your projects experience major workarounds (e.g. >10% cost overrun from the activity's planned budget) in project operations?

4. ***Reported project success***

Y_1 How often Are your projects completed to the satisfaction of your customers?

Y_2 How often Are your projects completed within budget?

Y_3 How often Are your projects completed on time?

Y_4 How often Are your projects completed according to their original Statement of Work (SOW) specifications?

Y_5 How often Are your projects descoped from their original Statement of Work (SOW) specifications?

Y_6 Are your projects terminated early – *i.e.* without completing the original planned deliverables?

Y_7 Do you consider the risk management policies of your organization to make a measurable difference on your project performance?

Sampling Adequacy

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO-MSA) was used to determine if the sample size and number of variables were adequate to perform factor analyses on the data. The higher the KMO MSA score the better the appropriateness of applying factor analysis.

The KMO-MSA index is 0.845 (out of a maximum score of 1.000), which falls within the 'meritorious range' (0.80 and above) and indicates that the sample size (136 cases) provides 8.5 cases for each variable analyzed thereby, showing that this web survey sample is a good set for identifying multi-colinearity – even though response bias is still an issue of concern, as discussed in Chapter 3 "Research Methodology".[4] (See Appendix 13 page 1 for the KMO and Bartlett's Test SPSS 11.5™ table.)

Factor Analysis Data Results

Factor analysis using an oblique factor rotation identified three components (or factors) that account for the interrelationships (multi-colinearity) identified in the data set. The results of the factor analysis show positive statistical relationships for 15 of the 16 variables analyzed. This means that for the 15 variables having a positive statistical relationship, the more the variable is present the greater its interrelationship with other variables in that factor; and, for the variable having a negative relationship, the more the variable is present the less its interrelationship with other variables in that factor. (See Appendix 13 page 3 for the SPSS 11.5™ table displaying the component matrix for all the variables analyzed.)

As shown in Table 12-2 below, three factors are identified in the un-rotated component matrix. These factors have been labeled as follows: Factor 1 – Project Risk Management Culture; Factor 2 – Project Management Results; and, Factor 3 – Risk-averse Culture. The naming of these factors is a function of the following considerations: the role of this factor analysis in confirming or denying the validity of the original construct dynamic and model of the research; if justified, maintaining as much consistency as possible between the original four research constructs of this research and any emerging underlying factors; and, accurately describing the predominant identity of the underlying factor given its specific surrogate variables. (A more detailed discussion on the factor naming can be found in the rotated factor loading section below. That section discusses the final component line-up for each factor that is analyzed in this phase of the research analysis.)

As indicated in Table 12-2, 12 out of the 16 variables analyzed show a factor loading $\geq$ .500 or -.500 with all but one of these falling under Factor 1. As expected, Factor 1 contains the single largest number of variables – with 14 out of the 16 variables analyzed having their strongest loadings in this factor.

Factor 2 shows no variables with a factor loading $\geq$ .500. Factor 3 shows only one variable with a factor loading $\geq$ .500 (X_7 Senior management discouragement of risk reporting at .619) and one variable with its highest loading in this factor (Y_5 Are your projects descoped from their original Statement of Work (SOW) specifications at .498).

The more rigorous analysis of the rotated component matrix identifies a more evenly balanced distribution of specific variables in Factors 1, 2 and 3. (See Appendix 13 page 4 for the SPSS 11.5™ table displaying the rotated structure matrix for all the variables analyzed.) Table 12-2 displays all the variables analyzed along with both their un-rotated and rotated factor loadings $\geq$ .500. (The list is organized by original research construct):

Table 12-2 Research Variable Factor Loadings (Un-rotated and Rotated)			
No.	**Variable**	**Factor and Factor Loadings**	
		Un-rotated	**Rotated**
Perceived senior management support for project risk management practice			
X_6	Does senior management in your organization encourage and reward risk taking in projects?	Factor 1: .391	Factor 1 .424
X_7	Does senior management in your organization discourage the reporting of risks associated with its projects?	Factor 3: .691	Factor 3 .805
X_8	Does senior management in your organization provide adequate money, human resources, and time for the entire process of project risk management (e.g. planning, identification, impact analysis, response planning, and monitoring)?	Factor 1: .652	Factor 1 .733
Reported project risk management planning practice			
X_9	Do your project team members obtain training in risk management planning and impact analysis at some point during the project's life?	Factor 1: .620	Factor 1 .760
X_{10}	Do your projects use any structured quantitative technique (e.g. Monte Carlo simulation, decision trees) when evaluating the merits and demerits of prospective projects?	Factor 1: .498	Factor 1 .669
X_{11}	Do your projects use qualitative risk analysis (e.g. probability and impact matrix) when evaluating the merits and demerits of prospective projects?	Factor 1: .546	Factor 1 .696
Reported risk response planning and risk event handling practice			
X_{22}	Do your projects conduct risk reviews?	Factor 1 .705	Factor 1 .780
X_{23}	Do your projects experience risk audits?	Factor 1 .509	Factor 1 .720
X_{24}	Do your projects experience major workarounds (e.g. $\geq$10% cost overrun from the activity's planned budget) in project operations?	Factor 1 -.541	Factor 2 .648
Reported project success			
Y_1	How often Are your projects completed to the satisfaction of your customers?	Factor 1 .728	Factor 2 -.866
Y_2	How often Are your projects completed within budget?	Factor 1 .743	Factor 2 -.889
Y_3	How often Are your projects completed on time?	Factor 1 .761	Factor 2 -.833
Y_4	How often Are your projects completed according to their original Statement of Work (SOW) specifications?	Factor 1 .624	Factor 2 -.759
Y_5	How often Are your projects descoped from their original Statement of Work (SOW) specifications?	Factor 3 .498	Factor 3 .707
Y_6	Are your projects terminated early – i.e. without completing the original planned deliverables?	Factor 1: -.365	Factor 2 .536
Y_7	Do you consider the risk management policies of your organization to make a measurable difference on your project performance?	Factor 1: .602	Factor 1 .642

Based on the above table, three factors were identified using the decision rule that the rotated component score must be ≥ .500. As with the un-rotated component matrix in Table 12-2, these factors have been named as follows: Factor 1 – Project Risk Management Culture; Factor 2 – Project Management Results; Factor 3 – Risk-averse Culture. These three factors account for a little more than 56% of the total variance among the variables analyzed. The overall rationale behind the naming of each underlying factor is -- as mentioned above – to maintain conceptual consistency in the constructs and model of this research and to accurately reflect the identity of the factor based on its surrogate variables. The specific rationale for each factor name is as follows:

- **Factor 1 – Project Risk Management Culture**: The first factor identified in the factors analysis consists of seven specific components with a factor loading ≥ .500. The distribution of these surrogate variables among the four research constructs is as follows: three variables from ***Reported project risk management planning practice;*** two variables from ***Reported risk response planning and risk event handling practice*** and ***Perceived senior management support for project risk management practice*** each; and, one variable from ***Reported Project Success***. Since this factor is populated with variables that indicate an organization culture that facilitates – if not encourages – the use of project risk management practices, it has been named accordingly.

- **Factor 2 – Project Management Results**: The second factor identified is populated with six variables with a factor loading $\geq$ .500 or -.500. The distribution of these surrogate variables among the four research constructs is as follows: five variables from ***Reported project success;*** and, one variable from ***Reported risk response planning and risk event handling practice*** research construct. Thus, the name choice for this factor reflects the research construct overwhelming represented by the surrogate variables.
- **Factor 3 – Risk-averse Culture**: The third factor identified consists of two variables one each from the following research constructs: ***Perceived senior management support for project risk management practice,*** and ***Reported project success***. Since the component variable with the highest loading (.805) is from the ***Perceived senior management support for project risk management practice*** construct and concerns risk aversion in senior management support, this variable name has been selected to identify its strongest loading.

Table 12-3 shows these factors, their surrogate variables, and the percent of variance explained by each variable within each factor and within the overall data set. This table was prepared using the, Communalities, Total Variance Explained, Component Matrix, and Structure Matrix tables generated by SPSS 11.5 ™. (See Appendix 13 pages 1, 3 and 4 respectively for the SPSS 11.5™ tables for all the variables analyzed.)

Table 12-3
Results of Rotated Factor Analysis

	Factors			Communality
Survey Variable	**PRM Process**	**Reported PM Results**	**Risk Behavior**	
PRM Culture				
Adequate Resources for PRM	.733			.636
Training in PRM	.760			.578
Use of Quantitative Tool	.669			.457
Qualitative Risk Analysis	.696			.496
Risk Reviews	.780			.626
Risk Audits	.720			.577
Perceived Overall Impact of PRM	.642			.443
Reported PM Results				
Reported Workarounds		.648		.566
Customer Satisfaction		-.866		.759
Within Budget Delivery		-.889		.797
On-Time Delivery		-.833		.730
Within Original SOW		-.759		.587
Early Terminated Projects		.536		.310
Risk-averse Culture				
Discouragement of Risk Reporting			.805	.672
Descoped SOW			.707	.546
Percent of Variance Explained by Factor Cumulative Total	34.28%	14.65%	7.11%	**56.05%**

Of the 16 variables analyzed, 11 of the variables show their highest factor loading in the same factor of the rotated matrix. The exceptions are the five project success and one Reported risk response planning and risk event handling practice variables in Factor 1 of the un-rotated component matrix which fall under Factor 2 of the rotated structure matrix. This basic consistency in variable placement within the three identified factors is largely compatible with the research constructs depicted in Figure 1-1 Research Model. In order to support the results of the factor analysis, follow-up Chi-square analysis was conducted on the three factors identified above.

Follow-up Chi-square Data Analysis

Pearson's Chi-square analysis was used to test the statistical significance of the relationship between the three factors identified in the factor analysis: Project Risk Management Culture, Project Management Success, and Risk-averse Culture.

Chi-square Data Decision Rule

As with the exploratory Chi-square data analysis, the decision rule was set at the 95% confidence level in order to test the null hypotheses, which are: There is no difference in reported project success between those organizations that have a project risk management culture and those organizations that have a risk-adverse culture. Any Chi-square probability of $\leq .05$ led to a rejection of the null hypothesis. This level of significance was chosen as most social scientists use 5% to balance the likelihood of Type I and Type II errors. [5]

Chi-square Data Variables

Two sets of factors were analyzed using Chi-square analysis: the original factors as populated by the surrogate variables with their highest factor loading among all three factors; and, a second set of factors that did not include any surrogate variables conceptually incongruent with the named factor.

As stated earlier, the purpose of the follow-up Chi-square analysis was to test the continued validity of the original research constructs and model that project risk management does make a difference in reported project management success. Therefore, for the second Chi-square factor data set, any factor component variable conceptually unrelated to either the overwhelming factor identity or its name was dropped -- even though these dropped surrogate variables still relate statistically to their respective underlying factors and load accordingly. In the refined Chi-square analysis of the identified factors, all surrogate variables for each factor were conceptually congruent with one another and their predicted factor. Thus, the follow-up Chi-square analysis for this second factor data set more accurately reflects the statistical relationship between each factor in light of the original research model found in Figure 1-2 on page 6.

For both factor data sets, the specific surrogate variables were averaged into one aggregated value as indicated in Table 12-1 above: 1-2-3-4-5 with 0 for 'Do Not Know' responses that were treated as systems missing values. Chi-square analysis was then performed on each data set.

Original Factor Data Chi-square Results

Table 12-4 below shows the results of the follow-up Chi-square analysis for the original unaltered factor data set. As indicated in the table, there is one statistically significant relationship at the 95% confidence level between the four factors: Factor 1 (F1) – Project Risk Management Culture; Factor 2 (F2) –Project Management Results; and, Factor 3 (F3) – Risk-averse Culture. The only factor combination showing a statistically significant relationship at the .05 level was: Risk-averse Culture and Project Management Results at the .001 level.

Thus, based on the sample of this initial factor data set, we can be 95% confident that the results of the initial Chi-square analysis are partially supported. At the aggregate level, the data indicate that the null hypotheses that there is no relationship between senior support (and the lack of such support) for project risk management and between the presence of a project risk management process and reported project management success valid. However, the initial Chi-square results indicate that there is a statistically significant relationship between a risk-averse project risk management culture and reported project management results. Thus, for this factor combination, the related alternative hypotheses can be accepted.

Table 12-4
Summary Table of Statistically Significant Chi-square Relationships between Original Factors
(The number in each box is the significance level.)

Variable: Dependent/Independent	F_1 Project Risk Management Culture	F_2 Project Management Results	F_3 Risk Averse Culture
F_1 Project Risk Management Culture	-		
F_2 Project Management Results	0.951	-	
F_3 Risk Averse Culture	0.666	0.001	-

Statistically Significant Relationship	NOT Statistically Significant Relationship

Despite the above conclusion from the original factor data set, the research constructs identified in Chapter 1 Figure 1-2 are not exactly replicated in the specific variable load as components on specific factors. Therefore, the Chi-square results for the revised factor data set are found below.

Revised Factor Data Chi-square Results

As mentioned above, for the refined Chi-square factor data set, any factor component variable conceptually unrelated to either the overwhelming factor identity or its name was dropped. Thus, for Factor 1 – Project Risk Management Culture the surrogate variable ***X_6 Senior management encouragement and reward for risk taking in projects was dropped***; for Factor 2 – Project Management Results the surrogate variable ***X_{24} Project experience of major workarounds (e.g. ≥10% cost overrun from the activity's planned budget) in project operations*** was dropped; and, for Factor 3 – Risk-averse Culture the surrogate variable ***Y_5 Frequency of project descoped from their original Statement of Work (SOW) specifications*** was dropped.

Table 12-5 below shows the results of the follow-up Chi-square analysis for the revised factor data set. As indicated in the table, there is one statistically significant relationship at the 95% confidence level between the three factors: Factor 1 – Project Risk Management Culture; Factor 2 – Project Management Results; and, Factor 3 – Risk-averse Culture. The only factor combination showing a statistically significant relationship at the .05 level was: Project Risk Management Culture and Project Management Results at the .047 level.

However, the statistical relationship between Risk-averse Culture and Project Management Results was notably significant at the .058 level – very close the decision of .050. This indicates that the type of risk management culture prevailing in an organization does have statistical correlation to reported project management success.

Table 12-5 ***Summary Table of Statistically Significant Chi-square Relationships* between Refined Factors** **(The number in each box is the significance level.)**			
Variable: Dependent/Independent	F_1 **Project Risk Management Culture**	F_2 **Project Management Results**	F_3 **Risk Averse Culture**
F_1 **Project Risk Management Culture**	-		
F_2 **Project Management Results**	0.047	-	
F_3 **Risk Averse Culture**	0.819	0.058	-

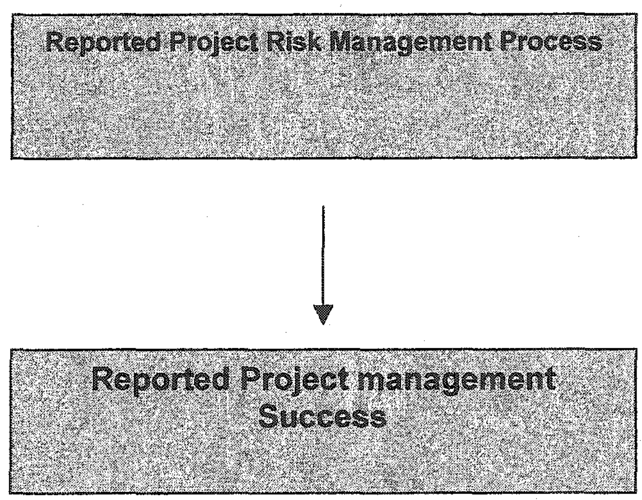
Statistically Significant Relationship	**Statistically Notable Relationship**	**NOT Statistically Significant Relationship**

Thus, based on the sample and this second refined factor data set, we can still be 95% confident that the results of the initial Chi-square analysis are supported. Specifically, the data indicate that the null hypotheses that there is no relationship between senior support (or the lack of such support) for project risk management and the presence of a project risk management process and, between senior support (or the lack of such support) and reported project success can be rejected and the related alternative hypotheses accepted.

Research Implications

The above data analyses reveal a new construct dynamic that is different from the research construct dynamic found in Figure 3-1 on page 89. The new project risk management dynamic is displayed in Figure 12-1, below.

Figure 12-1 Revised Construct Dynamic



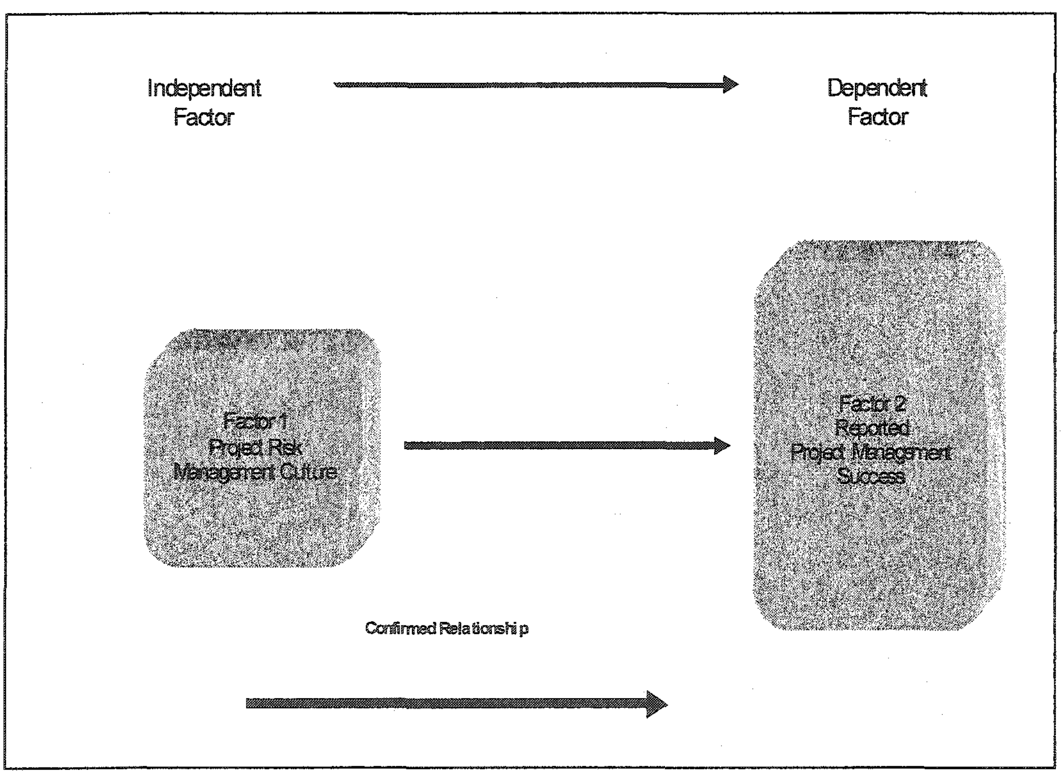
A conceptual equation for the revised construct dynamic model is expressed as follows:

Reported Project Success = Function Project Risk Management Culture (*i.e.,* Reported Project Risk Management Process)*

*Considers risk management to be implicit in all critical success factors, (*e.g.*, scope, communication, cost, and time management).

A new construct model based on the revised construct dynamic and conceptual equation is found in Figure 12-2 below. This model shows the two factors revealed by the factor analysis and follow-up Chi-square analysis discussed above. This factor includes adequate resource mobilization and staff training in project risk management. These two factors appear to be critical as they both have strong factor loadings of .733 and .760 respectively. (See Appendix 13, page 4 for details.) In turn, these variables enable support staff to engage in risk management planning efforts and successful risk event management, thereby reducing project workarounds and promoting successful project execution.

Figure 12-2: Revised Research Model



With respect to the revised research model's independent construct, Project Risk Management Culture, recent research (Royer 2001) suggests that organizational culture against change and the introduction of new tools and techniques are key reasons for the gap between expressed risk management policies and the actual use of project risk management tools and techniques.

Conclusions

In conclusion, the data analysis, using both factor analysis and Chi-square analysis, supports the conclusion that there is a statistically significant relationship between senior support (or the lack of such support) for project risk management and the presence of a project risk management process and, between each of these variables and reported project success. This data analysis on the research construct dynamic and model suggests an improved research dynamic in which reported project success is a function of a risk management culture that makes systematic use of risk tools and techniques in concert with other project management knowledge tools and techniques.

End Notes

[1] Joseph F. Hair (editor), Rolph E. Anderson, Ronald L. Tatham and William C. Black, *Multivariate Data Analysis,* Fifth edition Prentice Hall College Division, NJ 1998: Pages 87-137.

[2] Hair, Anderson, Tatham and Black, *Multivariate Data Analysis*: page 110.

[3] IBID: pages 110-111.

[4] IBID: pages 99-100.

[5] North Carolina State University Raleigh, North Carolina. Syllabus for PA 765: Quantitative Research in Public Administration G. David Garson, Instructor. Located at: http://www2.chass.ncsu.edu/garson/pa765/signif.htm

Appendix Number 13

SPSS 11.5™ Ancillary Data Analysis Results

Appendix 13

Factor Analysis Data

Factor Analysis

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
QIII#6	2.0809	1.24159	136
QIII#7	1.7647	1.13029	136
QIII#8	2.3456	1.38446	136
QIV#1	2.0000	1.24127	136
QIV#2	1.9044	1.25243	136
QIV#3	3.0294	1.50526	136
QV#1	2.7721	1.51030	136
QV#2	1.8456	1.31588	136
QV#3	2.3897	1.15581	136
QVI#1	3.9926	1.10552	136
QVI#2	3.5000	1.24722	136
QVI#3	3.5368	1.28759	136
QVI#4	3.1544	1.40306	136
QVI#5	2.0515	1.13085	136
QVI#6	1.3088	.57754	136
QVI#7	2.9412	1.56236	136

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.845
Bartlett's Test of Sphericity	Approx. Chi-Square	895.941
	df	120
	Sig.	.000

Correlation Matrix

		QIII#6	QIII#7	QIII#8	QIV#1	QIV#2	QIV#3	QV#1	QV#2	QV#3	QVI#1	QVI#2	QVI#3	QVI#4	QVI#5	QVI#6	QVI#7
Sig. (1-ta	QIII#		.283	.000	.001	.010	.020	.003	.005	.091	.012	.003	.009	.009	.084	.471	.001
	QIII#	.283		.000	.018	.039	.005	.001	.067	.001	.001	.002	.001	.009	.000	.220	.008
	QIII#	.000	.000		.000	.000	.000	.000	.000	.005	.003	.000	.000	.005	.008	.108	.000
	QIV#	.001	.018	.000		.000	.000	.000	.000	.009	.001	.008	.000	.005	.056	.094	.000
	QIV#	.010	.039	.000	.000		.000	.000	.000	.338	.041	.014	.000	.002	.109	.239	.000
	QIV#	.020	.005	.000	.000	.000		.000	.000	.031	.005	.004	.001	.240	.167	.134	.000
	QV#	.003	.001	.000	.000	.000	.000		.000	.005	.000	.000	.000	.003	.009	.111	.000
	QV#	.005	.067	.000	.000	.000	.000	.000		.303	.019	.013	.000	.067	.324	.079	.000
	QV#	.091	.001	.005	.009	.338	.031	.005	.303		.000	.000	.000	.000	.000	.011	.007
	QVI#	.012	.001	.003	.001	.041	.005	.000	.019	.000		.000	.000	.000	.000	.000	.000
	QVI#	.003	.002	.000	.008	.014	.004	.000	.013	.000	.000		.000	.000	.000	.000	.000
	QVI#	.009	.001	.000	.000	.000	.001	.000	.000	.000	.000	.000		.000	.001	.001	.001
	QVI#	.009	.009	.005	.005	.002	.240	.003	.067	.000	.000	.000	.000		.000	.000	.002
	QVI#	.084	.000	.008	.056	.109	.167	.009	.324	.000	.000	.000	.001	.000		.006	.056
	QVI#	.471	.220	.108	.094	.239	.134	.111	.079	.011	.000	.000	.001	.000	.006		.020
	QVI#	.001	.008	.000	.000	.000	.000	.000	.000	.007	.000	.000	.001	.002	.056	.020	

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	5.486	34.285	34.285	5.486	34.285	34.285	4.366
2	2.345	14.658	48.943	2.345	14.658	48.943	4.156
3	1.138	7.111	56.054	1.138	7.111	56.054	2.130
4	.984	6.150	62.204				
5	.891	5.568	67.771				
6	.864	5.398	73.169				
7	.674	4.215	77.384				
8	.653	4.080	81.464				
9	.606	3.788	85.252				
10	.530	3.311	88.563				
11	.428	2.673	91.237				
12	.382	2.389	93.625				
13	.329	2.059	95.684				
14	.291	1.821	97.505				
15	.231	1.444	98.950				
16	.168	1.050	100.000				

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Component Matrix[a]

	Component		
	1	2	3
QIII#6	.391	.180	5.812E-02
QIII#7	-.437	5.802E-02	.691
QIII#8	.652	.376	-.264
QIV#1	.620	.438	5.066E-02
QIV#2	.498	.442	.117
QIV#3	.546	.440	-6.39E-02
QV#1	.705	.358	2.949E-02
QV#2	.509	.500	.259
QV#3	-.541	.488	.188
QVI#1	.728	-.447	.171
QVI#2	.743	-.451	.203
QVI#3	.761	-.321	.219
QVI#4	.624	-.433	.103
QVI#5	-.438	.326	.498
QVI#6	-.365	.310	-.284
QVI#7	.602	.274	-7.60E-02

Extraction Method: Principal Component Analysis.

a. 3 components extracted.

Pattern Matrix[a]

	Component		
	1	2	3
QIII#6	.395	-.101	1.130E-02
QIII#7	-.161	-7.53E-02	.797
QIII#8	.697	7.664E-02	-.330
QIV#1	.755	-2.07E-02	4.844E-03
QIV#2	.690	1.384E-02	9.797E-02
QIV#3	.703	7.990E-02	-9.48E-02
QV#1	.737	-.117	-4.89E-02
QV#2	.758	-1.91E-02	.249
QV#3	.108	.574	.393
QVI#1	6.939E-02	-.828	-6.24E-02
QVI#2	7.742E-02	-.856	-3.39E-02
QVI#3	.201	-.773	2.237E-03
QVI#4	1.268E-02	-.726	-.107
QVI#5	5.383E-02	.233	.653
QVI#6	2.364E-02	.584	-.152
QVI#7	.593	-7.26E-02	-.149

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

a. Rotation converged in 7 iterations.

Structure Matrix

	Component		
	1	2	3
QIII#6	.424	-.217	-.086
QIII#7	-.279	.188	.805
QIII#8	.733	-.222	-.432
QIV#1	.760	-.246	-.134
QIV#2	.669	-.167	-.020
QIV#3	.696	-.157	-.197
QV#1	.780	-.351	-.211
QV#2	.720	-.179	.110
QV#3	-.134	.648	.530
QVI#1	.329	-.866	-.299
QVI#2	.340	-.889	-.279
QVI#3	.432	-.833	-.242
QVI#4	.249	-.759	-.306
QVI#5	-.131	.394	.707
QVI#6	-.125	.536	.002
QVI#7	.642	-.291	-.274

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

Component Correlation Matrix

Component	1	2	3
1	1.000	-.300	-.177
2	-.300	1.000	.271
3	-.177	.271	1.000

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

Appendix Number 13

SPSS 11.5™ Follow-up Chi-Square Results

Initial Aggregated Follow-up Chi-square Analysis

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PMRESULT * RMCULTUR	141	80.6%	34	19.4%	175	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2068.085[a]	2176	.951
Likelihood Ratio	647.639	2176	1.000
Linear-by-Linear Association	25.347	1	.000
N of Valid Cases	141		

a. 2275 cells (100.0%) have expected count less than 5. The minimum expected count is .01.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
RMCULTUR * RAVCULTR	139	79.4%	36	20.6%	175	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	687.366[a]	704	.666
Likelihood Ratio	361.003	704	1.000
Linear-by-Linear Association	11.873	1	.001
N of Valid Cases	139		

a. 780 cells (100.0%) have expected count less than 5. The minimum expected count is .01.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PMRESULT * RAVCULTR	157	89.7%	18	10.3%	175	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	475.045[a]	385	.001
Likelihood Ratio	269.259	385	1.000
Linear-by-Linear Association	11.652	1	.001
N of Valid Cases	157		

a. 432 cells (100.0%) have expected count less than 5. The minimum expected count is .01.

Refined Follow-up Chi-square Analysis

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PMRESUL1 * RMCULTU1	149	85.1%	26	14.9%	175	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2418.755[a]	2304	.047
Likelihood Ratio	693.115	2304	1.000
Linear-by-Linear Association	22.916	1	.000
N of Valid Cases	149		

a. 2405 cells (100.0%) have expected count less than 5. The minimum expected count is .01.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
RAVCULT1 * RMCULTU1	152	86.9%	23	13.1%	175	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	242.940[a]	264	.819
Likelihood Ratio	181.917	264	1.000
Linear-by-Linear Association	13.094	1	.000
N of Valid Cases	152		

a. 334 cells (99.7%) have expected count less than 5. The minimum expected count is .03.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PMRESUL1 * RAVCULT1	160	91.4%	15	8.6%	175	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	175.953[a]	148	.058
Likelihood Ratio	126.325	148	.901
Linear-by-Linear Association	8.582	1	.003
N of Valid Cases	160		

a. 183 cells (96.3%) have expected count less than 5. The minimum expected count is .03.

Initial Aggregated Follow-up Chi-square Analysis

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PMRESULT * RMCULTUR	141	80.6%	34	19.4%	175	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2068.085[a]	2176	.951
Likelihood Ratio	647.639	2176	1.000
Linear-by-Linear Association	25.347	1	.000
N of Valid Cases	141		

a. 2275 cells (100.0%) have expected count less than 5. The minimum expected count is .01.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
RMCULTUR * RAVCULTR	139	79.4%	36	20.6%	175	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	687.366[a]	704	.666
Likelihood Ratio	361.003	704	1.000
Linear-by-Linear Association	11.873	1	.001
N of Valid Cases	139		

a. 780 cells (100.0%) have expected count less than 5. The minimum expected count is .01.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PMRESULT * RAVCULTR	157	89.7%	18	10.3%	175	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	475.045[a]	385	.001
Likelihood Ratio	269.259	385	1.000
Linear-by-Linear Association	11.652	1	.001
N of Valid Cases	157		

a. 432 cells (100.0%) have expected count less than 5. The minimum expected count is .01.

Refined Follow-up Chi-square Analysis

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PMRESUL1 * RMCULTU1	149	85.1%	26	14.9%	175	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2418.755[a]	2304	.047
Likelihood Ratio	693.115	2304	1.000
Linear-by-Linear Association	22.916	1	.000
N of Valid Cases	149		

a. 2405 cells (100.0%) have expected count less than 5. The minimum expected count is .01.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
RAVCULT1 * RMCULTU1	152	86.9%	23	13.1%	175	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	242.940[a]	264	.819
Likelihood Ratio	181.917	264	1.000
Linear-by-Linear Association	13.094	1	.000
N of Valid Cases	152		

a. 334 cells (99.7%) have expected count less than 5. The minimum expected count is .03.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PMRESUL1 * RAVCULT1	160	91.4%	15	8.6%	175	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	175.953[a]	148	.058
Likelihood Ratio	126.325	148	.901
Linear-by-Linear Association	8.582	1	.003
N of Valid Cases	160		

a. 183 cells (96.3%) have expected count less than 5. The minimum expected count is .03.

Appendix Number 14

Major Research Question 1 Contingency Tables

APPENDIX 14
Contingency Tables

Table 5-1
Supporting Hypothesis 1.1

Table 14-1 Org. PRM Policy – PRM Training (Chi-Square)

QIV#1 * QIII#2 Crosstabulation

			X2: Does your employing organization have a policy requiring that projects have a risk management plan?			
			Yes	No	Sometimes	Total
X9: Do your project team members obtain training in risk management planning and impact analysis at some point during the project's life?	Rarely (0-19%)	Count	33	44	3	80
		% within QIV#1	41.3%	55.0%	3.8%	100.0%
		% within QIII#2	32.0%	72.1%	50.0%	47.1%
		% of Total	19.4%	25.9%	1.8%	47.1%
	Occasionally (20-39%)	Count	34	10	3	47
		% within QIV#1	72.3%	21.3%	6.4%	100.0%
		% within QIII#2	33.0%	16.4%	50.0%	27.6%
		% of Total	20.0%	5.9%	1.8%	27.6%
	Frequently (40-59%)	Count	10	3	0	13
		% within QIV#1	76.9%	23.1%	.0%	100.0%
		% within QIII#2	9.7%	4.9%	.0%	7.6%
		% of Total	5.9%	1.8%	.0%	7.6%
	Usually (60-79%)	Count	15	3	0	18
		% within QIV#1	83.3%	16.7%	.0%	100.0%
		% within QIII#2	14.6%	4.9%	.0%	10.6%
		% of Total	8.8%	1.8%	.0%	10.6%
	Almost Always (80-100%)	Count	11	1	0	12
		% within QIV#1	91.7%	8.3%	.0%	100.0%
		% within QIII#2	10.7%	1.6%	.0%	7.1%
		% of Total	6.5%	.6%	.0%	7.1%
Total		Count	103	61	6	170
		% within QIV#1	60.6%	35.9%	3.5%	100.0%
		% within QIII#2	100.0%	100.0%	100.0%	100.0%
		% of Total	60.6%	35.9%	3.5%	100.0%

Table 14-2 Org. PRM Policy – Qualitative Risk Analysis (Chi-Square)

QIV#3 * QIII#2 Crosstabulation

			X2: Does your employing organization have a policy requiring that projects have a risk management plan?			
			Yes	No	Sometimes	Total
X11: Do your projects use qualitative risk analysis (e.g. probability and impact matrix) when evaluating the merits and demerits of prospective projects?	Rarely (0-19%)	Count	15	22	1	38
		% within QIV#3	39.5%	57.9%	2.6%	100.0%
		% within QIII#2	14.4%	36.1%	16.7%	22.2%
		% of Total	8.8%	12.9%	.6%	22.2%
	Occasionally (20-39%)	Count	19	17	2	38
		% within QIV#3	50.0%	44.7%	5.3%	100.0%
		% within QIII#2	18.3%	27.9%	33.3%	22.2%
		% of Total	11.1%	9.9%	1.2%	22.2%
	Frequently (40-59%)	Count	16	11	2	29
		% within QIV#3	55.2%	37.9%	6.9%	100.0%
		% within QIII#2	15.4%	18.0%	33.3%	17.0%
		% of Total	9.4%	6.4%	1.2%	17.0%
	Usually (60-79%)	Count	16	6	0	22
		% within QIV#3	72.7%	27.3%	.0%	100.0%
		% within QIII#2	15.4%	9.8%	.0%	12.9%
		% of Total	9.4%	3.5%	.0%	12.9%
	Almost Always (80-100%)	Count	38	5	1	44
		% within QIV#3	86.4%	11.4%	2.3%	100.0%
		% within QIII#2	36.5%	8.2%	16.7%	25.7%
		% of Total	22.2%	2.9%	.6%	25.7%
Total		Count	104	61	6	171
		% within QIV#3	60.8%	35.7%	3.5%	100.0%
		% within QIII#2	100.0%	100.0%	100.0%	100.0%
		% of Total	60.8%	35.7%	3.5%	100.0%

Table 14-3 Org. PRM Policy – Risk Technique for Contingency Costs (Chi-Square)

QIV#9 * QIII#2 Crosstabulation

			X2: Does your employing organization have a policy requiring that projects have a risk management plan?			
			Yes	No	Sometimes	Total
X17: Do you use a risk analysis technique to develop a contingency fund for project costs?	Yes	Count	57	18	2	77
		% within QIV#9	74.0%	23.4%	2.6%	100.0%
		% within QIII#2	54.8%	30.5%	33.3%	45.6%
		% of Total	33.7%	10.7%	1.2%	45.6%
	No	Count	44	40	2	86
		% within QIV#9	51.2%	46.5%	2.3%	100.0%
		% within QIII#2	42.3%	67.8%	33.3%	50.9%
		% of Total	26.0%	23.7%	1.2%	50.9%
	Sometimes	Count	3	1	2	6
		% within QIV#9	50.0%	16.7%	33.3%	100.0%
		% within QIII#2	2.9%	1.7%	33.3%	3.6%
		% of Total	1.8%	.6%	1.2%	3.6%
Total		Count	104	59	6	169
		% within QIV#9	61.5%	34.9%	3.6%	100.0%
		% within QIII#2	100.0%	100.0%	100.0%	100.0%
		% of Total	61.5%	34.9%	3.6%	100.0%

Table 14-4 Org. PRM Policy – Risk Technique for Contingency Time (Chi-Square)

QIV#11 * QIII#2 Crosstabulation

			X2: Does your employing organization have a policy requiring that projects have a risk management plan?			
			Yes	No	Sometimes	Total
X19: Do you use a risk analysis technique to develop a contingency fund for project schedule durations?	Yes	Count	47	16	1	64
		% within QIV#11	73.4%	25.0%	1.6%	100.0%
		% within QIII#2	45.6%	27.1%	16.7%	38.1%
		% of Total	28.0%	9.5%	.6%	38.1%
	No	Count	54	41	3	98
		% within QIV#11	55.1%	41.8%	3.1%	100.0%
		% within QIII#2	52.4%	69.5%	50.0%	58.3%
		% of Total	32.1%	24.4%	1.8%	58.3%
	Sometimes	Count	2	2	2	6
		% within QIV#11	33.3%	33.3%	33.3%	100.0%
		% within QIII#2	1.9%	3.4%	33.3%	3.6%
		% of Total	1.2%	1.2%	1.2%	3.6%
Total		Count	103	59	6	168
		% within QIV#11	61.3%	35.1%	3.6%	100.0%
		% within QIII#2	100.0%	100.0%	100.0%	100.0%
		% of Total	61.3%	35.1%	3.6%	100.0%

Table 14-5 Org. PRM Concern –PRM Training (Chi-Square)

QIV#1 * QIII#4 Crosstabulation

			X4: Do you consider your employing organization to be concerned about project risk?			Total
			Yes	No	Sometimes	
X9: Do your project team members obtain training in risk management planning and impact analysis at some point during the project's life?	Rarely (0-19%)	Count	32	6	44	82
		% within QIV#1	39.0%	7.3%	53.7%	100.0%
		% within QIII#4	33.0%	75.0%	65.7%	47.7%
		% of Total	18.6%	3.5%	25.6%	47.7%
	Occasionally (20-39%)	Count	27	1	19	47
		% within QIV#1	57.4%	2.1%	40.4%	100.0%
		% within QIII#4	27.8%	12.5%	28.4%	27.3%
		% of Total	15.7%	.6%	11.0%	27.3%
	Frequently (40-59%)	Count	11	0	2	13
		% within QIV#1	84.6%	.0%	15.4%	100.0%
		% within QIII#4	11.3%	.0%	3.0%	7.6%
		% of Total	6.4%	.0%	1.2%	7.6%
	Usually (60-79%)	Count	16	0	2	18
		% within QIV#1	88.9%	.0%	11.1%	100.0%
		% within QIII#4	16.5%	.0%	3.0%	10.5%
		% of Total	9.3%	.0%	1.2%	10.5%
	Almost Always (80-100%)	Count	11	1	0	12
		% within QIV#1	91.7%	8.3%	.0%	100.0%
		% within QIII#4	11.3%	12.5%	.0%	7.0%
		% of Total	6.4%	.6%	.0%	7.0%
Total		Count	97	8	67	172
		% within QIV#1	56.4%	4.7%	39.0%	100.0%
		% within QIII#4	100.0%	100.0%	100.0%	100.0%
		% of Total	56.4%	4.7%	39.0%	100.0%

Table 14-6 Org. PRM Concern – Qualitative Risk Analysis (Chi-Square)

QIV#3 * QIII#4 Crosstabulation

			X4: Do you consider your employing organization to be concerned about project risk?			
			Yes	No	Sometimes	Total
X11: Do your projects use qualitative risk analysis (e.g. probability and impact matrix) when evaluating the merits and demerits of prospective projects?	Rarely (0-19%)	Count	17	4	19	40
		% within QIV#3	42.5%	10.0%	47.5%	100.0%
		% within QIII#4	17.2%	50.0%	28.4%	23.0%
		% of Total	9.8%	2.3%	10.9%	23.0%
	Occasionally (20-39%)	Count	16	3	20	39
		% within QIV#3	41.0%	7.7%	51.3%	100.0%
		% within QIII#4	16.2%	37.5%	29.9%	22.4%
		% of Total	9.2%	1.7%	11.5%	22.4%
	Frequently (40-59%)	Count	13	0	16	29
		% within QIV#3	44.8%	.0%	55.2%	100.0%
		% within QIII#4	13.1%	.0%	23.9%	16.7%
		% of Total	7.5%	.0%	9.2%	16.7%
	Usually (60-79%)	Count	15	0	7	22
		% within QIV#3	68.2%	.0%	31.8%	100.0%
		% within QIII#4	15.2%	.0%	10.4%	12.6%
		% of Total	8.6%	.0%	4.0%	12.6%
	Almost Always (80-100%)	Count	38	1	5	44
		% within QIV#3	86.4%	2.3%	11.4%	100.0%
		% within QIII#4	38.4%	12.5%	7.5%	25.3%
		% of Total	21.8%	.6%	2.9%	25.3%
Total		Count	99	8	67	174
		% within QIV#3	56.9%	4.6%	38.5%	100.0%
		% within QIII#4	100.0%	100.0%	100.0%	100.0%
		% of Total	56.9%	4.6%	38.5%	100.0%

Table 14-7 Org. PRM Concern – Risk ID Sessions (Chi-Square)

QIV#7 * QIII#4 Crosstabulation

			X4: Do you consider your employing organization to be concerned about project risk?			
			Yes	No	Sometimes	Total
X15: During which of the following project phases do your projects have risk identification sessions?	Never	Count	1	0	0	1
		% within QIV#7	100.0%	.0%	.0%	100.0%
		% within QIII#4	1.0%	.0%	.0%	.6%
		% of Total	.6%	.0%	.0%	.6%
	Initiating	Count	7	2	12	21
		% within QIV#7	33.3%	9.5%	57.1%	100.0%
		% within QIII#4	7.3%	28.6%	19.4%	12.7%
		% of Total	4.2%	1.2%	7.3%	12.7%
	Planning	Count	8	1	7	16
		% within QIV#7	50.0%	6.3%	43.8%	100.0%
		% within QIII#4	8.3%	14.3%	11.3%	9.7%
		% of Total	4.8%	.6%	4.2%	9.7%
	Executing & Controlling	Count	3	1	8	12
		% within QIV#7	25.0%	8.3%	66.7%	100.0%
		% within QIII#4	3.1%	14.3%	12.9%	7.3%
		% of Total	1.8%	.6%	4.8%	7.3%
	All Project Phases	Count	14	0	7	21
		% within QIV#7	66.7%	.0%	33.3%	100.0%
		% within QIII#4	14.6%	.0%	11.3%	12.7%
		% of Total	8.5%	.0%	4.2%	12.7%
	Initiating, Planning, Executing & Controlling	Count	41	1	14	56
		% within QIV#7	73.2%	1.8%	25.0%	100.0%
		% within QIII#4	42.7%	14.3%	22.6%	33.9%
		% of Total	24.8%	.6%	8.5%	33.9%
	Initiating, Planning	Count	12	2	9	23
		% within QIV#7	52.2%	8.7%	39.1%	100.0%
		% within QIII#4	12.5%	28.6%	14.5%	13.9%
		% of Total	7.3%	1.2%	5.5%	13.9%
	Planning, Executing & Controlling	Count	10	0	5	15
		% within QIV#7	66.7%	.0%	33.3%	100.0%
		% within QIII#4	10.4%	.0%	8.1%	9.1%
		% of Total	6.1%	.0%	3.0%	9.1%
Total		Count	96	7	62	165
		% within QIV#7	58.2%	4.2%	37.6%	100.0%
		% within QIII#4	100.0%	100.0%	100.0%	100.0%
		% of Total	58.2%	4.2%	37.6%	100.0%

Table 14-8 Org. PRM Concern – Risk Technique for Contingency Costs (Chi-Square)

QIV#9 * QIII#4 Crosstabulation

			X4: Do you consider your employing organization to be concerned about project risk?			Total
			Yes	No	Sometimes	
X17: Do you use a risk analysis technique to develop a contingency fund for project costs?	Yes	Count	54	3	20	77
		% within QIV#9	70.1%	3.9%	26.0%	100.0%
		% within QIII#4	55.7%	37.5%	30.8%	45.3%
		% of Total	31.8%	1.8%	11.8%	45.3%
	No	Count	39	5	43	87
		% within QIV#9	44.8%	5.7%	49.4%	100.0%
		% within QIII#4	40.2%	62.5%	66.2%	51.2%
		% of Total	22.9%	2.9%	25.3%	51.2%
	Sometimes	Count	4	0	2	6
		% within QIV#9	66.7%	.0%	33.3%	100.0%
		% within QIII#4	4.1%	.0%	3.1%	3.5%
		% of Total	2.4%	.0%	1.2%	3.5%
Total		Count	97	8	65	170
		% within QIV#9	57.1%	4.7%	38.2%	100.0%
		% within QIII#4	100.0%	100.0%	100.0%	100.0%
		% of Total	57.1%	4.7%	38.2%	100.0%

Table 14-9 Work Unit PRM Policy – PRM Training (Chi-Square)

QIV#1 * QIII#5 Crosstabulation

			X5: Does your employing organization work unit have a policy requiring that projects have a risk management plan?			
			Yes	No	Sometimes	Total
X9: Do your project team members obtain training in risk management planning and impact analysis at some point during the project's life?	Rarely (0-19%)	Count	33	44	3	80
		% within QIV#1	41.3%	55.0%	3.8%	100.0%
		% within QIII#5	32.4%	72.1%	60.0%	47.6%
		% of Total	19.6%	26.2%	1.8%	47.6%
	Occasionally (20-39%)	Count	31	12	2	45
		% within QIV#1	68.9%	26.7%	4.4%	100.0%
		% within QIII#5	30.4%	19.7%	40.0%	26.8%
		% of Total	18.5%	7.1%	1.2%	26.8%
	Frequently (40-59%)	Count	11	2	0	13
		% within QIV#1	84.6%	15.4%	.0%	100.0%
		% within QIII#5	10.8%	3.3%	.0%	7.7%
		% of Total	6.5%	1.2%	.0%	7.7%
	Usually (60-79%)	Count	16	2	0	18
		% within QIV#1	88.9%	11.1%	.0%	100.0%
		% within QIII#5	15.7%	3.3%	.0%	10.7%
		% of Total	9.5%	1.2%	.0%	10.7%
	Almost Always (80-100%)	Count	11	1	0	12
		% within QIV#1	91.7%	8.3%	.0%	100.0%
		% within QIII#5	10.8%	1.6%	.0%	7.1%
		% of Total	6.5%	.6%	.0%	7.1%
Total		Count	102	61	5	168
		% within QIV#1	60.7%	36.3%	3.0%	100.0%
		% within QIII#5	100.0%	100.0%	100.0%	100.0%
		% of Total	60.7%	36.3%	3.0%	100.0%

Table 14-10 Work Unit PRM Policy – Qualitative Risk Analysis (Chi-Square)

QIV#3 * QIII#5 Crosstabulation

			X5: Does your employing organization work unit have a policy requiring that projects have a risk management plan?			
			Yes	No	Sometimes	Total
X11: Do your projects use qualitative risk analysis (e.g. probability and impact matrix) when evaluating the merits and demerits of prospective projects?	Rarely (0-19%)	Count	16	22	1	39
		% within QIV#3	41.0%	56.4%	2.6%	100.0%
		% within QIII#5	15.5%	36.1%	20.0%	23.1%
		% of Total	9.5%	13.0%	.6%	23.1%
	Occasionally (20-39%)	Count	20	16	1	37
		% within QIV#3	54.1%	43.2%	2.7%	100.0%
		% within QIII#5	19.4%	26.2%	20.0%	21.9%
		% of Total	11.8%	9.5%	.6%	21.9%
	Frequently (40-59%)	Count	15	12	1	28
		% within QIV#3	53.6%	42.9%	3.6%	100.0%
		% within QIII#5	14.6%	19.7%	20.0%	16.6%
		% of Total	8.9%	7.1%	.6%	16.6%
	Usually (60-79%)	Count	14	6	2	22
		% within QIV#3	63.6%	27.3%	9.1%	100.0%
		% within QIII#5	13.6%	9.8%	40.0%	13.0%
		% of Total	8.3%	3.6%	1.2%	13.0%
	Almost Always (80-100%)	Count	38	5	0	43
		% within QIV#3	88.4%	11.6%	.0%	100.0%
		% within QIII#5	36.9%	8.2%	.0%	25.4%
		% of Total	22.5%	3.0%	.0%	25.4%
Total		Count	103	61	5	169
		% within QIV#3	60.9%	36.1%	3.0%	100.0%
		% within QIII#5	100.0%	100.0%	100.0%	100.0%
		% of Total	60.9%	36.1%	3.0%	100.0%

Table 14-11 Work Unit PRM Policy – Risk Technique for Contingency Costs (Chi-Square)

QIV#9 * QIII#5 Crosstabulation

			X5: Does your employing organization work unit have a policy requiring that projects have a risk management plan?			
			Yes	No	Sometimes	Total
X17: Do you use a risk analysis technique to develop a contingency fund for project costs?	Yes	Count	59	18	0	77
		% within QIV#9	76.6%	23.4%	.0%	100.0%
		% within QIII#5	57.8%	30.0%	.0%	46.1%
		% of Total	35.3%	10.8%	.0%	46.1%
	No	Count	39	41	4	84
		% within QIV#9	46.4%	48.8%	4.8%	100.0%
		% within QIII#5	38.2%	68.3%	80.0%	50.3%
		% of Total	23.4%	24.6%	2.4%	50.3%
	Sometimes	Count	4	1	1	6
		% within QIV#9	66.7%	16.7%	16.7%	100.0%
		% within QIII#5	3.9%	1.7%	20.0%	3.6%
		% of Total	2.4%	.6%	.6%	3.6%
Total		Count	102	60	5	167
		% within QIV#9	61.1%	35.9%	3.0%	100.0%
		% within QIII#5	100.0%	100.0%	100.0%	100.0%
		% of Total	61.1%	35.9%	3.0%	100.0%

Table 14-12 Work Unit PRM Policy - Risk Technique for Contingency Time (Chi-Square)

QIV#11 * QIII#5 Crosstabulation

			X5: Does your employing organization work unit have a policy requiring that projects have a risk management plan?			Total
			Yes	No	Sometimes	
X19: Do you use a risk analysis technique to develop a contingency fund for project schedule durations?	Yes	Count	48	15	0	63
		% within QIV#11	76.2%	23.8%	.0%	100.0%
		% within QIII#5	47.1%	25.4%	.0%	38.0%
		% of Total	28.9%	9.0%	.0%	38.0%
	No	Count	51	42	4	97
		% within QIV#11	52.6%	43.3%	4.1%	100.0%
		% within QIII#5	50.0%	71.2%	80.0%	58.4%
		% of Total	30.7%	25.3%	2.4%	58.4%
	Sometimes	Count	3	2	1	6
		% within QIV#11	50.0%	33.3%	16.7%	100.0%
		% within QIII#5	2.9%	3.4%	20.0%	3.6%
		% of Total	1.8%	1.2%	.6%	3.6%
Total		Count	102	59	5	166
		% within QIV#11	61.4%	35.5%	3.0%	100.0%
		% within QIII#5	100.0%	100.0%	100.0%	100.0%
		% of Total	61.4%	35.5%	3.0%	100.0%

Table 14-13 Org. PRM Encouragement –PRM Training (Chi-Square)

QIV#1 * QIII#6 Crosstabulation

			X6: Does senior management in your organization encourage and reward risk taking in projects?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
X9: Do your project team members obtain training in risk management planning and impact analysis at some point during the project's life?	Rarely (0-19%)	Count	38	20	5	7	6	76
		% within QIV#1	50.0%	26.3%	6.6%	9.2%	7.9%	100.0%
		% within QIII#6	59.4%	42.6%	25.0%	41.2%	60.0%	48.1%
		% of Total	24.1%	12.7%	3.2%	4.4%	3.8%	48.1%
	Occasionally (20-39%)	Count	18	16	8	4	0	46
		% within QIV#1	39.1%	34.8%	17.4%	8.7%	.0%	100.0%
		% within QIII#6	28.1%	34.0%	40.0%	23.5%	.0%	29.1%
		% of Total	11.4%	10.1%	5.1%	2.5%	.0%	29.1%
	Frequently (40-59%)	Count	4	7	1	1	0	13
		% within QIV#1	30.8%	53.8%	7.7%	7.7%	.0%	100.0%
		% within QIII#6	6.3%	14.9%	5.0%	5.9%	.0%	8.2%
		% of Total	2.5%	4.4%	.6%	.6%	.0%	8.2%
	Usually (60-79%)	Count	1	3	5	3	1	13
		% within QIV#1	7.7%	23.1%	38.5%	23.1%	7.7%	100.0%
		% within QIII#6	1.6%	6.4%	25.0%	17.6%	10.0%	8.2%
		% of Total	.6%	1.9%	3.2%	1.9%	.6%	8.2%
	Almost Always (80-100%)	Count	3	1	1	2	3	10
		% within QIV#1	30.0%	10.0%	10.0%	20.0%	30.0%	100.0%
		% within QIII#6	4.7%	2.1%	5.0%	11.8%	30.0%	6.3%
		% of Total	1.9%	.6%	.6%	1.3%	1.9%	6.3%
Total		Count	64	47	20	17	10	158
		% within QIV#1	40.5%	29.7%	12.7%	10.8%	6.3%	100.0%
		% within QIII#6	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	40.5%	29.7%	12.7%	10.8%	6.3%	100.0%

Table 14-14 Org. PRM Encouragement – Quantitative Technique (Chi-Square)

QIV#2 * QIII#6 Crosstabulation

			X6: *Does senior management in your organization encourage and reward risk taking in projects?*					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
X10: *Do your projects* use any structured quantitative technique (e.g. Monte Carlo simulation, decision trees) when evaluating *the merits and demerits* of prospective projects?	Rarely (0-19%)	*Count*	44	24	6	10	6	90
		% within QIV#2	48.9%	26.7%	6.7%	11.1%	6.7%	100.0%
		% within QIII#6	68.8%	52.2%	30.0%	58.8%	54.5%	57.0%
		% of Total	27.8%	15.2%	3.8%	6.3%	3.8%	57.0%
	Occasionally (20-39%)	Count	11	11	7	4	0	33
		% within QIV#2	33.3%	33.3%	21.2%	12.1%	.0%	100.0%
		% within QIII#6	17.2%	23.9%	35.0%	23.5%	.0%	20.9%
		% of Total	7.0%	7.0%	4.4%	2.5%	.0%	20.9%
	Frequently (40-59%)	Count	5	7	2	2	0	16
		% within QIV#2	31.3%	43.8%	12.5%	12.5%	.0%	100.0%
		% within QIII#6	7.8%	15.2%	10.0%	11.8%	.0%	10.1%
		% of Total	3.2%	4.4%	1.3%	1.3%	.0%	10.1%
	Usually (60-79%)	Count	1	0	4	0	3	8
		% within QIV#2	12.5%	.0%	50.0%	.0%	37.5%	100.0%
		% within QIII#6	1.6%	.0%	20.0%	.0%	27.3%	5.1%
		% of Total	.6%	.0%	2.5%	.0%	1.9%	5.1%
	Almost Always (80-100%)	Count	3	4	1	1	2	11
		% within QIV#2	27.3%	36.4%	9.1%	9.1%	18.2%	100.0%
		% within QIII#6	4.7%	8.7%	5.0%	5.9%	18.2%	7.0%
		% of Total	1.9%	2.5%	.6%	.6%	1.3%	7.0%
Total		Count	64	46	20	17	11	158
		% within QIV#2	40.5%	29.1%	12.7%	10.8%	7.0%	100.0%
		% within QIII#6	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	40.5%	29.1%	12.7%	10.8%	7.0%	100.0%

Table 14-15 Org. PRM Discouragement – Qualitative Risk Analysis (Chi-Square)

QIV#3 * QIII#7 Crosstabulation

			X7: Does senior management in your organization discourage the reporting of risks associated with its projects?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-10 0%)	Total
X11: Do your projects use qualitative risk analysis (e.g. probability and impact matrix) when evaluating the merits and demerits of prospective projects?	Rarely (0-19%)	Count	23	3	4	3	4	37
		% within QIV#3	62.2%	8.1%	10.8%	8.1%	10.8%	100.0%
		% within QIII#7	22.3%	9.1%	28.6%	25.0%	80.0%	22.2%
		% of Total	13.8%	1.8%	2.4%	1.8%	2.4%	22.2%
	Occasionally (20-39%)	Count	16	11	4	4	0	35
		% within QIV#3	45.7%	31.4%	11.4%	11.4%	.0%	100.0%
		% within QIII#7	15.5%	33.3%	28.6%	33.3%	.0%	21.0%
		% of Total	9.6%	6.6%	2.4%	2.4%	.0%	21.0%
	Frequently (40-59%)	Count	14	11	3	1	0	29
		% within QIV#3	48.3%	37.9%	10.3%	3.4%	.0%	100.0%
		% within QIII#7	13.6%	33.3%	21.4%	8.3%	.0%	17.4%
		% of Total	8.4%	6.6%	1.8%	.6%	.0%	17.4%
	Usually (60-79%)	Count	13	6	2	1	0	22
		% within QIV#3	59.1%	27.3%	9.1%	4.5%	.0%	100.0%
		% within QIII#7	12.6%	18.2%	14.3%	8.3%	.0%	13.2%
		% of Total	7.8%	3.6%	1.2%	.6%	.0%	13.2%
	Almost Always (80-100%)	Count	37	2	1	3	1	44
		% within QIV#3	84.1%	4.5%	2.3%	6.8%	2.3%	100.0%
		% within QIII#7	35.9%	6.1%	7.1%	25.0%	20.0%	26.3%
		% of Total	22.2%	1.2%	.6%	1.8%	.6%	26.3%
Total		Count	103	33	14	12	5	167
		% within QIV#3	61.7%	19.8%	8.4%	7.2%	3.0%	100.0%
		% within QIII#7	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	61.7%	19.8%	8.4%	7.2%	3.0%	100.0%

Table 14-16 Org. PRM Discouragement – Risk ID Sessions (Chi-Square)

QIV#7 * QIII#7 Crosstabulation

			X7: Does senior management in your organization discourage the reporting of risks associated with its projects?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
X15: During which of the following project phases do your projects have risk identification sessions?	Never	Count	0	0	1	0	0	1
		% within QIV#7	.0%	.0%	100.0%	.0%	.0%	100.0%
		% within QIII#7	.0%	.0%	7.7%	.0%	.0%	.6%
		% of Total	.0%	.0%	.6%	.0%	.0%	.6%
	Initiating	Count	13	6	1	1	1	22
		% within QIV#7	59.1%	27.3%	4.5%	4.5%	4.5%	100.0%
		% within QIII#7	13.1%	18.2%	7.7%	8.3%	25.0%	13.7%
		% of Total	8.1%	3.7%	.6%	.6%	.6%	13.7%
	Planning	Count	5	6	1	2	1	15
		% within QIV#7	33.3%	40.0%	6.7%	13.3%	6.7%	100.0%
		% within QIII#7	5.1%	18.2%	7.7%	16.7%	25.0%	9.3%
		% of Total	3.1%	3.7%	.6%	1.2%	.6%	9.3%
	Executing & Controlling	Count	1	4	3	2	1	11
		% within QIV#7	9.1%	36.4%	27.3%	18.2%	9.1%	100.0%
		% within QIII#7	1.0%	12.1%	23.1%	16.7%	25.0%	6.8%
		% of Total	.6%	2.5%	1.9%	1.2%	.6%	6.8%
	All Project Phases	Count	14	6	1	0	0	21
		% within QIV#7	66.7%	28.6%	4.8%	.0%	.0%	100.0%
		% within QIII#7	14.1%	18.2%	7.7%	.0%	.0%	13.0%
		% of Total	8.7%	3.7%	.6%	.0%	.0%	13.0%
	Initiating, Planning, Executing & Controlling	Count	42	5	4	4	1	56
		% within QIV#7	75.0%	8.9%	7.1%	7.1%	1.8%	100.0%
		% within QIII#7	42.4%	15.2%	30.8%	33.3%	25.0%	34.8%
		% of Total	26.1%	3.1%	2.5%	2.5%	.6%	34.8%
	Initiating, Planning	Count	13	6	0	2	0	21
		% within QIV#7	61.9%	28.6%	.0%	9.5%	.0%	100.0%
		% within QIII#7	13.1%	18.2%	.0%	16.7%	.0%	13.0%
		% of Total	8.1%	3.7%	.0%	1.2%	.0%	13.0%
	Planning, Executing & Controlling	Count	11	0	2	1	0	14
		% within QIV#7	78.6%	.0%	14.3%	7.1%	.0%	100.0%
		% within QIII#7	11.1%	.0%	15.4%	8.3%	.0%	8.7%
		% of Total	6.8%	.0%	1.2%	.6%	.0%	8.7%
Total		Count	99	33	13	12	4	161
		% within QIV#7	61.5%	20.5%	8.1%	7.5%	2.5%	100.0%
		% within QIII#7	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	61.5%	20.5%	8.1%	7.5%	2.5%	100.0%

Table 14-17 Org. PRM Discouragement - Risk Technique for Contingency Time (Chi-Square)

QIV#11 * QIII#7 Crosstabulation

			X7: Does senior management in your organization discourage the reporting of risks associated with its projects?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
X19: Do you use a risk analysis technique to develop a contingency fund for project schedule durations?	Yes	Count	46	8	5	4	0	63
		% within QIV#11	73.0%	12.7%	7.9%	6.3%	.0%	100.0%
		% within QIII#7	45.1%	25.0%	35.7%	33.3%	.0%	38.2%
		% of Total	27.9%	4.8%	3.0%	2.4%	.0%	38.2%
	No	Count	54	20	9	8	5	96
		% within QIV#11	56.3%	20.8%	9.4%	8.3%	5.2%	100.0%
		% within QIII#7	52.9%	62.5%	64.3%	66.7%	100.0%	58.2%
		% of Total	32.7%	12.1%	5.5%	4.8%	3.0%	58.2%
	Sometimes	Count	2	4	0	0	0	6
		% within QIV#11	33.3%	66.7%	.0%	.0%	.0%	100.0%
		% within QIII#7	2.0%	12.5%	.0%	.0%	.0%	3.6%
		% of Total	1.2%	2.4%	.0%	.0%	.0%	3.6%
Total		Count	102	32	14	12	5	165
		% within QIV#11	61.8%	19.4%	8.5%	7.3%	3.0%	100.0%
		% within QIII#7	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	61.8%	19.4%	8.5%	7.3%	3.0%	100.0%

Supporting Hypothesis 1.2
Table 5-2

Table 14-18 Adequate PRM Resources – PRM Training (Chi-Square)

QIV#1 * QIII#8 Crosstabulation

			X8: Does senior management in your organization provide adequate money, human resources, and time for the entire process of project risk management (e.g. planning, identification, impact analysis, response planning, and monitoring)?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
X9: Do your project team members obtain training in risk management planning and impact analysis at some point during the project's life?	Rarely (0-19%)	Count	47	20	6	3	4	80
		% within QIV#1	58.8%	25.0%	7.5%	3.8%	5.0%	100.0%
		% within QIII#8	75.8%	44.4%	28.6%	13.6%	22.2%	47.6%
		% of Total	28.0%	11.9%	3.6%	1.8%	2.4%	47.6%
	Occasionally (20-39%)	Count	12	18	7	5	5	47
		% within QIV#1	25.5%	38.3%	14.9%	10.6%	10.6%	100.0%
		% within QIII#8	19.4%	40.0%	33.3%	22.7%	27.8%	28.0%
		% of Total	7.1%	10.7%	4.2%	3.0%	3.0%	28.0%
	Frequently (40-59%)	Count	1	3	5	4	0	13
		% within QIV#1	7.7%	23.1%	38.5%	30.8%	.0%	100.0%
		% within QIII#8	1.6%	6.7%	23.8%	18.2%	.0%	7.7%
		% of Total	.6%	1.8%	3.0%	2.4%	.0%	7.7%
	Usually (60-79%)	Count	0	2	2	7	5	16
		% within QIV#1	.0%	12.5%	12.5%	43.8%	31.3%	100.0%
		% within QIII#8	.0%	4.4%	9.5%	31.8%	27.8%	9.5%
		% of Total	.0%	1.2%	1.2%	4.2%	3.0%	9.5%
	Almost Always (80-100%)	Count	2	2	1	3	4	12
		% within QIV#1	16.7%	16.7%	8.3%	25.0%	33.3%	100.0%
		% within QIII#8	3.2%	4.4%	4.8%	13.6%	22.2%	7.1%
		% of Total	1.2%	1.2%	.6%	1.8%	2.4%	7.1%
Total		Count	62	45	21	22	18	168
		% within QIV#1	36.9%	26.8%	12.5%	13.1%	10.7%	100.0%
		% within QIII#8	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	36.9%	26.8%	12.5%	13.1%	10.7%	100.0%

Table 14-19 Adequate PRM Resources – Quantitative Technique (Chi-Square)

QIV#2 * QIII#8 Crosstabulation

			X8: Does senior management in your organization provide adequate money, human resources, and time for the entire process of project risk management (e.g. planning, identification, impact analysis, response planning, and monitoring)?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
X10: Do your projects use any structured quantitative technique (e.g. Monte Carlo simulation, decision trees) when evaluating the merits and demerits of prospective projects?	Rarely (0-19%)	Count	46	21	9	10	7	93
		% within QIV#2	49.5%	22.6%	9.7%	10.8%	7.5%	100.0%
		% within QIII#8	74.2%	47.7%	42.9%	45.5%	36.8%	55.4%
		% of Total	27.4%	12.5%	5.4%	6.0%	4.2%	55.4%
	Occasionally (20-39%)	Count	8	14	8	5	4	39
		% within QIV#2	20.5%	35.9%	20.5%	12.8%	10.3%	100.0%
		% within QIII#8	12.9%	31.8%	38.1%	22.7%	21.1%	23.2%
		% of Total	4.8%	8.3%	4.8%	3.0%	2.4%	23.2%
	Frequently (40-59%)	Count	5	5	4	3	0	17
		% within QIV#2	29.4%	29.4%	23.5%	17.6%	.0%	100.0%
		% within QIII#8	8.1%	11.4%	19.0%	13.6%	.0%	10.1%
		% of Total	3.0%	3.0%	2.4%	1.8%	.0%	10.1%
	Usually (60-79%)	Count	1	3	0	2	2	8
		% within QIV#2	12.5%	37.5%	.0%	25.0%	25.0%	100.0%
		% within QIII#8	1.6%	6.8%	.0%	9.1%	10.5%	4.8%
		% of Total	.6%	1.8%	.0%	1.2%	1.2%	4.8%
	Almost Always (80-100%)	Count	2	1	0	2	6	11
		% within QIV#2	18.2%	9.1%	.0%	18.2%	54.5%	100.0%
		% within QIII#8	3.2%	2.3%	.0%	9.1%	31.6%	6.5%
		% of Total	1.2%	.6%	.0%	1.2%	3.6%	6.5%
Total		Count	62	44	21	22	19	168
		% within QIV#2	36.9%	26.2%	12.5%	13.1%	11.3%	100.0%
		% within QIII#8	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	36.9%	26.2%	12.5%	13.1%	11.3%	100.0%

Table 14-20 Adequate PRM Resources – Qualitative Risk Analysis (Chi-Square)

QIV#3 * QIII#8 Crosstabulation

			X8: Does senior management in your organization provide adequate money, human resources, and time for the entire process of project risk management (e.g. planning, identification, impact analysis, response planning, and monitoring)?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
X11: Do your projects use qualitative risk analysis (e.g. probability and impact matrix) when evaluating the merits and demerits of prospective projects?	Rarely (0-19%)	Count	24	8	2	1	2	37
		% within QIV#3	64.9%	21.6%	5.4%	2.7%	5.4%	100.0%
		% within QIII#8	38.7%	17.8%	9.5%	4.5%	10.5%	21.9%
		% of Total	14.2%	4.7%	1.2%	.6%	1.2%	21.9%
	Occasionally (20-39%)	Count	15	17	3	1	2	38
		% within QIV#3	39.5%	44.7%	7.9%	2.6%	5.3%	100.0%
		% within QIII#8	24.2%	37.8%	14.3%	4.5%	10.5%	22.5%
		% of Total	8.9%	10.1%	1.8%	.6%	1.2%	22.5%
	Frequently (40-59%)	Count	13	8	5	2	1	29
		% within QIV#3	44.8%	27.6%	17.2%	6.9%	3.4%	100.0%
		% within QIII#8	21.0%	17.8%	23.8%	9.1%	5.3%	17.2%
		% of Total	7.7%	4.7%	3.0%	1.2%	.6%	17.2%
	Usually (60-79%)	Count	4	4	4	7	3	22
		% within QIV#3	18.2%	18.2%	18.2%	31.8%	13.6%	100.0%
		% within QIII#8	6.5%	8.9%	19.0%	31.8%	15.8%	13.0%
		% of Total	2.4%	2.4%	2.4%	4.1%	1.8%	13.0%
	Almost Always (80-100%)	Count	6	8	7	11	11	43
		% within QIV#3	14.0%	18.6%	16.3%	25.6%	25.6%	100.0%
		% within QIII#8	9.7%	17.8%	33.3%	50.0%	57.9%	25.4%
		% of Total	3.6%	4.7%	4.1%	6.5%	6.5%	25.4%
Total		Count	62	45	21	22	19	169
		% within QIV#3	36.7%	26.6%	12.4%	13.0%	11.2%	100.0%
		% within QIII#8	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	36.7%	26.6%	12.4%	13.0%	11.2%	100.0%

Table 14-21 Adequate PRM Resources – Risk ID Sessions (Chi-Square)

QIV#7 * QIII#8 Crosstabulation

			X8: Does senior management in your organization provide adequate money, human resources, and time for the entire process of project risk management (e.g. planning, identification, impact analysis, response planning, and monitoring)?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
X15: During which of the following project phases do your projects have risk identification sessions?	Never	Count	1	0	0	0	0	1
		% within QIV#7	100.0%	.0%	.0%	.0%	.0%	100.0%
		% within QIII#8	1.8%	.0%	.0%	.0%	.0%	.6%
		% of Total	.6%	.0%	.0%	.0%	.0%	.6%
	Initiating	Count	13	2	3	2	1	21
		% within QIV#7	61.9%	9.5%	14.3%	9.5%	4.8%	100.0%
		% within QIII#8	22.8%	4.7%	14.3%	9.1%	5.3%	13.0%
		% of Total	8.0%	1.2%	1.9%	1.2%	.6%	13.0%
	Planning	Count	10	3	1	1	0	15
		% within QIV#7	66.7%	20.0%	6.7%	6.7%	.0%	100.0%
		% within QIII#8	17.5%	7.0%	4.8%	4.5%	.0%	9.3%
		% of Total	6.2%	1.9%	.6%	.6%	.0%	9.3%
	Executing & Controlling	Count	8	2	1	0	0	11
		% within QIV#7	72.7%	18.2%	9.1%	.0%	.0%	100.0%
		% within QIII#8	14.0%	4.7%	4.8%	.0%	.0%	6.8%
		% of Total	4.9%	1.2%	.6%	.0%	.0%	6.8%
	All Project Phases	Count	5	3	7	3	3	21
		% within QIV#7	23.8%	14.3%	33.3%	14.3%	14.3%	100.0%
		% within QIII#8	8.8%	7.0%	33.3%	13.6%	15.8%	13.0%
		% of Total	3.1%	1.9%	4.3%	1.9%	1.9%	13.0%
	Initiating, Planning, Executing & Controlling	Count	12	18	5	9	11	55
		% within QIV#7	21.8%	32.7%	9.1%	16.4%	20.0%	100.0%
		% within QIII#8	21.1%	41.9%	23.8%	40.9%	57.9%	34.0%
		% of Total	7.4%	11.1%	3.1%	5.6%	6.8%	34.0%
	Initiating, Planning	Count	4	12	2	2	3	23
		% within QIV#7	17.4%	52.2%	8.7%	8.7%	13.0%	100.0%
		% within QIII#8	7.0%	27.9%	9.5%	9.1%	15.8%	14.2%
		% of Total	2.5%	7.4%	1.2%	1.2%	1.9%	14.2%
	Planning, Executing & Controlling	Count	4	3	2	5	1	15
		% within QIV#7	26.7%	20.0%	13.3%	33.3%	6.7%	100.0%
		% within QIII#8	7.0%	7.0%	9.5%	22.7%	5.3%	9.3%
		% of Total	2.5%	1.9%	1.2%	3.1%	.6%	9.3%
Total		Count	57	43	21	22	19	162
		% within QIV#7	35.2%	26.5%	13.0%	13.6%	11.7%	100.0%
		% within QIII#8	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	35.2%	26.5%	13.0%	13.6%	11.7%	100.0%

Table 14-22 Adequate PRM Resources – Risk Technique for Contingency Costs (Chi-Square)

QIV#9 * QIII#8 Crosstabulation

			X8: Does senior management in your organization provide adequate money, human resources, and time for the entire process of project risk management (e.g. planning, identification, impact analysis, response planning, and monitoring)?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
X17: Do you use a risk analysis technique to develop a contingency fund for project costs?	Yes	Count	19	23	8	12	13	75
		% within QIV#9	25.3%	30.7%	10.7%	16.0%	17.3%	100.0%
		% within QIII#8	31.7%	52.3%	38.1%	54.5%	68.4%	45.2%
		% of Total	11.4%	13.9%	4.8%	7.2%	7.8%	45.2%
	No	Count	40	17	12	10	6	85
		% within QIV#9	47.1%	20.0%	14.1%	11.8%	7.1%	100.0%
		% within QIII#8	66.7%	38.6%	57.1%	45.5%	31.6%	51.2%
		% of Total	24.1%	10.2%	7.2%	6.0%	3.6%	51.2%
	Sometimes	Count	1	4	1	0	0	6
		% within QIV#9	16.7%	66.7%	16.7%	.0%	.0%	100.0%
		% within QIII#8	1.7%	9.1%	4.8%	.0%	.0%	3.6%
		% of Total	.6%	2.4%	.6%	.0%	.0%	3.6%
Total		Count	60	44	21	22	19	166
		% within QIV#9	36.1%	26.5%	12.7%	13.3%	11.4%	100.0%
		% within QIII#8	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	36.1%	26.5%	12.7%	13.3%	11.4%	100.0%

Table 14-23 Adequate PRM Resources – Risk Technique for Contingency Time (Chi-Square)

QIV#11 * QIII#8 Crosstabulation

			X8: Does senior management in your organization provide adequate money, human resources, and time for the entire process of project risk management (e.g. planning, identification, impact analysis, response planning, and monitoring)?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
X19: Do you use a risk analysis technique to develop a contingency fund for project schedule durations?	Yes	Count	15	13	9	12	14	63
		% within QIV#11	23.8%	20.6%	14.3%	19.0%	22.2%	100.0%
		% within QIII#8	24.6%	30.2%	42.9%	57.1%	73.7%	38.2%
		% of Total	9.1%	7.9%	5.5%	7.3%	8.5%	38.2%
	No	Count	44	27	11	9	5	96
		% within QIV#11	45.8%	28.1%	11.5%	9.4%	5.2%	100.0%
		% within QIII#8	72.1%	62.8%	52.4%	42.9%	26.3%	58.2%
		% of Total	26.7%	16.4%	6.7%	5.5%	3.0%	58.2%
	Sometimes	Count	2	3	1	0	0	6
		% within QIV#11	33.3%	50.0%	16.7%	.0%	.0%	100.0%
		% within QIII#8	3.3%	7.0%	4.8%	.0%	.0%	3.6%
		% of Total	1.2%	1.8%	.6%	.0%	.0%	3.6%
Total		Count	61	43	21	21	19	165
		% within QIV#11	37.0%	26.1%	12.7%	12.7%	11.5%	100.0%
		% within QIII#8	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	37.0%	26.1%	12.7%	12.7%	11.5%	100.0%

Appendix Number 15

Major Research Question 2 Contingency Tables

APPENDIX 15
Contingency Tables

Supporting Hypothesis 2.1
Table 5-3
Table 15-1 PRM Training – Risk Reviews (Chi-Square)

QV#1 * QIV#1 Crosstabulation

			X9: Do your project team members obtain training in risk management planning and impact analysis at some point during the project's life?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
X22: Do your projects conduct risk reviews?	Rarely (0-19%)	Count	34	10	1	1	0	46
		% within QV#1	73.9%	21.7%	2.2%	2.2%	.0%	100.0%
		% within QIV#1	41.0%	21.3%	7.7%	5.6%	.0%	26.6%
		% of Total	19.7%	5.8%	.6%	.6%	.0%	26.6%
	Occasionally (20-39%)	Count	27	15	1	5	0	48
		% within QV#1	56.3%	31.3%	2.1%	10.4%	.0%	100.0%
		% within QIV#1	32.5%	31.9%	7.7%	27.8%	.0%	27.7%
		% of Total	15.6%	8.7%	.6%	2.9%	.0%	27.7%
	Frequently (40-59%)	Count	10	8	3	4	0	25
		% within QV#1	40.0%	32.0%	12.0%	16.0%	.0%	100.0%
		% within QIV#1	12.0%	17.0%	23.1%	22.2%	.0%	14.5%
		% of Total	5.8%	4.6%	1.7%	2.3%	.0%	14.5%
	Usually (60-79%)	Count	3	9	5	2	1	20
		% within QV#1	15.0%	45.0%	25.0%	10.0%	5.0%	100.0%
		% within QIV#1	3.6%	19.1%	38.5%	11.1%	8.3%	11.6%
		% of Total	1.7%	5.2%	2.9%	1.2%	.6%	11.6%
	Almost Always (80-100%)	Count	9	5	3	6	11	34
		% within QV#1	26.5%	14.7%	8.8%	17.6%	32.4%	100.0%
		% within QIV#1	10.8%	10.6%	23.1%	33.3%	91.7%	19.7%
		% of Total	5.2%	2.9%	1.7%	3.5%	6.4%	19.7%
Total		Count	83	47	13	18	12	173
		% within QV#1	48.0%	27.2%	7.5%	10.4%	6.9%	100.0%
		% within QIV#1	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	48.0%	27.2%	7.5%	10.4%	6.9%	100.0%

Table 15-2 PRM Training – Risk Audits (Chi-Square)

QV#2 * QIV#1 Crosstabulation

			X9: Do your project team members obtain training in risk management planning and impact analysis at some point during the project's life?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
X23: Do your projects experience risk audits?	Rarely (0-19%)	Count	69	25	4	7	2	107
		% within QV#2	64.5%	23.4%	3.7%	6.5%	1.9%	100.0%
		% within QIV#1	83.1%	53.2%	30.8%	41.2%	16.7%	62.2%
		% of Total	40.1%	14.5%	2.3%	4.1%	1.2%	62.2%
	Occasionally (20-39%)	Count	8	16	2	7	1	34
		% within QV#2	23.5%	47.1%	5.9%	20.6%	2.9%	100.0%
		% within QIV#1	9.6%	34.0%	15.4%	41.2%	8.3%	19.8%
		% of Total	4.7%	9.3%	1.2%	4.1%	.6%	19.8%
	Frequently (40-59%)	Count	1	2	1	1	2	7
		% within QV#2	14.3%	28.6%	14.3%	14.3%	28.6%	100.0%
		% within QIV#1	1.2%	4.3%	7.7%	5.9%	16.7%	4.1%
		% of Total	.6%	1.2%	.6%	.6%	1.2%	4.1%
	Usually (60-79%)	Count	2	1	4	1	2	10
		% within QV#2	20.0%	10.0%	40.0%	10.0%	20.0%	100.0%
		% within QIV#1	2.4%	2.1%	30.8%	5.9%	16.7%	5.8%
		% of Total	1.2%	.6%	2.3%	.6%	1.2%	5.8%
	Almost Always (80-100%)	Count	3	3	2	1	5	14
		% within QV#2	21.4%	21.4%	14.3%	7.1%	35.7%	100.0%
		% within QIV#1	3.6%	6.4%	15.4%	5.9%	41.7%	8.1%
		% of Total	1.7%	1.7%	1.2%	.6%	2.9%	8.1%
Total		Count	83	47	13	17	12	172
		% within QV#2	48.3%	27.3%	7.6%	9.9%	7.0%	100.0%
		% within QIV#1	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	48.3%	27.3%	7.6%	9.9%	7.0%	100.0%

Table 15-3 PRM Training – Org. Risk Response Plans (Chi-Square)

QV#4 * QIV#1 Crosstabulation

			X9: Do your project team members obtain training in risk management planning and impact analysis at some point during the project's life?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
X25: Does your employing organization have a policy requiring that projects have a risk response plan?	Yes	Count	20	21	11	15	10	77
		% within QV#4	26.0%	27.3%	14.3%	19.5%	13.0%	100.0%
		% within QIV#1	26.7%	47.7%	84.6%	83.3%	83.3%	47.5%
		% of Total	12.3%	13.0%	6.8%	9.3%	6.2%	47.5%
	No	Count	53	21	2	3	2	81
		% within QV#4	65.4%	25.9%	2.5%	3.7%	2.5%	100.0%
		% within QIV#1	70.7%	47.7%	15.4%	16.7%	16.7%	50.0%
		% of Total	32.7%	13.0%	1.2%	1.9%	1.2%	50.0%
	Sometimes	Count	2	2	0	0	0	4
		% within QV#4	50.0%	50.0%	.0%	.0%	.0%	100.0%
		% within QIV#1	2.7%	4.5%	.0%	.0%	.0%	2.5%
		% of Total	1.2%	1.2%	.0%	.0%	.0%	2.5%
Total		Count	75	44	13	18	12	162
		% within QV#4	46.3%	27.2%	8.0%	11.1%	7.4%	100.0%
		% within QIV#1	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	46.3%	27.2%	8.0%	11.1%	7.4%	100.0%

Table 15-4 Quantitative Technique – Risk Reviews (Chi-Square)

QV#1 * QIV#2 Crosstabulation

			X10: Do your projects use any structured quantitative technique (e.g. Monte Carlo simulation, decision trees) when evaluating the merits and demerits of prospective projects?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
X22: Do your projects conduct risk reviews?	Rarely (0-19%)	Count	36	7	3	1	0	47
		% within QV#1	76.6%	14.9%	6.4%	2.1%	.0%	100.0%
		% within QIV#2	36.7%	17.5%	17.6%	12.5%	.0%	27.0%
		% of Total	20.7%	4.0%	1.7%	.6%	.0%	27.0%
	Occasionally (20-39%)	Count	29	12	4	1	1	47
		% within QV#1	61.7%	25.5%	8.5%	2.1%	2.1%	100.0%
		% within QIV#2	29.6%	30.0%	23.5%	12.5%	9.1%	27.0%
		% of Total	16.7%	6.9%	2.3%	.6%	.6%	27.0%
	Frequently (40-59%)	Count	13	7	3	1	1	25
		% within QV#1	52.0%	28.0%	12.0%	4.0%	4.0%	100.0%
		% within QIV#2	13.3%	17.5%	17.6%	12.5%	9.1%	14.4%
		% of Total	7.5%	4.0%	1.7%	.6%	.6%	14.4%
	Usually (60-79%)	Count	8	5	3	2	2	20
		% within QV#1	40.0%	25.0%	15.0%	10.0%	10.0%	100.0%
		% within QIV#2	8.2%	12.5%	17.6%	25.0%	18.2%	11.5%
		% of Total	4.6%	2.9%	1.7%	1.1%	1.1%	11.5%
	Almost Always (80-100%)	Count	12	9	4	3	7	35
		% within QV#1	34.3%	25.7%	11.4%	8.6%	20.0%	100.0%
		% within QIV#2	12.2%	22.5%	23.5%	37.5%	63.6%	20.1%
		% of Total	6.9%	5.2%	2.3%	1.7%	4.0%	20.1%
Total		Count	98	40	17	8	11	174
		% within QV#1	56.3%	23.0%	9.8%	4.6%	6.3%	100.0%
		% within QIV#2	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	56.3%	23.0%	9.8%	4.6%	6.3%	100.0%

Table 15-5 Quantitative Technique – Risk Audits (Chi-Square)

QV#2 * QIV#2 Crosstabulation

			X10: Do your projects use any structured quantitative technique (e.g. Monte Carlo simulation, decision trees) when evaluating the merits and demerits of prospective projects?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
X23: Do your projects experience risk audits?	Rarely (0-19%)	Count	69	22	9	4	3	107
		% within QV#2	64.5%	20.6%	8.4%	3.7%	2.8%	100.0%
		% within QIV#2	71.9%	55.0%	52.9%	50.0%	27.3%	62.2%
		% of Total	40.1%	12.8%	5.2%	2.3%	1.7%	62.2%
	Occasionally (20-39%)	Count	17	13	2	1	1	34
		% within QV#2	50.0%	38.2%	5.9%	2.9%	2.9%	100.0%
		% within QIV#2	17.7%	32.5%	11.8%	12.5%	9.1%	19.8%
		% of Total	9.9%	7.6%	1.2%	.6%	.6%	19.8%
	Frequently (40-59%)	Count	3	1	2	0	1	7
		% within QV#2	42.9%	14.3%	28.6%	.0%	14.3%	100.0%
		% within QIV#2	3.1%	2.5%	11.8%	.0%	9.1%	4.1%
		% of Total	1.7%	.6%	1.2%	.0%	.6%	4.1%
	Usually (60-79%)	Count	2	2	4	2	0	10
		% within QV#2	20.0%	20.0%	40.0%	20.0%	.0%	100.0%
		% within QIV#2	2.1%	5.0%	23.5%	25.0%	.0%	5.8%
		% of Total	1.2%	1.2%	2.3%	1.2%	.0%	5.8%
	Almost Always (80-100%)	Count	5	2	0	1	6	14
		% within QV#2	35.7%	14.3%	.0%	7.1%	42.9%	100.0%
		% within QIV#2	5.2%	5.0%	.0%	12.5%	54.5%	8.1%
		% of Total	2.9%	1.2%	.0%	.6%	3.5%	8.1%
Total		Count	96	40	17	8	11	172
		% within QV#2	55.8%	23.3%	9.9%	4.7%	6.4%	100.0%
		% within QIV#2	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	55.8%	23.3%	9.9%	4.7%	6.4%	100.0%

Table 15-6 Qualitative Risk Analysis – Risk Reviews (Chi-Square)

QV#1 * QIV#3 Crosstabulation

			X11: Do your projects use qualitative risk analysis (e.g. probability and impact matrix) when evaluating the merits and demerits of prospective projects?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
X22: Do your projects conduct risk reviews?	Rarely (0-19%)	Count	27	8	10	0	2	47
		% within QV#1	57.4%	17.0%	21.3%	.0%	4.3%	100.0%
		% within QIV#3	65.9%	20.5%	34.5%	.0%	4.5%	26.9%
		% of Total	15.4%	4.6%	5.7%	.0%	1.1%	26.9%
	Occasionally (20-39%)	Count	7	19	9	6	7	48
		% within QV#1	14.6%	39.6%	18.8%	12.5%	14.6%	100.0%
		% within QIV#3	17.1%	48.7%	31.0%	27.3%	15.9%	27.4%
		% of Total	4.0%	10.9%	5.1%	3.4%	4.0%	27.4%
	Frequently (40-59%)	Count	2	6	4	4	9	25
		% within QV#1	8.0%	24.0%	16.0%	16.0%	36.0%	100.0%
		% within QIV#3	4.9%	15.4%	13.8%	18.2%	20.5%	14.3%
		% of Total	1.1%	3.4%	2.3%	2.3%	5.1%	14.3%
	Usually (60-79%)	Count	1	2	2	8	7	20
		% within QV#1	5.0%	10.0%	10.0%	40.0%	35.0%	100.0%
		% within QIV#3	2.4%	5.1%	6.9%	36.4%	15.9%	11.4%
		% of Total	.6%	1.1%	1.1%	4.6%	4.0%	11.4%
	Almost Always (80-100%)	Count	4	4	4	4	19	35
		% within QV#1	11.4%	11.4%	11.4%	11.4%	54.3%	100.0%
		% within QIV#3	9.8%	10.3%	13.8%	18.2%	43.2%	20.0%
		% of Total	2.3%	2.3%	2.3%	2.3%	10.9%	20.0%
Total		Count	41	39	29	22	44	175
		% within QV#1	23.4%	22.3%	16.6%	12.6%	25.1%	100.0%
		% within QIV#3	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	23.4%	22.3%	16.6%	12.6%	25.1%	100.0%

Table 15-7 Qualitative Risk Analysis – Risk Audits (Chi-Square)

QV#2 * QIV#3 Crosstabulation

			X11: Do your projects use qualitative risk analysis (e.g. probability and impact matrix) when evaluating the merits and demerits of prospective projects?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
X23: Do your projects experience risk audits?	Rarely (0-19%)	Count	35	29	17	9	18	108
		% within QV#2	32.4%	26.9%	15.7%	8.3%	16.7%	100.0%
		% within QIV#3	87.5%	74.4%	58.6%	40.9%	41.9%	62.4%
		% of Total	20.2%	16.8%	9.8%	5.2%	10.4%	62.4%
	Occasionally (20-39%)	Count	4	5	7	7	11	34
		% within QV#2	11.8%	14.7%	20.6%	20.6%	32.4%	100.0%
		% within QIV#3	10.0%	12.8%	24.1%	31.8%	25.6%	19.7%
		% of Total	2.3%	2.9%	4.0%	4.0%	6.4%	19.7%
	Frequently (40-59%)	Count	0	2	1	2	2	7
		% within QV#2	.0%	28.6%	14.3%	28.6%	28.6%	100.0%
		% within QIV#3	.0%	5.1%	3.4%	9.1%	4.7%	4.0%
		% of Total	.0%	1.2%	.6%	1.2%	1.2%	4.0%
	Usually (60-79%)	Count	1	0	2	3	4	10
		% within QV#2	10.0%	.0%	20.0%	30.0%	40.0%	100.0%
		% within QIV#3	2.5%	.0%	6.9%	13.6%	9.3%	5.8%
		% of Total	.6%	.0%	1.2%	1.7%	2.3%	5.8%
	Almost Always (80-100%)	Count	0	3	2	1	8	14
		% within QV#2	.0%	21.4%	14.3%	7.1%	57.1%	100.0%
		% within QIV#3	.0%	7.7%	6.9%	4.5%	18.6%	8.1%
		% of Total	.0%	1.7%	1.2%	.6%	4.6%	8.1%
Total		Count	40	39	29	22	43	173
		% within QV#2	23.1%	22.5%	16.8%	12.7%	24.9%	100.0%
		% within QIV#3	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	23.1%	22.5%	16.8%	12.7%	24.9%	100.0%

Table 15-8 Qualitative Risk Analysis– Org. Risk Response Plans (Chi-Square)

QV#4 * QIV#3 Crosstabulation

			X11: Do your projects use qualitative risk analysis (e.g. probability and impact matrix) when evaluating the merits and demerits of prospective projects?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
X25: Does your employing organization have a policy requiring that projects have a risk response plan?	Yes	Count	9	13	9	12	35	78
		% within QV#4	11.5%	16.7%	11.5%	15.4%	44.9%	100.0%
		% within QIV#3	24.3%	37.1%	32.1%	60.0%	81.4%	47.9%
		% of Total	5.5%	8.0%	5.5%	7.4%	21.5%	47.9%
	No	Count	28	21	16	8	8	81
		% within QV#4	34.6%	25.9%	19.8%	9.9%	9.9%	100.0%
		% within QIV#3	75.7%	60.0%	57.1%	40.0%	18.6%	49.7%
		% of Total	17.2%	12.9%	9.8%	4.9%	4.9%	49.7%
	Sometimes	Count	0	1	3	0	0	4
		% within QV#4	.0%	25.0%	75.0%	.0%	.0%	100.0%
		% within QIV#3	.0%	2.9%	10.7%	.0%	.0%	2.5%
		% of Total	.0%	.6%	1.8%	.0%	.0%	2.5%
Total		Count	37	35	28	20	43	163
		% within QV#4	22.7%	21.5%	17.2%	12.3%	26.4%	100.0%
		% within QIV#3	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	22.7%	21.5%	17.2%	12.3%	26.4%	100.0%

Table 15-9 Risk ID Sessions – Risk Reviews (Chi-Square)

QV#1 * QIV#7 Crosstabulation

			X15: During which of the following project phases do your projects have risk identification sessions?								
			Never	Initiating	Planning	Executing & Controlling	All Project Phases	Initiating, Planning, Executing & Controlling	Initiating, Planning	Planning, Executing & Controlling	Total
X22: Do your projects conduct risk reviews?	Rarely (0-19%)	Count	1	12	7	7	0	5	3	5	40
		% within QV#1	2.5%	30.0%	17.5%	17.5%	.0%	12.5%	7.5%	12.5%	100.0%
		% within QIV#7	100.0%	54.5%	43.8%	58.3%	.0%	8.9%	13.0%	33.3%	24.1%
		% of Total	.6%	7.2%	4.2%	4.2%	.0%	3.0%	1.8%	3.0%	24.1%
	Occasionally (20-39%)	Count	0	5	6	3	3	14	11	5	47
		% within QV#1	.0%	10.6%	12.8%	6.4%	6.4%	29.8%	23.4%	10.6%	100.0%
		% within QIV#7	.0%	22.7%	37.5%	25.0%	14.3%	25.0%	47.8%	33.3%	28.3%
		% of Total	.0%	3.0%	3.6%	1.8%	1.8%	8.4%	6.6%	3.0%	28.3%
	Frequently (40-59%)	Count	0	1	3	2	5	9	3	2	25
		% within QV#1	.0%	4.0%	12.0%	8.0%	20.0%	36.0%	12.0%	8.0%	100.0%
		% within QIV#7	.0%	4.5%	18.8%	16.7%	23.8%	16.1%	13.0%	13.3%	15.1%
		% of Total	.0%	.6%	1.8%	1.2%	3.0%	5.4%	1.8%	1.2%	15.1%
	Usually (60-79%)	Count	0	2	0	0	4	9	3	1	19
		% within QV#1	.0%	10.5%	.0%	.0%	21.1%	47.4%	15.8%	5.3%	100.0%
		% within QIV#7	.0%	9.1%	.0%	.0%	19.0%	16.1%	13.0%	6.7%	11.4%
		% of Total	.0%	1.2%	.0%	.0%	2.4%	5.4%	1.8%	.6%	11.4%
	Almost Always (80-100%)	Count	0	2	0	0	9	19	3	2	35
		% within QV#1	.0%	5.7%	.0%	.0%	25.7%	54.3%	8.6%	5.7%	100.0%
		% within QIV#7	.0%	9.1%	.0%	.0%	42.9%	33.9%	13.0%	13.3%	21.1%
		% of Total	.0%	1.2%	.0%	.0%	5.4%	11.4%	1.8%	1.2%	21.1%
Total		Count	1	22	16	12	21	56	23	15	166
		% within QV#1	.6%	13.3%	9.6%	7.2%	12.7%	33.7%	13.9%	9.0%	100.0%
		% within QIV#7	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	.6%	13.3%	9.6%	7.2%	12.7%	33.7%	13.9%	9.0%	100.0%

Table 15-10 Risk ID Sessions – Risk Audits (Chi-Square)

QV#2 * QIV#7 Crosstabulation

			X15: During which of the following project phases do your projects have risk identification sessions?								
			Never	Initiating	Planning	Executing & Controlling	All Project Phases	Initiating, Planning, Executing & Controlling	Initiating, Planning	Planning, Executing & Controlling	Total
X23: Do your projects experience risk audits?	Rarely (0-19%)	Count	1	16	14	9	7	28	12	12	99
		% within QV#2	1.0%	16.2%	14.1%	9.1%	7.1%	28.3%	12.1%	12.1%	100.0%
		% within QIV#7	100.0%	72.7%	87.5%	81.8%	33.3%	50.9%	52.2%	80.0%	60.4%
		% of Total	.6%	9.8%	8.5%	5.5%	4.3%	17.1%	7.3%	7.3%	60.4%
	Occasionally (20-39%)	Count	0	3	1	1	3	18	6	2	34
		% within QV#2	.0%	8.8%	2.9%	2.9%	8.8%	52.9%	17.6%	5.9%	100.0%
		% within QIV#7	.0%	13.6%	6.3%	9.1%	14.3%	32.7%	26.1%	13.3%	20.7%
		% of Total	.0%	1.8%	.6%	.6%	1.8%	11.0%	3.7%	1.2%	20.7%
	Frequently (40-59%)	Count	0	1	0	0	1	4	1	0	7
		% within QV#2	.0%	14.3%	.0%	.0%	14.3%	57.1%	14.3%	.0%	100.0%
		% within QIV#7	.0%	4.5%	.0%	.0%	4.8%	7.3%	4.3%	.0%	4.3%
		% of Total	.0%	.6%	.0%	.0%	.6%	2.4%	.6%	.0%	4.3%
	Usually (60-79%)	Count	0	1	0	1	5	1	1	1	10
		% within QV#2	.0%	10.0%	.0%	10.0%	50.0%	10.0%	10.0%	10.0%	100.0%
		% within QIV#7	.0%	4.5%	.0%	9.1%	23.8%	1.8%	4.3%	6.7%	6.1%
		% of Total	.0%	.6%	.0%	.6%	3.0%	.6%	.6%	.6%	6.1%
	Almost Always (80-100%)	Count	0	1	1	0	5	4	3	0	14
		% within QV#2	.0%	7.1%	7.1%	.0%	35.7%	28.6%	21.4%	.0%	100.0%
		% within QIV#7	.0%	4.5%	6.3%	.0%	23.8%	7.3%	13.0%	.0%	8.5%
		% of Total	.0%	.6%	.6%	.0%	3.0%	2.4%	1.8%	.0%	8.5%
Total		Count	1	22	16	11	21	55	23	15	164
		% within QV#2	.6%	13.4%	9.8%	6.7%	12.8%	33.5%	14.0%	9.1%	100.0%
		% within QIV#7	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	.6%	13.4%	9.8%	6.7%	12.8%	33.5%	14.0%	9.1%	100.0%

Table 15-11 Risk ID Sessions – Org. Risk Response Plans (Chi-Square)

QV#4 * QIV#7 Crosstabulation

			X15: During which of the following project phases do your projects have risk identification sessions?								
			Never	Initiating	Planning	Executing & Controlling	All Project Phases	Initiating, Planning, Executing & Controlling	Initiating, Planning	Planning, Executing & Controlling	Total
X25: Does your employing organization have a policy requiring that projects have a risk response plan?	Yes	Count	0	4	5	3	13	34	10	7	76
		% within QV#4	.0%	5.3%	6.6%	3.9%	17.1%	44.7%	13.2%	9.2%	100.0%
		% within QIV#7	.0%	19.0%	38.5%	33.3%	61.9%	64.2%	43.5%	46.7%	48.7%
		% of Total	.0%	2.6%	3.2%	1.9%	8.3%	21.8%	6.4%	4.5%	48.7%
	No	Count	1	17	8	6	7	19	11	7	76
		% within QV#4	1.3%	22.4%	10.5%	7.9%	9.2%	25.0%	14.5%	9.2%	100.0%
		% within QIV#7	100.0%	81.0%	61.5%	66.7%	33.3%	35.8%	47.8%	46.7%	48.7%
		% of Total	.6%	10.9%	5.1%	3.8%	4.5%	12.2%	7.1%	4.5%	48.7%
	Sometimes	Count	0	0	0	0	1	0	2	1	4
		% within QV#4	.0%	.0%	.0%	.0%	25.0%	.0%	50.0%	25.0%	100.0%
		% within QIV#7	.0%	.0%	.0%	.0%	4.8%	.0%	8.7%	6.7%	2.6%
		% of Total	.0%	.0%	.0%	.0%	.6%	.0%	1.3%	.6%	2.6%
Total		Count	1	21	13	9	21	53	23	15	156
		% within QV#4	.6%	13.5%	8.3%	5.8%	13.5%	34.0%	14.7%	9.6%	100.0%
		% within QIV#7	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	.6%	13.5%	8.3%	5.8%	13.5%	34.0%	14.7%	9.6%	100.0%

Table 15-12 Risk Technique for Contingency Costs – Risk Reviews (Chi-Square)

QV#1 * QIV#9 Crosstabulation

			X17: Do you use a risk analysis technique to develop a contingency fund for project costs?			
			Yes	No	Sometimes	Total
X22: Do your projects conduct risk reviews?	Rarely (0-19%)	Count	11	35	0	46
		% within QV#1	23.9%	76.1%	.0%	100.0%
		% within QIV#9	14.3%	39.8%	.0%	26.9%
		% of Total	6.4%	20.5%	.0%	26.9%
	Occasionally (20-39%)	Count	24	19	3	46
		% within QV#1	52.2%	41.3%	6.5%	100.0%
		% within QIV#9	31.2%	21.6%	50.0%	26.9%
		% of Total	14.0%	11.1%	1.8%	26.9%
	Frequently (40-59%)	Count	11	11	2	24
		% within QV#1	45.8%	45.8%	8.3%	100.0%
		% within QIV#9	14.3%	12.5%	33.3%	14.0%
		% of Total	6.4%	6.4%	1.2%	14.0%
	Usually (60-79%)	Count	11	9	0	20
		% within QV#1	55.0%	45.0%	.0%	100.0%
		% within QIV#9	14.3%	10.2%	.0%	11.7%
		% of Total	6.4%	5.3%	.0%	11.7%
	Almost Always (80-100%)	Count	20	14	1	35
		% within QV#1	57.1%	40.0%	2.9%	100.0%
		% within QIV#9	26.0%	15.9%	16.7%	20.5%
		% of Total	11.7%	8.2%	.6%	20.5%
Total		Count	77	88	6	171
		% within QV#1	45.0%	51.5%	3.5%	100.0%
		% within QIV#9	100.0%	100.0%	100.0%	100.0%
		% of Total	45.0%	51.5%	3.5%	100.0%

Table 15-13 Risk Technique for Contingency Costs – Org. Risk Response Plans (Chi-Square)

QV#4 * QIV#9 Crosstabulation

			X17: Do you use a risk analysis technique to develop a contingency fund for project costs?			
			Yes	No	Sometimes	Total
X25: Does your employing organization have a policy requiring that projects have a risk response plan?	Yes	Count	44	30	4	78
		% within QV#4	56.4%	38.5%	5.1%	100.0%
		% within QIV#9	57.9%	38.0%	66.7%	48.4%
		% of Total	27.3%	18.6%	2.5%	48.4%
	No	Count	30	49	0	79
		% within QV#4	38.0%	62.0%	.0%	100.0%
		% within QIV#9	39.5%	62.0%	.0%	49.1%
		% of Total	18.6%	30.4%	.0%	49.1%
	Sometimes	Count	2	0	2	4
		% within QV#4	50.0%	.0%	50.0%	100.0%
		% within QIV#9	2.6%	.0%	33.3%	2.5%
		% of Total	1.2%	.0%	1.2%	2.5%
Total		Count	76	79	6	161
		% within QV#4	47.2%	49.1%	3.7%	100.0%
		% within QIV#9	100.0%	100.0%	100.0%	100.0%
		% of Total	47.2%	49.1%	3.7%	100.0%

Table 15-14 Risk Technique for Contingency Time – Risk Reviews (Chi-Square)

QV#1 * QIV#11 Crosstabulation

			X19: Do you use a risk analysis technique to develop a contingency fund for project schedule durations?			
			Yes	No	Sometimes	Total
X22: Do your projects conduct risk reviews?	Rarely (0-19%)	Count	7	39	0	46
		% within QV#1	15.2%	84.8%	.0%	100.0%
		% within QIV#11	10.9%	39.0%	.0%	27.1%
		% of Total	4.1%	22.9%	.0%	27.1%
	Occasionally (20-39%)	Count	20	24	2	46
		% within QV#1	43.5%	52.2%	4.3%	100.0%
		% within QIV#11	31.3%	24.0%	33.3%	27.1%
		% of Total	11.8%	14.1%	1.2%	27.1%
	Frequently (40-59%)	Count	8	14	2	24
		% within QV#1	33.3%	58.3%	8.3%	100.0%
		% within QIV#11	12.5%	14.0%	33.3%	14.1%
		% of Total	4.7%	8.2%	1.2%	14.1%
	Usually (60-79%)	Count	11	8	0	19
		% within QV#1	57.9%	42.1%	.0%	100.0%
		% within QIV#11	17.2%	8.0%	.0%	11.2%
		% of Total	6.5%	4.7%	.0%	11.2%
	Almost Always (80-100%)	Count	18	15	2	35
		% within QV#1	51.4%	42.9%	5.7%	100.0%
		% within QIV#11	28.1%	15.0%	33.3%	20.6%
		% of Total	10.6%	8.8%	1.2%	20.6%
Total		Count	64	100	6	170
		% within QV#1	37.6%	58.8%	3.5%	100.0%
		% within QIV#11	100.0%	100.0%	100.0%	100.0%
		% of Total	37.6%	58.8%	3.5%	100.0%

Table 15-15 Risk Technique for Contingency Time – Risk Audits (Chi-Square)

QV#2 * QIV#11 Crosstabulation

			X19: Do you use a risk analysis technique to develop a contingency fund for project schedule durations?			
			Yes	No	Sometimes	Total
X23: Do your projects experience risk audits?	Rarely (0-19%)	Count	28	74	3	105
		% within QV#2	26.7%	70.5%	2.9%	100.0%
		% within QIV#11	44.4%	74.0%	50.0%	62.1%
		% of Total	16.6%	43.8%	1.8%	62.1%
	Occasionally (20-39%)	Count	17	14	2	33
		% within QV#2	51.5%	42.4%	6.1%	100.0%
		% within QIV#11	27.0%	14.0%	33.3%	19.5%
		% of Total	10.1%	8.3%	1.2%	19.5%
	Frequently (40-59%)	Count	3	4	0	7
		% within QV#2	42.9%	57.1%	.0%	100.0%
		% within QIV#11	4.8%	4.0%	.0%	4.1%
		% of Total	1.8%	2.4%	.0%	4.1%
	Usually (60-79%)	Count	7	3	0	10
		% within QV#2	70.0%	30.0%	.0%	100.0%
		% within QIV#11	11.1%	3.0%	.0%	5.9%
		% of Total	4.1%	1.8%	.0%	5.9%
	Almost Always (80-100%)	Count	8	5	1	14
		% within QV#2	57.1%	35.7%	7.1%	100.0%
		% within QIV#11	12.7%	5.0%	16.7%	8.3%
		% of Total	4.7%	3.0%	.6%	8.3%
Total		Count	63	100	6	169
		% within QV#2	37.3%	59.2%	3.6%	100.0%
		% within QIV#11	100.0%	100.0%	100.0%	100.0%
		% of Total	37.3%	59.2%	3.6%	100.0%

Table 15-16 Risk Technique for Contingency Time – Org. Risk Response Plans (Chi-Square)

QV#4 * QIV#11 Crosstabulation

			X19: Do you use a risk analysis technique to develop a contingency fund for project schedule durations?			
			Yes	No	Sometimes	Total
X25: Does your employing organization have a policy requiring that projects have a risk response plan?	Yes	Count	37	37	3	77
		% within QV#4	48.1%	48.1%	3.9%	100.0%
		% within QIV#11	58.7%	40.7%	50.0%	48.1%
		% of Total	23.1%	23.1%	1.9%	48.1%
	No	Count	24	54	1	79
		% within QV#4	30.4%	68.4%	1.3%	100.0%
		% within QIV#11	38.1%	59.3%	16.7%	49.4%
		% of Total	15.0%	33.8%	.6%	49.4%
	Sometimes	Count	2	0	2	4
		% within QV#4	50.0%	.0%	50.0%	100.0%
		% within QIV#11	3.2%	.0%	33.3%	2.5%
		% of Total	1.3%	.0%	1.3%	2.5%
Total		Count	63	91	6	160
		% within QV#4	39.4%	56.9%	3.8%	100.0%
		% within QIV#11	100.0%	100.0%	100.0%	100.0%
		% of Total	39.4%	56.9%	3.8%	100.0%

Supporting Hypothesis 2.2
Table 5-4
Table 15-17 Quantitative Technique – Major Workarounds (Chi-Square)

QV#3 * QIV#2 Crosstabulation

			X10: Do your projects use any structured quantitative technique (e.g. Monte Carlo simulation, decision trees) when evaluating the merits and demerits of prospective projects?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
X24: Do your projects experience major workarounds (e.g. >10% cost overrun from the activity's planned budget) in project operations?	Rarely (0-19%)	Count	22	8	6	1	1	38
		% within QV#3	57.9%	21.1%	15.8%	2.6%	2.6%	100.0%
		% within QIV#2	22.7%	21.1%	35.3%	12.5%	9.1%	22.2%
		% of Total	12.9%	4.7%	3.5%	.6%	.6%	22.2%
	Occasionally (20-39%)	Count	33	17	3	7	5	65
		% within QV#3	50.8%	26.2%	4.6%	10.8%	7.7%	100.0%
		% within QIV#2	34.0%	44.7%	17.6%	87.5%	45.5%	38.0%
		% of Total	19.3%	9.9%	1.8%	4.1%	2.9%	38.0%
	Frequently (40-59%)	Count	26	12	3	0	1	42
		% within QV#3	61.9%	28.6%	7.1%	.0%	2.4%	100.0%
		% within QIV#2	26.8%	31.6%	17.6%	.0%	9.1%	24.6%
		% of Total	15.2%	7.0%	1.8%	.0%	.6%	24.6%
	Usually (60-79%)	Count	8	1	2	0	3	14
		% within QV#3	57.1%	7.1%	14.3%	.0%	21.4%	100.0%
		% within QIV#2	8.2%	2.6%	11.8%	.0%	27.3%	8.2%
		% of Total	4.7%	.6%	1.2%	.0%	1.8%	8.2%
	Almost Always (80-100%)	Count	8	0	3	0	1	12
		% within QV#3	66.7%	.0%	25.0%	.0%	8.3%	100.0%
		% within QIV#2	8.2%	.0%	17.6%	.0%	9.1%	7.0%
		% of Total	4.7%	.0%	1.8%	.0%	.6%	7.0%
Total		Count	97	38	17	8	11	171
		% within QV#3	56.7%	22.2%	9.9%	4.7%	6.4%	100.0%
		% within QIV#2	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	56.7%	22.2%	9.9%	4.7%	6.4%	100.0%

Table 15-18 Risk ID Sessions – Major Workarounds (Chi-Square)

QV#3 * QIV#7 Crosstabulation

			X15: During which of the following project phases do your projects have risk identification sessions?								
			Never	Initiating	Planning	Executing & Controlling	All Project Phases	Initiating, Planning, Executing & Controlling	Initiating, Planning	Planning, Executing & Controlling	Total
X24: Do your projects experience major workarounds (e.g. >10% cost overrun from the activity's planned budget) in project operations?	Rarely (0-19%)	Count	0	2	6	1	4	15	5	4	37
		% within QV#3	.0%	5.4%	16.2%	2.7%	10.8%	40.5%	13.5%	10.8%	100.0%
		% within QIV#7	.0%	9.1%	37.5%	8.3%	20.0%	26.8%	22.7%	26.7%	22.6%
		% of Total	.0%	1.2%	3.7%	.6%	2.4%	9.1%	3.0%	2.4%	22.6%
	Occasionally (20-39%)	Count	0	6	4	2	14	22	10	5	63
		% within QV#3	.0%	9.5%	6.3%	3.2%	22.2%	34.9%	15.9%	7.9%	100.0%
		% within QIV#7	.0%	27.3%	25.0%	16.7%	70.0%	39.3%	45.5%	33.3%	38.4%
		% of Total	.0%	3.7%	2.4%	1.2%	8.5%	13.4%	6.1%	3.0%	38.4%
	Frequently (40-59%)	Count	1	10	5	4	0	13	3	2	38
		% within QV#3	2.6%	26.3%	13.2%	10.5%	.0%	34.2%	7.9%	5.3%	100.0%
		% within QIV#7	100.0%	45.5%	31.3%	33.3%	.0%	23.2%	13.6%	13.3%	23.2%
		% of Total	.6%	6.1%	3.0%	2.4%	.0%	7.9%	1.8%	1.2%	23.2%
	Usually (60-79%)	Count	0	2	1	1	1	4	1	4	14
		% within QV#3	.0%	14.3%	7.1%	7.1%	7.1%	28.6%	7.1%	28.6%	100.0%
		% within QIV#7	.0%	9.1%	6.3%	8.3%	5.0%	7.1%	4.5%	26.7%	8.5%
		% of Total	.0%	1.2%	.6%	.6%	.6%	2.4%	.6%	2.4%	8.5%
	Almost Always (80-100%)	Count	0	2	0	4	1	2	3	0	12
		% within QV#3	.0%	16.7%	.0%	33.3%	8.3%	16.7%	25.0%	.0%	100.0%
		% within QIV#7	.0%	9.1%	.0%	33.3%	5.0%	3.6%	13.6%	.0%	7.3%
		% of Total	.0%	1.2%	.0%	2.4%	.6%	1.2%	1.8%	.0%	7.3%
Total		Count	1	22	16	12	20	56	22	15	164
		% within QV#3	.6%	13.4%	9.8%	7.3%	12.2%	34.1%	13.4%	9.1%	100.0%
		% within QIV#7	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	.6%	13.4%	9.8%	7.3%	12.2%	34.1%	13.4%	9.1%	100.0%

Appendix Number 16

Major Research Question 3 Contingency Tables

APPENDIX 16
Contingency Tables

Supporting Hypothesis 3.1
Table 5-5

Table 16-1 PRM Training – On-Time Delivery (Chi-Square)

QVI#3 * QIV#1 Crosstabulation

			X9: Do your project team members obtain training in risk management planning and impact analysis at some point during the project's life?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
Y3: How often are your projects completed on time?	Rarely (0-19%)	Count	8	4	0	0	0	12
		% within QVI#3	66.7%	33.3%	.0%	.0%	.0%	100.0%
		% within QIV#1	9.9%	8.5%	.0%	.0%	.0%	7.1%
		% of Total	4.7%	2.4%	.0%	.0%	.0%	7.1%
	Occasionally (20-39%)	Count	19	10	1	2	0	32
		% within QVI#3	59.4%	31.3%	3.1%	6.3%	.0%	100.0%
		% within QIV#1	23.5%	21.3%	7.7%	11.1%	.0%	18.8%
		% of Total	11.2%	5.9%	.6%	1.2%	.0%	18.8%
	Frequently (40-59%)	Count	21	11	4	2	1	39
		% within QVI#3	53.8%	28.2%	10.3%	5.1%	2.6%	100.0%
		% within QIV#1	25.9%	23.4%	30.8%	11.1%	9.1%	22.9%
		% of Total	12.4%	6.5%	2.4%	1.2%	.6%	22.9%
	Usually (60-79%)	Count	17	8	4	1	6	36
		% within QVI#3	47.2%	22.2%	11.1%	2.8%	16.7%	100.0%
		% within QIV#1	21.0%	17.0%	30.8%	5.6%	54.5%	21.2%
		% of Total	10.0%	4.7%	2.4%	.6%	3.5%	21.2%
	Almost Always (80-100%)	Count	16	14	4	13	4	51
		% within QVI#3	31.4%	27.5%	7.8%	25.5%	7.8%	100.0%
		% within QIV#1	19.8%	29.8%	30.8%	72.2%	36.4%	30.0%
		% of Total	9.4%	8.2%	2.4%	7.6%	2.4%	30.0%
Total		Count	81	47	13	18	11	170
		% within QVI#3	47.6%	27.6%	7.6%	10.6%	6.5%	100.0%
		% within QIV#1	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	47.6%	27.6%	7.6%	10.6%	6.5%	100.0%

Table 16-2 PRM Training – Org. PRM Impact (Chi-Square)

QVI#7 * QIV#1 Crosstabulation

			X9: Do your project team members obtain training in risk management planning and impact analysis at some point during the project's life?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
Y7: Do you consider the risk management policies of your organization to make a measurable difference on your project performance?	Rarely (0-19%)	Count	35	7	2	0	1	45
		% within QVI#7	77.8%	15.6%	4.4%	.0%	2.2%	100.0%
		% within QIV#1	46.1%	15.9%	16.7%	.0%	8.3%	28.0%
		% of Total	21.7%	4.3%	1.2%	.0%	.6%	28.0%
	Occasionally (20-39%)	Count	14	8	0	6	0	28
		% within QVI#7	50.0%	28.6%	.0%	21.4%	.0%	100.0%
		% within QIV#1	18.4%	18.2%	.0%	35.3%	.0%	17.4%
		% of Total	8.7%	5.0%	.0%	3.7%	.0%	17.4%
	Frequently (40-59%)	Count	5	11	5	2	1	24
		% within QVI#7	20.8%	45.8%	20.8%	8.3%	4.2%	100.0%
		% within QIV#1	6.6%	25.0%	41.7%	11.8%	8.3%	14.9%
		% of Total	3.1%	6.8%	3.1%	1.2%	.6%	14.9%
	Usually (60-79%)	Count	10	9	1	3	2	25
		% within QVI#7	40.0%	36.0%	4.0%	12.0%	8.0%	100.0%
		% within QIV#1	13.2%	20.5%	8.3%	17.6%	16.7%	15.5%
		% of Total	6.2%	5.6%	.6%	1.9%	1.2%	15.5%
	Almost Always (80-100%)	Count	12	9	4	6	8	39
		% within QVI#7	30.8%	23.1%	10.3%	15.4%	20.5%	100.0%
		% within QIV#1	15.8%	20.5%	33.3%	35.3%	66.7%	24.2%
		% of Total	7.5%	5.6%	2.5%	3.7%	5.0%	24.2%
Total		Count	76	44	12	17	12	161
		% within QVI#7	47.2%	27.3%	7.5%	10.6%	7.5%	100.0%
		% within QIV#1	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	47.2%	27.3%	7.5%	10.6%	7.5%	100.0%

Table 16-3 Quantitative Technique – Org. PRM Impact (Chi-Square)

QVI#7 * QIV#2 Crosstabulation

			X10: Do your projects use any structured quantitative technique (e.g. Monte Carlo simulation, decision trees) when evaluating the merits and demerits of prospective projects?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
Y7: Do you consider the risk management policies of your organization to make a measurable difference on your project performance?	Rarely (0-19%)	Count	34	6	2	1	1	44
		% within QVI#7	77.3%	13.6%	4.5%	2.3%	2.3%	100.0%
		% within QIV#2	38.2%	16.7%	11.8%	12.5%	9.1%	27.3%
		% of Total	21.1%	3.7%	1.2%	.6%	.6%	27.3%
	Occasionally (20-39%)	Count	14	8	3	1	2	28
		% within QVI#7	50.0%	28.6%	10.7%	3.6%	7.1%	100.0%
		% within QIV#2	15.7%	22.2%	17.6%	12.5%	18.2%	17.4%
		% of Total	8.7%	5.0%	1.9%	.6%	1.2%	17.4%
	Frequently (40-59%)	Count	11	7	6	0	0	24
		% within QVI#7	45.8%	29.2%	25.0%	.0%	.0%	100.0%
		% within QIV#2	12.4%	19.4%	35.3%	.0%	.0%	14.9%
		% of Total	6.8%	4.3%	3.7%	.0%	.0%	14.9%
	Usually (60-79%)	Count	14	5	2	3	2	26
		% within QVI#7	53.8%	19.2%	7.7%	11.5%	7.7%	100.0%
		% within QIV#2	15.7%	13.9%	11.8%	37.5%	18.2%	16.1%
		% of Total	8.7%	3.1%	1.2%	1.9%	1.2%	16.1%
	Almost Always (80-100%)	Count	16	10	4	3	6	39
		% within QVI#7	41.0%	25.6%	10.3%	7.7%	15.4%	100.0%
		% within QIV#2	18.0%	27.8%	23.5%	37.5%	54.5%	24.2%
		% of Total	9.9%	6.2%	2.5%	1.9%	3.7%	24.2%
Total		Count	89	36	17	8	11	161
		% within QVI#7	55.3%	22.4%	10.6%	5.0%	6.8%	100.0%
		% within QIV#2	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	55.3%	22.4%	10.6%	5.0%	6.8%	100.0%

Table 16-4 Qualitative Risk Analysis – Org. PRM Impact (Chi-Square)

QVI#7 * QIV#3 Crosstabulation

			X11: Do your projects use qualitative risk analysis (e.g. probability and impact matrix) when evaluating the merits and demerits of prospective projects?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
Y7: Do you consider the risk management policies of your organization to make a measurable difference on your project performance?	Rarely (0-19%)	Count	21	9	8	3	4	45
		% within QVI#7	46.7%	20.0%	17.8%	6.7%	8.9%	100.0%
		% within QIV#3	58.3%	26.5%	27.6%	15.0%	9.3%	27.8%
		% of Total	13.0%	5.6%	4.9%	1.9%	2.5%	27.8%
	Occasionally (20-39%)	Count	3	9	8	4	4	28
		% within QVI#7	10.7%	32.1%	28.6%	14.3%	14.3%	100.0%
		% within QIV#3	8.3%	26.5%	27.6%	20.0%	9.3%	17.3%
		% of Total	1.9%	5.6%	4.9%	2.5%	2.5%	17.3%
	Frequently (40-59%)	Count	4	3	7	4	6	24
		% within QVI#7	16.7%	12.5%	29.2%	16.7%	25.0%	100.0%
		% within QIV#3	11.1%	8.8%	24.1%	20.0%	14.0%	14.8%
		% of Total	2.5%	1.9%	4.3%	2.5%	3.7%	14.8%
	Usually (60-79%)	Count	3	7	2	2	12	26
		% within QVI#7	11.5%	26.9%	7.7%	7.7%	46.2%	100.0%
		% within QIV#3	8.3%	20.6%	6.9%	10.0%	27.9%	16.0%
		% of Total	1.9%	4.3%	1.2%	1.2%	7.4%	16.0%
	Almost Always (80-100%)	Count	5	6	4	7	17	39
		% within QVI#7	12.8%	15.4%	10.3%	17.9%	43.6%	100.0%
		% within QIV#3	13.9%	17.6%	13.8%	35.0%	39.5%	24.1%
		% of Total	3.1%	3.7%	2.5%	4.3%	10.5%	24.1%
Total		Count	36	34	29	20	43	162
		% within QVI#7	22.2%	21.0%	17.9%	12.3%	26.5%	100.0%
		% within QIV#3	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	22.2%	21.0%	17.9%	12.3%	26.5%	100.0%

Table 16-5 Contingency Planning during PLC – Descoped SOW (Chi-Square)

QVI#5 * QIV#4 Crosstabulation

			X12: During which of the following project phases do your projects prepare contingency plans or strategies for responding to specific risk events?												
			None	Initiating	Planning	Executing & Controlling	Closing	All Project Phases	Initiating, Planning, Executing & Controlling	Planning, Executing & Controlling, Closing	Initiating, Planning,	Initiating, Executing & Controlling	Planning, Executing & Controlling	Executing & Controlling, Closing	Total
Y5: How often are your projects descoped from their original Statement of Work (SOW) specifications?	Rarely (0-19%)	Count	0	2	9	4	0	8	16	1	2	0	23	0	65
		% within QVI#5	.0%	3.1%	13.8%	6.2%	.0%	12.3%	24.6%	1.5%	3.1%	.0%	35.4%	.0%	100.0%
		% within QIV#4	.0%	15.4%	45.0%	28.6%	.0%	36.4%	48.5%	50.0%	13.3%	.0%	54.8%	.0%	39.2%
		% of Total	.0%	1.2%	5.4%	2.4%	.0%	4.8%	9.6%	.6%	1.2%	.0%	13.9%	.0%	39.2%
	Occasionally (20-39%)	Count	0	9	6	5	0	7	12	1	6	0	6	1	53
		% within QVI#5	.0%	17.0%	11.3%	9.4%	.0%	13.2%	22.6%	1.9%	11.3%	.0%	11.3%	1.9%	100.0%
		% within QIV#4	.0%	69.2%	30.0%	35.7%	.0%	31.8%	36.4%	50.0%	40.0%	.0%	14.3%	100.0%	31.9%
		% of Total	.0%	5.4%	3.6%	3.0%	.0%	4.2%	7.2%	.6%	3.6%	.0%	3.6%	.6%	31.9%
	Frequently (40-59%)	Count	0	0	1	4	0	4	3	0	6	0	4	0	22
		% within QVI#5	.0%	.0%	4.5%	18.2%	.0%	18.2%	13.6%	.0%	27.3%	.0%	18.2%	.0%	100.0%
		% within QIV#4	.0%	.0%	5.0%	28.6%	.0%	18.2%	9.1%	.0%	40.0%	.0%	9.5%	.0%	13.3%
		% of Total	.0%	.0%	.6%	2.4%	.0%	2.4%	1.8%	.0%	3.6%	.0%	2.4%	.0%	13.3%
	Usually (60-79%)	Count	1	1	3	1	0	2	1	0	1	1	8	0	19
		% within QVI#5	5.3%	5.3%	15.8%	5.3%	.0%	10.5%	5.3%	.0%	5.3%	5.3%	42.1%	.0%	100.0%
		% within QIV#4	100.0%	7.7%	15.0%	7.1%	.0%	9.1%	3.0%	.0%	6.7%	50.0%	19.0%	.0%	11.4%
		% of Total	.6%	.6%	1.8%	.6%	.0%	1.2%	.6%	.0%	.6%	.6%	4.8%	.0%	11.4%
	Almost Always (80-100%)	Count	0	1	1	0	1	1	1	0	0	1	1	0	7
		% within QVI#5	.0%	14.3%	14.3%	.0%	14.3%	14.3%	14.3%	.0%	.0%	14.3%	14.3%	.0%	100.0%
		% within QIV#4	.0%	7.7%	5.0%	.0%	100.0%	4.5%	3.0%	.0%	.0%	50.0%	2.4%	.0%	4.2%
		% of Total	.0%	.6%	.6%	.0%	.6%	.6%	.6%	.0%	.0%	.6%	.6%	.0%	4.2%
Total		Count	1	13	20	14	1	22	33	2	15	2	42	1	166
		% within QVI#5	.6%	7.8%	12.0%	8.4%	.6%	13.3%	19.9%	1.2%	9.0%	1.2%	25.3%	.6%	100.0%
		% within QIV#4	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	.6%	7.8%	12.0%	8.4%	.6%	13.3%	19.9%	1.2%	9.0%	1.2%	25.3%	.6%	100.0%

Table 16-6 Contingency Planning during PLC – Org. PRM Impact (Chi-Square)

QVI#7 * QIV#4 Crosstabulation

			X12: During which of the following project phases do your projects prepare contingency plans or strategies for responding to specific risk events?											
			None	Initiating	Planning	Executing & Controlling	Closing	All Project Phases	Initiating, Planning, Executing & Controlling	Planning, Executing & Controlling, Closing	Initiating, Planning	Initiating, Executing & Controlling	Planning, Executing & Controlling	Total
Y7: Do you consider the risk management policies of your organization to make a measurable difference on your project performance?	Rarely (0-19%)	Count	1	9	7	4	0	1	7	0	4	0	9	42
		% within QVI#7	2.4%	21.4%	16.7%	9.5%	.0%	2.4%	16.7%	.0%	9.5%	.0%	21.4%	100.0%
		% within QIV#4	100.0%	75.0%	33.3%	33.3%	.0%	4.8%	20.6%	.0%	28.6%	.0%	22.5%	26.4%
		% of Total	.6%	5.7%	4.4%	2.5%	.0%	.6%	4.4%	.0%	2.5%	.0%	5.7%	26.4%
	Occasionally (20-39%)	Count	0	1	1	1	0	3	6	1	5	0	10	28
		% within QVI#7	.0%	3.6%	3.6%	3.6%	.0%	10.7%	21.4%	3.6%	17.9%	.0%	35.7%	100.0%
		% within QIV#4	.0%	8.3%	4.8%	8.3%	.0%	14.3%	17.6%	50.0%	35.7%	.0%	25.0%	17.6%
		% of Total	.0%	.6%	.6%	.6%	.0%	1.9%	3.8%	.6%	3.1%	.0%	6.3%	17.6%
	Frequently (40-59%)	Count	0	0	3	0	0	2	9	0	3	1	6	24
		% within QVI#7	.0%	.0%	12.5%	.0%	.0%	8.3%	37.5%	.0%	12.5%	4.2%	25.0%	100.0%
		% within QIV#4	.0%	.0%	14.3%	.0%	.0%	9.5%	26.5%	.0%	21.4%	100.0%	15.0%	15.1%
		% of Total	.0%	.0%	1.9%	.0%	.0%	1.3%	5.7%	.0%	1.9%	.6%	3.8%	15.1%
	Usually (60-79%)	Count	0	1	5	2	0	6	3	1	1	0	7	26
		% within QVI#7	.0%	3.8%	19.2%	7.7%	.0%	23.1%	11.5%	3.8%	3.8%	.0%	26.9%	100.0%
		% within QIV#4	.0%	8.3%	23.8%	16.7%	.0%	28.6%	8.8%	50.0%	7.1%	.0%	17.5%	16.4%
		% of Total	.0%	.6%	3.1%	1.3%	.0%	3.8%	1.9%	.6%	.6%	.0%	4.4%	16.4%
	Almost Always (80-100%)	Count	0	1	5	5	1	9	9	0	1	0	8	39
		% within QVI#7	.0%	2.6%	12.8%	12.8%	2.6%	23.1%	23.1%	.0%	2.6%	.0%	20.5%	100.0%
		% within QIV#4	.0%	8.3%	23.8%	41.7%	100.0%	42.9%	26.5%	.0%	7.1%	.0%	20.0%	24.5%
		% of Total	.0%	.6%	3.1%	3.1%	.6%	5.7%	5.7%	.0%	.6%	.0%	5.0%	24.5%
Total		Count	1	12	21	12	1	21	34	2	14	1	40	159
		% within QVI#7	.6%	7.5%	13.2%	7.5%	.6%	13.2%	21.4%	1.3%	8.8%	.6%	25.2%	100.0%
		% within QIV#4	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	.6%	7.5%	13.2%	7.5%	.6%	13.2%	21.4%	1.3%	8.8%	.6%	25.2%	100.0%

Table 16-7 Risk ID Sessions – Customer Satisfaction (Chi-Square)

QVI#1 * QIV#7 Crosstabulation

			X15: During which of the following project phases do your projects have risk identification sessions?								
			Never	Initiating	Planning	Executing & Controlling	All Project Phases	Initiating, Planning, Executing & Controlling	Initiating, Planning	Planning, Executing & Controlling	Total
Y1: How often are your projects completed to the satisfaction of your customers?	Rarely (0-19%)	Count	0	1	0	0	1	0	1	0	3
		% within QVI#1	.0%	33.3%	.0%	.0%	33.3%	.0%	33.3%	.0%	100.0%
		% within QIV#7	.0%	4.5%	.0%	.0%	5.0%	.0%	4.3%	.0%	1.8%
		% of Total	.0%	.6%	.0%	.0%	.6%	.0%	.6%	.0%	1.8%
	Occasionally (20-39%)	Count	1	3	1	3	0	4	4	2	18
		% within QVI#1	5.6%	16.7%	5.6%	16.7%	.0%	22.2%	22.2%	11.1%	100.0%
		% within QIV#7	100.0%	13.6%	6.3%	25.0%	.0%	7.1%	17.4%	14.3%	11.0%
		% of Total	.6%	1.8%	.6%	1.8%	.0%	2.4%	2.4%	1.2%	11.0%
	Frequently (40-59%)	Count	0	3	5	3	3	7	3	3	27
		% within QVI#1	.0%	11.1%	18.5%	11.1%	11.1%	25.9%	11.1%	11.1%	100.0%
		% within QIV#7	.0%	13.6%	31.3%	25.0%	15.0%	12.5%	13.0%	21.4%	16.5%
		% of Total	.0%	1.8%	3.0%	1.8%	1.8%	4.3%	1.8%	1.8%	16.5%
	Usually (60-79%)	Count	0	11	4	1	4	14	11	5	50
		% within QVI#1	.0%	22.0%	8.0%	2.0%	8.0%	28.0%	22.0%	10.0%	100.0%
		% within QIV#7	.0%	50.0%	25.0%	8.3%	20.0%	25.0%	47.8%	35.7%	30.5%
		% of Total	.0%	6.7%	2.4%	.6%	2.4%	8.5%	6.7%	3.0%	30.5%
	Almost Always (80-100%)	Count	0	4	6	5	12	31	4	4	66
		% within QVI#1	.0%	6.1%	9.1%	7.6%	18.2%	47.0%	6.1%	6.1%	100.0%
		% within QIV#7	.0%	18.2%	37.5%	41.7%	60.0%	55.4%	17.4%	28.6%	40.2%
		% of Total	.0%	2.4%	3.7%	3.0%	7.3%	18.9%	2.4%	2.4%	40.2%
Total		Count	1	22	16	12	20	56	23	14	164
		% within QVI#1	.6%	13.4%	9.8%	7.3%	12.2%	34.1%	14.0%	8.5%	100.0%
		% within QIV#7	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	.6%	13.4%	9.8%	7.3%	12.2%	34.1%	14.0%	8.5%	100.0%

Table 16-8 Risk ID Sessions – On-time Delivery (Chi-Square)

QVI#3 * QIV#7 Crosstabulation

			X15: During which of the following project phases do your projects have risk identification sessions?								
			Never	Initiating	Planning	Executing & Controlling	All Project Phases	Initiating, Planning, Executing & Controlling	Initiating, Planning	Planning, Executing & Controlling	Total
Y3: How often are your projects completed on time?	Rarely (0-19%)	Count	0	1	0	3	0	3	4	0	11
		% within QVI#3	.0%	9.1%	.0%	27.3%	.0%	27.3%	36.4%	.0%	100.0%
		% within QIV#7	.0%	4.5%	.0%	25.0%	.0%	5.4%	17.4%	.0%	6.7%
		% of Total	.0%	.6%	.0%	1.8%	.0%	1.8%	2.4%	.0%	6.7%
	Occasionally (20-39%)	Count	1	4	3	4	2	9	2	4	29
		% within QVI#3	3.4%	13.8%	10.3%	13.8%	6.9%	31.0%	6.9%	13.8%	100.0%
		% within QIV#7	100.0%	18.2%	18.8%	33.3%	10.0%	16.1%	8.7%	28.6%	17.7%
		% of Total	.6%	2.4%	1.8%	2.4%	1.2%	5.5%	1.2%	2.4%	17.7%
	Frequently (40-59%)	Count	0	9	7	1	6	9	3	3	38
		% within QVI#3	.0%	23.7%	18.4%	2.6%	15.8%	23.7%	7.9%	7.9%	100.0%
		% within QIV#7	.0%	40.9%	43.8%	8.3%	30.0%	16.1%	13.0%	21.4%	23.2%
		% of Total	.0%	5.5%	4.3%	.6%	3.7%	5.5%	1.8%	1.8%	23.2%
	Usually (60-79%)	Count	0	4	3	2	2	15	9	0	35
		% within QVI#3	.0%	11.4%	8.6%	5.7%	5.7%	42.9%	25.7%	.0%	100.0%
		% within QIV#7	.0%	18.2%	18.8%	16.7%	10.0%	26.8%	39.1%	.0%	21.3%
		% of Total	.0%	2.4%	1.8%	1.2%	1.2%	9.1%	5.5%	.0%	21.3%
	Almost Always (80-100%)	Count	0	4	3	2	10	20	5	7	51
		% within QVI#3	.0%	7.8%	5.9%	3.9%	19.6%	39.2%	9.8%	13.7%	100.0%
		% within QIV#7	.0%	18.2%	18.8%	16.7%	50.0%	35.7%	21.7%	50.0%	31.1%
		% of Total	.0%	2.4%	1.8%	1.2%	6.1%	12.2%	3.0%	4.3%	31.1%
Total		Count	1	22	16	12	20	56	23	14	164
		% within QVI#3	.6%	13.4%	9.8%	7.3%	12.2%	34.1%	14.0%	8.5%	100.0%
		% within QIV#7	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	.6%	13.4%	9.8%	7.3%	12.2%	34.1%	14.0%	8.5%	100.0%

Table 16-9 Risk ID Sessions – Descoped SOW (Chi-Square)

QVI#5 * QIV#7 Crosstabulation

			X15: During which of the following project phases do your projects have risk identification sessions?								
			Never	Initiating	Planning	Executing & Controlling	All Project Phases	Initiating, Planning, Executing & Controlling	Initiating, Planning	Planning, Executing & Controlling	Total
Y5: How often are your projects descoped from their original Statement of Work (SOW) specifications?	Rarely (0-19%)	Count	0	4	9	3	8	27	8	4	63
		% within QVI#5	.0%	6.3%	14.3%	4.8%	12.7%	42.9%	12.7%	6.3%	100.0%
		% within QIV#7	.0%	18.2%	56.3%	27.3%	38.1%	48.2%	40.0%	28.6%	39.1%
		% of Total	.0%	2.5%	5.6%	1.9%	5.0%	16.8%	5.0%	2.5%	39.1%
	Occasionally (20-39%)	Count	0	7	3	2	9	14	9	6	50
		% within QVI#5	.0%	14.0%	6.0%	4.0%	18.0%	28.0%	18.0%	12.0%	100.0%
		% within QIV#7	.0%	31.8%	18.8%	18.2%	42.9%	25.0%	45.0%	42.9%	31.1%
		% of Total	.0%	4.3%	1.9%	1.2%	5.6%	8.7%	5.6%	3.7%	31.1%
	Frequently (40-59%)	Count	0	7	0	2	1	10	1	1	22
		% within QVI#5	.0%	31.8%	.0%	9.1%	4.5%	45.5%	4.5%	4.5%	100.0%
		% within QIV#7	.0%	31.8%	.0%	18.2%	4.8%	17.9%	5.0%	7.1%	13.7%
		% of Total	.0%	4.3%	.0%	1.2%	.6%	6.2%	.6%	.6%	13.7%
	Usually (60-79%)	Count	1	3	3	2	2	4	0	3	18
		% within QVI#5	5.6%	16.7%	16.7%	11.1%	11.1%	22.2%	.0%	16.7%	100.0%
		% within QIV#7	100.0%	13.6%	18.8%	18.2%	9.5%	7.1%	.0%	21.4%	11.2%
		% of Total	.6%	1.9%	1.9%	1.2%	1.2%	2.5%	.0%	1.9%	11.2%
	Almost Always (80-100%)	Count	0	1	1	2	1	1	2	0	8
		% within QVI#5	.0%	12.5%	12.5%	25.0%	12.5%	12.5%	25.0%	.0%	100.0%
		% within QIV#7	.0%	4.5%	6.3%	18.2%	4.8%	1.8%	10.0%	.0%	5.0%
		% of Total	.0%	.6%	.6%	1.2%	.6%	.6%	1.2%	.0%	5.0%
Total		Count	1	22	16	11	21	56	20	14	161
		% within QVI#5	.6%	13.7%	9.9%	6.8%	13.0%	34.8%	12.4%	8.7%	100.0%
		% within QIV#7	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	.6%	13.7%	9.9%	6.8%	13.0%	34.8%	12.4%	8.7%	100.0%

Table 16-10 Risk ID Sessions – Org. PRM Impact (Chi-Square)

QVI#7 * QIV#7 Crosstabulation

			X15: During which of the following project phases do your projects have risk identification sessions?								
			Never	Initiating	Planning	Executing & Controlling	All Project Phases	Initiating, Planning, Executing & Controlling	Initiating, Planning	Planning, Executing & Controlling	Total
Y7: Do you consider the risk management policies of your organization to make a measurable difference on your project performance?	Rarely (0-19%)	Count	1	10	8	3	3	9	3	3	40
		% within QVI#7	2.5%	25.0%	20.0%	7.5%	7.5%	22.5%	7.5%	7.5%	100.0%
		% within QIV#7	100.0%	47.6%	50.0%	30.0%	15.0%	17.3%	14.3%	21.4%	25.8%
		% of Total	.6%	6.5%	5.2%	1.9%	1.9%	5.8%	1.9%	1.9%	25.8%
	Occasionally (20-39%)	Count	0	5	5	3	0	8	6	0	27
		% within QVI#7	.0%	18.5%	18.5%	11.1%	.0%	29.6%	22.2%	.0%	100.0%
		% within QIV#7	.0%	23.8%	31.3%	30.0%	.0%	15.4%	28.6%	.0%	17.4%
		% of Total	.0%	3.2%	3.2%	1.9%	.0%	5.2%	3.9%	.0%	17.4%
	Frequently (40-59%)	Count	0	2	1	0	3	8	4	6	24
		% within QVI#7	.0%	8.3%	4.2%	.0%	12.5%	33.3%	16.7%	25.0%	100.0%
		% within QIV#7	.0%	9.5%	6.3%	.0%	15.0%	15.4%	19.0%	42.9%	15.5%
		% of Total	.0%	1.3%	.6%	.0%	1.9%	5.2%	2.6%	3.9%	15.5%
	Usually (60-79%)	Count	0	4	2	1	4	11	2	1	25
		% within QVI#7	.0%	16.0%	8.0%	4.0%	16.0%	44.0%	8.0%	4.0%	100.0%
		% within QIV#7	.0%	19.0%	12.5%	10.0%	20.0%	21.2%	9.5%	7.1%	16.1%
		% of Total	.0%	2.6%	1.3%	.6%	2.6%	7.1%	1.3%	.6%	16.1%
	Almost Always (80-100%)	Count	0	0	0	3	10	16	6	4	39
		% within QVI#7	.0%	.0%	.0%	7.7%	25.6%	41.0%	15.4%	10.3%	100.0%
		% within QIV#7	.0%	.0%	.0%	30.0%	50.0%	30.8%	28.6%	28.6%	25.2%
		% of Total	.0%	.0%	.0%	1.9%	6.5%	10.3%	3.9%	2.6%	25.2%
Total		Count	1	21	16	10	20	52	21	14	155
		% within QVI#7	.6%	13.5%	10.3%	6.5%	12.9%	33.5%	13.5%	9.0%	100.0%
		% within QIV#7	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	.6%	13.5%	10.3%	6.5%	12.9%	33.5%	13.5%	9.0%	100.0%

Table 16-11 Risk Technique for Contingency Costs – Org. PRM Impact (Chi-Square)

QVI#7 * QIV#9 Crosstabulation

			X17: Do you use a risk analysis technique to develop a contingency fund for project costs? Yes	No	Sometimes	Total
Y7: Do you consider the risk management policies of your organization to make a measurable difference on your project performance?	Rarely (0-19%)	Count	14	30	0	44
		% within QVI#7	31.8%	68.2%	.0%	100.0%
		% within QIV#9	18.7%	38.0%	.0%	27.5%
		% of Total	8.8%	18.8%	.0%	27.5%
	Occasionally (20-39%)	Count	12	12	3	27
		% within QVI#7	44.4%	44.4%	11.1%	100.0%
		% within QIV#9	16.0%	15.2%	50.0%	16.9%
		% of Total	7.5%	7.5%	1.9%	16.9%
	Frequently (40-59%)	Count	15	7	2	24
		% within QVI#7	62.5%	29.2%	8.3%	100.0%
		% within QIV#9	20.0%	8.9%	33.3%	15.0%
		% of Total	9.4%	4.4%	1.3%	15.0%
	Usually (60-79%)	Count	10	15	1	26
		% within QVI#7	38.5%	57.7%	3.8%	100.0%
		% within QIV#9	13.3%	19.0%	16.7%	16.3%
		% of Total	6.3%	9.4%	.6%	16.3%
	Almost Always (80-100%)	Count	24	15	0	39
		% within QVI#7	61.5%	38.5%	.0%	100.0%
		% within QIV#9	32.0%	19.0%	.0%	24.4%
		% of Total	15.0%	9.4%	.0%	24.4%
Total		Count	75	79	6	160
		% within QVI#7	46.9%	49.4%	3.8%	100.0%
		% within QIV#9	100.0%	100.0%	100.0%	100.0%
		% of Total	46.9%	49.4%	3.8%	100.0%

Table 16-12 Risk Technique for Contingency Time – Org. PRM Impact (Chi-Square)

QVI#7 * QIV#11 Crosstabulation

			X19: Do you use a risk analysis technique to develop a contingency fund for project schedule durations?			
			Yes	No	Sometimes	Total
Y7: Do you consider the risk management policies of your organization to make a measurable difference on your project performance?	Rarely (0-19%)	Count	10	34	0	44
		% within QVI#7	22.7%	77.3%	.0%	100.0%
		% within QIV#11	16.1%	37.4%	.0%	27.7%
		% of Total	6.3%	21.4%	.0%	27.7%
	Occasionally (20-39%)	Count	8	16	3	27
		% within QVI#7	29.6%	59.3%	11.1%	100.0%
		% within QIV#11	12.9%	17.6%	50.0%	17.0%
		% of Total	5.0%	10.1%	1.9%	17.0%
	Frequently (40-59%)	Count	11	12	1	24
		% within QVI#7	45.8%	50.0%	4.2%	100.0%
		% within QIV#11	17.7%	13.2%	16.7%	15.1%
		% of Total	6.9%	7.5%	.6%	15.1%
	Usually (60-79%)	Count	10	15	1	26
		% within QVI#7	38.5%	57.7%	3.8%	100.0%
		% within QIV#11	16.1%	16.5%	16.7%	16.4%
		% of Total	6.3%	9.4%	.6%	16.4%
	Almost Always (80-100%)	Count	23	14	1	38
		% within QVI#7	60.5%	36.8%	2.6%	100.0%
		% within QIV#11	37.1%	15.4%	16.7%	23.9%
		% of Total	14.5%	8.8%	.6%	23.9%
Total		Count	62	91	6	159
		% within QVI#7	39.0%	57.2%	3.8%	100.0%
		% within QIV#11	100.0%	100.0%	100.0%	100.0%
		% of Total	39.0%	57.2%	3.8%	100.0%

Supporting Hypothesis 3.2
Table 5-6
Table 16-13 Risk Reviews – Within Budget Delivery (Chi-Square)

QVI#2 * QV#1 Crosstabulation

			X22: Do your projects conduct risk reviews?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
Y2: How often are your projects completed within budget?	Rarely (0-19%)	Count	8	4	0	0	1	13
		% within QVI#2	61.5%	30.8%	.0%	.0%	7.7%	100.0%
		% within QV#1	17.4%	9.1%	.0%	.0%	2.9%	7.7%
		% of Total	4.8%	2.4%	.0%	.0%	.6%	7.7%
	Occasionally (20-39%)	Count	14	12	4	2	1	33
		% within QVI#2	42.4%	36.4%	12.1%	6.1%	3.0%	100.0%
		% within QV#1	30.4%	27.3%	16.7%	10.0%	2.9%	19.6%
		% of Total	8.3%	7.1%	2.4%	1.2%	.6%	19.6%
	Frequently (40-59%)	Count	9	7	6	4	6	32
		% within QVI#2	28.1%	21.9%	18.8%	12.5%	18.8%	100.0%
		% within QV#1	19.6%	15.9%	25.0%	20.0%	17.6%	19.0%
		% of Total	5.4%	4.2%	3.6%	2.4%	3.6%	19.0%
	Usually (60-79%)	Count	6	15	8	7	11	47
		% within QVI#2	12.8%	31.9%	17.0%	14.9%	23.4%	100.0%
		% within QV#1	13.0%	34.1%	33.3%	35.0%	32.4%	28.0%
		% of Total	3.6%	8.9%	4.8%	4.2%	6.5%	28.0%
	Almost Always (80-100%)	Count	9	6	6	7	15	43
		% within QVI#2	20.9%	14.0%	14.0%	16.3%	34.9%	100.0%
		% within QV#1	19.6%	13.6%	25.0%	35.0%	44.1%	25.6%
		% of Total	5.4%	3.6%	3.6%	4.2%	8.9%	25.6%
Total		Count	46	44	24	20	34	168
		% within QVI#2	27.4%	26.2%	14.3%	11.9%	20.2%	100.0%
		% within QV#1	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	27.4%	26.2%	14.3%	11.9%	20.2%	100.0%

Table 16-14 Risk Reviews – On-Time Delivery (Chi-Square)

QVI#3 * QV#1 Crosstabulation

			X22: Do your projects conduct risk reviews?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
Y3: How often are your projects completed on time?	Rarely (0-19%)	Count	7	4	0	1	1	13
		% within QVI#3	53.8%	30.8%	.0%	7.7%	7.7%	100.0%
		% within QV#1	15.2%	8.5%	.0%	5.0%	2.9%	7.6%
		% of Total	4.1%	2.3%	.0%	.6%	.6%	7.6%
	Occasionally (20-39%)	Count	13	13	2	1	3	32
		% within QVI#3	40.6%	40.6%	6.3%	3.1%	9.4%	100.0%
		% within QV#1	28.3%	27.7%	8.0%	5.0%	8.8%	18.6%
		% of Total	7.6%	7.6%	1.2%	.6%	1.7%	18.6%
	Frequently (40-59%)	Count	16	7	8	5	3	39
		% within QVI#3	41.0%	17.9%	20.5%	12.8%	7.7%	100.0%
		% within QV#1	34.8%	14.9%	32.0%	25.0%	8.8%	22.7%
		% of Total	9.3%	4.1%	4.7%	2.9%	1.7%	22.7%
	Usually (60-79%)	Count	3	14	5	5	9	36
		% within QVI#3	8.3%	38.9%	13.9%	13.9%	25.0%	100.0%
		% within QV#1	6.5%	29.8%	20.0%	25.0%	26.5%	20.9%
		% of Total	1.7%	8.1%	2.9%	2.9%	5.2%	20.9%
	Almost Always (80-100%)	Count	7	9	10	8	18	52
		% within QVI#3	13.5%	17.3%	19.2%	15.4%	34.6%	100.0%
		% within QV#1	15.2%	19.1%	40.0%	40.0%	52.9%	30.2%
		% of Total	4.1%	5.2%	5.8%	4.7%	10.5%	30.2%
Total		Count	46	47	25	20	34	172
		% within QVI#3	26.7%	27.3%	14.5%	11.6%	19.8%	100.0%
		% within QV#1	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	26.7%	27.3%	14.5%	11.6%	19.8%	100.0%

Table 16-15 Risk Reviews – Org. PRM Impact (Chi-Square)

QVI#7 * QV#1 Crosstabulation

			X22: Do your projects conduct risk reviews?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
Y7: Do you consider the risk management policies of your organization to make a measurable difference on your project performance?	Rarely (0-19%)	Count	25	14	3	1	2	45
		% within QVI#7	55.6%	31.1%	6.7%	2.2%	4.4%	100.0%
		% within QV#1	58.1%	32.6%	12.5%	5.9%	5.7%	27.8%
		% of Total	15.4%	8.6%	1.9%	.6%	1.2%	27.8%
	Occasionally (20-39%)	Count	4	14	4	3	3	28
		% within QVI#7	14.3%	50.0%	14.3%	10.7%	10.7%	100.0%
		% within QV#1	9.3%	32.6%	16.7%	17.6%	8.6%	17.3%
		% of Total	2.5%	8.6%	2.5%	1.9%	1.9%	17.3%
	Frequently (40-59%)	Count	5	6	6	3	4	24
		% within QVI#7	20.8%	25.0%	25.0%	12.5%	16.7%	100.0%
		% within QV#1	11.6%	14.0%	25.0%	17.6%	11.4%	14.8%
		% of Total	3.1%	3.7%	3.7%	1.9%	2.5%	14.8%
	Usually (60-79%)	Count	5	3	8	5	5	26
		% within QVI#7	19.2%	11.5%	30.8%	19.2%	19.2%	100.0%
		% within QV#1	11.6%	7.0%	33.3%	29.4%	14.3%	16.0%
		% of Total	3.1%	1.9%	4.9%	3.1%	3.1%	16.0%
	Almost Always (80-100%)	Count	4	6	3	5	21	39
		% within QVI#7	10.3%	15.4%	7.7%	12.8%	53.8%	100.0%
		% within QV#1	9.3%	14.0%	12.5%	29.4%	60.0%	24.1%
		% of Total	2.5%	3.7%	1.9%	3.1%	13.0%	24.1%
Total		Count	43	43	24	17	35	162
		% within QVI#7	26.5%	26.5%	14.8%	10.5%	21.6%	100.0%
		% within QV#1	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	26.5%	26.5%	14.8%	10.5%	21.6%	100.0%

Table 16-16 Risk Audits – Org. PRM Impact (Chi-Square)

QVI#7 * QV#2 Crosstabulation

			X23: Do your projects experience risk audits? Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
Y7: Do you consider the risk management policies of your organization to make a measurable difference on your project performance?	Rarely (0-19%)	Count	37	7	0	0	1	45
		% within QVI#7	82.2%	15.6%	.0%	.0%	2.2%	100.0%
		% within QV#2	37.4%	21.2%	.0%	.0%	7.1%	28.0%
		% of Total	23.0%	4.3%	.0%	.0%	.6%	28.0%
	Occasionally (20-39%)	Count	19	4	1	1	3	28
		% within QVI#7	67.9%	14.3%	3.6%	3.6%	10.7%	100.0%
		% within QV#2	19.2%	12.1%	14.3%	12.5%	21.4%	17.4%
		% of Total	11.8%	2.5%	.6%	.6%	1.9%	17.4%
	Frequently (40-59%)	Count	13	7	2	0	2	24
		% within QVI#7	54.2%	29.2%	8.3%	.0%	8.3%	100.0%
		% within QV#2	13.1%	21.2%	28.6%	.0%	14.3%	14.9%
		% of Total	8.1%	4.3%	1.2%	.0%	1.2%	14.9%
	Usually (60-79%)	Count	12	8	2	3	1	26
		% within QVI#7	46.2%	30.8%	7.7%	11.5%	3.8%	100.0%
		% within QV#2	12.1%	24.2%	28.6%	37.5%	7.1%	16.1%
		% of Total	7.5%	5.0%	1.2%	1.9%	.6%	16.1%
	Almost Always (80-100%)	Count	18	7	2	4	7	38
		% within QVI#7	47.4%	18.4%	5.3%	10.5%	18.4%	100.0%
		% within QV#2	18.2%	21.2%	28.6%	50.0%	50.0%	23.6%
		% of Total	11.2%	4.3%	1.2%	2.5%	4.3%	23.6%
Total		Count	99	33	7	8	14	161
		% within QVI#7	61.5%	20.5%	4.3%	5.0%	8.7%	100.0%
		% within QV#2	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	61.5%	20.5%	4.3%	5.0%	8.7%	100.0%

Table 16-17 Org. Risk Response Plan – Org. PRM Impact (Chi-Square)

QVI#7 * QV#4 Crosstabulation

			X25: Does your employing organization have a policy requiring that projects have a risk response plan? Yes	No	Sometimes	Total
Y7: Do you consider the risk management policies of your organization to make a measurable difference on your project performance?	Rarely (0-19%)	Count	6	36	0	42
		% within QVI#7	14.3%	85.7%	.0%	100.0%
		% within QV#4	8.0%	49.3%	.0%	27.6%
		% of Total	3.9%	23.7%	.0%	27.6%
	Occasionally (20-39%)	Count	12	10	1	23
		% within QVI#7	52.2%	43.5%	4.3%	100.0%
		% within QV#4	16.0%	13.7%	25.0%	15.1%
		% of Total	7.9%	6.6%	.7%	15.1%
	Frequently (40-59%)	Count	14	7	3	24
		% within QVI#7	58.3%	29.2%	12.5%	100.0%
		% within QV#4	18.7%	9.6%	75.0%	15.8%
		% of Total	9.2%	4.6%	2.0%	15.8%
	Usually (60-79%)	Count	15	11	0	26
		% within QVI#7	57.7%	42.3%	.0%	100.0%
		% within QV#4	20.0%	15.1%	.0%	17.1%
		% of Total	9.9%	7.2%	.0%	17.1%
	Almost Always (80-100%)	Count	28	9	0	37
		% within QVI#7	75.7%	24.3%	.0%	100.0%
		% within QV#4	37.3%	12.3%	.0%	24.3%
		% of Total	18.4%	5.9%	.0%	24.3%
Total		Count	75	73	4	152
		% within QVI#7	49.3%	48.0%	2.6%	100.0%
		% within QV#4	100.0%	100.0%	100.0%	100.0%
		% of Total	49.3%	48.0%	2.6%	100.0%

Supplemental Supporting Hypothesis 3.3
Table 5-7
Table 16-18 Org. PRM Policy – Org. PRM Impact (Chi-Square)

QVI#7 * QIII#2 Crosstabulation

			X2: Does your employing organization have a policy requiring that projects have a risk management plan?			Total
			Yes	No	Sometimes	
Y7: Do you consider the risk management policies of your organization to make a measurable difference on your project performance?	Rarely (0-19%)	Count	12	30	2	44
		% within QVI#7	27.3%	68.2%	4.5%	100.0%
		% within QIII#2	12.0%	56.6%	33.3%	27.7%
		% of Total	7.5%	18.9%	1.3%	27.7%
	Occasionally (20-39%)	Count	18	6	2	26
		% within QVI#7	69.2%	23.1%	7.7%	100.0%
		% within QIII#2	18.0%	11.3%	33.3%	16.4%
		% of Total	11.3%	3.8%	1.3%	16.4%
	Frequently (40-59%)	Count	18	5	1	24
		% within QVI#7	75.0%	20.8%	4.2%	100.0%
		% within QIII#2	18.0%	9.4%	16.7%	15.1%
		% of Total	11.3%	3.1%	.6%	15.1%
	Usually (60-79%)	Count	18	8	0	26
		% within QVI#7	69.2%	30.8%	.0%	100.0%
		% within QIII#2	18.0%	15.1%	.0%	16.4%
		% of Total	11.3%	5.0%	.0%	16.4%
	Almost Always (80-100%)	Count	34	4	1	39
		% within QVI#7	87.2%	10.3%	2.6%	100.0%
		% within QIII#2	34.0%	7.5%	16.7%	24.5%
		% of Total	21.4%	2.5%	.6%	24.5%
Total		Count	100	53	6	159
		% within QVI#7	62.9%	33.3%	3.8%	100.0%
		% within QIII#2	100.0%	100.0%	100.0%	100.0%
		% of Total	62.9%	33.3%	3.8%	100.0%

Table 16-19 Org. PRM Concern – Customer Satisfaction (Chi-Square)

QVI#1 * QIII#4 Crosstabulation

			X4: Do you consider your employing organization to be concerned about project risk?			Total
			Yes	No	Sometimes	
Y1: How often are your projects completed to the satisfaction of your customers?	Rarely (0-19%)	Count	0	1	2	3
		% within QVI#1	.0%	33.3%	66.7%	100.0%
		% within QIII#4	.0%	14.3%	3.0%	1.8%
		% of Total	.0%	.6%	1.2%	1.8%
	Occasionally (20-39%)	Count	7	0	11	18
		% within QVI#1	38.9%	.0%	61.1%	100.0%
		% within QIII#4	7.2%	.0%	16.4%	10.5%
		% of Total	4.1%	.0%	6.4%	10.5%
	Frequently (40-59%)	Count	11	1	18	30
		% within QVI#1	36.7%	3.3%	60.0%	100.0%
		% within QIII#4	11.3%	14.3%	26.9%	17.5%
		% of Total	6.4%	.6%	10.5%	17.5%
	Usually (60-79%)	Count	30	2	20	52
		% within QVI#1	57.7%	3.8%	38.5%	100.0%
		% within QIII#4	30.9%	28.6%	29.9%	30.4%
		% of Total	17.5%	1.2%	11.7%	30.4%
	Almost Always (80-100%)	Count	49	3	16	68
		% within QVI#1	72.1%	4.4%	23.5%	100.0%
		% within QIII#4	50.5%	42.9%	23.9%	39.8%
		% of Total	28.7%	1.8%	9.4%	39.8%
Total		Count	97	7	67	171
		% within QVI#1	56.7%	4.1%	39.2%	100.0%
		% within QIII#4	100.0%	100.0%	100.0%	100.0%
		% of Total	56.7%	4.1%	39.2%	100.0%

Table 16-20 Org. PRM Concern – Original SOW Delivery (Chi-Square)

QVI#4 * QIII#4 Crosstabulation

			X4: Do you consider your employing organization to be concerned about project risk? Yes	No	Sometimes	Total
Y4: How often are your projects completed according to their original statement of work (SOW) specifications?	Rarely (0-19%)	Count	10	1	16	27
		% within QVI#4	37.0%	3.7%	59.3%	100.0%
		% within QIII#4	10.2%	14.3%	24.2%	15.8%
		% of Total	5.8%	.6%	9.4%	15.8%
	Occasionally (20-39%)	Count	23	0	13	36
		% within QVI#4	63.9%	.0%	36.1%	100.0%
		% within QIII#4	23.5%	.0%	19.7%	21.1%
		% of Total	13.5%	.0%	7.6%	21.1%
	Frequently (40-59%)	Count	16	3	16	35
		% within QVI#4	45.7%	8.6%	45.7%	100.0%
		% within QIII#4	16.3%	42.9%	24.2%	20.5%
		% of Total	9.4%	1.8%	9.4%	20.5%
	Usually (60-79%)	Count	22	1	14	37
		% within QVI#4	59.5%	2.7%	37.8%	100.0%
		% within QIII#4	22.4%	14.3%	21.2%	21.6%
		% of Total	12.9%	.6%	8.2%	21.6%
	Almost Always (80-100%)	Count	27	2	7	36
		% within QVI#4	75.0%	5.6%	19.4%	100.0%
		% within QIII#4	27.6%	28.6%	10.6%	21.1%
		% of Total	15.8%	1.2%	4.1%	21.1%
Total		Count	98	7	66	171
		% within QVI#4	57.3%	4.1%	38.6%	100.0%
		% within QIII#4	100.0%	100.0%	100.0%	100.0%
		% of Total	57.3%	4.1%	38.6%	100.0%

Table 16-21 Org. PRM Concern – Descoped SOW (Chi-Square)

QVI#5 * QIII#4 Crosstabulation

			X4: Do you consider your employing organization to be concerned about project risk?			Total
			Yes	No	Sometimes	
Y5: How often are your projects descoped from their original Statement of Work (SOW) specifications?	Rarely (0-19%)	Count	47	2	16	65
		% within QVI#5	72.3%	3.1%	24.6%	100.0%
		% within QIII#4	48.5%	25.0%	25.0%	38.5%
		% of Total	27.8%	1.2%	9.5%	38.5%
	Occasionally (20-39%)	Count	28	2	23	53
		% within QVI#5	52.8%	3.8%	43.4%	100.0%
		% within QIII#4	28.9%	25.0%	35.9%	31.4%
		% of Total	16.6%	1.2%	13.6%	31.4%
	Frequently (40-59%)	Count	12	4	8	24
		% within QVI#5	50.0%	16.7%	33.3%	100.0%
		% within QIII#4	12.4%	50.0%	12.5%	14.2%
		% of Total	7.1%	2.4%	4.7%	14.2%
	Usually (60-79%)	Count	8	0	11	19
		% within QVI#5	42.1%	.0%	57.9%	100.0%
		% within QIII#4	8.2%	.0%	17.2%	11.2%
		% of Total	4.7%	.0%	6.5%	11.2%
	Almost Always (80-100%)	Count	2	0	6	8
		% within QVI#5	25.0%	.0%	75.0%	100.0%
		% within QIII#4	2.1%	.0%	9.4%	4.7%
		% of Total	1.2%	.0%	3.6%	4.7%
Total		Count	97	8	64	169
		% within QVI#5	57.4%	4.7%	37.9%	100.0%
		% within QIII#4	100.0%	100.0%	100.0%	100.0%
		% of Total	57.4%	4.7%	37.9%	100.0%

Table 16-22 Org. PRM Concern – Org. PRM Impact (Chi-Square)

QVI#7 * QIII#4 Crosstabulation

			X4: Do you consider your employing organization to be concerned about project risk?			
			Yes	No	Sometimes	Total
Y7: Do you consider the risk management policies of your organization to make a measurable difference on your project performance?	Rarely (0-19%)	Count	11	6	27	44
		% within QVI#7	25.0%	13.6%	61.4%	100.0%
		% within QIII#4	11.8%	75.0%	45.0%	27.3%
		% of Total	6.8%	3.7%	16.8%	27.3%
	Occasionally (20-39%)	Count	15	1	12	28
		% within QVI#7	53.6%	3.6%	42.9%	100.0%
		% within QIII#4	16.1%	12.5%	20.0%	17.4%
		% of Total	9.3%	.6%	7.5%	17.4%
	Frequently (40-59%)	Count	15	0	9	24
		% within QVI#7	62.5%	.0%	37.5%	100.0%
		% within QIII#4	16.1%	.0%	15.0%	14.9%
		% of Total	9.3%	.0%	5.6%	14.9%
	Usually (60-79%)	Count	18	1	7	26
		% within QVI#7	69.2%	3.8%	26.9%	100.0%
		% within QIII#4	19.4%	12.5%	11.7%	16.1%
		% of Total	11.2%	.6%	4.3%	16.1%
	Almost Always (80-100%)	Count	34	0	5	39
		% within QVI#7	87.2%	.0%	12.8%	100.0%
		% within QIII#4	36.6%	.0%	8.3%	24.2%
		% of Total	21.1%	.0%	3.1%	24.2%
Total		Count	93	8	60	161
		% within QVI#7	57.8%	5.0%	37.3%	100.0%
		% within QIII#4	100.0%	100.0%	100.0%	100.0%
		% of Total	57.8%	5.0%	37.3%	100.0%

Table 16-23 Work Unit PRM Policy – Org. PRM Impact (Chi-Square)

QVI#7 * QIII#5 Crosstabulation

			X5: Does your employing organization work unit have a policy requiring that projects have a risk management plan?			
			Yes	No	Sometimes	Total
Y7: Do you consider the risk management policies of your organization to make a measurable difference on your project performance?	Rarely (0-19%)	Count	14	29	1	44
		% within QVI#7	31.8%	65.9%	2.3%	100.0%
		% within QIII#5	14.0%	53.7%	25.0%	27.8%
		% of Total	8.9%	18.4%	.6%	27.8%
	Occasionally (20-39%)	Count	18	7	1	26
		% within QVI#7	69.2%	26.9%	3.8%	100.0%
		% within QIII#5	18.0%	13.0%	25.0%	16.5%
		% of Total	11.4%	4.4%	.6%	16.5%
	Frequently (40-59%)	Count	18	6	0	24
		% within QVI#7	75.0%	25.0%	.0%	100.0%
		% within QIII#5	18.0%	11.1%	.0%	15.2%
		% of Total	11.4%	3.8%	.0%	15.2%
	Usually (60-79%)	Count	18	7	0	25
		% within QVI#7	72.0%	28.0%	.0%	100.0%
		% within QIII#5	18.0%	13.0%	.0%	15.8%
		% of Total	11.4%	4.4%	.0%	15.8%
	Almost Always (80-100%)	Count	32	5	2	39
		% within QVI#7	82.1%	12.8%	5.1%	100.0%
		% within QIII#5	32.0%	9.3%	50.0%	24.7%
		% of Total	20.3%	3.2%	1.3%	24.7%
Total		Count	100	54	4	158
		% within QVI#7	63.3%	34.2%	2.5%	100.0%
		% within QIII#5	100.0%	100.0%	100.0%	100.0%
		% of Total	63.3%	34.2%	2.5%	100.0%

Table 16-24 Org. PRM Encouragement – Org. PRM Impact (Chi-Square)

QVI#7 * QIII#6 Crosstabulation

			X6: Does senior management in your organization encourage and reward risk taking in projects?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
Y7: Do you consider the risk management policies of your organization to make a measurable difference on your project performance?	Rarely (0-19%)	Count	25	9	2	4	2	42
		% within QVI#7	59.5%	21.4%	4.8%	9.5%	4.8%	100.0%
		% within QIII#6	41.7%	20.0%	11.8%	26.7%	18.2%	28.4%
		% of Total	16.9%	6.1%	1.4%	2.7%	1.4%	28.4%
	Occasionally (20-39%)	Count	11	7	2	4	1	25
		% within QVI#7	44.0%	28.0%	8.0%	16.0%	4.0%	100.0%
		% within QIII#6	18.3%	15.6%	11.8%	26.7%	9.1%	16.9%
		% of Total	7.4%	4.7%	1.4%	2.7%	.7%	16.9%
	Frequently (40-59%)	Count	8	10	4	1	0	23
		% within QVI#7	34.8%	43.5%	17.4%	4.3%	.0%	100.0%
		% within QIII#6	13.3%	22.2%	23.5%	6.7%	.0%	15.5%
		% of Total	5.4%	6.8%	2.7%	.7%	.0%	15.5%
	Usually (60-79%)	Count	5	10	6	1	1	23
		% within QVI#7	21.7%	43.5%	26.1%	4.3%	4.3%	100.0%
		% within QIII#6	8.3%	22.2%	35.3%	6.7%	9.1%	15.5%
		% of Total	3.4%	6.8%	4.1%	.7%	.7%	15.5%
	Almost Always (80-100%)	Count	11	9	3	5	7	35
		% within QVI#7	31.4%	25.7%	8.6%	14.3%	20.0%	100.0%
		% within QIII#6	18.3%	20.0%	17.6%	33.3%	63.6%	23.6%
		% of Total	7.4%	6.1%	2.0%	3.4%	4.7%	23.6%
Total		Count	60	45	17	15	11	148
		% within QVI#7	40.5%	30.4%	11.5%	10.1%	7.4%	100.0%
		% within QIII#6	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	40.5%	30.4%	11.5%	10.1%	7.4%	100.0%

Table 16-25 Org. PRM Discouragement – Customer Satisfaction (Chi-Square)

QVI#1 * QIII#7 Crosstabulation

			X7: Does senior management in your organization discourage the reporting of risks associated with its projects?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
Y1: How often are your projects completed to the satisfaction of your customers?	Rarely (0-19%)	Count	1	0	0	1	1	3
		% within QVI#1	33.3%	.0%	.0%	33.3%	33.3%	100.0%
		% within QIII#7	1.0%	.0%	.0%	8.3%	20.0%	1.8%
		% of Total	.6%	.0%	.0%	.6%	.6%	1.8%
	Occasionally (20-39%)	Count	7	5	3	3	0	18
		% within QVI#1	38.9%	27.8%	16.7%	16.7%	.0%	100.0%
		% within QIII#7	6.9%	15.2%	21.4%	25.0%	.0%	10.9%
		% of Total	4.2%	3.0%	1.8%	1.8%	.0%	10.9%
	Frequently (40-59%)	Count	11	8	5	1	0	25
		% within QVI#1	44.0%	32.0%	20.0%	4.0%	.0%	100.0%
		% within QIII#7	10.9%	24.2%	35.7%	8.3%	.0%	15.2%
		% of Total	6.7%	4.8%	3.0%	.6%	.0%	15.2%
	Usually (60-79%)	Count	30	13	2	4	1	50
		% within QVI#1	60.0%	26.0%	4.0%	8.0%	2.0%	100.0%
		% within QIII#7	29.7%	39.4%	14.3%	33.3%	20.0%	30.3%
		% of Total	18.2%	7.9%	1.2%	2.4%	.6%	30.3%
	Almost Always (80-100%)	Count	52	7	4	3	3	69
		% within QVI#1	75.4%	10.1%	5.8%	4.3%	4.3%	100.0%
		% within QIII#7	51.5%	21.2%	28.6%	25.0%	60.0%	41.8%
		% of Total	31.5%	4.2%	2.4%	1.8%	1.8%	41.8%
Total		Count	101	33	14	12	5	165
		% within QVI#1	61.2%	20.0%	8.5%	7.3%	3.0%	100.0%
		% within QIII#7	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	61.2%	20.0%	8.5%	7.3%	3.0%	100.0%

Table 16-26 Org. PRM Discouragement – Descoped SOW (Chi-Square)

QVI#5 * QIII#7 Crosstabulation

			X7: Does senior management in your organization discourage the reporting of risks associated with its projects?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
Y5: How often are your projects descoped from their original *Statement of Work* (SOW) specifications?	Rarely (0-19%)	Count	47	12	2	4	0	65
		% within QVI#5	72.3%	18.5%	3.1%	6.2%	.0%	100.0%
		% within QIII#7	47.0%	37.5%	15.4%	33.3%	.0%	40.1%
		% of Total	29.0%	7.4%	1.2%	2.5%	.0%	40.1%
	Occasionally (20-39%)	Count	36	8	2	1	2	49
		% within QVI#5	73.5%	16.3%	4.1%	2.0%	4.1%	100.0%
		% within QIII#7	36.0%	25.0%	15.4%	8.3%	40.0%	30.2%
		% of Total	22.2%	4.9%	1.2%	.6%	1.2%	30.2%
	Frequently (40-59%)	Count	11	3	3	4	2	23
		% within QVI#5	47.8%	13.0%	13.0%	17.4%	8.7%	100.0%
		% within QIII#7	11.0%	9.4%	23.1%	33.3%	40.0%	14.2%
		% of Total	6.8%	1.9%	1.9%	2.5%	1.2%	14.2%
	Usually (60-79%)	Count	5	7	4	2	1	19
		% within QVI#5	26.3%	36.8%	21.1%	10.5%	5.3%	100.0%
		% within QIII#7	5.0%	21.9%	30.8%	16.7%	20.0%	11.7%
		% of Total	3.1%	4.3%	2.5%	1.2%	.6%	11.7%
	Almost Always (80-100%)	Count	1	2	2	1	0	6
		% within QVI#5	16.7%	33.3%	33.3%	16.7%	.0%	100.0%
		% within QIII#7	1.0%	6.3%	15.4%	8.3%	.0%	3.7%
		% of Total	.6%	1.2%	1.2%	.6%	.0%	3.7%
Total		Count	100	32	13	12	5	162
		% within QVI#5	61.7%	19.8%	8.0%	7.4%	3.1%	100.0%
		% within QIII#7	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	61.7%	19.8%	8.0%	7.4%	3.1%	100.0%

Table 16-27 Org. PRM Discouragement – Org. PRM Impact (Chi-Square)

QVI#7 * QIII#7 Crosstabulation

			X7: Does senior management in your organization discourage the reporting of risks associated with its projects?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
Y7: Do you consider the risk management policies of your organization to make a measurable difference on your project performance?	Rarely (0-19%)	Count	22	7	7	3	2	41
		% within QVI#7	53.7%	17.1%	17.1%	7.3%	4.9%	100.0%
		% within QIII#7	22.7%	21.9%	58.3%	27.3%	40.0%	26.1%
		% of Total	14.0%	4.5%	4.5%	1.9%	1.3%	26.1%
	Occasionally (20-39%)	Count	13	8	3	4	0	28
		% within QVI#7	46.4%	28.6%	10.7%	14.3%	.0%	100.0%
		% within QIII#7	13.4%	25.0%	25.0%	36.4%	.0%	17.8%
		% of Total	8.3%	5.1%	1.9%	2.5%	.0%	17.8%
	Frequently (40-59%)	Count	12	8	2	1	0	23
		% within QVI#7	52.2%	34.8%	8.7%	4.3%	.0%	100.0%
		% within QIII#7	12.4%	25.0%	16.7%	9.1%	.0%	14.6%
		% of Total	7.6%	5.1%	1.3%	.6%	.0%	14.6%
	Usually (60-79%)	Count	18	5	0	1	2	26
		% within QVI#7	69.2%	19.2%	.0%	3.8%	7.7%	100.0%
		% within QIII#7	18.6%	15.6%	.0%	9.1%	40.0%	16.6%
		% of Total	11.5%	3.2%	.0%	.6%	1.3%	16.6%
	Almost Always (80-100%)	Count	32	4	0	2	1	39
		% within QVI#7	82.1%	10.3%	.0%	5.1%	2.6%	100.0%
		% within QIII#7	33.0%	12.5%	.0%	18.2%	20.0%	24.8%
		% of Total	20.4%	2.5%	.0%	1.3%	.6%	24.8%
Total		Count	97	32	12	11	5	157
		% within QVI#7	61.8%	20.4%	7.6%	7.0%	3.2%	100.0%
		% within QIII#7	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	61.8%	20.4%	7.6%	7.0%	3.2%	100.0%

Table 16-28 Adequate PRM Resources – Within Budget Delivery (Chi-Square)

QVI#2 * QIII#8 Crosstabulation

			X8: Does senior management in your organization provide adequate money, human resources, and time for the entire process of project risk management (e.g. planning, identification, impact analysis, response planning, and monitoring)?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
Y2: How often are your projects completed within budget?	Rarely (0-19%)	Count	7	4	0	0	1	12
		% within QVI#2	58.3%	33.3%	.0%	.0%	8.3%	100.0%
		% within QIII#8	11.3%	9.5%	.0%	.0%	5.3%	7.4%
		% of Total	4.3%	2.5%	.0%	.0%	.6%	7.4%
	Occasionally (20-39%)	Count	17	9	2	2	2	32
		% within QVI#2	53.1%	28.1%	6.3%	6.3%	6.3%	100.0%
		% within QIII#8	27.4%	21.4%	10.0%	10.0%	10.5%	19.6%
		% of Total	10.4%	5.5%	1.2%	1.2%	1.2%	19.6%
	Frequently (40-59%)	Count	15	7	3	5	2	32
		% within QVI#2	46.9%	21.9%	9.4%	15.6%	6.3%	100.0%
		% within QIII#8	24.2%	16.7%	15.0%	25.0%	10.5%	19.6%
		% of Total	9.2%	4.3%	1.8%	3.1%	1.2%	19.6%
	Usually (60-79%)	Count	11	16	7	10	3	47
		% within QVI#2	23.4%	34.0%	14.9%	21.3%	6.4%	100.0%
		% within QIII#8	17.7%	38.1%	35.0%	50.0%	15.8%	28.8%
		% of Total	6.7%	9.8%	4.3%	6.1%	1.8%	28.8%
	Almost Always (80-100%)	Count	12	6	8	3	11	40
		% within QVI#2	30.0%	15.0%	20.0%	7.5%	27.5%	100.0%
		% within QIII#8	19.4%	14.3%	40.0%	15.0%	57.9%	24.5%
		% of Total	7.4%	3.7%	4.9%	1.8%	6.7%	24.5%
Total		Count	62	42	20	20	19	163
		% within QVI#2	38.0%	25.8%	12.3%	12.3%	11.7%	100.0%
		% within QIII#8	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	38.0%	25.8%	12.3%	12.3%	11.7%	100.0%

Table 16-29 Adequate PRM Resources – On-Time Delivery (Chi-Square)

QVI#3 * QIII#8 Crosstabulation

			X8: Does senior management in your organization provide adequate money, human resources, and time for the entire process of project risk management (e.g. planning, identification, impact analysis, response planning, and monitoring)?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
Y3: How often are your projects completed on time?	Rarely (0-19%)	Count	8	3	0	0	1	12
		% within QVI#3	66.7%	25.0%	.0%	.0%	8.3%	100.0%
		% within QIII#8	12.9%	6.8%	.0%	.0%	5.3%	7.2%
		% of Total	4.8%	1.8%	.0%	.0%	.6%	7.2%
	Occasionally (20-39%)	Count	15	11	3	2	1	32
		% within QVI#3	46.9%	34.4%	9.4%	6.3%	3.1%	100.0%
		% within QIII#8	24.2%	25.0%	15.0%	9.1%	5.3%	19.2%
		% of Total	9.0%	6.6%	1.8%	1.2%	.6%	19.2%
	Frequently (40-59%)	Count	18	9	2	6	3	38
		% within QVI#3	47.4%	23.7%	5.3%	15.8%	7.9%	100.0%
		% within QIII#8	29.0%	20.5%	10.0%	27.3%	15.8%	22.8%
		% of Total	10.8%	5.4%	1.2%	3.6%	1.8%	22.8%
	Usually (60-79%)	Count	12	13	4	5	2	36
		% within QVI#3	33.3%	36.1%	11.1%	13.9%	5.6%	100.0%
		% within QIII#8	19.4%	29.5%	20.0%	22.7%	10.5%	21.6%
		% of Total	7.2%	7.8%	2.4%	3.0%	1.2%	21.6%
	Almost Always (80-100%)	Count	9	8	11	9	12	49
		% within QVI#3	18.4%	16.3%	22.4%	18.4%	24.5%	100.0%
		% within QIII#8	14.5%	18.2%	55.0%	40.9%	63.2%	29.3%
		% of Total	5.4%	4.8%	6.6%	5.4%	7.2%	29.3%
Total		Count	62	44	20	22	19	167
		% within QVI#3	37.1%	26.3%	12.0%	13.2%	11.4%	100.0%
		% within QIII#8	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	37.1%	26.3%	12.0%	13.2%	11.4%	100.0%

Table 16-30 Adequate PRM Resources – Org. PRM Impact (Chi-Square)

QVI#7 * QIII#8 Crosstabulation

			X8: Does senior management in your organization provide adequate money, human resources, and time for the entire process of project risk management (e.g. planning, identification, impact analysis, response planning, and monitoring)?					
			Rarely (0-19%)	Occasionally (20-39%)	Frequently (40-59%)	Usually (60-79%)	Almost Always (80-100%)	Total
Y7: Do you consider the risk management policies of your organization to make a measurable difference on your project performance?	Rarely (0-19%)	Count	29	10	2	1	0	42
		% within QVI#7	69.0%	23.8%	4.8%	2.4%	.0%	100.0%
		% within QIII#8	51.8%	24.4%	9.5%	5.0%	.0%	26.8%
		% of Total	18.5%	6.4%	1.3%	.6%	.0%	26.8%
	Occasionally (20-39%)	Count	9	11	3	2	2	27
		% within QVI#7	33.3%	40.7%	11.1%	7.4%	7.4%	100.0%
		% within QIII#8	16.1%	26.8%	14.3%	10.0%	10.5%	17.2%
		% of Total	5.7%	7.0%	1.9%	1.3%	1.3%	17.2%
	Frequently (40-59%)	Count	5	11	2	5	1	24
		% within QVI#7	20.8%	45.8%	8.3%	20.8%	4.2%	100.0%
		% within QIII#8	8.9%	26.8%	9.5%	25.0%	5.3%	15.3%
		% of Total	3.2%	7.0%	1.3%	3.2%	.6%	15.3%
	Usually (60-79%)	Count	8	6	4	6	2	26
		% within QVI#7	30.8%	23.1%	15.4%	23.1%	7.7%	100.0%
		% within QIII#8	14.3%	14.6%	19.0%	30.0%	10.5%	16.6%
		% of Total	5.1%	3.8%	2.5%	3.8%	1.3%	16.6%
	Almost Always (80-100%)	Count	5	3	10	6	14	38
		% within QVI#7	13.2%	7.9%	26.3%	15.8%	36.8%	100.0%
		% within QIII#8	8.9%	7.3%	47.6%	30.0%	73.7%	24.2%
		% of Total	3.2%	1.9%	6.4%	3.8%	8.9%	24.2%
Total		Count	56	41	21	20	19	157
		% within QVI#7	35.7%	26.1%	13.4%	12.7%	12.1%	100.0%
		% within QIII#8	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	35.7%	26.1%	13.4%	12.7%	12.1%	100.0%

Appendix Number 17

Final Defense Slides

Final Defense Presentation

Risk Management Practices Among Risk-sensitive Project Management Professionals

Robert James Voetsch
Thursday, 23 October 2003
Conference Room (PAD 601)
Public Administration Department
The George Washington University
Washington, D.C.

Overall Research Question:

Does risk management make a difference?

- That is, do organizations that employ formal risk management practices outperform those that do not?
- This study examines risk management practices in project-based organizations, with a view toward determining whether such practices correlate with project performance.

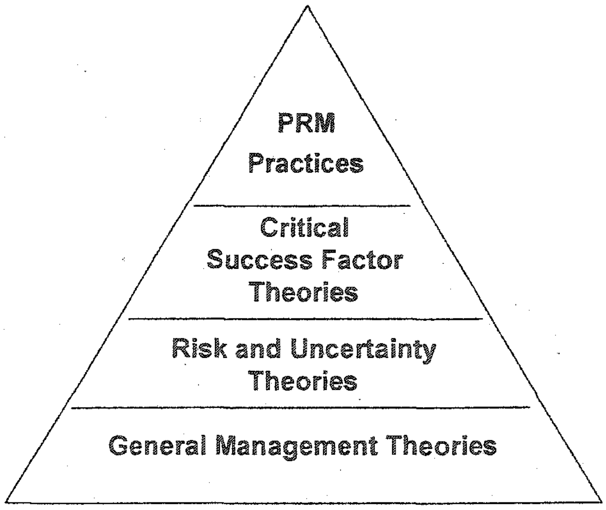
2

Key Validity Concerns

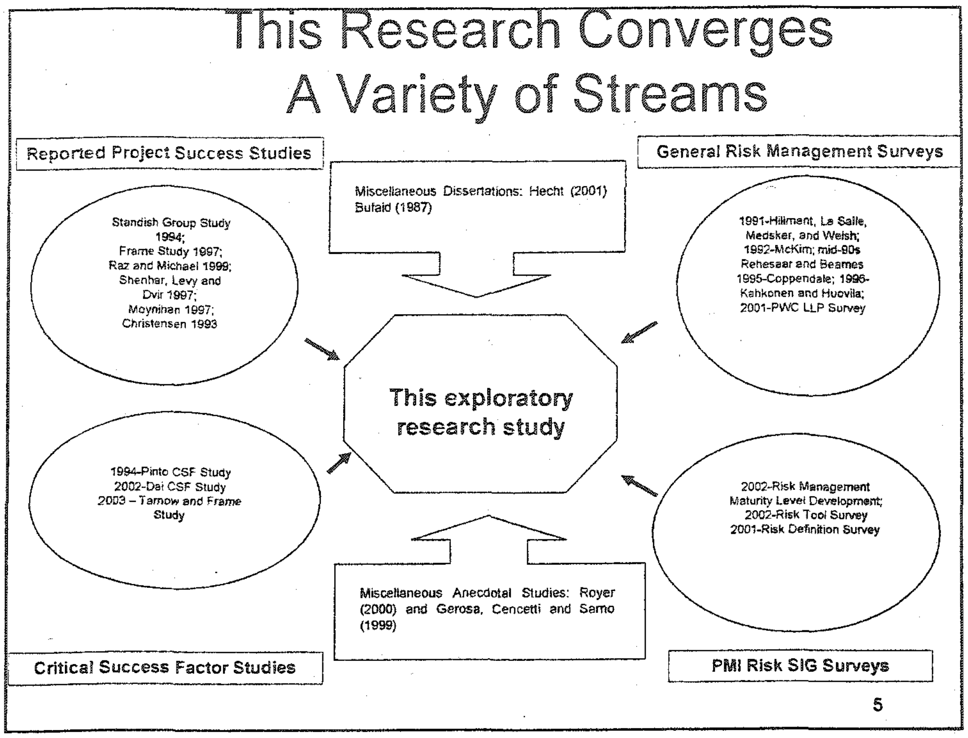
- Internal: Key concerns are selection, recall, response bias, and location.
- External: Given the self-selected sample, the research results cannot be used to describe the larger project management community.
- Overall: Data results can only be interpreted to represent the current Risk SIG membership.

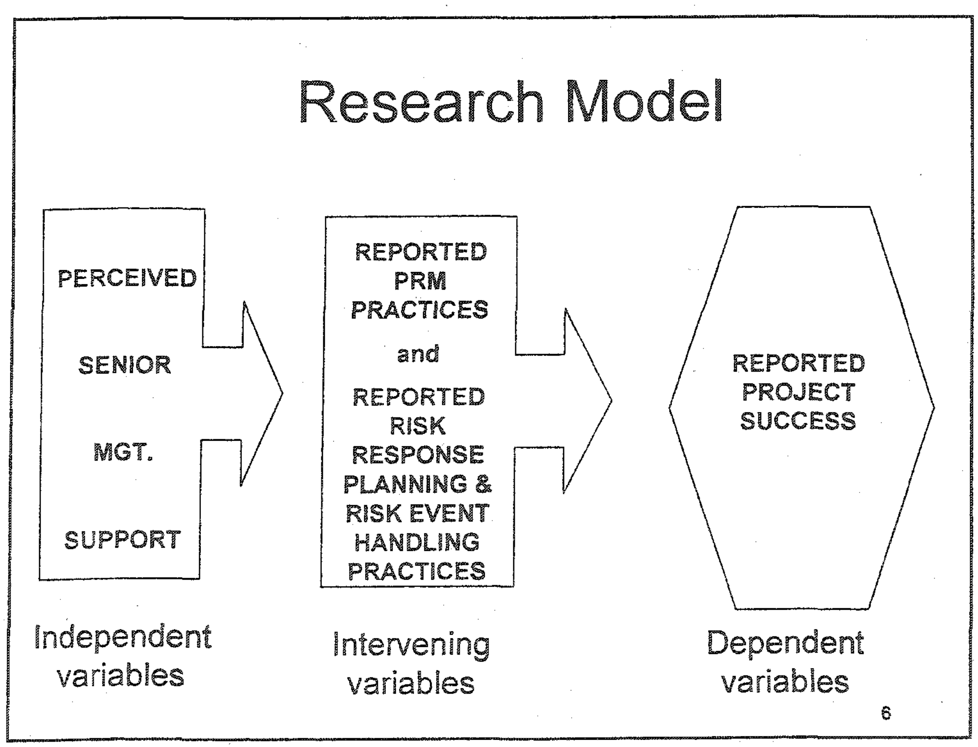
3

Research Foundation

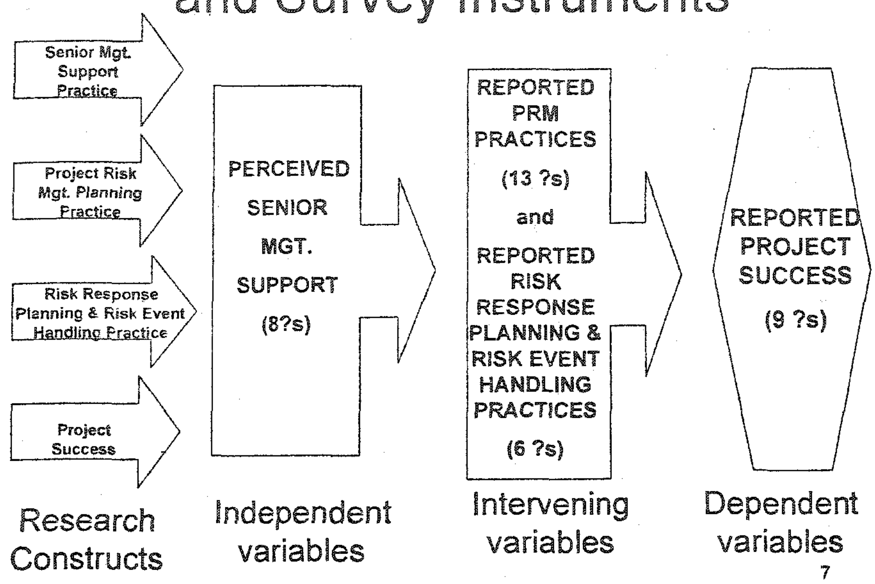


4


This Research Converges
A Variety of Streams
Reported Project Success Studies
Standish Group Study 1994; Frame Study 1997; Raz and Michael 1999; Shenhar, Levy and Dvir 1997; Moynihan 1997; Christensen 1993
Miscellaneous Dissertations: Hecht (2001) Bufaid (1987)
General Risk Management Surveys
1991-Hillment, La Salle, Medsker, and Welsh; 1992-McKim; mid-90s Rehesaar and Beames 1995-Coppendale; 1996-Kahkonen and Huovila; 2001-PWC LLP Survey
This exploratory research study
1994-Pinto CSF Study
2002-Dai CSF Study
2003 – Tarnow and Frame Study
2002-Risk Management Maturity Level Development; 2002-Risk Tool Survey 2001-Risk Definition Survey
Miscellaneous Anecdotal Studies: Royer (2000) and Gerosa, Cencetti and Samo (1999)
Critical Success Factor Studies
PMI Risk SIG Surveys
5


Research Model
PERCEIVED
SENIOR
MGT.
SUPPORT
REPORTED PRM PRACTICES
and
REPORTED RISK RESPONSE PLANNING & RISK EVENT HANDLING PRACTICES
REPORTED PROJECT SUCCESS
Independent variables
Intervening variables
Dependent variables
6

Operationalized Research Model and Survey Instruments



7

Research Dynamic

A conceptual equation for this construct dynamic model is expressed as follows:

Reported Project Success = Function (
Perceived Senior Management Support,
Reported Risk Management Planning,
Reported Risk Response Planning and
Risk Event Handling)

8

Overall Research Question:

Does risk management make a difference?

- That is, do organizations that employ formal risk management practices outperform those that do not?
- This study examines risk management practices in project-based organizations, with a view toward determining whether such practices correlate with project performance.

9

Reported Project Success

- Project Success has been operationalized as completion of projects:
  - Within budget
  - On-time
  - According to the original statement of work specifications
  - Meeting with customer satisfaction

10

Main Research Findings (1)

1. Positive statistical correlation between reported senior management support for project risk management practices, actual practices and reported positive project management results within the traditional triple constraint.
2. Majority of survey respondents report formal organization-wide or work unit-specific policy for project risk management.
3. Project risk management, adequate resource allocation and staff training for it, lag behind its visibility in organization policymaking and expressed concern.
4. Low use of quantitative risk mgt tools.

11

Main Research Findings (2)

5. Almost universal use of project team risk identification sessions.
6. Risk practices maybe subsumed into general project control activities and not identified as risk practices per se.
7. Respondents may equate project management success with perceived customer satisfaction.
8. If risk sensitive project professionals report a gap between actual risk management practice and expressed official support, the state of project risk management beyond this community is probably only worse.

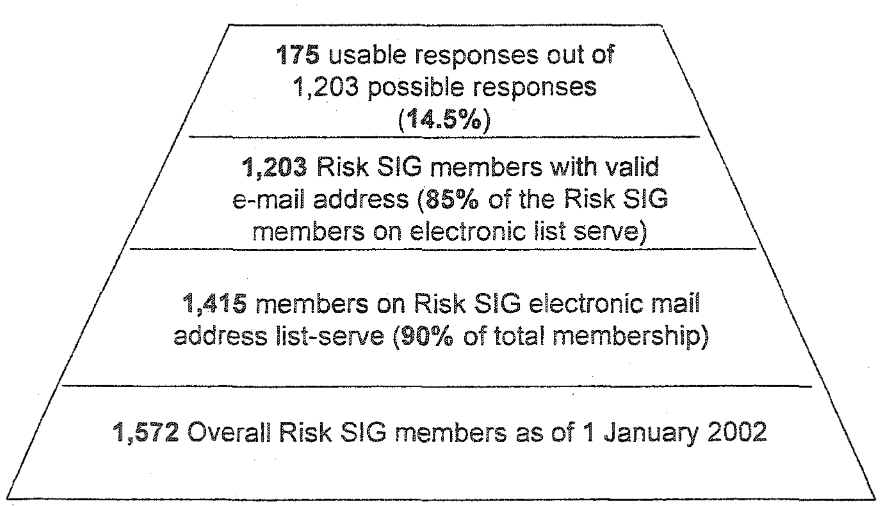
12

Research Process Steps

Table 1-2 Research Procedures				
Step No.	**Description**	**Sample Size**	**Dates (Month/Year)**	**Status**
1.	Pre-test with PMI Risk SIG Officers and APM/UK Risk SIG Officer	4 persons	11/01 – 3/02	Completed
2.	Field test with Chinese Project Managers	100 persons	4/02 – 5/02	Completed
3.	Pre-test of website and telephone interview survey instruments	4 persons	6/01 - 8/31	Completed
4.	Web survey	1,572 invitees (176 responses)	10/02 – 2/03	Completed
5.	Telephone interview survey	12 persons	12/02 – 3/03	Completed
6.	Data Analysis	N/A	2/03 – 03/03	Completed
7.	Final Research Write-up	N/A	3/03 – 04/03	Completed

13

Survey Response Rate



14

Data Analysis Techniques (1)

Exploratory Data Analysis:

- Chi-Square Analysis of all relevant pair-wise variables. Decision Rule: statistical significance < 0.05, enabling rejection of the null hypothesis with a 95% level of confidence.

(See Chapter 5)

15

Data Analysis Techniques

Confirmatory Data Analyses:

- Factor Analysis: Oblique Factor Rotation using Oblimin. Decision rules:
  - Eigenvalue $\geq$ 1.00 for extracted factors
  - Factor loadings greater than .500 considered as surrogate variables for identified factors.
- Follow-up Chi-Square Analysis: Identified Underlying Factors. Decision Rule: statistical significance < 0.05 enabling rejection of the null hypothesis with a 95% level of confidence.

(See Chapter 6)

16

Data Analysis Techniques

Qualitative Data Analysis:

- Content analysis of 12 interview transcripts.
- Frequency counts of key research variables.

(See Chapter 7)

17

Research Question 1 and Its Supporting Hypotheses

RQ 1	**Is there an association between perceived senior management support of risk management practice and implementation of reported project risk planning practices?**
Ho 1.1 (Rejected)	Perceived risk sensitive organizations implement the same amountof reported formal risk management processes as those organizations that arenot perceived to be risk sensitive.
Ha 1.1 (Accepted)	**Perceived risk sensitive organizations implement more reported formal risk management processes than those organizations that are not perceived to be risk sensitive.**
Ho 1.2 (Rejected)	Organizations that report senior managers providing adequate resources to implement risk management processes implement the same amount ofreported formal risk management processes as those organizations that do not report senior managers providing adequate resources.
Ha 1.2 (Accepted)	**Organizations that report senior managers providing adequate resources to implement risk management processes implement more reported formal risk management processes than those organizations that do not report senior managers providing adequate resources.**

18

Research Question 1:
Chi-Square Data Analysis

H. 1.1: Senior Mgt. Support and Reported PRM Practices → 30 pair-wise variable combinations having 17 statistically significant relationships ≤ .0.05

H. 1.2: Adequate Resources and Reported PRM Practices → 6 pair-wise variable combinations having 6 statistically significant relationships ≤ 0.05

19

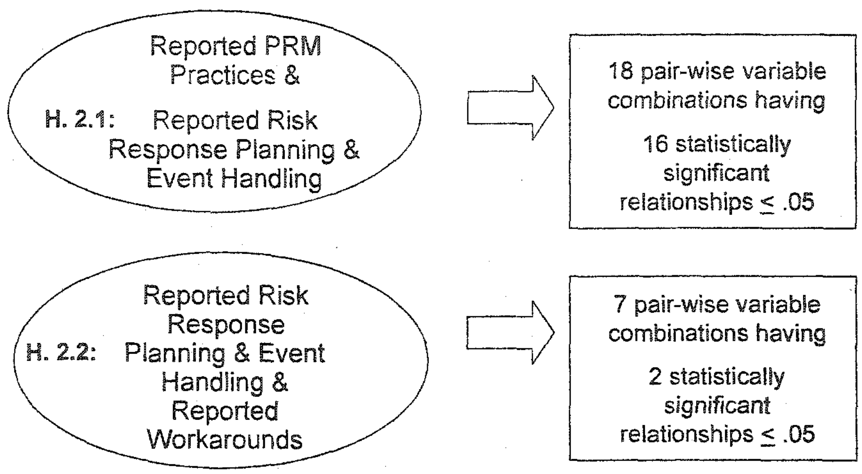
Research Question 2
and Its Supporting Hypotheses

RQ 2	**Is there an association between reported risk planning practices and the implementation of reported risk event monitoring and handling practices?**
Ho 2.1 (Rejected)	Organizations where reported formal risk planning practices are implemented report monitoring risks the same as those organizations where reported risk-planning practices are weak.
Ha 2.1 (Accepted)	**Organizations where reported formal risk planning practices are implemented report monitoring risks more rigorously than those organizations where reported risk-planning practices are weak.**
Ho 2.2 (Rejected)	Organizations where reported formal risk planning efforts are implemented report experiencing the same number of workarounds as those organizations where reported formal risk planning efforts are weak.
Ha 2.2 (Accepted)	**Organizations where reported formal risk planning efforts are implemented report experiencing fewer workarounds than those organizations where reported formal risk planning efforts are weak.**

20

Research Question 2:

Chi-Square Data Analysis



21

Research Question 3

and Its Supporting Hypotheses

RQ 3	**Is there an association between the implementation of reported risk monitoring and handling practices and reported project success?**
Ho 3.1 (Rejected)	Organizations where reported formal risk planning efforts are implemented have the same reported project success rates as those organizations where reported formal risk planning practices are weak.
Ha 3.1 (Accepted)	***Organizations where reported formal risk planning efforts are*** **implemented have higher reported project success rates than those organizations where reported formal risk planning practices are weak.**
Ho 3.2 (Rejected)	Organizations that report monitoring risks rigorously have the same reported project success rates as those organizations that do not.
Ha 3.2 (Accepted)	**Organizations that report monitoring risks rigorously have higher reported project success rates than those organizations that do not.**
Ho 3.3 (Rejected)	Perceived risk sensitive organizations have the same reported project success rates as those organizations that are not perceived to be risk sensitive.
Ha 3.3 (Accepted)	**Perceived risk sensitive organizations have higher reported project success rates than those organizations that are not perceived to be risk sensitive. [supplemental]**

22

Research Question 3:
Chi-Square Data Analysis

H. 3.1: Reported PRM Practices & Reported PM Success → 49 pair-wise variable combinations having 12 statistically significant relationships $\leq .05$

H. 3.2: Risk Response Planning & Event Handling & Reported PM Success → 21 pair-wise variable combinations having 5 statistically significant relationships $\leq .05$

H. 3.3: Senior Mgt. Support and Reported PM Success [supplemental] → 42 pair-wise variable combinations having 15statistically significant relationships $\leq .05$

23

Key Factor Analysis Results

- The KMO-MSA index is 0.845 (out of a maximum score of 1.000), which falls within the 'meritorious range' (0.80 and above)
- The sample size (136 cases) provides 8.5 cases for each variable analyzed
- This web survey sample is a good set for identifying multi-colinearity
- Oblique factor rotation identified three components (or factors) that account for the variance (multi-colinearity) identified in the data set.

24

Oblique Factor Analysis Results

Results of Rotated Confirmatory Factor Analysis				
	Identified Factors			Communality
Survey Variable	F1: PRM Culture	F2: Reported PM Results	F3: Risk-averse Culture	
PRM Culture				
Adequate Resources for PRM	0.733			0.636
Training in PRM	0.760			0.578
Use of Quantitative Tool	0.669			0.457
Qualitative Risk Analysis	0.696			0.496
Risk Reviews	0.780			0.626
Risk Audits	0.720			0.577
Perceived Overall Impact of PRM	0.642			0.443
Reported PM Results				
Reported Workarounds		0.648		0.566
Customer Satisfaction		-0.866		0.759
Within Budget Delivery		-0.889		0.797
On-Time Delivery		-0.833		0.730
Within Original SOW		-0.759		0.587
Early Terminated Projects		0.536		0.310
Risk-averse Culture				
Discouragement of Risk Reporting			0.805	0.672
Descoped SOW			0.707	0.546
Percent of Variance Explained by Factor Cumulative Total	34.28%	14.65%	7.11%	**56.05%**

25

Identified Underlying Factors (1)

Factor 1 – Project Risk Management Culture: Seven specific components with a factor loading > 0.500. Three variables from *Reported Project Risk Management Planning Practice*; two variables from *Reported Risk Response Planning and Risk Event Handling Practice* and *Perceived Senior Management Support for Project Risk Management Practice* each; and, one variable from *Reported Project Success*. Factor name reflects surrogate variables indicating an organization culture of project risk management practices.

26

Identified Underlying Factors (2)

Factor 2 – Project Management Results: Six variables with a factor loading > 0.500 or -0.500. Five variables from *Reported Project Success*; and one variable from *Reported Risk Response Planning and Risk Event Handling Practice* research construct. Factor name reflects the research construct overwhelming represented by the surrogate variables.

27

Identified Underlying Factors (3)

Factor 3 – Risk-Averse Culture: Third factor identified consists of one variable each from: *Perceived Senior Management Support for Project Risk Management Practice*, and *Reported Project Success*. Factor name reflects surrogate variable with the highest loading (0.805): risk aversion in senior management support.

28

Refined Factors:

Follow-up Chi-Square Data Analysis

Factor 1: **PRM Culture** ⇨ Common Factor: 6 surrogate variables

Factor 2: **PM Success** ⇨ Common Factor: 5 surrogate variables

Factor 3: **Risk-Averse Culture** ⇨ Unique Factor: 1 surrogate variable

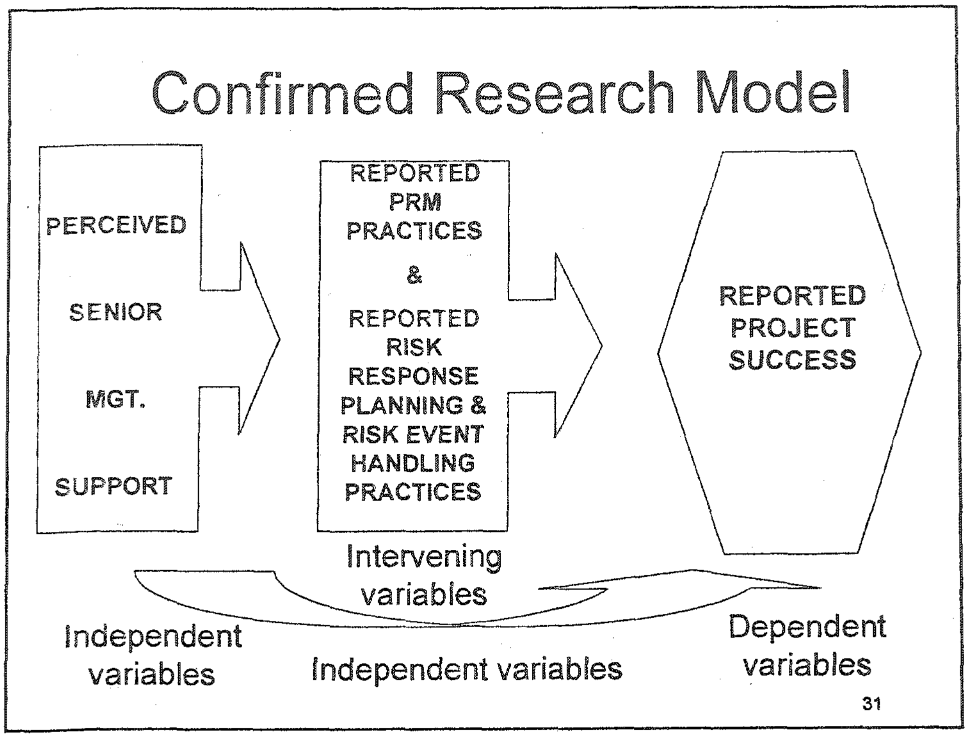
29

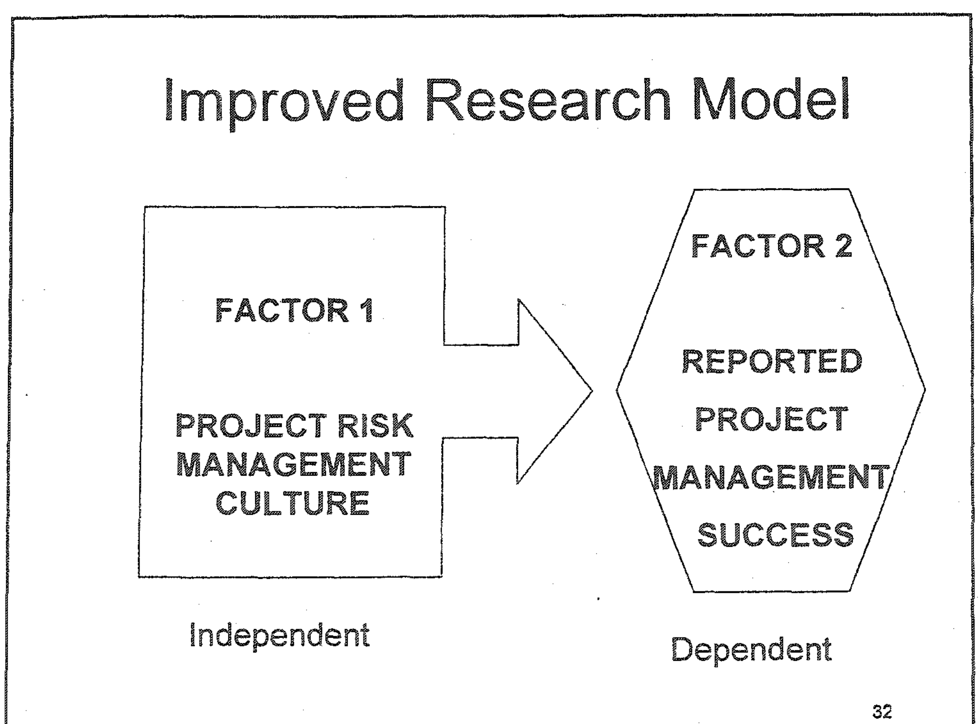
Follow-up Chi-Square Analysis

Summary Table of Statistically Significant Chi-square Relationships between Refined Factors

Variable: *Dependent/* Independent	Factor 1 Project Risk Management Culture	Factor 2 Project Management Results	Factor 3 Risk Averse Culture
Factor 1 Project Risk Management Culture	–		
Factor 2 Project Management Results	Statistically Significant .047*	–	
Factor 3 Risk Averse *Culture*	*.819*	*.058*	–

30


Confirmed Research Model
PERCEIVED
SENIOR
MGT.
SUPPORT
REPORTED PRM PRACTICES
&
REPORTED RISK RESPONSE PLANNING & RISK EVENT HANDLING PRACTICES
REPORTED PROJECT SUCCESS
Intervening variables
Independent variables
Independent variables
Dependent variables
31


Improved Research Model
FACTOR 1
PROJECT RISK MANAGEMENT CULTURE
FACTOR 2
REPORTED PROJECT MANAGEMENT SUCCESS
Independent
Dependent
32

Improved Research Dynamic

A conceptual equation for the revised construct dynamic model is expressed as follows:

Reported Project Success = Function
PRM Culture
(*i.e.*, Reported PRM Process)

33

Summary: Key Research Findings

- The more often risk management is practiced the more often projects are executed successfully.
- Risk widely recognized as an important factor in project operations.
- Risk policies widely reported in organizations.
- Risk identification sessions almost universally reported.
- Reported project management results still < 50% within triple constraint.
- Clear need to close gap between the expressed interest in risk management and the actual allocation of resources to practice it in projects.

34

Key Follow-up Research

- How can a risk management culture be fostered in an organization?
- What are the preconditions required for successful project risk management?
- What are the critical success factors for project risk assessment teams or offices?
- What heuristics can be assumed to aid in resource allocation for project risk management?
- How can the gap between identified risk events and actual risk events be reduced? (If at all.)
- Additional case studies in actual PRM.

35

Overall Research Question (answered):

Does risk management make a difference?

This study concludes:

YES

⇒ the more that organizations implement project risk management practices, the more frequently they report project management success.

36