PROJECT RISK MANAGEMENT PRACTICES AND THEIR ASSOCIATION WITH REPORTED PROJECT SUCCESS

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Abstract

The overall question answered by this paper is: 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 main conclusions of this research are: 1) A positive statistical correlation exists between reported senior management support for project risk management practices, actual practices and reported positive project management results, 2) A majority of the survey respondents reported a 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 organizational 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 may be subsumed into general project control activities and not identified as risk practices *per se*, 7) Respondents may equate project success with perceived customer satisfaction, 8) Since risk-sensitive project professionals report a gap between actual risk management practices and expressed official support, outside this community the state of project risk management is probably .less developed.

Introduction

Do organizations that employ formal risk management practices outperform those that do not? This paper is based on exploratory, descriptive, cross-sectional research. The data sample represents risk management applications in a wide range of areas, *e.g.*, insurance, financial, operational, environmental, and occupational. The paper explores the scope of risk consideration in project operations; describes the project risk practices in organizations executing projects; assesses the dynamics of current project risk management in organizations; summarizes the frequency of risk management practices in projects; updates reported project success rates; and determines the effect of risk management practices on reported project management results.

The research 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

From a theoretical foundation, these four research constructs were operationalized as independent, intervening and dependent variables. Figure 1 depicts the research construct dynamic.

Figure 1: Research Construct Dynamic

We consider risk management to be implicit in all critical success factors, (*e.g.*, scope, communication, cost, and time management), and thus a conceptual equation for this construct may be expressed as follows:

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

This paper determines the existence of any statistical correlation between the above four constructs within the data analyzed.

The major research questions and their respective alternate hypotheses are found in Table 1.

Table 1

Major Research Questions and Alternate Hypotheses

Question and Alternate Hypothesis	Alternate 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?
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.
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?
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.
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?
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.
Ha 3.2	Organizations that report monitoring risks rigorously have higher reported project success rates than those organizations that do not.

Summary of Literature Review

A comprehensive literature review was conducted to operationalize the four construct variables of this research: senior management support, critical success factors, project risk management practices, and project success.

The literature indicated project risk management and project management are directly linked with each other as disciplines and branches of management. This paper takes the critical success factor research continuum of Pinto and Slevin, Dai, Cooke-Davies, and Tarnow to a more detailed level: that of the sub-critical success factors as related to project risk management.

Key indicators of perceived senior management support for project risk management practices include: presence of a formal project risk management policy; senior management encouragement of risk-taking in project selection and planning; 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. (PMI®-INCOSE-APM Risk SIG RMMM 2003, Cooke-Davies 2002, Hulett 2001, Price-Waterhouse-Coopers, LLC 2001, AS/NZ 4360 1999, Bosler 1999, Murray 1998, SEI 1996).

Key indicators of promising 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 (again, 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 to produce a risk register; and appointing a full-time project team member to be responsible for all daily project risk management throughout the project's life. (Cooke-Davies 2002, PMI®-PMBOK® Guide 2000, APM-RAMP Guide 2000, ISO Standard 10006 2000, BS 6079-3 2000, AS/NZ 4360 1999, Bosler 1999, US-EPA 1999, US-FAA 1999, Chapman and Ward 1997, Kalle and Kohkanen 1997, SEI 1996, US-DoD 1996).

Key indicators of promising project risk event monitoring and handling practices include: conducting regular risk response planning; conducting, risk reviews to assess the emergence of risk events during project execution; conducting a risk audit at some point during project execution, which confirms the presence and use of a formal risk management plan; and, a low number of project workarounds in response to unidentified risk events. (Cooke-Davies 2002, PMI®-PMBOK® Guide 2000, APM-RAMP Guide 2000, ISO Standard 10006 2000, BS 6079-3 2000, AS/NZ 4360 1999, Bosler 1999, US-EPA 1999, US-FAA 1999, Chapman and Ward 1997, Kalle and Kohkanen 1997, SEI 1996, US-DoD 1996).

Key indicators for measuring project success include: on-time delivery; delivery within budget meeting the formal specifications in full; and leaving the project customers satisfied at project completion by meeting their expectations. (Cooke-Davies 2002, PMI®-PMBOK® Guide 2000, Kerzner 1998 and 2000, Shenhar, Levy, and Dvir 1997, Pinto and Kharbanda 1995, Frame 1995, Cleland 1994, Freeman and Beale 1992); and, De Wit (1988).

In surveys of incoming graduate students in project management, Hobbs (2003) found that quantitative risk analysis tools, such as Monte Carlo analysis, database of risks, decision tree, and PERT analysis were neither widely used nor well supported organizationally. He found that respondents indicated that risk management documents, ranking of risks, and database of risks had high unused potential, whereas Monte Carlo analysis, PERT analysis, and decision tree had low unused potential.

Based on responses of graduate students in project management, Kwak (2003) found that: "Although risk management is a daunting task, organizations that implement effective processes proved to be successful, while those that fail in this effort will be unsuccessful. … Formal risk management process is recommended to manage complex issues. Many risk management processes have been created to aid organizations, but integrating the processes into organizations was not successful. The theoretical aspects of the process must be reconciled with the practical challenges of the organization to implement risk management successfully."

Research Methodology and Data Analysis

The research consisted of two interrelated surveys of the membership of the Project Management Institute (PMI®) Risk Management Specific Interest Group (SIG): a website survey using close-ended questions and structured interviews using open-ended questions. A total of 176 web survey questionnaires were collected between October 2002 and early February 2003, of which 175 were usable as respondent's informed consent was received for use of the data collected. 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 (Adams 2003), but our number represents a response rate of about 15% of those Risk

SIG members having active e-mail addresses at the time of the survey. In addition to the web survey, 12 telephone interviews were conducted between October 2002 and the end of February 2003 to check for consistency and identify other characteristics of contemporary project risk management..

Initial data analysis of respondents' personal, professional, and industrial backgrounds assured us that the sample represented well the overall membership population of the Risk SIG. C*hi-squared analysis* tested the statistical significance of the relationship between any two-paired variable combinations examined. As most social scientists use 5% to balance the likelihood of Type I and Type II errors (Garson 2002), the decision rule was set at the 95% confidence level to test the null hypotheses, i.e., any chi-squared probability $\leq .05$ led to rejection of the null hypothesis.

Contingency tables analyze how responses to specific questions correlate with one another, and content analysis of the structured interview transcripts helps identify themes in the responses; for example, "sign-vehicles" are defined by Janis (1965) as being any word or phrase that signifies some meaning in the context of an interview.

Respondents' Demographics

The overall profile of the respondents to both surveys is that of private sector professionals employed in the information and communication sectors (72% and 45% of the respondents respectively), working in projects in the industrialized world. Nearly all respondents had a university degree, had gained some project risk management experience within the 12 months previous to their responses, and had a median of greater than 12 years of project management experience. Finally, more than 75% of the respondents were employed in organizations that had annual revenues or an annual budget in excess of US $100 million.

Results of Data Analysis

In general, chi-squared analysis enabled rejection of all null hypotheses and acceptance of the corresponding alternate hypotheses at a 95% level of confidence, supporting the research model explored in this paper: 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 are more likely in compliance with the project management triple constraint when senior management supports the use of formal project risk management practices throughout a project's life. We report some details of these analyses below.

Senior Management Support and Use of Project Risk Management

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? Chi-square analysis revealed statistically significant relationships between the independent and dependent variables analyzed for each supporting hypothesis. The null hypotheses were rejected and the alternate hypotheses accepted.

Risk sensitive organizations implement more formal risk management processes (Hypothesis Ha 1.1): Organizations reporting senior management sensitivity to project risk management also report use of various project risk management practices during the life of their projects.

Organizations that provide adequate resources implement more formal risk management processes (Hypothesis Ha 1.2): Organizations where senior managers provide adequate resources to implement risk management processes also report more frequent implementation of formal risk management processes.

Risk Planning Practices and Risk Event Monitoring and Handling

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

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 alternate hypotheses accepted at a 95% level of confidence.

Organizations that implement formal risk planning monitor risks more rigorously (Hypothesis Ha 2.1): Organizations reporting formal risk planning efforts also report monitoring risks more frequently than those organizations where reported risk planning efforts are less pronounced.

Organizations that implement formal risk planning experience fewer workarounds (Hypothesis Ha 2.2): Organizations reporting formal risk planning efforts also report experiencing fewer workarounds than those organizations where reported risk planning efforts are less pronounced.

Risk Response Planning, Risk Event Handling, and Project Success

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 constraints (time, cost, and performance), customer satisfaction and early project termination (before meeting project scope).

Chi-square analysis revealed statistically significant relationships between the independent and dependent variables analyzed for all supporting hypotheses of Major Research Question 3. All null hypotheses were rejected and the alternate hypotheses accepted at a 95% level of confidence.

Organizations that implement formal risk planning have higher project success rates (Hypothesis Ha 3.1): Organizations reporting frequent implementation of formal risk planning efforts also report more frequent project success.

Organizations that monitor risks rigorously have higher reported project success rates (Hypothesis Ha 3.2): Organizations reporting frequent implementation of formal risk event monitoring and handling practices also report more frequent project success.

Risk sensitive organizations have higher reported project success rates (Supplemental Hypothesis Ha 3.3): Organizations reporting strong senior management support for project risk management also report more frequent project success.

Risk Management Culture, Risk-Averse Culture, and Project Results

Confirmatory data analysis, using both factor analysis and chi-square analysis, supported the conclusion that there is a statistically significant relationship between senior management support (or the lack of such support) for project risk management, the presence of a project risk management process and reported project success.

Factor Analysis

The basic role of factor analysis in this research was to confirm the results of the Chi-square analysis. Oblimin factor analysis in an Oblique factor rotation was used since the factors

were derived from variables already assumed to be correlated due to the initial statistically significant Chi-square results. (Hair 2002).

Variable selection for the factor analysis was made on the basis of three factors:

Chi-square analysis results showing a statistically significant relation at the level ≤ 0.05.

Variables that best represented the construct variable they were meant to measure.

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 decision rules used were:

Only a factor component with an Eigenvalue greater than_1.00 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.

High cut-off points ensured that the extracted factors would explain a significant amount of the variance among the variables analyzed. All specific items with a factor loading $\geq$ .500 were averaged under their overall factor to perform additional Chi-square analysis to test the statistical significance between the various identified factors.

Web survey data was converted to a numeric scale as follows: '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; and, 'Do Not Know' which, was given the numeric value zero and treated as a system missing value in the analysis.

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.

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 overall rationale behind the naming of each underlying factor was to maintain conceptual consistency with the constructs and model of this research and to accurately reflect the identity of the factor based on its surrogate variables. The naming of these factors took into considerations the role of factor analysis in confirming or denying the validity of the original construct dynamic and model of the research, maintaining as much consistency as possible between the original four constructs of this research and any emerging underlying factors, and accurately describing the predominant identity of the underlying factor given its specific surrogate variables.

Rigorous analysis of the rotated component matrix identifies a more evenly balanced distribution of specific variables in Factors 1, 2 and 3. 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 $\geq$ .500. 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 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. 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.

These three factors account for more than 56% of the total variance among the variables analyzed.

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 Research Model.

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 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.

Follow-up Chi-square Data Analysis

Follow-up 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 success, and 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 with a p-value = .047, indicating that that *the type of risk management culture prevailing in an organization has a statistically significant relationship to reported project success.* The statistical relationship between Risk-averse Culture and Project Management Results was significant at the .058 level – very close to the decision level of .050.

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. Of the two data sets, the second factor data set more accurately reflects the statistical relationship between each factor in light of the original research dynamic found in Figure 1.

Original Factor Data Chi-square Results

The results of the follow-up Chi-square analysis for the original unaltered factor data set show one statistically significant relationship at the 95% confidence level between the 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: 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 in 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 alternate hypotheses can be accepted.

Revised Factor Data Chi-square Results

For the refined factors, there is one 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 significant at the .058 level – close to the decision of .050 – indicating that the

type of risk management culture prevailing in an organization is correlated with reported project success.

Thus, based on the sample and this second refined factor data set, we can still be 95% confident that there is a relationship between senior management support (or the lack of such support) for project risk management and the presence of a project risk management process and, between senior management support (or the lack of such support) and reported project success.

Common Characteristics of Project Risk Management

Qualitative data analysis of the telephone survey responses revealed some key characteristics of project risk management. It 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; and more formal in larger organizations. It has a positive impact on project performance and perceived project success.

This research has also revealed other characteristics that project risk management comprises. It 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 September 11, 2001

Data Analysis Conclusions

The data analyses used in this research confirm that there are statistically significant relationships as depicted in the confirmed research model found in Figure 2.

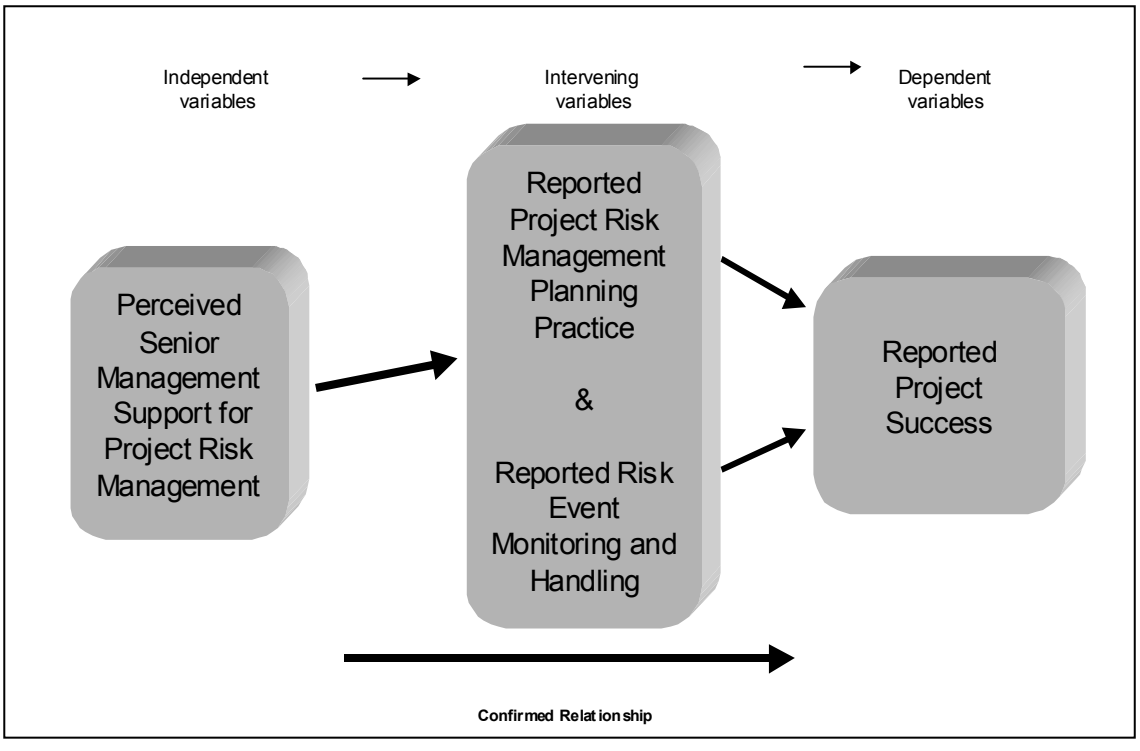

Figure 2: Confirmed Research Model

The above data analyses enable the following answer to the overall research question of this research: Yes, risk management does make a difference and organizations that employ formal risk management practices do outperform those that do not employ such practices. However, given the self-selected nature of the sample frame (Risk SIG members), the findings cannot be interpreted to represent the risk management experiences and practices of the wider project management professional community. Nevertheless, we can reasonably suggest that the research findings may serve as guidelines for research outside Risk SIG membership.

Specific Research Findings

The following sections report specific research findings related to each independent research variable and those dependent research variables from which a statistically significant relationship was discerned. The percentages reported are for the two extreme ends of the cardinal-ordinal scale described earlier. These categories were selected as they demonstrate more clearly the associations of risk management policies, attitudes and practices with each other as well as with the dependent construct variable Reported Project Success.

Perceived Senior Management Support of Risk Management Practice

The independent Perceived Senior Management Support variables showing the strongest correlation with the dependent Risk Management Practice variables are:

- **Organization Risk Management Policy**: A majority of the survey respondents (60%) reported a formal organization-wide policy for project risk management.
- **Work Unit Risk Management Policy**: A majority of the survey respondents (58%) reported a formal work unit-specific policy for project risk management.

Senior Management Discouragement for risk reporting: A majority of the respondents (61%) report "Rarely" receiving discouragement from senior management for reporting risks in projects versus only 3% who report "Almost Always" receiving such discouragement.

- **Senior Management Encouragement for Risk-taking**: less than 5% of the respondents report "Almost Always" receiving encouragement for risk-taking in projects versus 18% who "Rarely" received such encouragement.
- **Adequate resource Allocation for PRM**: Only 12% of the respondents report "Almost Always" receiving adequate resources (money, time and human resources) for risk management.

As indicated in Table 2, the more sensitive senior management is (perceived to be) to project risk management, the more frequently formal risk management practices are reported during project selection, planning and execution. This data supports Alternative Hypothesis Ha 1.1: 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.*

In addition, Table 2 clearly shows 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. These data support the alternative hypothesis Ha 1.2 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.*

Table 2

Perceived Senior Management Support of Risk Management Practice

and

Reported Project Risk Management Practices

(Percentages represent the percentage within each column in the original contingency table)

		Organization PRM Policy		Work Unit PRM Policy		Senior Management Risk Encouragement		Senior Management Risk Discouragement		Adequate Resources for PRM Practice	
		Yes	No	Yes	No	Almost Always	Rarely	Almost Always	Rarely	Almost Always	Rarely
PRM Training	Almost Always	10.7%	1.6%	10.8%	1.6%	30%	4.7%			22.2%	3.2%
	Rarely	32%	72.1%	32.4%	72.1%	60%	59.4%			22.2%	75.8%
Quantitative Risk Analysis	Almost Always					18.2%	4.7%			31.6%	3.2%
	Rarely					54.5%	68.8%			36.8%	74.2%
Qualitative Tool	Almost Always	36.5%	8.2%	36.9%	8.2%			20%	35.9%	57.9%	9.7%
	Rarely	14.4%	36.1%	15.5%	36.1%			80%	22.3%	10.5%	38.7%
Risk Technique for Contingency Costs	Yes	54.8%	30.5%	57.8%	30%					68.4%	31.7%
	No	42.3%	67.8%	38.2%	68.3%					31.6%	66.7%
Risk Technique for Contingency Time	Yes	45.6%	27.1%	47.1%	25.4%			0%	45.1%	73.7%	24.6%
	No	52.4%	69.5%	50%	71.2%			100%	52.9%	26.3%	72.1%

Finally, the data in Table 3 indicate that organizations perceived as risk sensitive report greater project success than do those organizations not perceived to be risk sensitive. This outcome supports the supplemental Alternate Hypothesis Ha 3.3 that there is a statistical relationship between risk sensitivity and project management performance.

Table 3

Perceived Senior Management Support of Risk Management Practice

and

Reported Project success

(Percentages represent the percentage within each column in the original contingency table)

		Organization PRM Policy		Work Unit PRM Policy		Senior Management Risk Encouragement		Senior Management Risk Discouragement		Adequate Resources for PRM Practice	
		Yes	No	Yes	No	Almost Always	Rarely	Almost Always	Rarely	Almost Always	Rarely
Within Budget Delivery	Almost Always									57.9%	19.4%
	Rarely									5.3%	11.3%
On-Time Delivery	Almost Always									63.2%	14.5%
	Rarely									5.3%	12.9%
Customer Satisfaction	Almost Always							60%	51.5%		
	Rarely							20%	1%		
PRM Impact	Almost Always	34%	7.5%	32%	9.3%	63.6%	18.3%	20%	33%	73.7%	8.9%
	Rarely	12%	56.6 %	14%	53.7%	18.2%	41.7%	40%	22.7%	0%	51.8%

Reported Project Risk Planning Practices

The frequency of the intervening reported risk management practice variables are:

- **Project Risk Management Training**: Only 7% report project team members "Almost Always" receiving training in risk management planning and impact analysis.
- **Use of a Quantitative Risk Analysis Technique**: Very few respondents (7%) use quantitative tools on an "Almost Always" basis to select projects.
- **Use of Qualitative Risk Analysis**: Very few respondents (7%) use quantitative tools on an "Almost Always" basis to select projects.
- **Holding Risk Identification Sessions**: Use of project-team risk identification sessions is almost universal, with 98% of the respondents reporting they use these at least once during life of the project.

- **Use of a Qualitative Risk Technique for Contingency Costs**: Fewer than half of the respondents (45%) use quantitative tools on an "Almost Always" basis to develop contingency costs.
- **Use of a Qualitative Risk Technique for Contingency Time**: Fewer than half of the respondents (38%) use quantitative tools on an "Almost Always" basis to develop contingency times.

The data displayed in Table 4 enable the following conclusion: the more frequently a risk management tool is used, the more frequently risk monitoring takes place. This outcome supports alternative hypothesis Ha 2.1 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.

Table 4

Reported Project Risk Management Practices

and

Reported Risk Response Planning and Risk Event Handling and Monitoring Practices

(Percentages represent the percentage within each column in the original contingency table)

		PRM Training		Quantitative Tool		Qualitative Tool		Risk Technique for Contingency Costs		Risk Technique for Contingency Time	
		Almost Always	Rarely	Almost Always	Rarely	Almost Always	Rarely	Yes	No	Yes	No
Risk Reviews	Almost Always	91.7%	10.8%	63.6%	12.2%			26%	15.9%	28.1%	15%
	Rarely	0%	41%	0%	36.7%			14.3%	39.8%	10.9%	39%
Risk Audits	Almost Always	41.7%	3.6%	54.5%	5.2%	18.6%	0%			12.7%	5%
	Rarely	16.7%	83.1%	27.3%	71.9%	41.9%	87.5%			44.4%	74%
Risk Response Plans	Yes	83.3%	26.7%	43.2%	9.8%	81.4%	24.3%	57.9%	38%	58.7%	40.7%
	No	16.7%	70.7%	4.5%	65.9%	18.6%	75.7%	39.5%	62%	38.1%	59.3%

The data indicated in Table 5 support alternative hypothesis Ha 3.1 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.

Thus, the weight of the above data shows 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 are conducted.

Table 5

Reported Project Risk Management Practices

and

Reported Project success

(Percentages represent the percentage within each column in the original contingency table)

		PRM Training		Quantitative Tool		Qualitative Tool		Risk Technique for Contingency Costs		Risk Technique for Contingency Time	
		Almost Always	Rarely	Almost Always	Rarely	Almost Always	Rarely	Yes	No	Yes	No
On-Time Delivery	Almost Always	36.4%	19.8%								
	Rarely	0%	9.9%								
PRM Impact	Almost Always	66.7%	15.8%	54.5%	18%	39.5%	13.9%	32%	19%	37.1%	15.4%
	Rarely	8.3%	46.1%	9.1%	38.2%	9.3%	58.3%	18.7%	38%	16.1%	37.4%

Reported Risk Response Planning and Risk Event Monitoring and Handling Practices

The frequency of the intervening risk response planning and risk event monitoring and handling practices variables are:

- **Risk Reviews**: Only 20.2% report "Almost Always" holding risk reviews.
- **Risk Audits**: Only 8.7% report "Almost Always" conducting risk audits.
- **Risk Response Planning**: Only 49.4% report having a company policy requiring risk response planning.

Table 6 displays the relationship between the above intervening research construct variables and reported project success variables.

Table 6

Reported Risk Response Planning and Risk Event Monitoring and Handling Practices

and

Reported Project success

(Percentages represent the percentage within each column in the original contingency table)

	Risk Reviews		Risk Audits		Risk Response Planning	
	Almost Always	Rarely	Almost Always	Rarely	Yes	No

Within Budget Delivery	Almost Always	44.1%	19.6%				
	Rarely	2.9%	17.4%				
On-Time Delivery	Almost Always	52.9%	15.2%				
	Rarely	2.9%	15.2%				
PRM Impact	Almost Always	60%	9.3%	50%	18.2%	37.3%	12.3%
	Rarely	5.7%	58.1%	7.1%	37.4%	8%	49.3%

The data in Table 6 enable the following conclusion: the more often project risks are monitored the higher the reported project success rates and *vice versa.* Thus, alternative hypotheses Ha 3.2 is supported as 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.

Validity Concerns

The research controlled for most of the identified internal and external validity threats by following standardized and disciplined protocols in the research, website survey, and telephone interviews. Identified internal validity threats were: selection, recall, response bias, reactivity, and location threats. The respondents in the sample were self-selected as opposed to being randomly selected.

It is not possible to control for the external validity threat: generalizability of the research findings. Thus, the findings cannot be interpreted to represent the risk management experiences and practices of the wider project management professional community.

Future 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.

Conclusions

Analysis of the data supports six general conclusions:

The more sensitive senior management is (perceived to be) to project risk management, the more frequent is the use of various project risk management practices. For example, 37% of respondents from organizations with a stated risk management policy report using qualitative risk tools “Almost Always” versus only 8% of the respondents from organizations without such a policy.

The more that senior managers provide adequate resources for risk management processes, the more frequent is their implementation. For example, 58% of the respondents reporting receiving adequate resources for risk management likewise report using qualitative risk techniques during project selection “Almost Always,” whereas only 10% of the respondents “Rarely” receiving such support also report “Almost Always” using risk tools during project selection.

The more that formal risk planning practices are implemented, the more rigorous is risk monitoring. Also, fewer workarounds are reported. For example, 43% of the respondents reporting use of qualitative risk techniques during project selection also report conducting risk reviews "Almost Always" whereas only 10% of those respondents reporting "Rarely" using such tools also report "Almost Always" conducting risk reviews.

More project success is reported with stronger senior management support for formal risk planning efforts, their subsequent actual practice, and regular risk monitoring. For example, 53% of the respondents who report their projects conduct risk reviews "Almost Always" also report completing projects on time "Almost Always," whereas only 15% of the respondents who report "Rarely" conducting risk reviews also report completing projects on time "Almost Always."

Adequate resource allocation and staff training for project risk management are less pronounced than risk visibility in organizational policymaking, and

Fewer than half of the respondents (45%) use quantitative tools on an "Almost Always" basis to develop contingency costs. Even fewer use them to estimate contingency times (38%) or to select projects (7%).

Possible reasons for the inconsistency between the widespread reporting of formal risk management policies and risk identification sessions and the low reported use of quantitative tools and provision of adequate resources include:

Senior management is not yet too willing to make the leap of faith to committing often-scarce funds for project risk management. This in turn leads to unwillingness to make the effort needed to ensure systematic and regular practices.

Project risk practices are not identified as risk activities *per se* because they are already fully integrated into general project control activities (and budget lines) and are not identified specifically as risk monitoring practices. Examples could include cost and schedule estimation, operational monitoring, financial audits, and supervisory work site visits. Also, instead of formal risk reviews, regular project team monitoring meetings, risk identification sessions, and periodic performance reports may be used to manage and monitor project risk.

In conclusion, data analysis, using both factor analysis and Chi-square analysis, supports the conclusion that there is a statistically significant relationship between senior management 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. The 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.

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