# Exploration of Risk Management Process Usage Levels and Their Relationship to Project Outcomes

*Completed Research Paper*

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## ABSTRACT

Project management processes such as risk management are used in many organizations however; research shows risk management is the least mature of all project management knowledge areas. This is important because poor risk management is one of many challenges on IS/IT projects that can lead to failure. The goal of this paper is to determine if the level of actual risk management process usage is important to successful project outcomes. A research study was conducted which surveyed over 550 project management practitioners about risk management on their own virtual IS/IT project. Survey responses were analyzed and a correlation analysis was conducted to determine if a relationship existed between risk management process usage and project outcome. The results indicated there was a definite relationship and specifically the "high usage" level of risk management processes is important to successful project outcomes while other lower levels are not as important.

**Keywords**

Project management, risk management, project management maturity, virtual projects, IS/IT projects

## INTRODUCTION

Over time, projects and project management processes have become critical to organizational success (Ibbs & Kwak, 2000; Kerzner, 2001). However, the occurrence of challenged and failed IS/IT projects continues to be high even after years of experience and the integration of project management processes into organizations. The Standish Group has measured software project success since 1994 through the publication of their CHAOS reports. They determined cancelled and challenged software projects represented approximately two thirds of all project outcomes while only about a third of those projects were successful (StandishGroupInternational, 2009). These results suggest it is still important to explore the many reasons for these challenges in an effort to reduce or eliminate them and subsequently improve the chances for successful project outcome. Additionally, one research study indicates several project management knowledge areas are immature in their actual usage in organizations, one of which is risk management (Ibbs & Kwak, 2000).

To add to the confusion of project challenges, the emergence of virtual/distributed projects several years ago has complicated matters due to the need to find methods that are effective in a virtual environment. A virtual project by definition is one in which project team members are not co-located, but instead reside in different, states and/or countries, operate in different time zones and must use Information Communication Technologies (ICTs) to communicate. This new environment applies additional pressure on projects and sometimes fuels the existing challenges.

The goal of this paper is to delve into the challenge presented by ineffective or immature risk management. While low risk management maturity can indicate a lack of integration of risk management processes into the organization, it is likely another serious issue exists with the actual usage level of risk management processes. Usage is just one aspect of measuring maturity. In other words, even if extensive, detailed risk management processes, procedures and documents are introduced into the organization they are of little value if they are not used on a consistent basis.

This paper will explore the following research question: How does the level of actual risk management usage impact project outcome? From this question, a hypothesis was developed:

*H1: A positive relationship exists between the level of actual risk management process usage and successful project outcomes as measured by project performance attributes on virtual IS/IT projects.*

It is a common belief in the IS community that increased maturity of risk management processes is positively related to project outcomes. Since the occurrence of failed and challenged projects has not improved significantly over time a deeper exploration of challenges to projects is warranted (StandishGroupInternational, 2009). Therefore, although this hypothesis may seem obvious, an empirical test of it is a worthwhile exercise. This paper will look at how much risk management processes are used in reality and the relationship of usage levels to project outcome. According to research by Wallace and Keil (2004) project risk was found to be very important to projects; they concluded project execution risk was likely more important than any other type of risk in influencing project outcome (Wallace & Keil, 2004). It should be noted that project execution risk includes risk planning and risk control.

The importance of the research presented in this paper is its' contribution to risk management literature through the discussion of various levels of risk management usage in virtual IS/IT projects and the resulting impact on project outcome. This research can also contribute to practitioner knowledge of risk management by identifying specific areas of improvement. The practitioner contribution is particularly significant due to recent increased practitioner interest in risk management as evidenced by growth in the number of PMI Risk Management Professional Certifications (PMI-RMP). PMI-RMP certifications increased by 103.2 % in 2012; which was double the next highest rate of growth in PMI certifications. Finally, the importance of effective risk management practices was recently stressed in a report by PMI on the outlook for project management in 2012 as it addressed the need for agility in organizations as market conditions rapidly change (PMI, 2011).

The remainder of this paper will discuss the usage of risk management processes through results of a recent research study which surveyed over 550 project management practitioners working on virtual IS/IT projects. The organization of the paper is as follows; it will begin with a background section and research methodology, followed by a results/discussion section. Finally, the findings will be summarized in a conclusion section.

## BACKGROUND

### Risk Management

The Project Management Institute indicates the purpose of risk management is "to increase the probability and impact of positive events, and decrease the probability and impact of negative events" (PMI, 2013). Risk management is a key aspect of the project management process. PMI publishes a project management guide called the Project Management Body of Knowledge (PMBOK) which identifies knowledge areas that are key competencies essential for project managers. The knowledge areas are: Integration Management, Scope Management, Time Management, Quality Management, Human Resource Management, Communications Management, Risk Management, Procurement Management, and Stakeholder Management (PMI, 2013). The PMBOK indicates risk management includes risk planning, identification, analysis, response planning and risk monitoring and control. Schwalbe (2011) views risk management in a more holistic manner which encompasses some of the idiosyncrasies of managing risk on an actual project; defining it as "the art and science of identifying, analyzing and responding to risk throughout the life of a project and in the best interest of meeting project objectives" (Schwalbe, 2011). The link between risk management and project outcome can be found in the main goal of performing risk management which is to eliminate negative impacts from uncertainty as much as possible leading to successful project outcomes.

The process of managing risk on projects generally involves three major steps: Risk Identification, Risk Assessment and Risk Monitoring and Control. A project manager is responsible for overseeing risk management processes beginning with a Risk Management Plan. Identified risks are recorded in a Risk Register and each risk is assessed and ranked using two criteria, the probability of the risk occurring and the degree of impact to project success (in monetary terms) should the risk occur.. Risk control consists of a plan of action for each risk. (Boehm, 1991; PMI, 2013).

Prior research has identified top risk factors on software development projects, both in traditional and virtual project environments in an effort to help practitioners (Barki, Rivard, & Talbot, 1993; Boehm, 1991; Keil, Lyytinen, & Schmidt, 1998; Reed & Knight, 2011; Wallace, Keil, & Rai, 2004). These "top" risk lists allows practitioners to focus on specific areas instead of tackling all risks across the board which is nearly impossible and not entirely beneficial. The PMBOK indicates there are aspects of the project's or organization's environment that can contribute to risk impact which is generally negative (PMI, 2013). One such aspect is likely immature project management practices. Therefore, this paper will explore

this area of project management practices in an effort to improve knowledge of the impact of risk management on successful project outcomes.

### Project Management Maturity

Maturity models are used to measure how well the elements of a process are actually incorporated into an organization. This paper will mainly focus on one aspect of risk management maturity which is the actual usage of risk management processes. A disadvantage of maturity models is that they are objective measures and there is no universal measure for maturity (Swanson, 2012; Voivedich, 2001). A few of the many project management maturity models are shown in Table 1 in order to shed light on the overall practice of maturity measurement (Fahrenkrog, Abrams, Haeck, & Whelbourn, 2003; Kerzner, 2001; Voivedich, 2001). Swanson (2012) indicates most methods used to evaluate maturity follow similar steps.

| Model Name | Model Creator | Measurement Levels |
|---|---|---|
| Project Management Capability Maturity Model (PMCMM) (Voivedich, 2001) | PMCC Inc. | 1) Crisis Management<br>2) Reactive management<br>3) Project Management<br>4) Program Management<br>5) Managing Excellence |
| Project Management Maturity Model (PMMM) (Kerzner, 2001) | Kerzner | 1) Common Language<br>2) Common Processes<br>3) Singular Methodology<br>4) Benchmarking<br>5) Continuous Improvement |
| Organizational Project Management Maturity Model (OPM3) (Fahrenkrog, Abrams, Haeck, & Whelbourn, 2003) | PMI | 1) Standardize<br>2) Measure<br>3) Control<br>4) Continuously Improve |

**Table 1 - Project Management Maturity Models**

In a study conducted by the University of California at Berkeley and sponsored by PMI, project management maturity was measured and compared across several organizations (Ibbs & Kwak, 2000). The researchers developed their own questionnaire to assess project management maturity in organizations by using eight project management knowledge areas and six project phases defined in the PMBOK. The research was conducted via a survey of 38 large public and private international companies across various industries. The study found the average maturity level for all project management processes was relatively low, at 3.26 on a five-point scale. Of the four industries represented, Information Systems organizations had the lowest average score at 3.06. The lowest score for all knowledge areas overall was 2.75 for risk management (Ibbs & Kwak, 2000). These results suggest project management processes could benefit from improvement in maturity overall and in particular; risk management processes which are the most immature.

## RESEARCH METHODOLOGY

The data for this paper came from a research study whose main goal was to identify critical project risk factors on virtual software development projects, however, only a subset of the data related to risk management usage will be shared here. The research tool was a survey questionnaire which was developed through the following steps. First, a questionnaire from a prior similar study was used as a starting point but was revised to cover several areas more thoroughly. The original survey was created through a literature review, face-to-face interviews with project management practitioners and a focus group of IS/IT practitioners.

The survey questionnaire was organized as follows. A couple of pre-survey questions were used to screen the participants and ensure they had played a management type role in a recent virtual IS project which would be used to answer all survey questions. The survey began by collecting background demographics about the project itself, the project team, the project manager and the organization. Several questions addressed project performance measures such as cost, duration and functionality. The core of the survey was a section where participants rated the degree of impact on project outcome from

each of fifty-five risk factors. The final section inquired about the actual usage of risk management processes and will be explained in the next section.

Participants were self-selected to take the survey from several different groups: a Fortune 500 organization, members of the PMI Information Systems Community of Practice, LinkedIn project management groups and the survey page of the PMI website. Also, a mailing list was purchased from PMI containing a list of general members who were sent a postal mail invitation.

Participants were asked to answer all survey questions based on a single, recent virtual software project. Use of an actual recent project was requested to reduce answers based on opinion and to reduce retrospective bias. The survey was conducted in the latter half of 2011 and early 2012. A total of 557 participants completed the survey and referenced a variety of projects as indicated from the demographics in Table 1. The participants were project management practitioners with an average of 10.1 years of project management experience. Approximately 92% of the participants were certified PMI Project Management Professionals (PMPs). Project cost and duration varied widely, however, the type of work performed for the projects predominantly involved software applications; either development, upgrade or package installation.

| Demographic | Category | Percent |
|---|---|---|
| Project Cost | 0 to $100,000 | 18% |
| | $100,001 to $500,000 | 27% |
| | $500,001 to $1,000,000 | 14% |
| | $1,000,001 to $5,000,000 | 25% |
| | > $5,000,000 | 16% |
| Project Duration (in months) | 1 to 6 | 23% |
| | 7 to 12 | 35% |
| | 13 to 24 | 29% |
| | 25 and above | 13% |
| Final Project Completion Status | In Progress | 26% |
| | Partially Installed | 11% |
| | Completed | 59% |
| | Cancelled without installation | 2% |
| | On hold | 2% |

**Table 2 – Research Study Demographics**

## RESULTS/DISCUSSION

### Risk Related Survey Results

In the risk management section of the survey, three questions addressed the basic components of risk management, i.e. risk identification, risk assessment and risk monitoring and control. The fourth question explored the level of risk process usage with a Likert scale. Together these questions were used as a measurement to estimate the risk management process usage level on the projects.

First, survey participants were given a definition of project risk management and then asked the following question: “Was a risk assessment performed by the project team for this project?”. The majority of participants (76.6%) answered “Yes” while only 28.4 % of the participants answered “No”. This large positive response was not surprising since the risk management knowledge area includes risk assessment and a large majority of survey participants were certified PMPs. A PMP is required to know details of all project management knowledge areas, which includes risk management. These results suggest a

majority of the survey participants conducted a risk assessment, which, according to the PMBOK are performed in both the qualitative and quantitative risk analysis steps of the risk management process and should produce a risk register as the deliverable (PMI, 2013).

The second survey risk question began with an explanation of risk control and indicated a "plan of action" would be the deliverable of this phase. The question was: "Were risk control processes used for this project?" A positive response would imply a plan of action was created and possibly executed for the project. A majority of participants (72.5%) answered "Yes" and only 27.5% answered "No". Again, these results are consistent with the results from the first question. It suggests a large majority of the survey participants performed some type of risk control. Risk control is generally conducted as a part of risk monitoring and control and results in a plan of action.

The results from these two questions are consistent with results from the 2012 PMI Pulse of the Profession survey which is a global annual survey of practitioners and project management leaders with more than 1,000 participants. In that survey, 72% of the participants indicated they always conduct risk management (PMI, 2012). Although definitions were provided in this survey, it is quite possible an affirmative response to a question about the use of risk management processes is not referring to the exact same set of processes across all projects reported on by participants and/or is not referring to the description of risk management outlined by PMI in the PMBOK. This is a potential limitation of the survey. Determining if risk processes are used on a project is not as difficult as determining project management maturity levels. Usage levels are often observable by the project leader/manager and can even be answered by project team members if the project has been well documented in a project directory. On the other hand, determining project management maturity levels (as discussed in the background section) can often be a long process determined through an audit which can take a few weeks or a few months and requires evidence of processes, procedures and documents.

The third risk related question revealed surprising results given the high percentage of affirmative answers to the first two questions. Participants were asked if a "documented risk management plan" was created for their project. The risk management plan according to the PMBOK is comprised of the following areas: methodology, roles and responsibilities, budgeting, timing, risk categories, definitions of risk probability and impact, probability and impact matrix, revised stakeholders' tolerances, reporting formats and tracking (PMI, 2013). This plan is a key deliverable in the risk knowledge area as it outlines all steps necessary to manage risk. Completing all of the risk management components is expected in order to effectively reduce the impact of risk on a project. The results indicated a little more than half, (55.9%) of the respondents answered "Yes" while 44.1% of the respondents answered "No". These results are surprising since the affirmative answers are quite a bit lower than the affirmative answers to the first two questions. It is assumed that project leaders/managers that perform risk assessment and risk control processes would also create an overall risk management plan, however, these results do not reflect that concept. It is also assumed when a project leader/manager indicates they have conducted risk management they would have addressed all basic risk management components. Creation of a full plan prior to the occurrence of a risk event is important to the proactive nature expected in risk management. The PMBOK suggests reactive risk management can lead to project failure while proactive risk management reduces the impact of a realized risk. Project managers, especially, certified PMPs should have knowledge of all risk management components and how to execute them. Therefore, I propose that incomplete risk management processes are being conducted by some practitioners and can lead to failure which can then lead to poor project outcomes.

### Correlation Analysis Results

Chi-square tests were performed using the fourth risk management question in order to test the hypothesis: (H1) A positive relationship exists between the level of actual risk management process usage and successful project outcomes as measured by project performance attributes on virtual IS/IT projects. The three performance attributes were final project budget, final project schedule and final project functionality. This last risk management question asked participants to rate the level of actual usage of risk management processes on their project by rating on a seven-point Likert scale where "1" represented "not used at all" and "7" represented "fully incorporated into the project". The Likert scale ratings were used in a Chi-square test with three performance attributes used to measure project outcome; project budget, project functionality and project schedule. Each performance attribute consisted of three levels representing achieving the target, exceeding the target or missing the target. This resulted in a very large Chi-square test which contained several cells with a count less than five. To resolve this issue, the Likert scale groups were combined since some of the middle ratings on the Likert scale had a low count. The resulting ratings were as follows: 1 represents "Risk Processes Not Used". Ratings 2 and 3 were combined to represent "low" usage; and called "Some Usage of Risk Processes". Ratings 4 and 5 were combined to represent "moderate" usage; and called "Risk Processes Used Often". Finally, ratings 6 and 7 were combined and represent "high" usage and called "Risk

Processes Well Used or Fully Incorporated". The results were interesting. The Chi-square test was run with the three performance attributes for measuring project success in conjunction with the participant's four reported levels of actual risk management usage. In the end, the final project schedule attribute was not used because more than 20% of the cells had a count less than five even after the combining was performed. It should be noted that for the 26% of projects that were in progress, participants were asked to answer based on the estimated final project performance results, which can be accomplished by project managers through the use of current project data and several commonly used tools such as earned value and budget at completion (BAC). This may be a limitation of the study due to inaccuracies that can occur using this type of estimation.

The first project performance attribute to be analyzed was the final project budget. Participants were asked to select the answer which most closely represented the final budget status on their project at completion. If the project was still in progress, they were asked to reply based on the estimated final budget status. The Chi-square results, which are shown in Figure 1, were highly significant (p-value 0.000), indicating a relationship does exists between levels of risk management processes and final project budget. A Spearman Rank Correlation Coefficient was calculated to measure the strength of the linear relationship between the two variables which was good. All seven of the Likert scale options for level of risk management process usage were part of the Spearman calculation, instead of the combined four. The result was -0.217 and was significant at the 0.01 level.

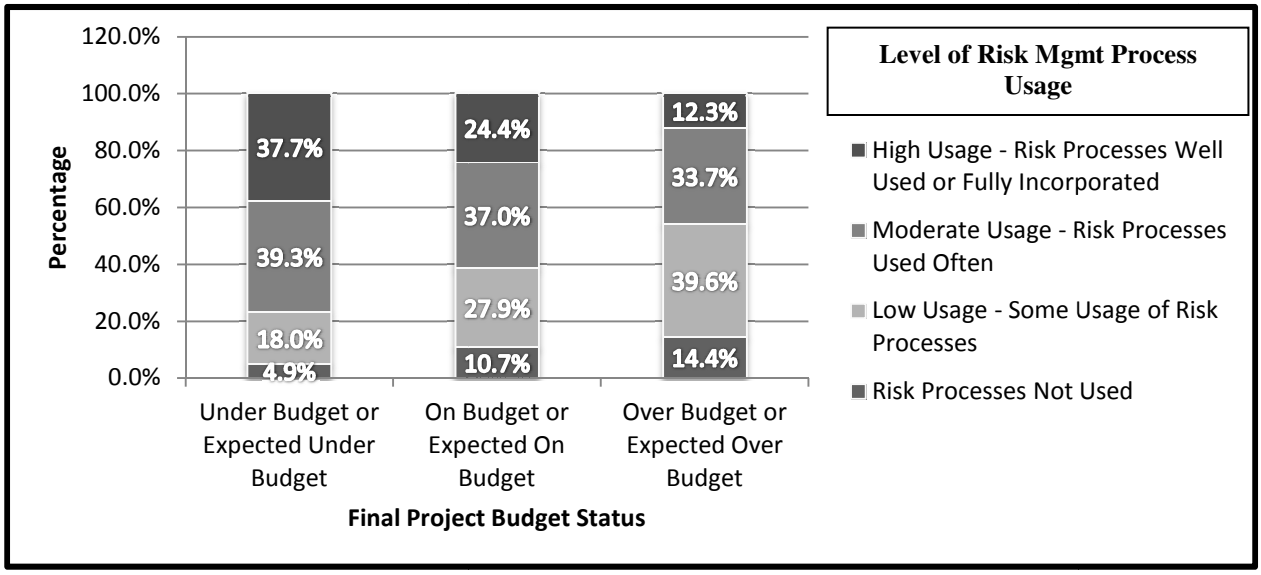


**Figure 1-Levels of Risk Management Usage by Final Project Budget Status Graph**

The graph in Figure 1 shows the percentage of participant responses for risk management usage levels and then grouped by budget status. Displaying the results leveled at 100% allows us to easily compare the levels of risk management usage across the three categories of budget status. The graph indicates under budget and on budget projects had a large percentage of "high risk process usage" for risk management processes (37.7% and 24.4% respectively) while over budget projects had the lowest level at 12.3%. It must be noted that only the "high usage" levels increased dramatically as project outcome improved. The moderate level of risk process usage remains relatively steady across the categories of budget status with a range of only 5.6. Therefore, I propose, only the level of "high usage" for risk management processes is important to successful project outcomes for budget, i.e. on budget or under budget. Additionally, the level of "high risk process usage" is positively correlated with meeting the project budget target since risk process usage increases as the final project budget status improves. This result was also supported by the Spearman Rank Correlation Coefficient which was negative. These results may have occurred because when budget pressures increase, a project team which very actively uses risk management processes is also likely to have a contingency plan in place with sufficient reserves set aside to help them achieve a successful project outcome in the budget area.

The Chi-square test for final project functionality status indicated a relationship existed with a significant p-value of 0.017. A Spearman Rank Correlation Coefficient was calculated to measure the strength of the linear relationship between the two variables which was good. All seven of the Likert scale options for level of risk management process usage were part of the

Spearman calculation, instead of the combined four. The result was -0.220 and was significant at the 0.01 level. The graph in Figure 2 shows a more dramatic difference in the "high risk process usage" across the three project functionality/quality status levels. "High risk process usage" was extremely small (6.6%) on projects that did not meet functionality, however, for those that met or exceeded functionality the percentage for "high risk process usage" was much larger at 24.4% and 21.8% respectively. It is unexpected that the level of high risk process usage is higher for projects that met functionality than for those that exceed functionality; however, that difference was minimal (2.6%). Again, I propose, only the level of "high usage" for risk management processes is important to successful project outcomes for functionality, i.e. met functionality or exceeded functionality. Unlike the budget performance measure, the percentage of "high risk process usage" did not steadily increase as functionality performance improved, instead, the percentage of projects at the high usage level was very similar on projects that completed on target for functionality or exceeded functionality. However, there was still a positive relationship between the level of risk management process usage and successful project outcomes for functionality. These results may have occurred because functionality, although, important, is sometimes more flexible in determining the success of project outcome. For example, occasionally unmet functionality (specific requirements) can be relocated to another project or another phase of the same project without the original project being considered a failure.

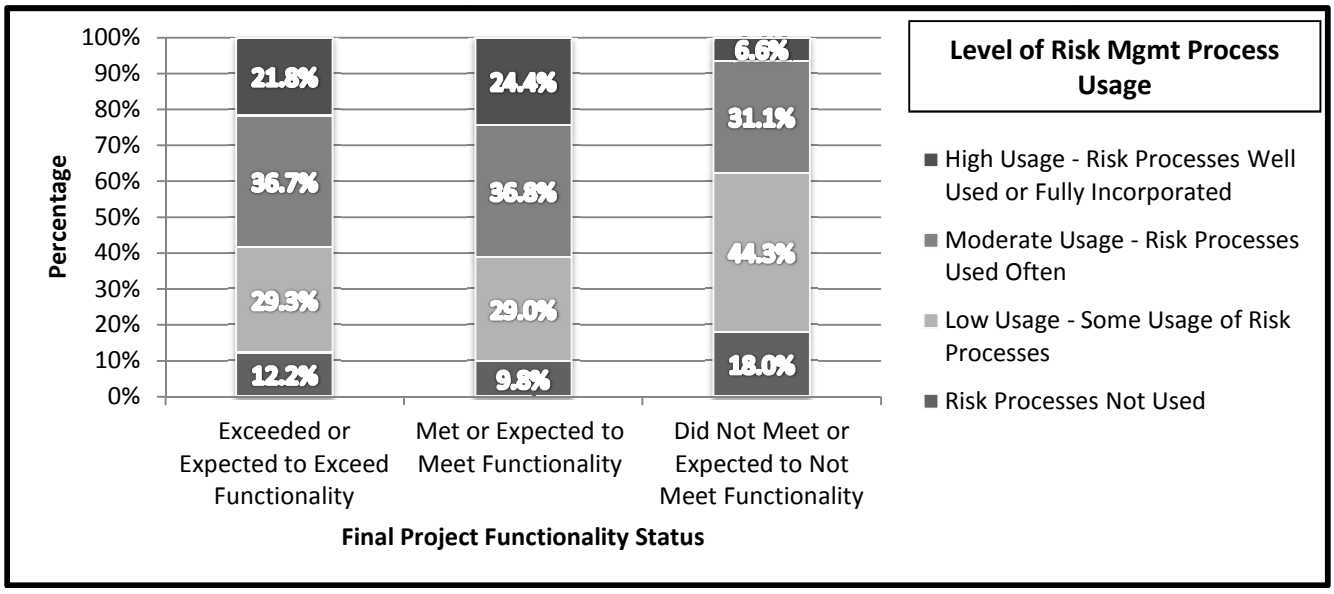


**Figure 2-Levels of Risk Management Usage by Final Project Functionality Status Graph**

## CONCLUSION

This paper sought to shed light on the relationship between levels of risk management process usage and successful project outcomes. An analysis of survey data from 557 project management practitioners was conducted to answer the research question: How does the level of actual risk management usage impact project outcome? A correlation analysis was performed to test the following hypothesis: *H1 A positive relationship exists between the level of actual risk management process usage and successful project outcomes as measured by project performance attributes on virtual IS/IT projects.*

The results of the correlation analysis indicated a relationship does exist when successful outcome is measured by budget or functionality. Both sets of Chi-square tests showed significant results, however, the relationship between levels of risk management process usage and project budget targets were the most interesting. The results for both budget and functionality measures indicated only high usage of risk management processes are important to successful project outcomes. These results were not expected, instead, common knowledge would have us believe performing any amount of risk management processes would lead to more successful projects. However, instead, the results suggest moderate to low usage of risk management processes is not necessarily positively related to successful project outcomes especially since the level of moderate usage was fairly consistent across all final budget results. Additionally, for the budget performance measure, it was shown that final budget performance improved as the level of risk management process usage increased.

In addition to the correlation analysis, an analysis of specific basic risk management processes was evaluated using yes/no questions and helped to shed light on an answer to the research question. Three questions addressed different areas of the risk management process and led to the conclusion that two risk management processes, i.e. risk assessment and risk control are performed by a majority of project management practitioners while a little more than half of the participants (55%) create the all-encompassing risk management plan. Although these are good percentages, the difference in the percentages is somewhat unexpected. The percentages suggest the possibly more well-known processes are commonly used but the more thorough; overall risk management plan is less commonly used. If project management practitioners perform *some* but not *all* risk management process components they may be acting in more of a reactive mode instead of proactive which can negatively impact project outcome.

Two conclusions were proposed from the results. First, only the "high usage" level of risk management processes is important to successful project outcomes for both budget and functionality while moderate levels show little difference in impact. Second, incomplete risk management processes can lead to failure which can then lead to poor project outcomes.

There are a few limitations to this research study such as lack of a common definition for risk management process usage among practitioners; i.e. which components are performed and what each component encompasses. The large percentage of participants who were PMPs is somewhat of a limitation and may affect generalizability of the results. However, it is likely this type of participant was more knowledgeable about definitions of risk processes allowing them to answer the questions more accurately. Finally, limitations are inherent due to participants self-selecting to take the survey and then self-reporting on their own actions within a project.

Future research is suggested based on the conclusions to validate the findings. There appears to be a need for additional research into project management practitioner usage of risk management components and their perceptions of how much risk management should be performed.

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