

KEYWORDS

Project Management • Risk Management

• ABSTRACT •

The purpose of this article is to examine the current state of project management risk assessments and extend the evaluation process to a higher level of multi-dimensional scrutiny. It does this by combining several popular risk management perspectives into a higher level of complexity. In doing so, the evaluation can provide additional insight to the risks associated with a particular project. The scope of this article confines itself to application in the project management field.

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INTRODUCTION

The purpose of this article is to discuss and propose a new four-dimensional framework to guide the risk management planning process. The methodology behind this article is by an associative extension of commonly accepted and proven project risk techniques and extended their use in a new framework. This framework will provide a detailed list of potential risks for the project manager to use as a starting point in evaluating their project's risks. The benefits of this framework are to; better organize, simplify, speed-up and improve the quality of their risk assessment process. This framework will speed up the evaluation and help ensure a thorough assessment by providing a starting point, an identification of likely risks in each category, along with the four dimensions discussed below.

Determining project risks is one of the most important jobs of the project manager (PM). It is here that they begin to consider, document and evaluate the risks of their project and this should be done at the very beginning of the project to help ensure project success (Zwikael1 & Ahn, 2011).

For purposes of this article, a definition of essential terms is needed. In this perspective:

- Risk – uncertain events that may result in some negative result or loss to the project
- Opportunity – uncertain events that may result in some positive result or gain to the project

Based on the above, the key term and concept is that of uncertainties. That is, unplanned events or situations presenting themselves during the execution of the project.

BACKGROUND

For very simple projects, naturally, not much time needs to be spent in this effort; just identify a few of the most critical risks, evaluate them, devise mitigation strategies and then move on (Bowers & Khorakian, 2014). However, this article is written for those projects that are complex in nature and are fraught with several types of risks. In the case of very large projects, this is especially true (Thamhain, 2013). For instance, projects involving newer technologies, and those projects that involve other factors, such as projects done overseas with very diverse cultures and laws, than one's country.

One other very important justification for using this proposed framework is the human factor. When a person begins the process of evaluating risks, their firsthand experiences and education will guide their thinking. For instance, a person with a strong background in finance may tend to orient their thinking towards cost-related risks, at the expense of other risks. Likewise, a person with a strong technical background may heavily orient their risk assessment to the technical risks at the expense of cost risks.

Another Look at

PROJECT RISKS. A MULTIDIMENSIONAL PERSPECTIVE

Typically, risk management planning is done during the initial stages of the project while the PM does the other planning components, such as planning for communications, procurement, budgeting, quality management, etc. So, during this time the PM, and their core staff must consider all facets of the project during this learning process. These planning components all tie into one another. They should be thought of as linked planning components to an overarching project plan (Kutsch, Denyer, Hall, & Lee-kelley, 2013). According to the Project Management Body of Knowledge (PMBOK), the risk management planning process follows this basic path (Figure 1):



Also, according to the PMBOK, Inputs to the risk planning process include:

- Project scope and schedule
- Cost management plan
- Communications plan
- Enterprise environmental factors
- Organizational process assets

With these in hand, one has a very excellent base of information with which to conduct this analysis. However, as good as these elements are, they may leave the risk planner with precious little

specific information on identifying the unique risks for their project (Fabricius & Buttgen, 2015). This article presents a framework with which to use to help the PM and risk planner be creative in their effort to identify specific risks.

LITERATURE REVIEW

Project risk management has been found to moderate the relation between risk levels and project success (Zwikael1 & Ahn, 2011). In fact, their study indicates that even moderate amounts of risk planning are found to be sufficient to mitigate negative risk levels.

This relationship was further amplified when complex projects are involved. It has been found that almost one-half of the serious risk events had not even been detected before they seriously impacted the project (Thamhain, 2013). It was also found that risk events are handled much more effectively when found in their initial stages and when a cross-functional team approach is

used to respond to those risks.

Conversely, it has been found the risk manager’s disengagement from risk manager practices can result in risk events in IT projects (Kutsch, Denyer, Hall, & Lee-kelley, 2013). The study mapped backward from significant risk events and looked at risk management practices; It was found that typically assessed risks remained untreated as had been planned.

Mapping tools used in conjunction with projects have been proposed before. It has been suggested using a 5-point Likert scale by subject matter experts (SMEs) to evaluate project risks (Yildiz, Dikmen, & Birgonul, 2013). Even with using SMEs, it was noted the sensitivity to risk attitude is not easily overcome.

It has also been suggested that a simulation-based risk model can be used to assess project risks due to the growing complexity, uncertainty and more stringent constraints seen in many current projects (Fang & Marle, 2012). Due to the greater complexity of some projects, project managers may need more robust tools to establish risk priorities.

It is also asserted that overconfidence can lead to a biased risk assessment. (Fabricius & Buttgen, 2015). This study shows that overconfidence can lead to a reduction of risk awareness of a project. This factor may be driven by the assumption of project success reduces the need for extensive project risk assessment.

One study on innovation projects noted the high failure rates in these types of projects and the better risk management could increase the success rates (Bowers & Khorakian, 2014). This study proposed the combining of a generic innovation process with traditional project risk management techniques.

One aspect of limitations of current project risk literature relates to the scalability of the assessment (Zoltán & Tamás, 2014). According to these authors, the problem with scalability is that as the later events in a project may not have the same set of risks as risks that exist in the earlier stages of the project.

The Dempster-Shafer Theory of Evidence (DST) has been proposed as a basis for a spreadsheet-based decision support system (Taroun & Yang, 2013). One especially useful feature of this framework is that the lack of perfect and full knowledge is not a hindrance in the assessment, but, that lack of information of risk elements is transparent in this framework.

Any risk assessment tool should can handle sev-

eral types of project. For example, in one study in the construction business, three diverse types of construction types were found to have diverse types of threats (Tran & Molenaar, 2014). This situation resulted in the identification of different risks, and when risks were similar, their priority was different, contingent about the type of construction project.

The idea of integrating the concept of social, technical, economic, environmental and political has been proposed before (Boateng, Chen, Ogunlana, & Ikediashi, 2013). This proposal, likewise, sees that some projects will be exposed to these factors as well and that these need to be quantified. This study went on to elaborate in even more detail on the STEP factors, with identifying by endogenous and exogenous factors. In a variation on this theme, this author used these additional factors as well in the proposed model.

One study noted the project risks in IT projects are often dependent on one another and that by clearly identifying these dependencies up front in the project, risks may be better managed (Kwan & Leung, 2011). The study proposed and expanded risk management methodology to include risk dependency issues.

After identifying the project risks and opportunities, a project manager must decide on which approach to use to manage the risks. These strategies provide structure for the project planner (Hillson, 2001). With this common frame of reference, a commonality of understanding can make the risk/opportunity management more effective.

CONCEPT PROPOSAL AND JUSTIFICATION

This article proposes the expansion of the current frameworks used in assessing project risk management, to the four dimensions illustrated below. The justification is that some projects, due to their complexity, may be subject to a larger variety of risks, many of which may be unfamiliar to the project manager. This framework can provide a multi-dimensional starting-point from when to consider all the unique factors of their project (Tran & Molenaar, 2014). This framework is intended to be used for complex and larger projects and not for routine projects with a simple set of project risks.

THE FIRST DIMENSION – SCOPE-COST-SCHEDULE

At the beginning of the risk management process, the planner needs to ask firstly, ‘The risks of what?’ Typically, the answer to this question is, ‘The risks to the scope, cost and schedule (SCS) of the project.’ This answer is very useful in that projects, and their project managers, are often evaluated along these three dimensions. So, this dimension, the performance elements of a project, the Scope-Cost-Schedule dimension, is part of the first part multidimensional framework and evaluation process. In this instance, the PM will be asking themselves more specific questions about whether risks are present in these three dimensions to ensure that have an all-inclusive list of risks to the project (Fang & Marle, 2012). This situation is working on the premise that the risks to the project’s scope may have nothing at all to do with the project’s cost so, the PM needs to ensure they at least consider each of the three elements on its individual merit. This way, the PM ensures clarity of thought and precision for identifying risks.

THE SECOND DIMENSION – SOURCE OF THE UNCERTAINTY

However, just using the SCS dimension to evaluate risks provides the PM with only a very high-level and generic way to look at risks so, another dimension will be added to help amplify and provide further guidance in risk identification. The next dimension proposed in this new framework will be the source of the risk; whether the source of the risk is internal or external to the organization. Why does this matter? By carefully considering each source on its merit, then the risks can be more easily understood. For example, costs are often identified as a risk in projects. However, consider that there two very different drivers behind the cost risk, one that emanates from inside the PM’s own organization, and cost risks that emanate from outside the PM’s organization.

The reason for the importance of this dimension, the source of the uncertainty, is that the source must be clearly understood as the actions taken because of this evaluation may be very different from an uncertainty that emanates from within the company than from one that emanates from outside the company.

THE THIRD DIMENSION – THE PEST FRAMEWORK

This dimension is a new aspect proposed by this paper. The intent of this part of the assessment is to expand and drill down into more detail as to whether risks or opportunities exist along a spectrum of views.

The PEST analysis in not a new technique but, its use in project risk management is new. A brief review the PEST technique follows (Boateng, Chen, Ogunlana, & Ikediashi, 2013). The four dimensions of a PEST analysis results in the below four categories for project risk assessment:

- Political/legal – this factor relates to government, at all levels and laws or regulations they may dictate. The legal is related in that the legal dimension is often associated with the laws of a community, state or central government.
- Economic – this factor relates to the economic dimension, and could be either internal or external to the organization.
- Socio-human – this could be either in a wider, community and cultural sense or, on the individual level such as personal competencies of the team members.
- Technology – this factor can relate to the relative maturity and complexity of the technologies involved in the project.

In assessing the PEST dimension, it must be understood that there is no mandate that there are in fact, uncertainties in every one of the PEST categories. The intent here is for the PM to at least ask themselves the question of, ‘Do I have this uncertainty in my project?’ If they do, then they will have to identify the uncertainty specifically, categorize it as a risk or opportunity, and then, score its likelihood of occurrence.

THE FOURTH DIMENSION – THE IMPACT OF THE UNCERTAINTY

This final dimension asks the planner to consider the uncertainty and its impact on the project. Although uncertainty is usually associated with some negative impact, also known as risk, there are times when an unplanned for event or situation presents itself, and that event turns out to be an opportunity for some improvement in the scope-cost-schedule of the project. For example, there are times when an initial task duration was based on an estimated level of work effort. However, it is well known that as an individual repeats a task during a project, they are likely to get better at doing that task, at times much better and

faster. This speed-up of work represent the concept of the learning curve applied to a project. Therefore, this unplanned increase in work efficiency will result in a reduction in task duration. This speed-up can have a downstream impact in that future tasks can be started earlier than planned. As a result, the project planner now has an opportunity to have a more favorable scope-cost-schedule result and should change plans accordingly.

So, this means that when a planner is considering uncertainties associated with the project, then they should consider if the uncertain will result in a positive impact or a negative impact, that is, the uncertainty may result in an Opportunity, if positive, or a Risk, if negative. This factor is the fourth dimension of the four-dimensional risk management planning process.

However, this fourth dimension does not imply that for each project uncertainty that there will be both a risk and an opportunity, only that the project planner should consider whether the impact results in a risk or an opportunity. Typically, an uncertainty will only be one or the other although it is possible that an uncertainty can result in both a risk and an opportunity. For instance, going back to the example above where the learning curve resulted in the early completion of a task, that is certainly an opportunity for the PM to advance the schedule of the future tasks. However, this could also be a risk in that the ‘shifting left,’ that is advancing the future tasks, may present problems as well. What if the resources that were planned, are not available early? What if there are very costly expenses, such as materials, that were planned to be used next month, but the advance of the schedule requires these expenses early? Is the company’s comptroller ready for this unexpected expense?

THE ROADMAP FOR A MULTIDIMENSIONAL RISK ASSESSMENT

Figure 2 is a flow chart of the process using the four dimensions discussed above. It is important to understand that the proposed framework provides only a starting place for the deliberation of uncertainties in the project. The framework is only a generic template and should be used by the planner to at least consider the multidimensional aspects of the risks in their project. It would seem highly unlikely that a project would have the exact risks as noted on the template as the uncertainties that are given in the template are only meant to trigger a determination by the planner. They may feel that not all areas in the PEST evaluation, for example, may need to be considered, in which case the project planner should skip over using the PEST dimension for their project risk evaluation. The value of this exercise then, is that at least the PEST dimension was considered before being eliminated. Alternatively, they may feel that a project has several external, economic factors only, and these should be given the key consideration during the risk assessment, and internal factors are not considered key factors.

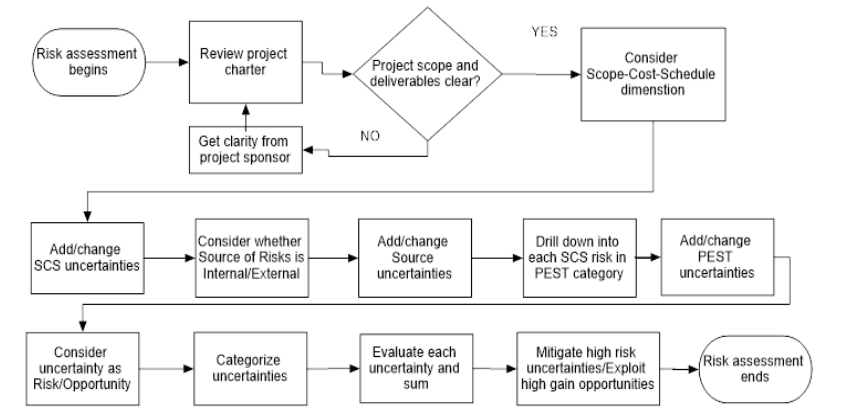


FIGURE 02. Roadmap for Multidimensional Risk Management Process

THE MULTIDIMENSIONAL RISK ASSESSMENT (MRA) FRAMEWORK IN PRACTICE

The first step in understanding and using the MRA framework is the rating scale to be used by the project planners, as shown in the scoring guide Table 1 (Yildiz, Dikmen, & Birgonul, 2013). This guide presents a very wide range of definitions from the very minor risks/opportunities, to very serious risks/opportunities, confronting the project manager (Zoltán & Tamás, 2014).

Score	Scoring criteria
1	Slight impact on risk/opportunity profile of this project
2	Noticeable impact on risk/opportunity profile of this project
3	Major impact on risk/opportunity profile of this project
4	Slight impact on risk/opportunity profile of this program/component of the company
5	Noticeable impact on risk/opportunity profile of this program/component of the company
6	Major impact on risk/opportunity profile of this program/component of the company
7	Slight impact on risk/opportunity profile of the entire company
8	Noticeable impact on risk/opportunity profile of the entire company
9	Major impact on risk/opportunity profile of the entire company

TABLE 01. Scoring Criteria Definitions

This scoring guide provides sufficient range of scoring from the very minor risks/opportunities to those that could have a major impact on the firm. It is also quite possible that many of the risks/opportunities show in the MRA example template shown below will receive a 0 for being not applicable for a project.

Table 2 is a notional example of the MRA framework in practice. The narrative descriptions in each of the below cells are only meant to be used as a starting guide for discovering the unique risks and opportunities of a project. The project planner's task is to at least consider the risk/opportunity presented in each cell. If it does not apply, delete the text in the cell, score the block a 0 and move on to the next cell. If the risk/opportunity does apply, change the wording if needed, score the cell and move on to the next cell to the table is complete.

At this point, the worksheet is divided into two parts, an assessment of the risks and assessment of the opportunities. The rationale behind this split is that the nature of the management actions taken to mitigate risks are very different from the management actions taken to exploit opportunities. This will be addressed later (Kwan & Leung, 2011). A summary of the above risk data points indicates the following:

	Summary Risk Assessment							
	Internal				External			
	Int Pol	Int Eco	Int Soc	Int Tec	Ext Pol	Ext Eco	Ext Soc	Ext Tec
Scope	1	1	4	2	4	2	3	3
Time	1	2	1	3	3	4	5	7
Cost	2	2	1	3	3	5	4	6

TABLE 03. Summary of Risk Data Points

A summary of the above opportunity data points indicates the following:

	Summary Opportunity Assessment							
	Internal				External			
	Int Pol	Int Eco	Int Soc	Int Tec	Ext Pol	Ext Eco	Ext Soc	Ext Tec
Scope	0	4	3	0	3	2	3	4
Time	0	0	7	3	4	3	5	3
Cost	3	7	0	3	2	5	6	2

TABLE 04. Summary of Opportunity Data Points

To read the radar charts below, notice the abbreviations for each of the PEST categories, to clearly distinguish between the Internal and the External factors. These Summary Assessments can be shown graphically for a clearer picture as shown Figure 3 e 4.



FIGURE 03. Summary Risk Assessment Radar Chart



FIGURE 04. Summary Opportunity Assessment Radar Chart

The value of these last two graphics is that they gave a quick pictorial representation of the relative criticality of the various risks and opportunities. In the above Risk Assessment, it can be quickly seen that there is an external technical factor that presents the greatest from to the Time element of the project.

The Opportunity Assessment, on the other hand, shows that there are two Internal elements that will present the greatest opportunity for exploitation; Time and Cost.

THE ACTION PLAN

After identifying the high-priority risks and opportunities, the final part of the project planners job is to determine the approaches to use for implementing their risk/opportunity action plan (Hillson, 2001). Table 5 are approaches commonly used for this purpose:

CONCLUSION

The article proposes an extension of current project risk evaluation techniques using a multi-dimensional approach. It uses a template which is easily constructed using COTS spreadsheet software to help structure the information and perform basic mathematical operations (Taroun & Yang, 2013). The definitions provided in the above example are not meant to be prescriptive but, provided the

	INTERNAL				Scope	Time	Cost	EXTERNAL				
	Pol/Legal	Economic	Social/Human	Technical				Technical	Social/Human	Economic	Pol/Legal	
Risk	-Management changes direction and project is no longer in line with long term objectives changing scope	-Budget cut or overruns for project limiting scope	-Not enough talent, quality or quantity, in company for scope of work	-Unforeseen technical difficulties on project team limiting completion of scope				-Unforeseen technical difficulties in supplier marketplace limiting completion of scope	-Not enough talent, quality or quantity, in job market for scope of work	-Client funding shortfalls call for reduced scope	-Unforeseen pol/legal events in business sector/country limiting scope	Risk
Sub-total	1	1	4	2	8	20	12	4	2	3	3	Sub-total
Opportunity	-Management raises priority of project to gain recognition/ develop new business markets or technologies based on scope of project	-Project solutions by team providing scope deliverables under budget	-Learning curve shorter than anticipated making tasks easier to complete	-Smarter solution to project providing expanded scope of capabilities for client				-Client may want to expand scope of project based on early successes in project	-Project approach of work finding wide acceptance outside company (community/market segment) leading to positive image for company	-Client wants to increase scope and willing to pay more	-Follow-on projects/ customers using same/similar deliverables as used in current project	Opportunity
Sub-total	0	4	3	0	7	19	12	3	2	3	4	Sub-total
Risk	-Other projects competing for resources	-Behind schedule calls for crashing tasks raising risks and costs	-Learning curve for project team members longer than anticipated	-Unforeseen technical difficulties on project team causing delays				-Unforeseen technical difficulties from project suppliers/ vendors causing delays	-Inability of company to recruit external talent in timely manner for project	-Depressed external economic environment delayed slowing down schedule	-Delays in schedule due to legal or regulatory obstacles	Risk
Sub-total	1	2	1	3	7	26	19	3	4	5	7	Sub-total
Opportunity	-Can start project/ tasks earlier that anticipated	-Tasks ahead of schedule leading to possibility of release of project employees early	-Early tasks complete can release employees to other tasks	-Smarter way to do project found by project team saving time in task duration				-Smarter way to do project found by project supplier/vendor saving time in task duration	-Ability of company to recruit external talent in timely manner for project	-Possibility of bonus from customer for early completion	-Relaxation of legal/regulatory guidelines that speed up tasks	Opportunity
Sub-total	0	0	7	3	10	25	15	4	3	5	3	Sub-total
Risk	-Company financial situation changes making project funding problematic	-Unplanned cost increases for labor and non-labor resources in company driving up project costs	-Extra expenses due to longer training needed for project team	-Unforeseen technical difficulties by project team slow progress and raise costs				-Unforeseen technical difficulties by suppliers/vendors slow progress and raise costs	-Extra expenses due to difficulty in acquiring skills in job market for	-Inflation in economy driving up costs over budget	-New/changed governmental regulation/law adding unplanned dollars to project	Risk
Sub-total	2	2	1	3	8	26	18	3	5	4	6	Sub-total
Opportunity	-Company financial situation changes making project funding assured	-Unplanned cost decreases for labor and non-labor resources in company driving down project costs	-Reduced expenses due to shorter training needed for project team	-Expanded scope due to technical efficiencies will justify price increase				-Unforeseen technical benefits by suppliers/vendors increase progress and lower costs	-Reduced expenses due to ease in acquiring skills in job market for	-Deflation in economy driving down costs below budgeted costs	-New/changed governmental regulation/law reducing costs of project	Opportunity
Sub-total	3	7	0	3	13	28	15	2	5	6	2	Sub-total

TABLE 02. Notional example of the MRA framework

project planner with a basis to consider risks unique to their project. This framework encourages a deliberate and structures review of a project's risks/opportunities to help ensure the project's success. ♦

To manage Risks		To manage Opportunities	
Avoid	Taking actions to remove the underlying cause of the risk to prevent its occurring	Exploit	Take actions to help to ensure that the opportunity in fact does occur
Transfer	Taking actions to move the responsibility of responding to the risk to another party	Share	Collaborate with some other entity, either inside or outside of the organization to share in the work.
Mitigate	Taking actions to reduce the likelihood of occurrence and/or the effect of the negative risk, should it occur.	Enhance	Taking actions to increase the magnitude of the positive outcome of the opportunity occurring
Accept	Taking no actions shown above to prevent the risk from happening by readying a response in case it does occur	Ignore	Taking none of the above actions but waiting for the opportunity to occur

TABLE 05. Strategies to Manage Risks/Opportunities

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