

Project Workflow Management¹

Risk Management Process

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By Dan Epstein

Note: *This article is based on the book [Project Workflow Management: A Business Process Approach](#) by Dan Epstein and Rich Maltzman, published by J Ross Publishing in 2014. The book describes PM Workflow® framework, the step-by-step workflow guiding approach using project management methods, practical techniques, examples, tools, templates, checklists and tips, teaching readers the detailed and necessary knowledge required to manage project “hands-on” from scratch, instructing what to do, when to do and how to do it up to delivering the completed and tested product or service to your client. This article is the third article in the series [Project Workflow Management](#).*

The project workflow framework is the result of Dan’s research into the subject, having the following objectives:

- 1. Create the virtually error-free project management environment to ensure significant reduction of project costs*
- 2. Reduce demands for highly qualified project managers using the step-by-step workflow guiding approach.*

While PM Workflow® is the continuous multi-threaded process, where all PM processes are integrated together, this article will attempt to describe the Risk Management group of processes as a stand-alone group of processes that can be used independently outside of PM Workflow® framework. It will be difficult in this article not to venture into processes outside of Risk Management, such as planning, quality, communications and other management processes, so they will be just mentioned. However, to get full benefit and the error free project management environment, the complete implementation of PM Workflow® is required. In order to understand how PM Workflow® ensures this environment, I strongly recommend reading my article [Project Workflow Framework – An Error Free Project Management Environment](https://www.projectmanagement.com/articles/330037/Project-Workflow-Framework--An-Error-Free-Project-Management-Environment) at (<https://www.projectmanagement.com/articles/330037/Project-Workflow-Framework--An-Error-Free-Project-Management-Environment>)

The article above provides the overview and explanation of how the project workflow framework works and achieves the established objectives.

For more information, please visit my website www.pm-workflow.com

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Purpose

The formal purpose of the Risk Management process is to ensure that all potential project risks (both threats and opportunities) are identified, their impact analyzed and risk management plans developed and implemented in order to eliminate or minimize the effect of threats and maximize the effects of opportunities on the project throughout its life cycle.

Since, by far, threats heavily outweigh opportunities in frequency and effect on projects and since the vast majority of your work as a project manager in the real world will be dealing with threats, the following description of Risk Management planning will deal only with negative risks, which you can read for the purposes of this article as “threats”.

Risk Management Planning provides a risk containment or response plan, which may change project estimates. Project risk is an uncertain event, which if it occurs, may have a negative impact on project deliverables in terms of the project cost, schedule and quality.

Risk Management consists of three elements:

1. *Risk Assessment, which is a process of identifying and analyzing risks.*
2. *Risk Response Planning, whose main purpose is avoiding or minimizing harmful effects of threats on project cost, schedule and quality. This will involve planning responses to high-scoring risks (those with high impact and probability) or reducing their probability and/or impact. It also includes responses to low and medium-scoring threats.*
3. *Risk Monitoring is the process of monitoring risk occurrence, adjusting the project plan for the response to each of the risks we have identified, and tracking the result of the risk response.*

When a risk occurs, it is initially treated as an issue. As described in the Issue Management Process section of the book, some of the issues require generating the project scope change request and treating the risk containment plans as scope changes in accordance with the Scope Change Control process section.

Risk monitoring is further described in the Construction Frame chapter.

Risk Assessment and Risk Planning Process Flow

The process of Risk Assessment and Planning is repeatedly executed many times during the project lifecycle. It is executed once before beginning of each project group of processes, called frames and also when significant project events happen during the project execution, such as major issues, large scope change requests or unsatisfactory project performance. By implementing the process, all significant threats should be eliminated or reduced to the level of low risks, because the project cannot start or continue when a high threat level challenges not only the project, but perhaps the entire organization. The process described here is executed in accordance with the risk assessment schedule, which is a part of the overall project schedule, and also if an additional risk is identified at any time during project execution.

The process flow is shown on Fig 6-1. The process consists of the following elements:

1. Identify potential risks (P1-1)
2. Determine probability of occurrence (P1-2)
3. Determine Maximum Loss Value of each risk (P1-3)
4. Calculate EMV (Expected Monetary Value) of each project risk (P1-4)
5. Develop risk response plan (P1-5)
6. Balance all acceptable project risks' EMV (P1-6)
7. Calculate total risk costs (P1-7)
8. Determine severity of each risk (P1-8)
9. Calculate each project risk rating (P1-9)
10. Balance all acceptable project risks' rating (P1-10)

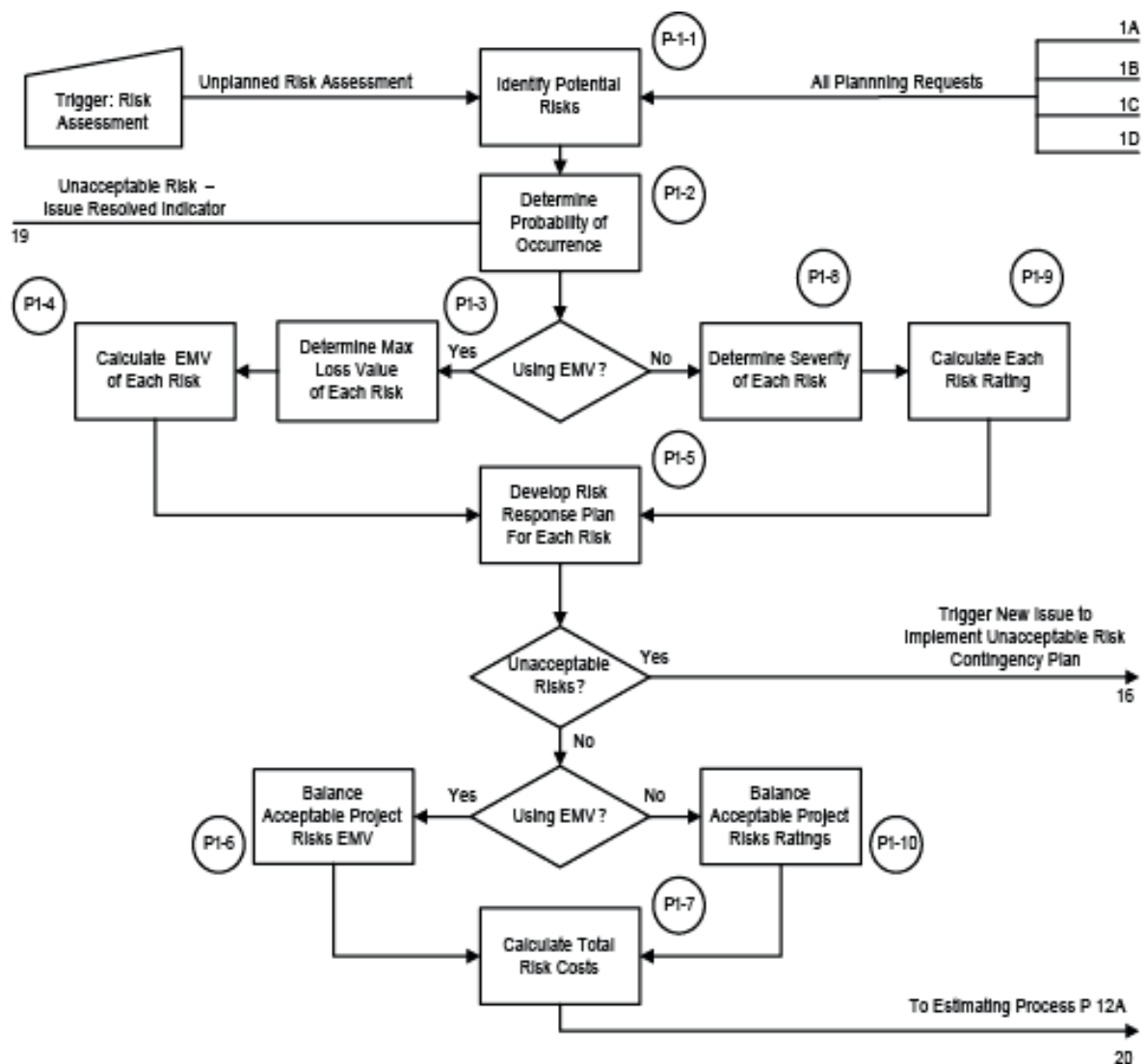


Fig 6-1

Risk effect may be calculated by using one of the following two methods:

1. Calculating project risk rating and converting it into percentage of the project cost. (P1-1, P1-2, P1-5, P1-7, P1-8, P1-9 and P1-10 processes).
2. Calculating the expected monetary value of risks in the project. (P1-1, P1-2, P1-3, P1-4, P1-5, P1-6 and P1-7 processes)

Processes P1-1, P1-2, P1-6 and P1-7 are common for both methods.

The process Identify Potential Risks (P1-1) starts when the risk assessment is triggered by one of the following:

- An outstanding project event, such as the unsatisfactory project performance or foreseeable future negative events.
- Every time the project process flow enters the Planning group of processes (Planning Frame), which happens when the request for planning one of the project frames enters the Planning Frame via entry points 1A, 1B, 1C or 1D, as well as when a large change request is triggered.

P1-1 process will identify all potential risks, as described in the corresponding section. When a list of project risks is assembled, the probability of each risk occurrence must be determined in the process Assign Probability of Occurrence (P1-2). It is necessary to rate the probability of each risk occurrence in a scale of 4: **L** for Low (less than 25%), **M** for Medium (25% to 49%), **H** for High (50% to 74%) and **E** for Exceptional (75% to 100%). (See description of P1-2 process below). When using EMV method, a person doing risk assessment will use numbers, rather than letters. Using approximate medium range (10%, 40%, 65% and 90%) for each of four ratings is usually sufficient, since it is almost impossible to rate it more accurately.

From this point, the two methods diverge. If the team at this point is not using EMV, the answer to the decision point question (**Using EMV?**) is NO and the next process executed is the process Determine Severity of Each Risk (P1-8). Regardless of which method is used first, the second method should also be used for verification.

Risk Rating Method Process Flow

After determination of risk probability and answering NO to the decision point question (**Using EMV Method?**) the process flow enters the process **Assign Severity to Each Risk** (P1-8), where severity is assigned on a scale of 4: **L** for Low, **M** for Medium, **H** for High and **E** for Exceptional - to be assessed assuming that the risk occurs. (See description of P1-8 process for details). By "risk severity" we mean the potential impact on the project's objectives of each risk in the ranking scale provided above.

Having the probability of risk occurrence and the severity, the overall risk ratings can be calculated in the process Calculate Project Risk Rating (P1-9). Risk ratings will be calculated on a scale 1 to 4 (L, M, H and E). The method is described in the corresponding section for the P1-9 process.

Now, when risk ratings are calculated, a risk response plan for each risk will be developed in the process Develop Risk Response Plan (P1-5), which is common for both Risk Rating and EMV

methods. There are four types of risk responses: Avoidance, Transfer, Mitigation and Acceptance. Details are provided in the description of P1-5 process. After this process is complete, plans to eliminate or convert unacceptable risks (most of medium and all high and exceptional risks) to low risks are developed. The process flow reaches the decision point (**Unacceptable risks?**). If there are unacceptable risks, this will trigger a new issue for each risk via exit point 16, which must be resolved in order to implement plans for elimination or reduction of those risks to low level. Some of those issues will generate scope change requests, as shown in the Issue Management chapter of the book. Those plans must be implemented before going on with the project execution. All exceptions from this rule must be specifically authorized by both delivery and business management after being warned of the danger doing so. When the unacceptable risk is converted to the acceptable one during an issue resolution or scope change, the indication of the resolution comes back via entry point 19 to the process P1-2 and the risk assessment process starts all over again.

When all risks have responses which make them acceptable, the process flow enters the decision point (**Using EMV?**). Since the risk rating method is used, the answer is NO. Assuming that at this point only the low rated risks are left, the overall cost of all acceptable low project risks remediation efforts will be calculated in the process Balance Acceptable Project Risk Rating (P1-10) as described in the corresponding section.

The cost of risk remediation efforts, plus a margin (also known as a contingency reserve) for unknown risks will be added to project estimates, as described in the Add Cost of Risks to Estimates (P1-7) section. The process flow goes to the Estimating process P12A which is described in the book as well as in my article at the following address: <https://pmworldjournal.net/article/project-estimating-process/>

Expected Monetary Value Method (EMV) Process Flow

EMV is a statistical assessment of project losses due to risks. While it is not possible to predict accurately the final cost of risks, this method is more accurate than the Risk Rating method, because instead of 4 levels of severity, the EMV method actually calculates the monetary value of risks in monetary units (US Dollars, Euros etc.) However, in order to achieve that accuracy, this method requires more effort and is more difficult to implement. Decision Tree Analysis may be used for analysis of complicated risks in large projects with many possible remediation options and branch points, analyzed before selecting the best option.

After the execution of P1-1 and P1-2 processes completed, which are common for both Risk Rating and EMV methods, all risks are identified and the probability of their occurrence is expressed in percentage points.

The process flow now enters the process Determine Maximum Loss Value (P1-3). Here the maximum loss value of each risk is calculated in monetary units. (See description of P1-3 process below). The next process executed is Calculate Each Project Risk EMV (P1-4). The method is described below. The project flow enters the Develop Risk Response Plan (P1-5), which is common for both Risk Rating and EMV methods, where plans are developed for each risk identified. The process described in the Risk Rating method section is repeated to the point where the decision point question (**Using EMV?**) is encountered. Since the answer is YES and

assuming that by now only the low risks are left, the overall cost of all acceptable low risks remediation efforts will be calculated in the process Balance Acceptable Project Risk EMV (P1-6), as described in the corresponding chapter.

Those costs of risk remediation efforts, plus a margin for unknown risks will be added to project estimates, as described in the Add Cost of Risks to Estimates (P1-7) chapter. The process flow goes to the Estimating process P12A via exit point 20.

Identify Potential Project Risks (P1-1)

This process is used in both Risk Rating and EMV methods. There are known fixed lists of project risks in every business field. Your organization may have templates provided by a PMO (Project Management Office). Using those templates, and taking advantage of past project wisdom will greatly simplify risk assessment. In addition, there will be other risks, specific to each particular project – so don't stop at the use of templates.

The following is a basic list of risk *areas*, or categories, which may be used for small to medium projects in the field of software, electrical/electronic and mechanical engineering.

- Business requirements
- Project complexity
- Nonfunctional requirements
- Delivery team experience with similar projects
- Delivery timeframe
- Project estimating
- Monetary exchange rates
- Environmental regulations
- Resources
- Client participation
- Relationship with client
- Contract elements
- Contract type
- Supplier or contractor issues
- Quality Management processes
- Cost structure
- Pricing practices
- Integration with other projects
- Project Management and established PM processes

Each area contains at least one risk, but it may also contain several definitions of that risk, one for each level of severity. The definitions applicable to your project should be selected. For example, the business requirements area risk (before the Project Planning starts) may have the following risk definitions identified:

1. *Business requirements are completely documented and signed off. Very few changes are expected.* This is obviously a low severity risk (Scenario 1).

2. *Business requirements only partly documented. Moderate level of changes may be expected.* This is a medium severity risk (Scenario 2).
3. *Business requirements are not documented or not signed off and expected to be unstable.* This is a highest possible risk severity, because the lack of the documented Business Requirements puts the successful implementation of the project in doubt. This is a high severity risk (Scenario 3).

Another risk area, Project Complexity, may have three risk severities identified in example 2:

1. *The solution or service is simple with no customization and no interface requirements.* This is low severity risk (Scenario 1).
2. *The solution or service has moderate complexity or requires modification or has one or two interfaces to other applications.* This is medium severity risk (Scenario 2).
3. *The solution is complex or requires customer specific functions or has more than two interfaces.* This is high severity risk (Scenario 3).

For the construction business, a good Risk Assessment source is the Project Risk

Management Handbook, Office of Statewide Project Management Improvement (OSPMI), 2007. Website: www.dot.ca.gov/hq/projmgmt

In addition to predefined risks, there certainly will be other risks in every project, which must be taken into consideration. It is always a good idea not just to have a risk name identified, but to have several possible risk definitions for different severities, as shown in the above examples. Remember to also look at your assumptions – these are often a rich source of risk identification.

Assign Probability of Each Risk Occurrence (P1-2)

This process is used in both the Risk Rating and EMV methods. In the examples above, using the Risk Rating method, the probability of occurrence of the Business Requirements risk is low (L) for Scenario 1, medium (M) for the second and high (H) for the third. This corresponds to the average occurrence of 5%, 20% and 40% for the EMV method, but the interim numbers are not used. When using the EMV method, the probability, after the analysis, is more accurate (See Risk Probability Quantification in Table 6-1):

Table 6-1 Risk Probability Quantification

Probability of Risk Occurrence	
Risk Rating Method	EMV Method
Low (5%)	0% to 10%
Medium (20%)	11% to 30%
High (40%)	31% to 50%
Exceptional (75%)	51% to 100%

However, it is not always possible to make several definitions for one risk. Thus, the reliance on certain material or technology, which is not yet available, but which is promised to be available on time, may not be a good idea, unless the general statistics for that specific supplier confirm

their reliability. If they keep their promise 40% of the time and there are significant verifiable statistics proving that, the chance of them failing to deliver on time is around 60%. The risk may be Late Delivery by Supplier and the probability of its occurrence is 60% for the EMV method, which corresponds to exceptional (E) probability of its occurrence in the Risk Rating Method.

Note: when identifying risks, we recommend that you use a risk statement with an if-then format that results in the effect to project objectives. For example, instead of just listing supplier delays as a risk, it is better to more precisely communicate the risk like this: “if the supplier fails to deliver the server on time, this will delay the beginning of the coding process, affecting our ability to meet the client’s schedule.”

Another method, which is somewhat similar, lists several options for each risk, as used in the Risk Assessment tool. For example, the Business Requirements Document is always a risk. To determine the level of risk, the following options may be offered:

1. Business Requirements Document is signed off. (Low risk)
2. Business Requirements Document is available, but not signed off by the deadline (High risk)
3. Business Requirements Document is not available and requirements are not complete by the deadline date (Exceptional risk)

Assign Maximum Loss Value to Each Risk (P1-3)

This process is used in the EMV method. As the name implies, this is the maximum cost of risk, if the risk occurs or, in other words, the severity of the risk in monetary form. This number depends not only on the risk, but also on the whole project. If the project cost is \$1M and the maximum penalty for failing to deliver the project on time is also \$1M, then in the worst case scenario, when Business Requirements are not documented or not signed off, but estimates are finalized, the maximum loss value may be as high as \$2M or even higher. Obviously, when the risk assessment is performed in accordance with the Risk Management process, the risk will never be accepted and this situation will not occur. If the project follows all processes presented in this book, the only acceptable risk scenario would be: “Business Requirements are agreed between delivery team and all business teams. All details are documented and signed off”. The quality management process will prevent the PM from going any further in the project if the Business Requirements Document is not signed off with notable exceptions, in which case the client takes responsibility for any Business Requirements issues. Therefore, the business requirements risk will be a low-severity risk and the maximum loss value will be in the range of 0% to 10% of the project cost, or in this case between 0 and \$100K. The EMV calculations will show later that the overall cost of risk will also depend on the probability of the risk occurrence. The cost of the late introduction of scope changes to the signed off business requirements will be fully covered in the Scope Change Control chapter (P7) of the book.

The maximum loss value of the above-mentioned Late Delivery risk must take into consideration the cost of the workaround or the cost of the alternative, including a possible redesign, as well as the additional time required to deliver the solution.

Determine Severity of Each Risk (P1-8)

This process is used in the Risk Rating method. As mentioned in the process flow paragraph, severity is assigned as L, M, H or E. The overall guideline is:

L is assigned when the maximum cost of risk is less than 10% of the project cost.

M is assigned when the maximum cost of risk is between 11% and 30% of the project cost.

H is assigned when the maximum cost of risk is between 31% and 50% of the project cost.

E is assigned when the maximum cost of risk is over 51% of the project cost.

Calculate Project Risk EMV (P1-4)

This process is used in the EMV method. Here, the EMV of every risk is calculated using the following formula:

$$\text{EMV} = \text{Probability} * \text{MaxLossValue}$$

Probability in this formula is the probability of risk occurrence, expressed in percentage points. MaxLossValue is the maximum loss to the project in monetary units if the risk occurs.

Using examples above for the Business Requirements risk, the worst case scenario will have probability between 50% and 100%, or 0.5 to 1.0 and the MaxLossValue is \$2M

The risk EMV will be between $0.5 * \$2M = \$1M$ and $1.0 * \$2M = \$2M$.

Note: Probability of 100% would mean, for example, expecting delivery from a vendor on time when you selected the vendor, but the vendor has already declared bankruptcy and there is no chance of getting any delivery.

If all processes are followed, then the probability of the Business Requirement risk occurrence will be low or less than 10% when the MaxLossValue at the low severity is \$50K (see description of PR3 process). The risk EMV will be $0.1 * \$50K = \$5K$.

Calculate Risk Ratings (P1-9)

This process is used in the Risk Rating method. There is no specific formula that we can use, but the empiric method offered below allows selection of the overall risk rating, based on its probability and severity of the risk. The intersection of probability and severity ratings will indicate the overall risk rating. The Risk Rating Method is displayed in Table 6-2. The alternate way to determine the overall risk rating is displayed in Table 6-3. The total project risk rating calculation and the corresponding costs are described below in the description of PR10 process.

Table 6-2 Risk Rating Method

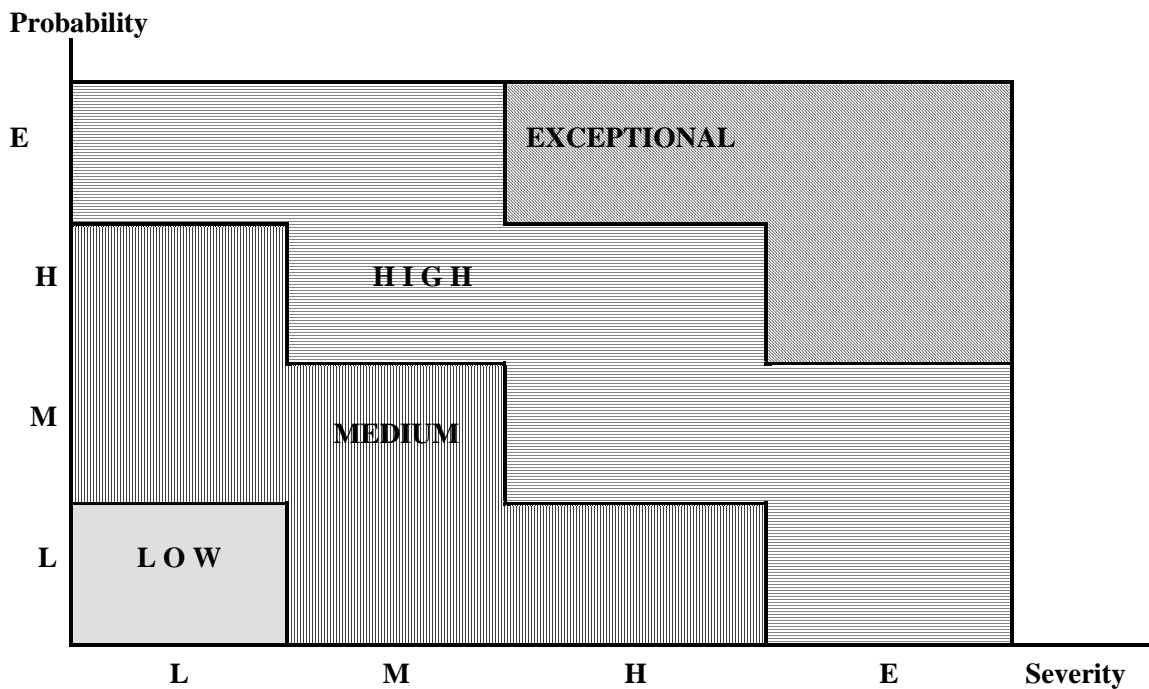


Table 6-3 Alternate Risk Rating Method

Probability	L	L	L	L	M	M	M	M	H	H	H	H	E	E	E	E
Severity	L	M	H	E	L	M	H	E	L	M	H	E	L	M	H	E
Risk Rating	L	M	M	H	M	M	H	H	M	H	H	E	H	H	E	E

Using Monte Carlo Analysis to assess project risk

Although a detailed review of this technique is outside the scope of this book, we felt that at least a basic understanding of this technique would be helpful. Monte Carlo Analysis is used in commercial Risk Assessment tools, and in very large mechanical, aeronautical, military and other projects. It is rarely used in the electronics and software daily project activities due to its high overhead.

Monte Carlo analysis involves determining the impact of the identified risks by running computer simulations – repeated calculations of all aspects of the project involving uncertainty - to find a range of possible outcomes for various scenarios. A random sampling is performed by using uncertain risk variable inputs to generate these outcome ranges with each outcome given a level of confidence. This is typically done by establishing a mathematical model and then running simulations based on this model to estimate the impact of project risks. This technique helps in forecasting the likely outcome of an event and thereby helps in making informed project decisions.

Using worst-case, most-likely, and best-case expected values and the probability distribution curve associated with the task or attribute (complete system test), a PM can now use the Monte Carlo analysis which run simulations to generate the most likely outcome for the event. In most situations, you will come across a bell-shaped normal distribution pattern for the possible outcomes. In a simple graphical form in Fig 6-2, the output of a Monte Carlo analysis shows cumulative probability and the actual samples plotted on the same chart. From this configuration we could, for example, give a sponsor a completion date or budget with a 50%, 70%, or 90% level of confidence, or, alternatively, determine the confidence level for meeting a certain completion date or budget spend.

In the example above, we see the cumulative probability plotted with a dotted line, in a continuously increasing percentage from 0% to 100% as we include more and more of the samples (which are shown as the grey bars). From the chart, we can see that if our sponsor wanted to know the chances of being completed by 4-July-2014, we can read 43%, or if we wanted a date of completion with 95% confidence when we would be done, we would report 4-August-2014.

Develop Risk Response Plan (P1-5)

The Risk Response Plan is not the same as the Risk Management Plan. The Risk Management Plan is a plan detailing how we will in general deal with risk in the project. In practical terms, the Risk Management Plan is a schedule of planned Risk Assessments and a description of when and under what conditions the Risk Assessments takes place. In contrast, the Risk Response Plan is a plan for dealing with the specific risks we have identified in each project risk assessment.

This process is used in both the Risk Rating and EMV methods. There are four general risk response approaches:

Avoidance – Use a different approach to the project implementation when the impact of risk on the project is too high and therefore the risk is unacceptable. This approach will eliminate or reduce exceptional, high and most medium risks to the acceptable low level. To avoid the risk, a different **approach to project implementation** should be used. Here we change the project plan altogether in some way. This may be very costly, especially when the project is in the later stages of implementation. The cost of risk avoidance must be estimated for the overall risk cost calculation.

Transfer – This is another way to eliminate high risks by transferring responsibility for implementation of some project elements to a different delivery group or contracting them out. This is usually done when the delivery team does not have enough experience or human resources to implement some project elements. This is often done with some form of insurance. The cost of transferring risks must be estimated for the overall risk cost calculation.

Mitigation – Develop and implement plans to reduce the likelihood of risk occurrence or its severity. The overall rating of the risk after mitigation must be reduced to low. (For example, use older methods of the project implementation or older materials instead of using unproven latest methods or materials). The cost of mitigation must be estimated for the overall risk cost

calculation. A good way to think of this is a project which has as its outcome an outdoor event (perhaps a graduation party). Mitigation could involve providing a canopy to reduce the **impact** of rain, and could involve choosing a date which historically has lower precipitation, to (at least theoretically) reduce the **probability** of rain. And, of course, you could do *both*.

Acceptance – Accept the risk without any attempt to eliminate it or to reduce its rating. Active acceptance means having a contingency plan developed for each accepted risk. The plan will be implemented only if the risk occurs. Passive acceptance means having no contingency plan. Usually, most low risks and some medium risks are accepted, when losses due to their occurrence are lower than the cost of mitigating them. If those risks are triggered during the course of the project, they will cause predictable losses, which are equivalent to the cost of the contingency plan implementation, if one was created. Keep in mind, that acceptance without contingency plan means we do not know the cost of contingency implementation if risk occurs. Passive acceptance should be applied only to low risks. Otherwise, the unknown cost of mitigation may present a high risk. All options should be analyzed and the most cost effective method of risk responses should be used.

Balance Acceptable Risks EMV (P1-6)

This process is used for risk quantification in the EMV method. In this process, costs of all acceptable risks are summarized as shown in the Table 6-4, assuming that the total project cost is \$1M. This amount, \$27.7K, must be added as the acceptable risks margin to the detailed project estimates.

Table 6-4 Risk Quantification Example Using EMV Method

#	Risk Name	Probability	Max Loss Value	Risk EMV
1	Risk #1	9%	\$60K	\$5.4K
2	Risk #2	7%	\$40K	\$2.8K
3	Risk #3	15%	\$70K	\$10.5K
4	Risk #4	10%	\$90K	\$9K
	Total Risks Cost (Sum of all risk EMV)			\$27.7K
	Total Risks Cost in % of project cost			2.8% (L)

Balance Acceptable Project Risk Ratings (P1-10)

This process is used for risk quantification in the Risk Rating method, as shown in Table 6-5. In this process costs of all acceptable risks are summarized as shown in the example below, assuming we have

The total risk cost calculation is done using the normalized risk score method:

1. Rate each risk and add up all risk scores

Risk Score may be 2 (Low), 5 (Medium), 9 (High), 14 (Exceptional)

Total Risk Score = 2 + 2 + 5 + 5 = 14

2. Normalized Score = Total Risk Score x (10 / Number of Risks)

Normalized Score = 14 * 10 / 4 = 35

3. Overall Risk Ratings: 21-40 (Low), 41-60 (Medium), 61-80 (High), 80+ (Exceptional)

The normalized score of 35 corresponds to the overall Low risk.

L corresponds to the maximum cost of risk less than 5% of the project cost.

M corresponds to the maximum cost of risk between 5% and 20% of the project cost.

H corresponds to the maximum cost of risk between 21% and 50% of the project cost.

E corresponds to the maximum cost of risk over 51% of the project cost.

Since the overall low risk costs less than 5% of the total project cost, then the accepted risk costs in this project are less than \$50K. This is the highest accuracy that can be achieved using the Risk Rating method.

Table 6-5 Risk Quantification Example Using Risk Rating Method

#	Risk Name	Probability	Severity	Overall Rating
1	Risk #1	L	L	L
2	Risk #1	L	L	L
3	Risk #1	M	L	M
4	Risk #1	M	L	M
	Normalized Risk Score (see below)			35 (L)
	Total Risk Cost (see below)			<\$50K

Calculate Total Risk Costs (P1-7)

This process is used in both the Risk Rating and EMV methods. Total Risk Costs are the sum of the following costs:

1. Accepted risks cost
2. Avoided risks cost
3. Transferred risks cost
4. Mitigated risks cost
5. Unknown risks cost

Unknown risks are risks that are beyond existing knowledge. Those risks cannot be assessed and no remediation plans can be built. Unknown risks may come from any area where the project manager does not have control or due to changing circumstances in the course of the project. The best way to estimate unknown risks is to examine statistics for the past several years. If statistics says the cost of unknown risks was 40% of the cost of known risks, the same cost margin may be used, since repeated failures are almost guaranteed. If no statistics are available, this signals the lack of the project management processes or poor quality management. The best

thing that a project manager can do in this situation is to insist on strictly following those processes. If the current organizational culture allows implementation of those processes on the enterprise level, assume the unknown risks cost margin at the 20% of all other risks cost. Otherwise, repeated failures are guaranteed not only in the risk management area, but in all project management areas. This by itself can put a project in the exceptional risk area. It is most probable that management in such an organization won't even allow inclusion of high risks associated with lack of quality assurance and other PM processes implementation into risk assessment. In some enterprises, the 'unknown unknowns' are covered across projects with a management reserve, to handle, for example, a labor action which would affect an entire portfolio of projects. Unlike the contingency reserve we mentioned earlier, which is in the control of the PM, the management reserve is under the control of a senior manager in the enterprise.

Risk Management Plan

The Risk Management Plan is the guidance on when and how, in general, to manage risks throughout the project, as described above. The schedule of Risk Management activities is built into the existing project plan. The Risk Management Plan includes the following topics:

- Risk Management objectives
- Risk Management processes
- Scales for probability and severity
- Established schedule and frequency of Risk Assessment
- Risk Management roles and responsibilities
- Reporting risk issues

It may not be necessary to have a Risk Management Plan as a separate document, because all the plan topics have been already laid out in the Risk Management section above. Risk Management processes, lists of all risks occurred, new risks found and results of risk assessments should have been documented in the PCB. The schedule of risk assessment should have been embedded into the existing project plan. Results of risk assessments are reported to senior delivery management at least monthly.

Risk Metrics

Here is a list of Risk Metrics which could be used by the project team:

- Record of each risk assessment and the reason for assessment.
- Total number of risk assessments up to date.
- Total number of the occurred planned risks (This comes from the Issue Management metrics).
- Total number of occurred unplanned risks (This comes from the Issue Management metrics).
- Planned cost of each risk mitigation (before the risk occurs) and the overall planned cost of risk mitigation.

- Actual cost of each risk mitigation and the overall actual cost of risk mitigation.
- Planned cost of each occurred risk and the overall planned cost of occurred risks. (This comes from the Issue Management and the Scope Change Control metrics).
- Actual cost of each occurred risk and the overall actual cost of occurred risks. (This comes from the Issue Management and the Scope Change Control metrics).

Risk Assessment Form

Table 6-6 Project Risk Assessment Form

PROJECT RISK ASSESSMENT	
Project Name: _____ Risk Assessment Number: _____ Date: _____ Total Acceptable Risks Score/EMV: _____ Calculation of the Total Acceptable Risks Score/EMV (or reference to a separate document) _____ _____ Total Cost of all Risk Remediation Plans: _____	
Risk Information	
Risk Number: _____ Risk Owner _____ Risk Identification: _____ _____ Probability and Justification of Probability (or reference to a separate document): _____ _____ Severity/EMV and Justification of Severity/EMV (or reference to a separate document): _____ _____ Risk Score/EMV and Calculation of Risk Score/EMV (or reference to a separate document): _____ _____ Risk Remediation Method: <input type="checkbox"/> Avoidance <input type="checkbox"/> Transfer <input type="checkbox"/> Mitigation <input type="checkbox"/> Acceptance Risk Remediation Plan (or reference to a separate document): _____ _____ Avoidance/Transfer/Mitigation Plan Due Date: _____ Remediation Plan Implementation Estimates (or reference to a separate document): _____ _____	
Risk Information	
Enter next risk information here _____ _____	

Project Risk Tool Description

A Risk Assessment Tool for small to medium projects in the engineering area is available for download from the authors' site www.pm-workflow.com. The tool is applicable for the risk score method of risk assessment. The entry page of the tool requires entering customer organization name, the project name and the date of risk assessment, which are propagated to other assessment pages.

Risk Assessment
(For Contracts under \$1M)

Customer Name: Customer1
Project Name: Project1
Date: mm/dd/yyyy

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Fig 6-2A Entry Page of the Risk Assessment Tool

There are several pages in the tool with twenty standard risks groups listed. Each risk is presented with several possible ways the risk may represent itself. For example, the first risk group, Business Case, has four options, as shown on Fig. 6-2B:

1. Not Applicable
2. Business Requirements Document is signed off.
3. Business Requirements Document is available, but not signed off yet
4. Business Requirements Document is not available and requirements are not complete

Common Risk Statements 1-6		
Customer Name: Customer1		
Project Name: Project1		
Date: mm/dd/yyyy		
Score: E - Exceptional, H - High, M - Medium, L - Low		Copyright © Daniel Epstein
Risk Identification	Select Risk	Risk Score
1. Business Case		
<NA> Not Applicable	<input type="radio"/>	
<1> Business Requirements Document is signed off.	<input type="radio"/>	
<M> Business Requirements Document available, but not signed off yet	<input type="radio"/>	
<i>Ensure that business requirements are signed off by all parties and estimates are agreed.</i>		
<i>Ensure that a project charter is received and a kick-off meeting has taken a place</i>		
<i>Ensure all PM processes are established and mandatory.</i>		
<4> Business Requirements Document is not available and requirements are not complete	<input checked="" type="radio"/>	H
Document business requirements and have it signed. Ensure that estimates are produced and agreed by all parties.		
Ensure that a project charter is received and a kick off meeting has taken a place		
Ensure that all PM processes are enforced.		
2. The delivery team familiarity with similar projects		
<1> The Delivery Team is familiar with similar projects.	<input type="radio"/>	L
<M> Some members of Delivery Team are familiar with the project, but most of them don't.	<input type="radio"/>	
<i>Assign the most experienced team member to guide the team for the duration of the project</i>		
<i>Propose a different implementation method</i>		
<4> The Delivery Team has no experience with similar projects.	<input type="radio"/>	
<i>Find an expert with the required experience to guide the team for the duration of the project</i>		
<i>Use a different, more familiar approach for the project.</i>		
<i>Hire external resources to develop less familiar parts of the project.</i>		

Fig 6-2B First Risk Assessment Page – Common Risks

When the corresponding selection is clicked, the risk score is displayed on the right of the risk definition. Risk score shown there is the derivative of risk probability and its severity. For risks that have medium, high and exceptional scores, there is the risk remediation suggestion in the tool, which is the basic risk remediation plan. For example, if the option #4 is selected, a letter H for high risk score is displayed and a list of three suggested risk remediation actions is displayed in red:

- **Document the business requirements, have it signed off by all parties and produce an estimate**
- **Ensure that a project charter is received and a kick-off meeting has taken a place**
- **Ensure a scope change control process and the rest of PM processes are in place.**

If all three suggestions are implemented, the business requirements risk will turn from medium to low risk. All twenty standard risks must be assessed and the resulting risk scores for standard risks will be automatically calculated. For unique risks, the risk description must be entered in the appropriate screen in the Risk Identification section and both severity and probability must be selected, as displayed on Fig 6-2C. On the right of the screen the resulting risk score will be displayed.

Risk Statements - Unique Risks			
Customer Name: Customer1			
Project Name: Project1			
Date: mm/dd/yyyy			
Copyright © Daniel Epstein			
Risk Identification	Severity of Risk if Occurs	Probability of Occurrence	Resulting Risk Score
Risk Description	<input type="radio"/> Except <input type="radio"/> High <input type="radio"/> Medium <input type="radio"/> Low <input checked="" type="radio"/> N/A	<input type="radio"/> Except <input type="radio"/> High <input type="radio"/> Medium <input type="radio"/> Low <input checked="" type="radio"/> N/A	N/A
Risk Remediation			
Risk Description	<input type="radio"/> Except <input type="radio"/> High <input type="radio"/> Medium <input type="radio"/> Low <input checked="" type="radio"/> N/A	<input type="radio"/> Except <input type="radio"/> High <input type="radio"/> Medium <input type="radio"/> Low <input checked="" type="radio"/> N/A	N/A
Risk Remediation			

Fig 6-2C Risk Assessment – Unique Risks

When the risk assessment is complete, the last screen will display a risk summary. The total number of risks will be displayed, along with a separate count for each of low, medium, high and exceptional risks, as displayed on Fig 6-2D. The overall normalized risk score for the entire risk assessment will be displayed along with the overall project risk rating. Use the total project cost and the method described above to convert the overall risk score into monetary value.

Risk Summary			
Customer Name: Customer1			
Project Name: Project1			
Date: mm/dd/yyyy			
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Known Risks	# of Risks	Normalized Risk Score	Overall Risk
TOTAL PROJECT	17	25.9	LOW
Exceptional	0		
High	1		
Medium	1		
Low	15		

Fig 6-2D Screenshot- Risk Tool Summary

About the Author



Dan Epstein

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Dan Epstein combines over 25 years of experience in the project management field and the best practices area, working for several major Canadian and U.S. corporations, as well as 4 years teaching university students project management and several software engineering subjects. He received a master's degree in electrical engineering from the LITMO University in Leningrad (today St. Petersburg, Russia) in 1970, was certified as a Professional Engineer in 1983 by the Canadian Association of Professional Engineers – Ontario, and earned a master's certificate in project management from George Washington University in 2000 and the Project Management Professional (PMP®) certification from the Project Management Institute (PMI®) in 2001.

Throughout his career, Dan managed multiple complex interdependent projects and programs, traveling extensively worldwide. He possesses multi-industry business analysis, process reengineering, best practices, professional training development and technical background in a wide array of technologies. In 2004 Dan was a keynote speaker and educator at the PMI-sponsored International Project Management Symposium in Central Asia. He published several articles and gave published interviews on several occasions. In the summer of 2008 he published "Methodology for Project Managers Education" in a university journal. His book, *Project Workflow Management - The Business Process Approach*, written in cooperation with Rich Maltzman, was published in 2014 by J. Ross Publishing.

Dan first started development of the Project Management Workflow in 2003, and it was used in a project management training course. Later this early version of the methodology was used for teaching project management classes at universities in the 2003–2005 school years. Later on, working in the best practices area, the author entertained the idea of presenting project management as a single multithreaded business workflow. In 2007–2008 the idea was further refined when teaching the project management class at a university. Since 2009, Dan has continued working full time in Project Management. Dan can be contacted at dan@pm-workflow.com.