Chapter 5

Risk Identification

5

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- Critical Success Factors
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Risks: Overall and Individual

Risk is evaluated both at the level of overall project risk and at the level of individual risk.

Overall project risk is the amount of uncertainty about achieving the larger or total project objectives. Generally speaking, the overall project risks are concerned with the project's ability to achieve the desired cost, time, scope, and quality requirements, based on stakeholder needs and their associated tolerance for uncertainty.

A measurement or indication of overall project risk can be used to establish the appropriate amount of contingency resources that should be allocated for the project.

Example: Overall Project Risk

Because the company has produced a similar product in the past, there is a high probability that the scope and quality objectives will be achieved.

However, due to an increase in the manufacturing costs and the lack of availability of the appropriate resources, the budget and schedule objectives will be difficult to achieve.

Individual risks, in contrast, are specific events or conditions that could affect smaller, individual project objectives. These risks may have a positive or negative effect on these project objectives and are the day-to-day focus of the project risk manager as he or she works to allow for the most efficient use of project resources as the project progresses.

Example: Individual Project Risks

Opportunities:

- The product may be first to market
- The client is offering an incentive if the product can be delivered early

Threats

- There may not be sufficient skilled resources
- The production may take longer than anticipated

Risk Effects

For a risk to be considered, it must have an impact on at least one project objective. The most common project objectives are related to the project's triple constraints: scope, time (or schedule), and cost (or resources).

When identifying project risks, these three areas should be evaluated for risks, starting with the project scope.

Project Scope Risk

For risks associated with the elements of the project management triple constraints, scope risks are generally considered first. Identification of scope risks reveals whether or not the project is feasible. Early decisions to shift the scope or abandon the project are essential for projects with significant scope risks. Two common sources of scope risk are scope creep and scope gap.

Scope Creep

Scope creep is any non-mandatory scope change, and it plagues all projects. There are a number of reasons why this is so common, including new opportunities, interesting ideas, undiscovered alternatives, and other information that emerges as the project progresses, providing a temptation to redefine the project and make it "better."

Scope creep represents unanticipated additional investment of time and money, because of both newly required effort and the need to redo work that has already been completed, specifically in plan-driven or waterfall environments. Scope creep is most damaging when entirely new requirements are added once the project is already underway. Scope creep can come from any direction, but one of the most common and dangerous is when it comes from within the project.

Scope Gap

Scope gap is a legitimate scope requirement discovered late in the project. Typically it is the result of committing to a project before the project requirements are complete. When legitimate needs are uncovered late in the project, change is unavoidable, and the work that arises needs to be completed.

Scope gap often occurs from requirements that are overlooked due to customers, managers, team members, or other project stakeholders being unavailable at the start of the project, leading to incomplete or inaccurate requirements.

Although some instances of scope gap are probably unavoidable, in many cases, these gaps are due to incomplete or rushed analysis or gathering of requirements.

Sources of Scope Risk

There are a number of sources of scope risk for a project, including:

- Requirements that seem likely to change
- The mandatory use of new technology
- The requirement to invent or discover new capabilities
- Unfamiliar or untried development tools or methods
- Extreme reliability or quality requirements
- External sourcing for a key subcomponent or tool
- Incomplete or poorly defined acceptance tests or criteria
- Technical complexity
- Conflicting or inconsistent specifications
- Incomplete product definition
- Large work breakdown structure (WBS)

Identifying Scope Risks

To identify scope risks, clearly define all project deliverables and note any challenges with developing any of the deliverables. Evaluate the project objectives and constraints in order to set limits on the project based on the value of the deliverables.

Separate all work on the project into small pieces, as for the creation of the WBS, and identify any work that is not easily understood. Assign all project work to project team members for ownership. If anyone expresses any type of reluctance to accept his or her assignment, that reluctance should be investigated to determine its causes.

Project Schedule Risk

Project schedule risks commonly fall into three categories: delays, estimates, and dependencies.

Delays

Schedule risks in the category of delays may include delays in information, product or component delays, and delays in decision-making.

For example, an information delay may be due to time differences between parts of distributed global teams, poor access to information, or an interruption of the delivery of needed information. Waiting on the production, completion, or arrival of products or components that are required to complete project work are another source of schedule delays. Depending on the organizational structure, the size of the

project, and the complexity of stakeholders, slow decisions can also cause project delays. This could result from poor access to the decision makers or their lack of interest in the project.

Estimates

Schedule risks arising from estimates are one of the more common risks affecting the project schedule. These are typically related to learning curves, poor judgment, or imposed deadlines.

Learning curve issues are common with the introduction of new technology or new resources. Poor judgments in estimating timelines are another common problem, because these estimates are often overoptimistic. Asking resources for their worst-case estimates for the length of a project or component can be very helpful. Not only does it reveal information about the likely duration, but it can also serve to uncover new sources of risk.

A very common situation is one in which projects are assigned with aggressive deadlines that have been set in advance with little or no input from the project team. These aggressive deadlines are often difficult if not impossible to achieve within the other constraints of the project. Even when the project schedule and dependencies show that a deadline is unrealistic, organizations often insist that the project objective still needs to be achieved. These projects may be subject to failure from the beginning.

Dependencies

Project schedule risks arising from dependencies can occur from dependencies on other projects, infrastructure factors, and legal issues.

In larger projects or programs, a number of smaller projects may interact and link to each other. In addition to providing each other with information and deliverables that meet well-defined specifications, all projects within a larger program must also synchronize the timing of their schedule dependencies to avoid being slowed down by other projects.

Infrastructure dependencies include technical services, such as computer systems or networks required by the project, that can be interrupted and access to resources such as help desks and system support that may be inadequate. It is very common for projects that are using vendors or contractors to experience schedule delays related to the legal aspects of executing contracts.

Activity Relationship Dependencies

Activity relationship dependencies are another category that should be considered. There are four types of relationship dependencies: mandatory, discretionary, internal, and external.

Mandatory dependencies are inherent to the work being done and typically involve physical limitations. Mandatory dependencies cannot be changed or modified, increasing schedule risk. Mandatory dependencies are also known as "hard logic."

Example: Mandatory Dependency

The books cannot be shipped until they are printed.

Discretionary dependencies are usually established based on the discretion of the project team when they discuss best practices or experience. These dependencies may also come from outside sources or industry experts. Discretionary dependencies are also referred to as "preferred logic," "preferential logic," or "soft logic."

Because they do not involve physical limitations, it is possible to alter or manipulate discretionary dependencies within the project schedule, relative to the amount of risk involved.

Example: Discretionary Dependency

The screen shots of the new system are to be approved prior to beginning the development of the user guides.

External dependencies are those that involve a relationship between project activities and non-project activities. Because external dependencies are outside of the project team's control, there is increased risk.

Example: External Dependency

The city must issue the permits before construction can begin.

Internal dependencies involve a precedence relationship between project activities that are usually inside of the project team's control.

Example: Internal Dependency

The team cannot test a software program until it is designed and built.

Be careful on the exam not to confuse questions on the dependencies with ethical questions. These activity dependencies are not moral judgments but rather physical or non-physical factors on which the project depends. For example, if the exam states that there is a company policy that requires products to be signed off on by a VP prior to shipping to the customer, that question refers to a discretionary dependency. It does not mean that we would violate the policy but that we physically could if necessary.

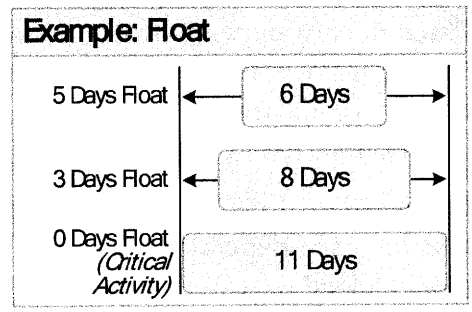
Identifying Schedule Risks

To identify schedule risks, determine the root causes of all uncertain estimates, identify all estimates not based on historical data, and note dependencies that pose delay risks.

It is often helpful to identify high-risk activities and schedule them early in the project, so that if there is a delay, there is enough time to adjust the remainder of the schedule.

Critical Path

The critical path is the longest path through the schedule network with zero or negative total float. Total float, also known as float or slack, is the amount of time an activity or sequence of activities can be delayed before it delays the overall project duration.



Total float occurs when there are multiple concurrent activities of different durations. The duration difference between the concurrent activities represents the amount of float the shorter path will have.

As illustrated in this graphic, the longest activity concurrently happening is the critical activity and has zero float. This means that if that activity gets delayed, the project will be delayed. The shortest activity has a six-day duration. Because it is happening concurrently with an activity that is 11 days, the activity has five days of total float. The middle activity has an eight-day duration, so it has three days of total float.

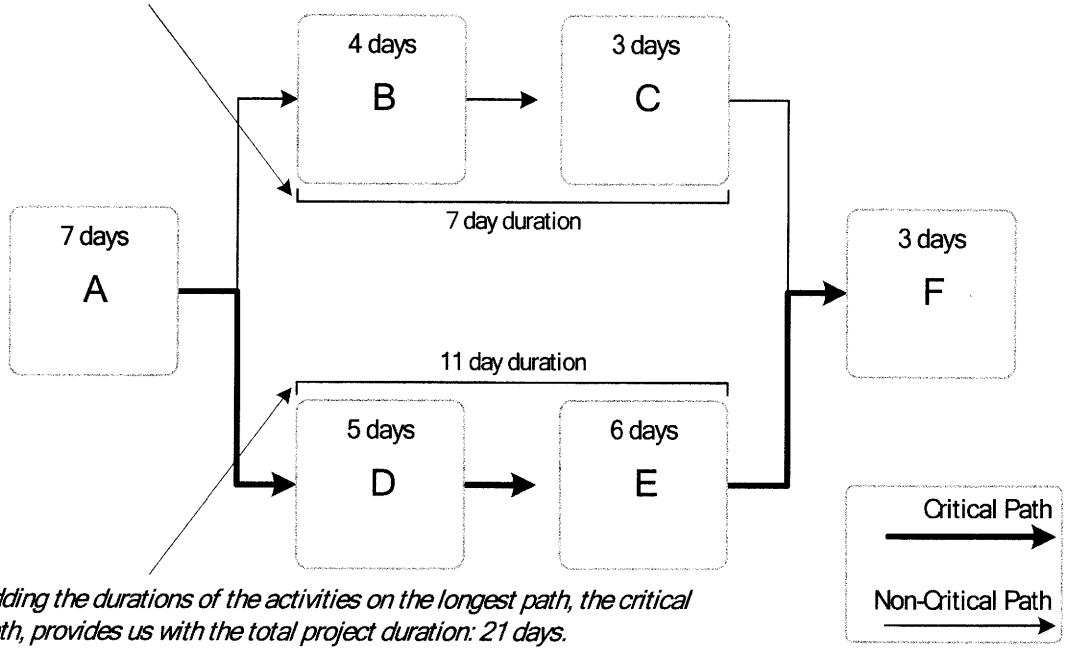
If an activity gets delayed beyond any float that is available, the activity now has negative total float. A negative total float indicates that the project is delayed by that many days. For example, if the six-day activity gets delayed by nine days and only had five days of float available, it would then have four days of negative total float. This means that the project would be delayed by four days.

For project schedules that have multiple critical or near-critical paths, risk is increased, due to the fact that if one of those critical activities is delayed, the project will be delayed.

For another example, based on the information in Figure 5-1 below, Activity A and Activity F are on the critical path. They have zero float, as they do not have concurrent activities.

The combined duration of Activities B and C is 7 days. The combined duration of Activities D and E is 11 days. As such, D and E have no float and are on the critical path, but activities B and C can float by as much as four days without affecting the overall project duration.

The four day difference between the two sequences indicates that activities B and C can be delayed, combined, by up to four days before affecting the project duration.

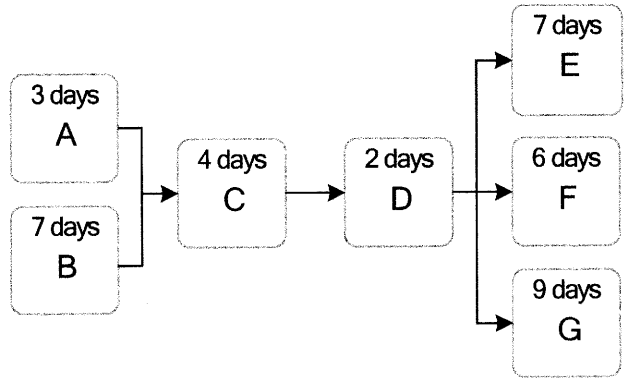


Adding the durations of the activities on the longest path, the critical path, provides us with the total project duration: 21 days.

Figure 5-1: Critical Path Method

PMBOK® Guide, page 177

Exercise: Critical Path Calculation



Use the above graphic to answer the following questions.

1. **Which activity has the greatest amount of float?**
   - A. Activity E
   - B. Activity F
   - C. Activity A
   - D. Activity D

2. **Which activities are on the critical path?**
   - A. A – C – D – G
   - B. C – D
   - C. B – C – D – E
   - D. B – C – D – G

3. **Activity B has __ days of float.**
   - A. 0
   - B. 6
   - C. 4
   - D. (4)

4. **Activity A has __ days of float.**
   - A. 4
   - B. 3
   - C. (4)
   - D. 0

5. **Activity F has __ days of float.**
   - A. 0
   - B. 3
   - C. (1)
   - D. 1

6. **If Activity A is delayed by 9 days, what is the impact on the project?**
   - A. There is no impact.
   - B. The project is delayed 3 days.
   - C. The project is delayed 5 days.
   - D. The project is delayed 9 days.

Project Cost/Resource Risk

Project cost and resource risks can be typically categorized as originating from human resources, contracts, and money.

Human Resources

All projects are dependent on human resources, and this can be one of the biggest areas of concern related to risk. Human resource risks include the potential loss of a permanent staff member due to resignation, promotion, reassignment, health, or other reasons or short-term staff loss due to illness or support priorities.

I had one particularly challenging and stressful project that was operating under a very tight delivery timeline. The team really pulled together and worked like rock stars all the way through. As we neared the end of the project and finalized the last of the system tests, I felt the team had earned a celebration dinner before our big install that was scheduled for the following morning. I ordered dinner from the local barbeque restaurant, and everyone enjoyed some well earned downtime, eating and socializing. As we departed for the night, I advised everyone to get some rest in preparation for the big day.

Unfortunately, when I next saw most of my team, it was sooner than I had expected, and it was not in the way I had anticipated. Apparently, something had been "off" with the barbecue, and we all came down with a horrible case of food poisoning. Nothing like a middle-of-the-night rendezvous in the local emergency room with your project team.

Needless to say, I had not identified my entire team being wiped out with food poisoning as a risk. But I can tell you that I have thought of it during every project since. And yes, I now only schedule celebration dinners *after* projects are signed, sealed, and delivered. You could say I am now influenced by an availability heuristic!

Other human resource risks can arise from project team members being unavailable at the start of the project. This frequently occurs when new projects begin while existing projects that were anticipated to have already ended and released their resources are still wrapping up. It can be challenging to find a time when the stars align perfectly so that all of the necessary resources are available right at the start of a new project.

An often-overlooked source of risk is the human motivation of the team members or their lack thereof. This may include a loss of team cohesion or interest, especially for longer-term or generally boring projects.

I had a project that was progressing nicely with a team that was fairly well rounded and delivering as expected. The particular company I was working with was seen as a "forever company" to a lot of the employees, and they planned to stay there until they retired. This is somewhat rare these days, but this company took care of their employees and gave them no reason to feel otherwise.

That was true until the day that they announced that they would have to reduce the workforce due to the decline in the economy. Employees were shocked and seemed to become somewhat paralyzed. The kind-heartedness of the CEO unfortunately led to a very slow, thorough decision-making process to determine which employees were going to be laid off. It was definitely not like "ripping the Band-Aid off." It was a slow, painful, miserable approach.

While the leadership struggled over the decisions that were ahead of them, morale plunged, productivity all but ceased, and my project pretty much crashed and burned. I had identified an emergent risk that I could lose some of my team members to the lay-offs, but I had not even considered the motivational impact.

To leveraging a Maslow assessment of the situation, my team members who were previously and obliviously bouncing around between self-actualization and self-esteem had now plunged desperately to the bottom of the pyramid. Now they were worried about keeping roofs over their heads and food on their tables.

Contracts

Legal contracts also pose another area of resource risk, not only from the procured resources but also from the contracts themselves.

Because projects are temporary, they are typically good candidates for the use of contract resources. Generally speaking, there is always risk associated with using people and services outside the project team for critical project work.

For projects with particularly unusual needs, finding an appropriate supplier may cause significant delays. For example, during Y2K renovations, programmers were in high demand. This caused a delay in staffing a number of time-sensitive projects.

Delayed starts are also fairly common with outsourced work. Before any external work can begin, contracts must be negotiated, approved, and signed. Finally, work done at a distance takes place out of sight, and problems that might easily be detected within a local team inside the organization may not surface as an issue until it is too late.

Contract Types

There are also risks that arise from the contracts themselves. From a procurement perspective on a project, three types of contracts may be used between the project organization and any vendors: fixed-price, cost-reimbursable, and time and material.

Fixed-price contracts involve a fixed total price for the product. The simplest form of a fixed-price contract is a purchase order. Because the buyer is paying one set price, the profit is typically not known by the buyer. In a fixed-price contract, the risk is on the seller, because if there are any changes in conditions or expenses, the seller has to absorb those costs. When we are buyers, we prefer fixed-price contracts, because they present a lower risk for us. However, if the scope of the work is not clearly defined, a cost-reimbursable contract may be the only option.

Cost-reimbursable contracts involve payment to the seller for seller's actual costs, plus a fee that typically represents seller profit. Because the final costs are not known until the work is completed, cost-reimbursable contracts place more risk on the buyer. However, as mentioned above, entering into a cost-reimbursable contract is sometimes unavoidable.

Time and material contracts (T&M) are hybrid contractual agreements that have both cost-reimbursable and fixed-price arrangements and place moderate risk on the buyer. T&M contracts are typically used for staff augmentation, acquisition of experts, and any outside support. A T&M contract can increase in contract value like cost-reimbursable contracts, and because of this, the organization may add a "not-to-exceed" value to prevent unlimited cost growth and limit the risk exposure.

For example, if you take your car into a dealership to be serviced, you expect to pay for parts and labor. However, there is typically a not-to-exceed cost at which the mechanic will call you before fixing the pricy additional problems that they always seem to find.

Money

Insufficient funding can significantly delay the launch of a project. Lack of funding is a contributing root cause to many other risks as well. For example, employee attrition may occur due to lower pay rates, hiring less expensive team members that do not have the appropriate skill levels can damage a project, and shortcutting recommended testing, analysis, and planning to spare the budget can give rise to risks.

Identifying Resource/Money Risks

To identify resource or money risks, identify all required skills you need for which you lack named, committed staffing and determine all situations in the project plan in which people or other resources are overcommitted. Consider the environment and the motivation of the team members.

Evaluate the project schedule to identify all activities with uncertain estimates. For any contracted or outsourced work, identify and document the contract-related risks.

Determine all expected project costs and gain funding approval early for necessary training, equipment purchases, travel, and other expenses that are typically overlooked.

Critical Success Factors

The critical success factors for effective risk identification include:

Early and Ongoing Identification

Risk identification should begin as early in the project as possible, as this enables project decision-making and allows sufficient time for risk response planning. Set intervals of risk identification activities can be established and documented within the risk management plan, but the risk process should also allow for ad-hoc or emergent risk identification and evaluation.

Unbiased Evaluation

There is always the potential for motivational and cognitive biases. Biases, which were presented in Chapter 3, should be explicitly recognized and exposed whenever possible.

Identify Risks Process

The objective of the Identify Risks process is to identify all knowable risks to project objectives, including both threats and opportunities. Risk identification begins early in the project. Rather than a one-time activity, risk identification is an ongoing process that continues throughout the life of the project, as old risks evolve and new risks become known as the project progresses.

The individuals involved in risk identification may vary depending on their areas of expertise and levels of involvement within the project. However, the more eyes there are on risk, the more thorough risk identification and management will be.

Participants can include the following individuals and groups.

- Project manager
- Project team members
- Risk management team (if applicable)
- Customers
- Subject matter experts from outside the project team
- End users
- Other project managers
- Stakeholders
- Risk management experts

I try to invite as many people as possible to the risk party, especially after seeing how detrimental it can be to overlook a particular area.

Typically, I'm the project or program manager, but on one particular project, I was the project manager over only the training aspect of a project. The overall project manager was a sharp, experienced, and thorough project manager, although she

kept a lot of information close to the vest, so to speak. She was not a fan of adding extra stakeholders to the project.

The goal of the initiative was to migrate some back-end operational tasks from our operational representatives in the United States to contract resources in India. My team and I landed in India ready to train 60+ representatives on our processes, procedures, and systems in a four-week initiative. Two-thirds of the way through the training program, we suddenly lost connectivity with the infrastructure back in the United States.

In India, we were essentially shut down for over five days, at which point we recognized that there was no way we would be able to complete the training in the time allocated. As a workaround, the project manager had us stay in India an additional week, a very costly solution. Not only was it damaging to the project budget, but it also caused some damage to the project manager's reputation.

After extensive troubleshooting, they determined that the cause of the connection failure was an upgrade in the US infrastructure and back end. Had a member of the IT maintenance team been asked to provide feedback on risks to our project, this potential problem would have been easily identified early on. This was an incredibly valuable lesson for all parties involved and inspired a change in the company's risk identification process for cross-enterprise projects.

Keep your ears, eyes, and options open when identifying risk. There is always someone who knows something that could impact your project!

According to the *PMBOK® Guide*, the Identify Risks process inputs, tools and techniques, and outputs are as follows.

Identify Risks: Inputs, Tools and Techniques, and Outputs

Inputs	Tools and Techniques	Outputs
1. Risk management plan	1. Documentation reviews	1. Risk register
2. Cost management plan	2. Information gathering techniques	
3. Schedule management plan	3. Checklist analysis	
4. Quality management plan	4. Assumptions analysis	
5. HR management plan	5. Diagramming techniques	
6. Scope baseline	6. SWOT analysis	
7. Activity cost estimates	7. Expert judgment	
8. Activity duration estimates		
9. Stakeholder register		
10. Project documents		
11. Procurement documents		
12. Enterprise environmental factors		
13. Organizational process assets		

Figure 5-2: Identify Risks ITTOs

PMBOK® Guide, page 319

Identify Risks: Inputs

Subsidiary Plans

A number of subsidiary plans may be considered and evaluated when identifying project risk. All subsidiary plans describe how a particular aspect of the project is being managed, along with any identified constraints and thresholds. This information can be critical to identifying the risks that relate to that particular area. For example, the quality management plan may describe certain desired quality metrics that may be challenging, given the project staffing and the team's experience.

Subsidiary plans to be evaluated may include the risk, cost, schedule, quality, and human resource management plans.

Scope Baseline

The scope baseline, a component of the project management plan, is the "frozen" version of the project scope. During the monitoring and controlling processes, the progress against the scope baseline is measured to determine any variances that may need to be addressed.

The scope baseline is an output of the Create WBS process and is made up of the project scope statement, the WBS, and the WBS dictionary.

Project Scope Statement

As mentioned previously, PMI states that there are three mandatory documents for a project, and two of them, the project management plan and the project charter, have already been discussed. The third mandatory document is the project scope statement.

The project scope statement describes in detail the project's deliverables and the work required to create those deliverables. The objective of the project scope statement is to provide a common understanding of the project scope among all project stakeholders.

The detailed project scope statement includes the product scope description, the product acceptance criteria, the project deliverables, exclusions, constraints, and assumptions.

Work Breakdown Structure (WBS)

The WBS is a graphical, hierarchical depiction of the work of the project. Essentially, it is a picture of the work described within the project scope statement. The project deliverables are separated into smaller, more manageable pieces known as work packages.

A WBS is an excellent tool to manage against scope risk as it clearly defines the work that is to be done on the project. Nothing is left out of the WBS, and nothing extra is added. If team members are working on tasks that are not a component of a work package, those tasks can easily be identified as scope creep.

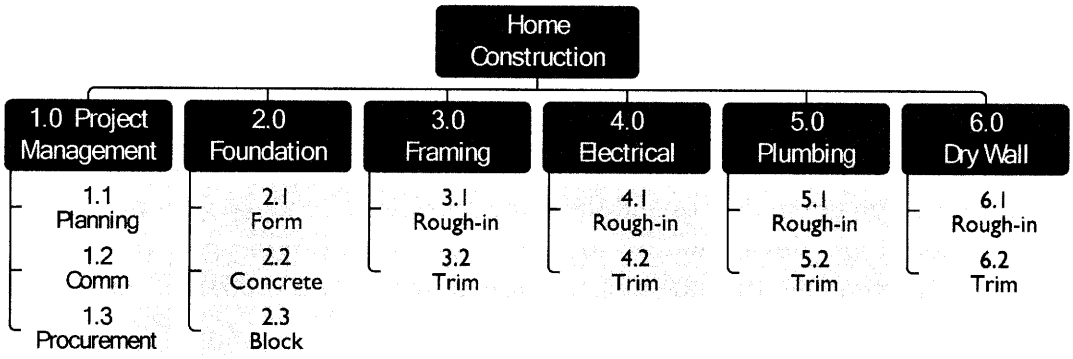
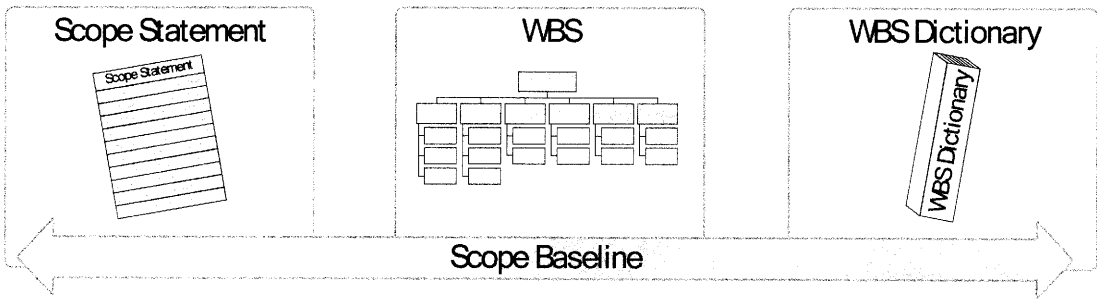


Figure 5-3: Work Breakdown Structure

PMBOK® Guide, page 9

WBS Dictionary

Because the WBS includes limited information, the detailed information for each work package is housed in the WBS dictionary. The WBS dictionary provides information such as resources assigned, dependencies, contract information, and the locations where the work will be conducted.



Activity Cost and Duration Estimates

The activity cost and durations estimates are evaluated to determine confidence levels and resulting uncertainties from these estimates. The estimating techniques that are used impact the levels of variability and uncertainty. Estimating techniques include analogous, parametric, three-point (PERT), and bottom-up.

Analogous Estimating

Analogous estimating is a combination of historical information and expert judgment, and it uses a similar past project as the basis of the estimate. Because this is typically done to estimate the overall project duration or cost, it is considered top-down estimating.

While it is quick and easy to do, it is not as accurate as the other techniques. The amount of risk associated with an analogous estimate is much more significant. Analogous estimating is usually used when there is not a lot of detail about the current project. Of the four estimating techniques, the analogous estimate creates the greatest amount of risk or uncertainty.

Example: Analogous Estimate

A project manager is assigned the management of the annual employee health fair. As she has never managed a project of this type or size before, she leverages historical information. Last year, the organization sponsored the health fair for the same population of employees and the same number of vendors. That project cost $25,000 and took three months to plan and execute. The project manager analogously estimates that the current project will cost $25,000 and take three months.

Parametric Estimating

Parametric estimating leverages a statistical relationship between variables to calculate a productivity rate or unit cost. A parametric estimate is based on historical information and is most accurate when the underlying data is representative and scalable.

Example: Parametric Estimate

For the employee health fair this year, all participants will be provided with a custom health and wellness plan. Last year, these packets cost $100 per person, and approximately 30 plans can be developed per hour. The projected attendance of the fair is 300 employees. The project manager estimates it will cost $3,000 for the health and wellness plans and that it will take 10 hours to complete the work of developing the plans.

Three-Point (PERT) Estimating

Three-point estimating, also known as the program evaluation and review technique (PERT) estimate factors in uncertainty by calculating the estimate based on the optimistic, most likely, and pessimistic estimates for cost or duration.

There are two three-point formulas: beta and triangular. The beta three-point is the most commonly used and should be the one used on the exam unless the question is specifically asking about a triangular three-point.

In a beta three-point, the most likely cost or duration is weighted by four. The formula for a beta three-point is:

- (Optimistic + 4(Most Likely) + Pessimistic) / 6

A triangular three-point estimate does not weight the most likely by four and instead simply takes the mean of the three costs. As such, the formula for a triangular three-point estimate is:

- (Optimistic + Most Likely + Pessimistic) / 3

Example: Three-Point (PERT) Estimate

A project manager is evaluating the estimates provided by her team. For the space rental and logistics, she has received the following:

- Optimistic: $1500 and 2 days
- Most likely: $2200 and 5 days
- Pessimistic: $4000 and 9 days

Using a beta three-point, she calculates the following estimates.

- ($1,500 + 4($2,200) + $4,000) / 6 = $2,383
- (2 + 4(5) + 9) / 6 = 5.2 days

Using a triangular three-point, she calculates the following estimates.

- ($1,500 + $2,200 + $4,000) / 3 = $2,567
- (2 + 5 + 9) / 3 = 5.3 days

Bottom-Up Estimating

Bottom-up estimating is the most time-consuming but most accurate estimating technique. In bottom-up estimating, cost estimates are developed for every activity or work package, and those estimates are then added together for an overall project cost estimate. However, bottom-up estimating cannot be used for duration estimating, as it does not account for concurrently running activities.

Of the four estimating techniques, bottom-up estimating has the lowest risk or uncertainty.

Example: Bottom-Up Estimate

The project manager has the following cost estimates.

Room rental: $3,000

Contract resources: $7,000

Brochures: $1,500

Food and beverages: $500

His bottom-up estimate is $12,000.

Exercise: Estimate Activity Durations

You are the project manager for the Chamber of Commerce Annual Banquet and Recognition Event. This is your first time managing a project of this size, and you need to estimate how long the project will take. You must estimate three components of this year's project duration: the event logistics, the venue selection, and the room set-up.

Event Logistics: Last year's event was held on site at the Chamber, and it took approximately three months to complete the project. This included the time it took to develop the guest list and the time it took to choose and order the food. Venue selection and room set-up were not previously included in the project.

Venue Selection: In a review of other past projects that utilized an off-site venue, you see that the time to locate, select, and book a venue has ranged from three weeks in the best case to nine weeks in the worst case. You expect that it will take your team approximately five weeks to identify, select, and book the location.

Room Set-Up: A recent project you completed also involved setting up a room for a banquet. That event hosted 100 guests, and it took approximately four hours to set up the room and prepare the food. You are expecting 300 guests.

1. **What is the best estimate for the venue selection?**
   A. 23 days
   B. 15 days
   C. 6 weeks
   D. 5.3 weeks

2. **What technique is best used to estimate the venue selection?**
   A. Parametric
   B. Analogous
   C. Reserve analysis
   D. Three-point

3. **What is the best estimate for the event logistics?**
   A. 3 months
   B. 6 months
   C. 10 weeks
   D. 12 weeks

4. **What technique is best used to estimate the event logistics?**
   A. Parametric
   B. Analogous
   C. Reserve analysis
   D. Three-point

5. **What is the best estimate for the room set-up?**
   A. 2 days
   B. 12 hours
   C. 1 week
   D. 4 hours
6. **What technique is best used to estimate the room set-up?**
   A. Parametric
   B. Analogous
   C. Reserve analysis
   D. Three-point

Stakeholder Register

The stakeholder register, an output of the Identify Stakeholders process, documents the project stakeholders, their roles in the project, their contact and department information, and other pertinent information related to their risk tolerances, attitudes, and areas of interest. The stakeholder register was described in Chapter 3.

Project Documents

An evaluation of the project documents can identify any gaps, omissions, trends, variances, or other information that may lead to uncertainty. This can include initiating documents such as the business case or ongoing project documentation such as the work performance reports.

Procurement Documents

As mentioned previously, a contributing source of resource and money risks is the area of contracts and procurement activities. A review of any procurement documents, such as contracts, statements of work, and request for proposals (RFPs), can uncover uncertainty or risks. For example, if work with a vendor requires the use of a cost-reimbursable (cost-plus) contract, there will be increased risk for the project organization, as the final costs are not defined.

Enterprise Environmental Factors and Organizational Process Assets

Environmental factors could include an increase in budget restrictions, which would increase the project cost risk. Organizational process assets could include past project files, which can be leveraged to discover for risks identified on similar projects.

Enterprise environmental factors and organizational process assets were discussed in Chapter 4.

Identify Risks: Tools and Techniques

There are a large number of tools and techniques that can be used to identify project risks. In any environment, it is important that a number of different tools and techniques are leveraged in order to facilitate comprehensive risk identification.

The *PMBOK® Guide* includes the following tools and techniques.

- Documentation reviews
- Information-gathering techniques including interviews, brainstorming, Delphi technique, interviews, nominal group technique, post-project reviews, lessons learned, historical information, prompt lists, and questionnaires
- Checklist analysis
- Assumptions and constraints analysis
- Diagramming techniques including FMEA/fault tree analysis, force field analysis, influence diagrams, root cause analysis, and system dynamics
- SWOT analysis

In addition to the *PMBOK® Guide* tools and techniques, the *Practice Standard for Project Risk Management* includes the following:

- Industry knowledge base
- Risk breakdown structure (RBS) review
- Work breakdown structure (WBS) review

These risk identification techniques consider the past (retrospective analysis), the present (current situation analysis), and the future (future analysis). For the benefit of reviewing the various techniques, they are bucketed into past, present, and future. However, it is important to note that the techniques can be applied at different points and are not necessarily limited to the particular bucket under which they are listed below.

Retrospective Analysis	Current Situation Analysis	Future Analysis
1. Industry knowledge base	1. Assumptions and constraints analysis	1. Brainstorming
2. Interviews	2. Checklist analysis	2. Delphi technique
3. Post project reviews and lessons learned	3. Documentation reviews	3. Force field analysis
	4. FMEA/fault tree analysis	4. Nominal group technique
	5. Influence diagrams	5. Questionnaires
	6. Prompt lists	
	7. RBS review	
	8. Root cause analysis	
	9. SWOT analysis	
	10. System dynamics	
	11. WBS review	

Retrospective Analysis

Industry Knowledge Base

Many industries have an established industry knowledge base, such as construction, engineering, and oil or other natural resources. These industry knowledge bases are a rich source of project risk data based on historical project details and experiences.

Leveraging an industry knowledge base provides insight into the risk exposure for the current project while also serving as a benchmark against external organizations. While a knowledge base can provide general industry risk information, it does not contain current project-specific risks.

Interviews

Interviews can be formal or informal, individual or group exercises used to solicit risk information. Expert interviews both inside and outside of your organization can be rich sources of information on risks that a project may encounter. Utilizing the experience and perspectives of others is a potent technique for identifying and managing risks.

When held with stakeholders, the interviews can improve their engagement in the project while also allowing the project manager to address specific risks in more detail. Because the interviewee can bring non-risk-related information into the interview, it is important that the interviewer has prepared an agenda ahead of time, keeps the interview on point, and manages the time of the interview appropriately. The interviewee must feel as though he or she can trust the interviewer with their information and their position on a particular risk or risks, so a level of emotional maturity and trust is also necessary.

Given that interviews can be time-consuming, it is not an optimal technique to use when working with a large number of stakeholders or experts.

Post-Project Reviews and Lessons Learned

The same risks tend to recur in project after project unless the root cause is identified and remedied. Data from earlier work (in the form of project retrospectives, lessons learned, post-mortems, post-project analyses, or close-out reports) can provide extensive risk information.

Everyone is familiar with the idiomatic definition of insanity, which is repeating the same action and expecting a different outcome. Leveraging the past and lessons already learned allows us the ability to break that cycle of insanity in project risk management.

This risk information is not limited to previously identified threats but also previously effective responses, successes in capturing opportunities, and areas of exposure that are organization-specific.

Considering the past will assist in preventing past mistakes while also potentially capturing opportunities similar to those that have arisen in the past. This also contributes to organizational learning that can be applied to future projects.

As is true for many of the techniques addressed here, leveraging the past is not a standalone technique for risk identification. Not all risks have been fully identified, addressed, or documented during past projects. In addition, some organizations struggle to provide an easily accessible source of historic information. That historic information, if available, is considered a component of the organizational process assets.

Current Situation Analysis

Assumptions and Constraints Analysis

Every project and every identified project risk is conceived and developed based on a set of hypotheses, scenarios, or assumptions. Assumptions are ideas that we believe to be true, real, and factual.

An assumptions analysis explores the validity of assumptions as they apply to the project. It identifies risks to the project from any inaccuracies, instabilities, inconsistencies, or incompleteness of assumptions that are made about a project.

The process for conducting an analysis of the project constraints and assumptions is as follows.

1. Document assumptions and constraints
2. Test assumptions and constraints
3. Generate risk

I recently completed a project that was heavily dependent on email, due to the fact that the team was completely virtual. When I developed my duration estimate, it was based on the assumption that the project team would have 24/7 access to email. Did I know without a doubt that they would have uninterrupted access? I did not, but it was the assumption I used when I generated the estimates.

I tested the assumption and the impact of its potential inaccuracy on the project. If the assumption was false and email access was interrupted, how big of an impact would it have? For this particular project, email interruption would have been a significant impact. What was the likelihood of that assumption being false? We had a stable infrastructure with no interruptions in recent history, so I considered it a low likelihood.

Because of its impact, I identified it as a yellow or moderate risk on my risk register, and because it was a moderate risk, we defined a contingent response strategy to implement in the event that email went down. We were certainly glad that we had done so when, right at the most critical juncture of our project, email was down for almost 24 hours. The contingency plan was easily invoked, and we had minimal disruption.

A relatively easy technique requiring no special tools the assumptions and constraints analysis provides exposure to project-specific risks. Assumptions and constraints must be clarified and documented in order to be evaluated, and evaluating assumptions and constraints is good practice for project managers on all projects. Not only does it protect you as the project manager, but it also creates a good record of your decision-making process that can be extremely beneficial for future projects.

Checklist Analysis

Risk identification checklists can be developed based on historical information and knowledge that has been accumulated from previous similar projects and from other sources of information.

The word "checklist" may seem a bit misleading in the context described here. A good way to think of it is as a master list of risks. In other words, if your organization consolidated all of the risk registers from recent projects and removed any redundancies, the result would be this type of risk checklist.

While creating a checklist can be quick and simple, it is impossible to build a complete and exhaustive one. The team should make sure to explore items that do not appear on the checklist. In addition, the checklist should be reviewed during project closure to incorporate new lessons learned and improve it for use on future projects. This can include leveraging some type of unique numbering scheme that is applied to the categories, subcategories, and risks.

Creating a risk identification checklist is considered a professional responsibility of the project manager. Typically, the risk checklist is owned by the project or program management office and aligns with the standard risk breakdown structure.

While it is a powerful starting point for project risk identification, a risk checklist does not include opportunities, as they are project-specific.

Documentation Reviews

A structured review of project documentation, including plans, assumptions, previous project files, contracts, and other information, may be performed to identify any areas or indications of risk or uncertainty. The quality of the plans, as well as the consistency between those plans and the project requirements and assumptions, can be indicators of risk in the project.

Project documentation review can include a review of:

- The assumptions log
- Work performance reports
- Earned value reports
- Network diagrams
- Baselines

Documentation outside of the project that may also be helpful includes:

- Lessons learned
- Published information
- Commercial databases
- Academic studies
- Published checklists
- Benchmarking
- Industry studies

FMEA and Fault Tree Analysis

A failure mode and effect analysis (FMEA) is used for the analysis of potential failures modes within a system. Failure modes are any errors or defects in a process, design, or item.

FMEA is considered a bottom-up technique that examines the failure modes of the components within a system and traces forward the potential effects of that failure mode on system performance.

FMEA is appropriate for analyzing systems that contain little or no redundancy and may also be used if a system contains new technology and the potential effects of failure of the components of the system need to be explored.

FMEA determines:

- Severity (S) – The effect of the failure
- Occurrence (O) – The likelihood the failure will occur
- Criticality (C) – Severity multiplied by occurrence (S x O)
- Detection (D) – The effectiveness of controls to prevent the failure
- Risk priority number (RPN) – S x O x D

Function	Potential Failure Mode	S	O	C	D	RPN
Dispense cash requested by customer	Does not dispense cash	8	5	40	10	400
	Dispenses too much cash	6	3	18	7	126
	Takes too long to dispense cash	3	7	21	8	168

A fault tree is used to analyze a single fault event by identifying the combinations of conditions and component failures that would lead to that fault. Unlike FMEA, a fault tree is a top-down, identifying and analyzing conditions that lead to the occurrence of a defined effect.

The steps involved in a fault tree analysis include:

1. Defining the undesirable event or failure
2. Obtaining a thorough understanding of the relationships
3. Constructing the fault tree
4. Evaluating the fault tree and identifying corrective measures to be taken
5. Implementing these measures in order to protect against the hazards

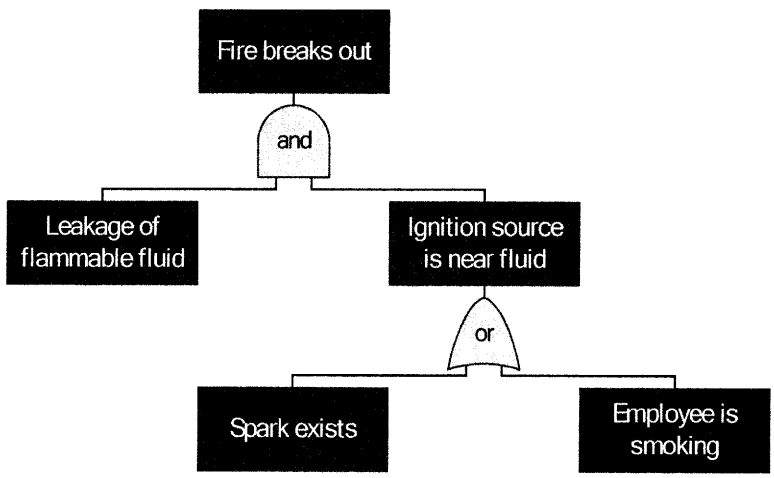


Figure 5-4: Fault Tree

FMEA is more appropriate than a fault tree analysis when a large number of distinct system conditions exist with a range of unacceptable consequences, and a fault tree analysis is more appropriate when there is concern about one or just a few system conditions that pose unacceptable consequences. A fault tree analysis is appropriate for showing how sensitive a system will be to one or more initiating faults.

Fault trees enable the fault/failure logic within a system of a particular effect of interest to be represented in diagrammatic form, whereas FMEA records the system effects of each failure cause in a tabular format.

Influence Diagrams

An influence diagram provides a graphical representation of situations, showing causal influences, the time ordering of events, and other relationships among variables and outcomes.

There are typically four nodes depicted as various shapes in an influence diagram:

- Uncertainty node – An oval
- Decision node – A rectangle
- Value or objective node – An octagon or a diamond
- Function node – A rounded rectangle
- Relevance – Solid arrows
- Information – Dashed arrows

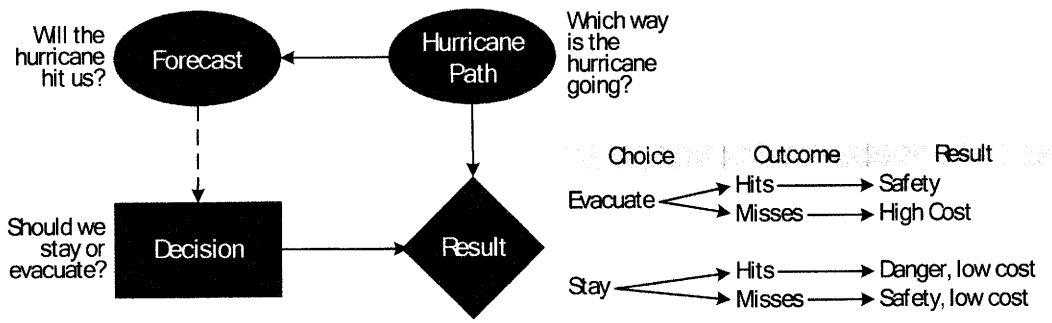


Figure 5-5: Influence Diagram

As seen in Figure 5-4, the decision needs to be made whether to evacuate or stay when there is a potential for a hurricane. The hurricane path and the forecast are both considered uncertainties, with the hurricane path being relevant and the forecast being information to consider.

The decision to evacuate will have two outcomes: the hurricane will hit and we will be safe or the hurricane will miss and we will have spent money unnecessarily. The decision to stay also has two outcomes: the hurricane will hit, and while we did not spend money on evacuating, we are in danger, or the hurricane will miss, and we will be safe and will not have spent any money.

Influence diagrams are used to expose key risk drivers and can generate counter-intuitive insights not available through other techniques. However, it may not always be easy to determine the appropriate structure.

Influence diagrams are also known as relevance diagrams, decision diagrams, and decision networks.

Prompt Lists

A prompt list is a list of common risk categories that can be used as a framework for additional risk identification techniques. Prompt lists stimulate creative thinking and are an excellent tool to use in conjunction with brainstorming. Often, the prompt list serves as the highest level of the risk breakdown structure (RBS).

Common prompt lists include:

PESTLE	TECOP	SPECTRUM
Political	Technical	Socio-cultural
Economic	Environmental	Political
Social	Commercial	Economic
Technological	Operational	Competitive
Legal	Political	Technology
Environmental		Regulatory/Legal
		Uncertainty
		Market

RBS Review

A risk breakdown structure (RBS) is a graphical, hierarchical depiction of risk categories and subcategories for the project. Risk data is organized and structured to provide a standard presentation of project risk categories that facilitates understanding, communication, and management.

As a best practice, a PMO may develop a standard RBS for similar types of projects. This RBS template, a component of the organizational process assets, can then be modified for specific individual projects.

I personally recommend applying some type of standard numbering as well in order to categorize and group risks. That numbering scheme should carry through to the risk register and risk checklist. For example, if the operational category was 4.0, the human resource category would be 4.1, and then HR risks would be 4.1.1, 4.1.2, etc.

The RBS can be used to structure and guide the risk management process.

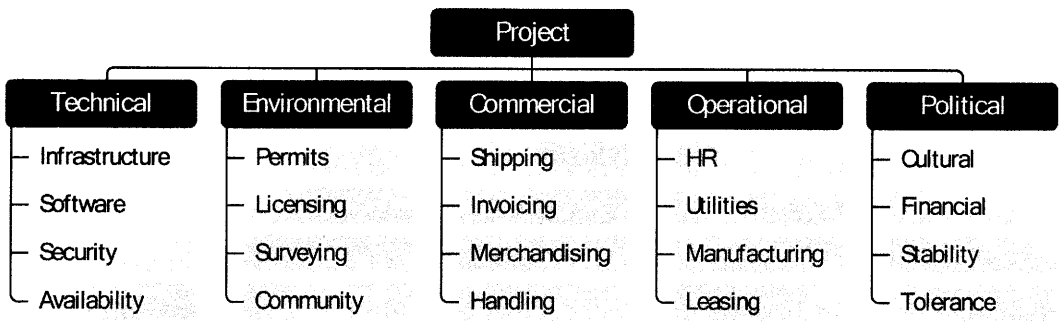


Figure 5-6: Risk Breakdown Structure

PMBOK® Guide, page 317

As mentioned previously, the upper levels of the RBS can be used as a prompt list to ensure complete coverage during the risk identification phase. This is accomplished by using the RBS to structure whichever risk identification method is used.

The major areas can also be used to structure risk identification interviews, providing an agenda for discussion between the facilitator and interviewees. Risks documented on the risk register can be mapped to the lowest levels of the RBS in order to reveal any possible gaps or redundancies in risk identification.

Categorizing risks according to the RBS provides a number of additional insights into the assessment of risk exposure on the project, which would not be available from a simple list of risks even if the list were prioritized. These include:

- Understanding the type of risk exposure on the project
- Exposing the most significant sources of risk to the project
- Revealing root causes of risk
- Indicating areas of dependency or correlation between risks
- Focusing risk response development on high-risk areas
- Allowing generic responses to be developed for root causes or dependent groups of risks

Root Cause Analysis

A root-cause analysis or "cause-and-effect" exercises may be used for risk identification. Effective risk management relies on identifying the root causes of the risks in order to apply more efficient responses. Rather than treating the headache with Tylenol, look for the cause of the headache, such as a sinus infection requiring antibiotics.

There are a number of effective techniques for discovering the sources of problems, including fishbone diagrams (also known as Ishikawa or cause-and-effect diagrams).

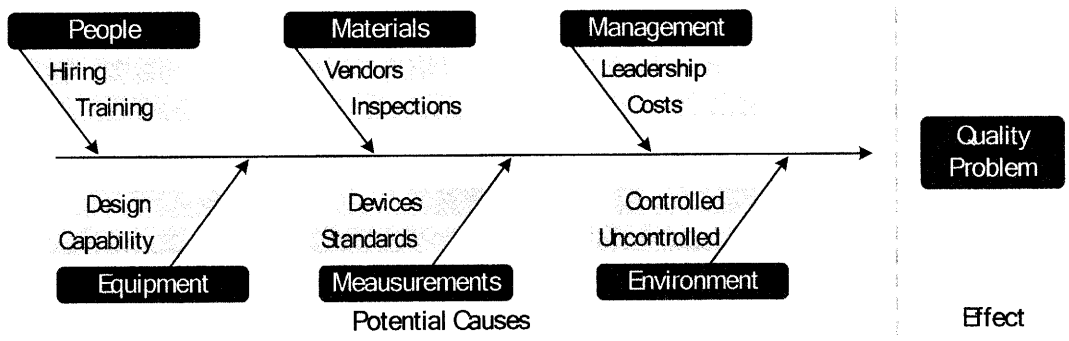


Figure 5-7: Fishbone Diagram

PMBOK® Guide, page 239

A fishbone diagram begins with identifying an undesirable outcome, problem, or quality issue. When it is identified, the project team is then challenged to work backwards to identify all potential causes of the problem.

In addition to uncovering specific risks that might not otherwise be detected, this exercise will often result in a more accurate perception of how probable certain problems are.

One technique used in association with a fishbone diagram is known as the Five Whys. The Five Whys is an iterative, interrogative technique used to explore the cause-and-effect relationships underlying a particular problem. The primary goal of the technique is to determine the root cause of a defect or problem by repeating the question "Why?"

Each question forms the basis of the next question. The number five in the name derives from an anecdotal observation on the number of iterations needed to resolve a problem. The technique was formally developed by Sakichi Toyoda and was used by the Toyota Motor Corporation during the evolution of its manufacturing methodologies.

Not all problems have a single root cause. If there is a need to uncover multiple root causes, the method must be repeated as many times as necessary, with a different sequence of questions each time.

The method provides no hard and fast rules about what lines of questions to explore or how long to continue the search for additional root causes. Thus, even when the method is closely followed, the outcome still depends upon the knowledge and persistence of the people involved.

The following is an example of the Five Whys used to interrogate a problem of team members leaving a company.

1. Why? – They are not happy with their job.
2. Why? – They do not feel challenged.
3. Why? – Their manager is not providing challenging assignments.
4. Why? – The manager is not aware of the level of challenge that would be appropriate for their direct reports.
5. Why? – The manager is not doing quarterly performance reviews with the appropriate assessments of skill level. (ROOT CAUSE)

SWOT Analysis

Evaluating the strengths, weaknesses, opportunities and threats for an organization or project is known as a SWOT analysis. For many projects, particularly those involving delivering solutions, these aspects are examined early in the project, often before the project is chartered.

A SWOT analysis is a good framework to establish during a risk identification brainstorming session. The team would first identify and list the organizational strengths and weaknesses. From there, they can derive opportunities from the strengths, and threats from weaknesses, using risk meta-language.

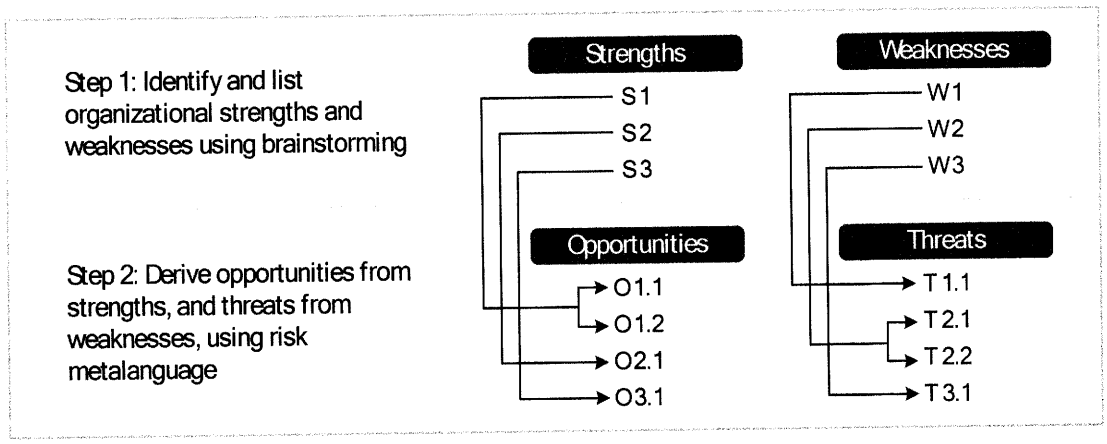


Figure 5-8: SWOT Analysis

Practice Standard for Project Risk Management, page 85

While a SWOT analysis provides a structured approach to evaluate both threats and opportunities, it does not account for external risks. Those risks that are identified are typically high-level and somewhat generic. These risks can then be further evaluated through other techniques.

System Dynamics

System dynamics are a particular application of influence diagrams used to identify risks within a project situation by using feedback and feed-forward loops. System dynamics are utilized when there is a complex, non-linear relationship between entities and information, and they show the impact of risk events on overall project results and a system's sensitivity to specific risks.

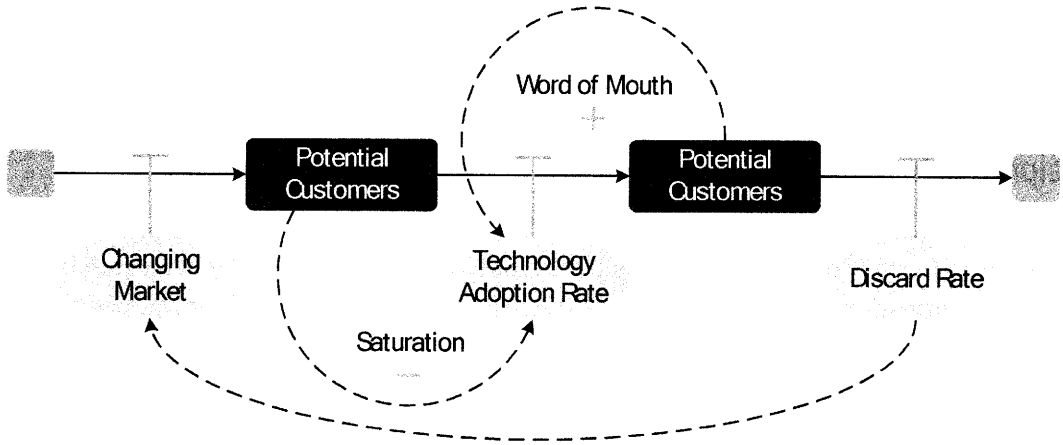


Figure 5-9: System Dynamics Model

Practice Standard for Project Risk Management, page 85

WBS Review

The work breakdown structure (WBS) is a graphical, hierarchical depiction of all of the work of the project. The WBS is an output of the Create WBS process and follows the 100% rule: the lower levels roll up to the higher levels, nothing is left out, and no extra work is included. The lowest level of the WBS is a work package, a group of related activities that are estimated, managed, and controlled by the work package owner.

The WBS can be analyzed and used to structure a number of other risk identification techniques, which help ensures that all elements of the project scope are considered.

Future Analysis

Brainstorming

One powerful risk discovery process is the group creativity technique of brainstorming, as discussed in Chapter 3. Brainstorming sessions are conducted with the project team and can begin with a review of the risk list that was already constructed. The team should work together to brainstorm additional potential project problems and project opportunities.

The brainstorming process occurs as follows.

- The project manager and project team will examine the methods and processes that are being used on the project and consider any aspects that are new or that may be particularly difficult.
- The team should also focus on outside factors that might have an impact on the project, such as natural disasters, weather, government or legal changes, and the actions of competitors.
- The facilitator of the brainstorming session should stimulate the participants to think of new risks and build off one another's ideas.
- The brainstorming session should continue until all of the participants have contributed.

The process can be concluded by restating any risks that are unclear and combining or eliminating risks where there is redundancy. When the brainstorming process is complete, the new risks can be added to the project risk list.

Delphi Technique

Also discussed in Chapter 3, the Delphi technique is a way to reach consensus from a panel of experts. Project risk experts participate in this technique anonymously via a survey or questionnaire mechanism. A Delphi group is a group intelligence process used to tap into anecdotal historical data would otherwise remain hidden.

The facilitator solicits ideas about the important project risks. These responses are summarized and are then recirculated to the experts for further comment and possible revision or reassessment of their previously submitted positions.

Consensus may be reached in a few rounds of this process. The Delphi technique helps reduce biases in the data and keeps any one person from having undue influence on the outcome, such as in environments in which "group think" may be prevalent.

Delphi groups are typically a minimum of four to five experts. This number establishes estimate ranges and stimulates discussion. Delphi groups are collaborative, which leads to group buy-in, ownership, and motivation.

A newer version of the Delphi technique is wideband Delphi, which removes the completely anonymous component from the process. Instead, experts meet and discuss their information, which increases interaction and communication. Their ideas and information are still captured anonymously, but they are then discussed as a group, potentially in multiple rounds, until agreement is reached.

Force Field Analysis

Although typically used in change management, a force field analysis can be used in risk management to identify the driving forces and restraining forces which affect the achievement of the project objectives.

The team starts by identifying the individual project objectives and then brainstorming the forces working to achieve that objective and the forces working against the achievement of that objective.

A scoring model can be used to evaluate the difference in driving versus restraining forces, such as a one (weak) to five (strong) scale.

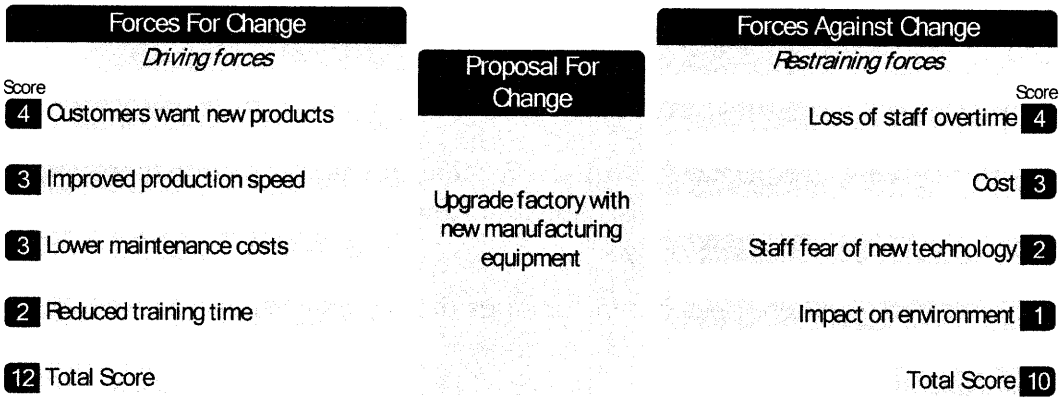


Figure 5-10: Force Field Analysis

Practice Standard for Project Risk Management, page 80

Futures Thinking, Visualization, and Scenario Planning

Futures thinking is another creativity technique that can be used to help a team identify and plan for positive and negative risks that can impact the future. One method is to have the team collaborate to envision a desired end-state. With that vision in mind, the group can then attempt to identify impediments to that future state and work to assess those impediments.

Unlike futures thinking based on a vision, which is a desirable view of the future, scenario planning involves a range of possible views of the future. Scenario planning for risk identification involves evaluating the environment to assess various scenarios that could occur and determine the uncertainties involved.

Nominal Group Technique

As discussed in Chapter 3, nominal group technique is a technique that enhances brainstorming by taking into account all of the participants' opinions through a tallying process.

Each group member gives his or her opinion, and duplicate opinions are removed. The remaining list is ranked by the members. This technique ensures contribution from all participants and can serve as the foundation for other analysis techniques.

Questionnaires

Risk questionniares can be used as a method similar to risk checklists, but where possible risks are phrased as questions rather than as risk statements. For example, on a risk checklist, a risk statement may be "Team members may not be available at the start of the project," but on the risk questionnaire, the same item would be presented as the question "Are the team members available at the start of the project?"

Risk questionnaires are another organizational process asset that may be developed and/or housed by the PMO.

Identify Risks: Output

Risk Register

The risk register is the primary document for housing all risk information. The risk register is developed during risk identification and updated throughout the subsequent risk activities and processes.

Upon risk identification, risks are included in the risk register and described in as much detail as is reasonable. The root causes of these risks are also documented in the register. Root causes are the fundamental conditions or events that give rise to one or more identified risks. They are recorded to be used to support future risk identification for this and other projects.

Upon risk identification, the risk register should contain for each risk:

1. A unique risk identification number – If there is a standard numbering scheme applied to the RBS, the resulting risks under those categories would reflect that numbering.
2. The risk name – The name should be as specific as possible.
3. A description of the risk, including whether it is an opportunity or a threat – The description should be clearly articulated. I call it "passing The MeMe test." My mother is The MeMe. She has been out of the business world for awhile. If she were to read the risk description, would she be able to understand what the risk is about? Be cautious about using acronyms, slang, and technical jargon. If someone were to evaluate your risk register in the future, would they understand the description?
4. Identified risk triggers or precursor events
5. Root causes of the risks