



eCameron, Inc.

Project Management Newsletter

Industry

Issue 10
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This Issue

Working with Risk's Impact: A look at quantifiable and non-quantifiable risk elements, how to analyze them and represent them to stakeholders.

Risk Estimation Tool. An educational Excel tool to assist in understanding risk; includes presentation proven graphics that convey risk impact to executives.

Agile Project Management with Scrum, by Ken Schwaber. Scrum software development requires changes in project management methodology. Mr. Schwaber describes how a Scrum team and a "ScrumMaster™" should work together.

Next Issue

Classical, Critical Chain, Agile Project Management and How They Relate A comparative look at the major points of each methodology.

Identifying and Managing Project Risk, by Tom Kendrick.

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Risk

In part one of this series we provided the background statistics required to start assessing the effect of risk on a project. This continuation will address how to apply that knowledge. To help with these concepts an education *Risk Estimation Tool* is described.

Methodology has a significant impact on risk. Agile development is touted as being

one of the primary methods of reducing risk. Scrum software development methodology, a subset of agile, is presented in the book synopsis.

To conclude this series on managing risk, next month we will include a synopsis of Tom Kendrick's book *Identifying and Managing Project Risk*.

Working with Risk's Impact

After reading part one in this series, you might be thinking "Wow, if such small numbers affect the cumulative risk so greatly, then the numbers I chose for the probability and impact are pretty important. So how should I generate those numbers?"

First, let's make sure it is understood that "numbers" are not always achievable; not all risks can be quantified.

Non-Quantifiable Risk

Risk comes from many areas and at times may be too general to determine a specific impact or probability. Project conditions, such as team or Project Manager experience, size of project or the use of new technology may increase risk in non-quantifiable ways. For instance, a one-month project with three people inherently has less risk than a twenty-four month project with eighty people on three continents speaking three languages. There are situations that arise that cannot be predicted and whose chances of occurring increase as complexity increases. These risks need to be handled using order of magnitude estimates grading them on a one-to-three or on a quintile scale for probability and impact. Lists of items to help guide people toward looking for failure modes may be found in books or the internet. Tom Kendrick's book on risk (reviewed next month) is a valuable source for these lists.

One of the more common presentation methods for non-quantifiable risk is to rate them on a scale of one to five for impact and probability and plot them on a grid. This can be accomplished with a nice presentation graphic generated in Excel (see

Figure 1 in the next article). In most cases the scatter-plot will show the density of risk in a given quadrant but adding a simple average (the red diamond) takes the guesswork out of where the "center-point" of risk lies. Further clarification can be

Workshops on Project Methodology

Your company now has the choice of three workshops available to assist in improving your project performance.

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3. Setting up a Project Management Office: Young or growing companies often find themselves doing an increasing amount of project work and need to consider which process to follow to minimize their efforts and maximize their return. This workshop will help you determine the level of process required in your organization.

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achieved by drawing lines to demark the areas of Low, Medium and High risk.

It is critical, as with all risks elements, to capture supporting information to justify the order-of-magnitude entries.

Quantifying Risk

In many projects there is enough empirical data that a significant number of risks elements can be quantified. National or regional databases and prior projects can often provide sufficient information to ensure probability and impact of risk elements are better than guesses or order of magnitude estimates.

Using the risk register from our previous [newsletter](#), let's work through how risks can be quantified.

Risk 1: 'A new programming tool may be needed to implement the requirements of a requested feature.'

The requirement was to track equipment status changes even when the equipment was not able to communicate with the equipment tracking system. The task was to convince the customer that the requirement could not be met based on the capabilities of the equipment. There had been success in convincing customers of this in the past.

To understand the chance of having to implement a solution, the team needed to understand in what cases the software would 1) be beneficial and 2) still not be able to transfer the data and would require human intervention. It was determined that there were forty-seven conditions in which the equipment would send a status change. Fourteen of those conditions were when the equipment was unable to communicate in the desired fashion. Of those fourteen conditions four might be assisted by this software. The remaining issue was that these four might be very critical conditions and the client might deem it warranted the effort. The decision was made that all forty-seven could be deemed statistically equal and therefore the chance of occurrence was calculated to be $4/14=30\%$.

Risk 2: 'Needing additional programming resources competent with the tool in Risk 1.'

There was a software tool that could be purchased that would assist in this but there were no resources on the staff that were familiar with the tool. The developers were polled with the following questions.

4. Do you have any experience with the product "Equip-Comm"?

5. Do you have any experience with a similar product?

6. How long would it take for you to become reasonably competent on this product?

7. Do you know anyone that is competent with this product?

A couple of scenarios were studied for when the tool would be needed and whether the team would have enough slack to learn the tool. It was determined that three of the five resources could learn the tool and would be only moderately loaded at the time the work needed to be completed. There was a 70% chance they would have the time to learn it. So the chance that an internal resource would be available and have time to learn the tool was $70*60=42\%$. The chance an external resource would be needed would be about 60%.

Risk 3: 'Construction may not be completed in time to do deployment testing.'

For the construction issue there was more empirical data to use. One source of information was construction contractor organizations (national and local) that could supply statistics for on-time completion. These sources were queried on late completion based on any reason—weather, client add-ons, poor performance, etc.

The second source of information was the client. Since the software project was a small portion of a much larger project (building and outfitting a manufacturing facility), the client's Project Manager for the construction was contacted and asked what risk factor they were using for on-time completion. The answer did not come easily, but after some persistent questioning a number was delivered. Lastly the construction company was contacted.

All sources were surprisingly close to one another indicating that 40% of projects were late. The amount of time they were late ranged from one to six months.

This may appear to be a lot of work, but it is required to define mitigation plans and justify your findings to the stakeholders. Before stakeholders will agree to added costs or delays, they need to understand that proper analysis and planning has been completed. Too many stakeholders do not understand risk and all too often shrug it off as a way for the Project Manager to justify more money. Having the data to back up your numbers, helps defend your position and educate stakeholders.

Are these the real risks?

Many times Project Managers complain about the quality of the items that are identified as risk. This can be for a variety of reasons including:

- Lack of Project Manager's domain experience,
- Team members not understanding the project,
- The Identified risks are too general and need to be qualified,
- The risks are used to deflect team deficiencies.

The best method to work past these impediments is to get further explanation of the items. Continually ask "why?"—"Would you please explain?", "What does that mean?" The questions should be open-ended and not leading. Ask the person to explain the risk. For instance, "Why do you think construction will be late?" The answer may be that the customer has a history of asking for changes, the builder has a record of being late, the weather or something else. These will help point to other risks, sources of issues and potential mitigations. The items discovered in the drilldown may be

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Item	Type	Action
Lack of a team atmosphere	Cause	PM: Build the team
Poor management	Cause	PM: Correct the project management style to compensate.
A team member recently left and is planning on raiding the team	Risk	Risk: Try to work with personnel to provide incentives to stay.
No chance for advancement	Cause	PM: Look for ways to promote good individuals
Low pay	Cause	PM: Talk to Manager about individuals pay structure. Include a project incentive.
There is a rumored layoff and people are looking for more stable positions	Risk	Risk Confirm rumor. If true try to get "contract" to exempt the project team.
The code is difficult to maintain	Cause	Task: Build refactoring into project.

Table 1: Risk Analysis

the real issue that needs to be addressed—in the risk register or in the task list. You are looking for the root cause.

For example, nearly all risk registers have an item that key resources may leave the team. Further questioning may produce some of the following responses:

- Lack of a team atmosphere,
- Poor management,
- A team member recently left and is planning on raiding the group,
- No chance for advancement,
- Low pay,
- There is a rumored layoff and people are looking for more stable positions,
- The code is difficult to maintain.

The problem is that this list is a mixture of causes, rumors and other risk. The first step is to categorize the items. Table 1 is a summary of the types of classifications and resulting actions

Notice that many of these items are not risks. There are a number of items on this list that "are" and not "may be". They are causes that contribute to the risk. These items need to be made overhead tasks or be added to the task list. Many of them are tasks for the Project Manager. Note that by making an issue a cause the risk is not removed. It

signifies making the project more complex, increasing the non-quantifiable risk.

Do not simply accept all the items. For instance refactoring code is a subjective statement. Many coders just do not like the coding style of previous programmers and want to use their own style. Instead, add a task to create coding standards and reviews and refactor for style on an as needed basis. Subjective items like refactoring have to have some very specific targets.

For all the items that are risks, your questioning should get to a low enough level that you can prioritizing them and generate mitigation plans.

The Cost

Once the risks are understood then the impact needs to be assessed. These numbers are often easier to determine than the odds of occurrence since this is similar to building a schedule—software costs, labor rates, learning curves and burn rates can be determined and estimates for their impact calculated.

To turn this into a set of contingency values there are a few options. One simple mathematical approach is to calculate the weighted average of the impact—the product of the probability and impact. Extracting data from the table in the last [newsletter](#), Table 2 shows the results from this calculation. The process is to take the odds of each combination

Risk			Chance of Combination	Cost			Probability Cost	Real Cost
1	2	3		1	2	3		
No	No	No	42%	\$ -	\$ -	\$ -	\$ -	\$ -
No	No	Yes	28%	\$ -	\$ -	\$ 30,000	\$ 8,400	\$ 30,000
Yes	No	No	7%	\$ 1,500	\$ -	\$ -	\$ 108	\$ 1,500
Yes	No	Yes	5%	\$ 1,500	\$ -	\$ 30,000	\$ 1,512	\$ 31,500
Yes	Yes	No	11%	\$ 1,500	\$ 30,000	\$ -	\$ 3,402	\$ 31,500
Yes	Yes	Yes	7%	\$ 1,500	\$ 30,000	\$ 30,000	\$ 4,428	\$ 61,500
Risk Contingency:							\$ 17,850	

Table 2: Contingency Calculation

occurring and calculating the potential impact based on those numbers. These values are represented in the table as the "Probability Cost". Using this method the value of the contingency would be set at \$18,000 (precision of the estimates should round the value).

The astute observer may note that this actual cost is not possible. The cost of each occurrence is in the "Real Cost" column. The two most likely costs to incur are \$0 (no cost) or \$30,000. By choosing \$18,000 you are certain to be "wrong". In addition, what are you to do if all the risk fires and you need \$61,500? This is precisely the reason that you need to educate people on statistics.

Some schools of thought believe you should use a more conservative number, say \$30,000, since it will cover you 93% of the time. That will probably result in people trimming your contingency since this philosophy always makes your estimates high. Your job is to educate the stakeholders on what these numbers mean and that they are statistically as accurate as the estimates that generate them.

Other factors will affect your decision. For instance, the non-quantifiable risks illustrated in Figure 1 (next article) show that based on the analysis of other factors this project is a high risk project. This could bias your decision on a contingency to, say, \$30,000. If non-quantifiable risks were lower it might make you feel more comfortable with the \$18,000. It is not advisable to go below this number. Make sure that the agreed upon contingency and the method

Cost	Odds
\$ 0	42%
\$ 2,000	7%
~ \$ 30,000	44%
\$ 61,500	7%

Table 3: Odds of Given Cost

used to arrive at it is fully documented and approved.


The same process should be repeated for and probability-weighted delay determined. The project should not be considered late until the most likely date plus the anticipated delay is exceeded.

To determine the relative importance of risk elements, use a consistent method to relate various elements. If, for instance, you have two risks that each have a cost impact of \$20,000 but one also has a 15 day schedule impact, it is easy to determine the one that you should invest more time in mitigating. But if you have one risk at \$15,000 and a 20 day delay and are comparing that to another risk with a \$20,000 and a 10 day delay, it might be more difficult to determine which you should spend more effort mitigating. One common method is to convert the delay to a monetary value by multiply it by a delay cost factor and using the sum of both costs to prioritize your work. This is discussed further in the next article.

Conclusion

Using probabilities you and the stakeholders need to understand that sometimes you will be high and sometimes you will be low. The average of all of your projects should be very close to the average of your contingencies. If you are right all the time, you are not putting risks in your register; you are putting "certainties". This project may only cost you \$2,000 in contingency where the next may cost you \$30,000 on the average you are correct.

This two-part series in summarizing risk analysis has provided you with the basics to understand how risk can be analyzed. There are many sophisticated tools on the market to help with the calculations and there are books and websites with lists and surveys that you can use to assist in avoiding overlooking risk elements you might encounter.

The following article in this Newsletter is the discussion of a simple educational tool to help you understand what you might need in a commercial product. 

Tools: Risk Estimation Tool

There are a variety of tools available on the market to analyze risk. They range from spreadsheet add-ons to standalone packages that do Monte Carlo simulations and more. In this article we describe a very simple tool called *The Risk Estimation Tool* that is available on our website. It provides a method for educating yourself and others on the impact of risk and ways to address risk with your stakeholders. This is not a risk analysis product; it is tool that most people can use since it only requires Excel. It provides education on the need for more sophisticated tools. Its purpose is to:

1. Be an educational tool.
2. Illustrate executive presentation techniques,
3. Provide an expression of risk as a function of time,
4. Show the impact of aggregated risk,
5. Show cost and delay impact analysis.

The spreadsheet is not intended to be a comprehensive risk modeling tool. It is a high-level estimation tool that pro-

vides order of magnitude estimates for small sets of data that can be used to determine if the risk is complex enough to warrant a full modeling/simulation tool. In that context, the formulas used are not as rigorous as commercial products.

The tool may be found on our website configured with the data found in this article. It contains:

1. Non-Quantifiable risk register with a matrix presentation graphic,
2. Quantifiable risk register with aggregate risk calculations,
3. Worksheets for assumptions and mitigation,
4. Presentation graphics for illustrating impact and risk status,
5. A Controls worksheet to manipulate the basic functionality of the tool.

In the zip file that is downloaded there is both the tool and a User Guide.

Using Risk Tools in General

This spreadsheet, like many tools, consists of two main sections—quantifiable and non-quantifiable risk. They allow you to enter numbers that are processed by one or more calculations to generate a result. But, when analyzing the results of any tool, you must remember where the numbers came from.

Based on the genesis of the estimates, risks should be classified as quantifiable or non-quantifiable. Deriving the values for impact (cost and duration) that come from group consensus (i.e. Delphi or PERT), industry standards, prior projects, etc. are probably quantifiable. Attributes of individual risk elements that are assigned by using intuitive feel of the Project Manager and the team are no more than guesses. If there is no way to make a traceable estimate, the risk should be classified as non-quantifiable.

Some general factors that need to be considered when looking at the source of estimates are:

1. The team's experience and knowledge in the domain,
2. The Project Manager's experience in estimating (or facilitating the estimation of) risk,
3. The method of determining the values of the attributes.

These numbers can be highly subjective and the precision is far from the multiple decimal places inherent in computerized tools like a spreadsheet. Durations should be rounded to the nearest day or week and financials to the nearest hundred or thousand dollars. This is often not done in the tool and is left to the user.

Also, it should be noted that statistical treatment of risk in projects has been questioned by some since the proper use of statistics is based on experimental data not inductive probabilities.

Probability

Probability is the most subjective attribute. Unless the team has data to show that this risk has executed X out of Y times while running this type of project under the same or similar conditions, this number could be closer to a guess. Care needs to be taken in determining probabilities since small changes in a probability can have significant impact.

A common problem is to attempt to quantify all the risks. Although pressure from stakeholders is high because they want an "estimate of the contingency" (which they will treat as a quote) an over zealous team should not try to quantify non-quantifiable risks. In technology projects, pressure to quantify risk is worse since there is a general feeling that numbers can be derived for everything. To help avert this, each risk should have a reference to how the number was generated.

In lieu of experimental data, experience from a variety of sources is the key to generating good approximations of the probability for risk execution.

Cost and Schedule

Cost and schedule impact should be less subjective. Regardless of how risk is analyzed and used, each risk element should have a complete mitigation sub-plan developed so that a reasonable impact (cost and schedule) can be estimated. These numbers are then used in a tool to determine the planned aggregate effect on the project.

All mitigation plans should be treated as subcomponents to the schedule. They should be staffed and scheduled to determine the cost and effect on the end point of the project. The obvious flaw is that two otherwise unrelated risks may require the same resources. This is determined by comparing the mitigation's resource plans to find overloading of resources. If reasonable, an assumption should be made and documented. If, on the other hand, the probability of mutual execution is too high for the elements, mitigation plans should account for this and adjust the resource plans to accommodate. This can be done by creating a secondary schedule containing those elements with conflicting resource utilization and determining the impact of mutual execution. High-end commercial risk analysis products can accommodate conditional paths and simulation of random risk execution.

With these concepts disclaimers and cautions made, let's proceed.

Assumptions in the Tool

A large number of assumptions are made in the function of this tool. Many are embedded in the formulas and a thorough reading of the "basics" in July's [Newsletter](#), is strongly recommended to understand the limitations. The general assumptions are:

- All risks are independent.
- All risks are non-exclusive.
- Accurate inductive probabilities can be generated—they are quantifiable.

Independence

As mentioned, independence of risk elements is imbedded in the calculations. In many cases technical independence is easy to verify. But other non-technical issues may create subtle relationships between the elements. Resource utilization, mentioned above, is one example of this. Another could be cascading risk caused by added stress on the project. Multiple risk elements executing may increase the complexity, requiring more management oversight of certain areas and less attention to others; increasing the non-quantifiable risk. This should be considered in larger projects by making multiple passes at the plans after assessing the probability of multiple risk executions.

Time Dependence of Risk

Risk and time are heavily intertwined. As time continues, the chances of a specific event occurring and its impact may increase or decrease. For instance, the loss of the Architect will have a big impact in the first few weeks of a year long project, but this impact will be much less than if all the specifications are half finished and a new architect has to ramp up on the project. Loss of the architect near the end of the testing cycle may be very minimal since only punch list items may remain that do not require the power (and cost) needed when designing the system. Therefore, this tool incorporates time dependence on risk. This, though, is relatively academic since a risk register should be reviewed and updated with new values every month. What it provides is a visual to educate executives on the trials and tribulations ahead.

Aggregate Probability Formula

The formula used to calculate aggregate probability is the converse probability, that is, one minus the probability it will not occur. For computing the probability that any one item will execute in a list of three items the formula is $1 - [(1 - P_1)(1 - P_2)(1 - P_3)]$. If $P_1=30%$, $P_2=20%$ and $P_3=15%$ then the probability of one occurrence would be $1 - [0.7 \times 0.8 \times 0.85] = .52$ or a 52%.

To calculate whether two will execute, the same process is used. First, the probability that two will occur ($P_x P_y$) is determined and this is used to determine the probability that none of those combinations will occur. The equation, using the previous example, would be $1 - [(1 - P_1 P_2)(1 - P_1 P_3)(1 - P_2 P_3)]$. This evaluates to $1 - [0.94 \times 0.955 \times 0.97] = 0.129$ or 13% chance that two will execute.

To provide a general solution, given that E is the count of mutually occurring elements and N is the total number of elements:

$$P_E = 1 - \left[\prod_{x=1}^{N-E} \prod_{y=x+1}^N (1 - P_x P_y) \right]$$

Equation 1 - Aggregate Probability for Two Risks

A user-defined function in the Excel workbook generates this equation through a recursive process. Safeguards have been placed in the tool to minimize the chances of the recursive action taking an inordinate time to calculate. Please read the user documentation that comes with the tool for more information.

Impact Estimation Formula

Impact is calculated as the sum of the product of the probability and the liability for the associated risks.

The formula used is the sum of the impact times the probability of occurrence based on the number of combinations, or, $P_1 I_1 + P_2 I_2 + P_3 I_3$. Given that P is the probability of occurrence and N is the total number of elements I (cost or delay), the equation is:

$$I_{tot} = \sum_{n=1}^N P_n I_n$$

Equation 2 - Cumulative Impact

Unlike the probability calculation, this is not an intensive computational effort, nor is it a custom formula.

Again it needs to be mentioned that these formulas generate numbers that imply great precision. The precision output is no better than precision of the input.

Risk Register

Primarily there are two sheets for input—the “Risk Register” and the “Non-Quantifiable Risk Register”. Each risk register is designed to look like a real register and includes the required fields. Each risk should be enumerated along with owner, trigger, mitigations and assumptions (the latter two being done on separate worksheets).

Non-quantifiable

The function of the Non-Quantifiable Risk Register is to provide a general feel for the project risk and generate a

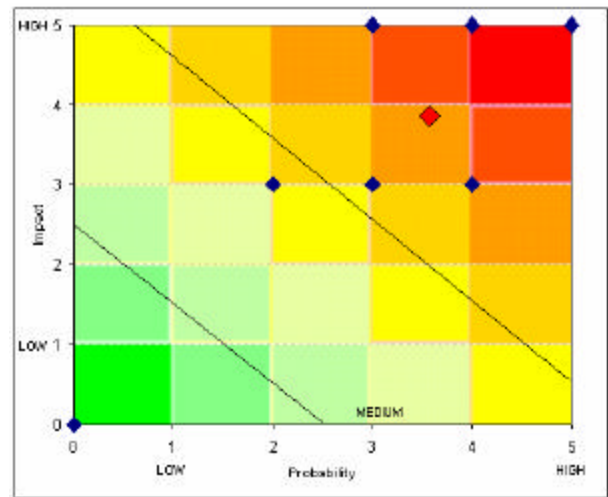


Figure 1: Non-Quantifiable Risk Presentation

presentation graphic. The calculations on this sheet are not extensive since it is non-quantifiable risk. The values are equated to integers for plotting in the risk matrix (Figure 1). Non-quantifiable risks are described in terms of Low, Low-Medium, Medium, Medium-High and High. If this is too fine a granularity, use only Low, Medium and High. The spreadsheet uses the quintile ranking to generate each point on a matrix and an “average” that is plotted in red. The average helps visualize the weighting that might otherwise be difficult to determine. This removes the subjective interpretation and discussion of where the point should be.

Quantifiable

As mentioned in the assumptions, all risks are considered to be independent and non-exclusive. This is very critical to the aggregate calculation and a significant limitation on the tool.

The register is arbitrarily broken into four potential phases for the project. These phases can be any logical break in the project. When using a classic waterfall approach, they can denote project stages—plan, develop, test and deploy phases.

Each element has a short description (used as the cross reference on other pages) and a full description (more verbiage to understand the risk). For each time period, a probability of occurrence, cost and schedule delay needs to be added. Consideration should be given to human resource requirements, leases, software costs, overtime, etc.

It must be understood that the delay has no effect on the cost. The delay is a change in duration (not effort) for the project. Delay is simply the change in the end point.

The delay does affect the ranking cost. Ranking cost is the sum of the cost and the duration multiplied by a “Delay Cost” factor. This is to provide a relative ranking value for the individual elements for prioritization.

Both cost and delay should be determined by a sub-plan developed for each proposed mitigation. The result from this is entered into the risk register. This is a project management best practice that should always be followed and is not specific to this spreadsheet and beyond the scope of this article.

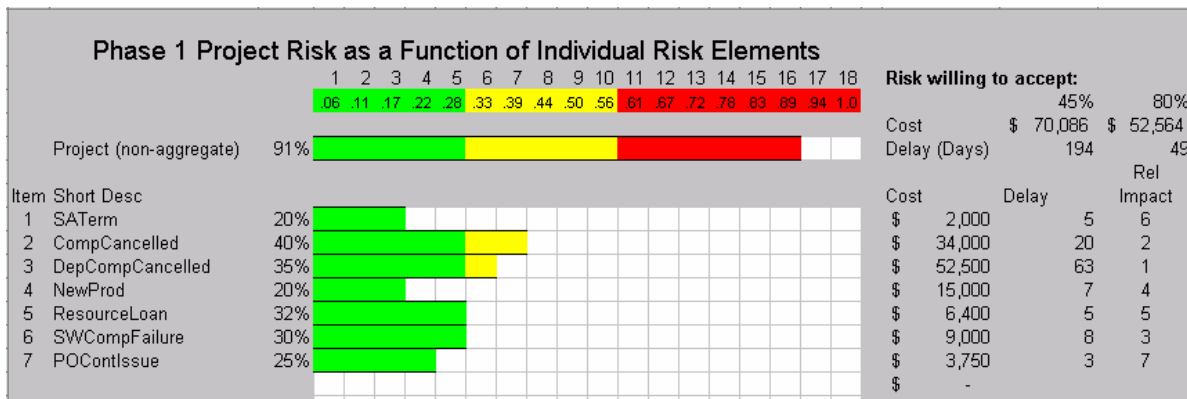


Figure 2: Risk Meter

The values entered in the risk register have a series of calculations that drive the graphics in the follow-on worksheets. Other data may be entered to control the calculations and the limits on the display of the charts; these are explained in the user guide.

Presentation Graphics

This tool provides three presentation examples. These are designed to provide the user with a method of communicating the project risk to stakeholders and to clarify the level of risk on the project.

Non-Quantifiable Risk Level

Non-quantifiable risk is presented in matrix form as described above. Ensure people understand that this risk is in addition to the quantifiable risk. When presenting this, the focus should be on the higher impact items so that there is an understanding that these may, in most cases are, the more important risks to try to avert or mitigate.

Risk Level

The Risk Level worksheet is a set of graphics (one per phase) that shows each risk element and its probability of execution. The presentation is similar to that of sound level meters to provide a medium of display that should be familiar to a general audience and is simple to develop and maintain in Excel.

The summary “meter” for the project is based on the aggregate probability that one risk will execute. This may overstate the risk of the project since the risk tolerance may

be greater than the potential from a single execution. Changing this reference will require a thorough explanation to the audience of the meaning of changes in risk tolerance.

Each meter is accompanied with a set of values that indicate the potential impact (Figure 2 upper right side) at the low and high levels of the risk tolerance. These values are calculated on the worksheet and displayed here for convenience.

The “Rel. Impact” column is the ranking based of the sum of the cost and the duration impact multiplied by a “Delay Cost” factor is used for ranking.

Impact Window

The Impact Window worksheet includes two charts, one for cost and one for delay. These two charts are designed to show a range of most-probable values based on the risk levels entered.

Two settings affect these charts – Aggressive and Conservative. The Aggressive setting, or the “high” setting, is the maximum level of risk that management will tolerate. A setting of, say, 80% would mean that the impact will only be calculated based on a set of risks executing that are aggregated to a 80% or higher level. The “Conservative” setting is the level on the safe end of the tolerance.

Using these two values creates a “window” of reasonable impacts for both duration and cost for the project. Figure 3 shows an example of the cost impact window. This is the shaded area in the chart. To interpret the chart one should look at a given time period. Note that for Phase 1 the aggressive setting (80%) yielded a cost impact of \$52,000. The lower tolerance (45%) adds \$18,000 to the impact, for a total of \$70,000.

The second factor shown in the chart is the overall impact as a function of time. In this example, it shows that the critical point of risk is in the second phase of the project where the impact from risk will have the greatest affect on the project.

The anticipated use of these graphics is to guide the team and stakeholders in determining contingency values that should be placed on the project. Changing the values of the two limits lets the user look at various “What if” conditions for the project, allowing them to chose a comfortable contingency.

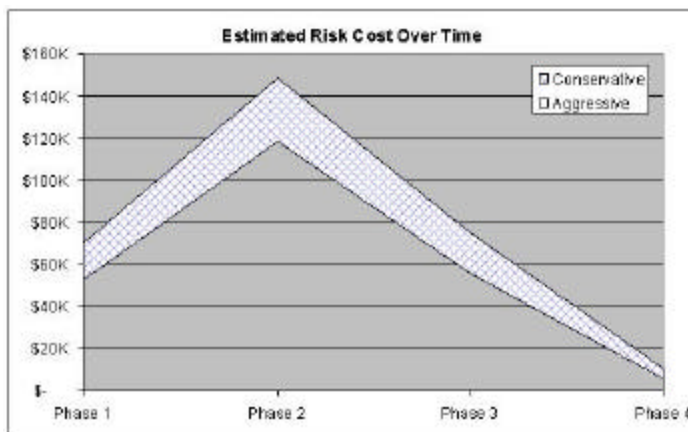



Figure 3: Cost Impact

Conclusion

The *Risk Estimation Tool* is an educational tool to provide you with a method to explain the complexity of risk elements and their interrelationship. Although oversimplifying the relationships, it will help you understand when to use a more extensive tool and the importance of presentation methods for relating a complex topic.

VBA Macro Caution

Lastly it should be noted that this spreadsheet contains user-defined macros. To use the aggregate probability function you must enable macros. All attempts have been made to ensure harmful macros have not been introduced into this workbook. The functions have been tested and used many times over the last three years and are considered safe. Regardless, eCameron does not warrant the code or concepts of this system. The user uses this at their own risk 

Book Synopsis

Agile Project Management with Scrum, by Ken Schwaber, describes the process of managing a Scrum software development project. It uses a mixture of definitions and case studies to educate a would-be Project Manager (aka ScrumMaster™) on the:

- Scrum process,
- Major players in a Scrum project,
- ScrumMaster's role.

The case studies exhibited are both success and failure cases.

The book presumes very little knowledge of Scrum and agile processes; although the latter may be helpful in understanding the bigger picture of agile development. The appendix supplies a variety of background data that might be needed by the novice.

The book is relatively short and easy to read.

Analysis

Schwaber defines the concept of *empirical process control* and uses this as the foundation for justification of the Scrum process. His claim is that in the "real world" of software development most projects that build or improve a product are breaking new ground and cannot use *defined process control*, as might be used in repetitive projects. Empirical process control relies on recently observed data to affect the project and change its execution. The iterative nature of Scrum (see Figure 4) provides opportunity to adjust the process every cycle (30 days) allowing it to adapt to current conditions.

As with other agile processes, time boxing reduces sources of waste and produces a variety of benefits:

1. Reduces dwell time on features that are not top priority,
2. Minimizes excess documentation,
3. Rapidly creates deployable product—increasing Return on Investment (ROI),
4. Stops discussions in large groups where one-on-one interaction is needed.

The heart of Scrum is iterative incremental development and delivery. Figure 4 summarizes the flow of a Scrum process. It consists of:

1. Product Backlog creation.
2. An eight hour meeting to define the work to be completed. The first four hours is for the Product Owner to define the highest priority features and the second four hours is for the Team to commit to a work plan for the Sprint.



Agile Project Management with Scrum

By Ken Schwaber

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3. Thirty-day Sprint increments where all development is completed. Each day there is a Scrum meeting (15-minutes) where the following questions are addressed within the Team:

- a) What was completed yesterday?
- b) What is planned for today?
- c) What is in the way of completing further work?

4. At the end of the Sprint there is a four hour meeting with the stakeholders where **shippable** product is demonstrated.

5. If the stakeholders want to deploy the product, a deployment Sprint is executed.

6. If more iterations are needed and funded, then the Product Owner presents the updated Product Backlog and the process starts over.

Scrum projects do not have a manager as with traditional projects. Management is done by a group of three sets of people—ScrumMaster, Product Owner and The Team

ScrumMaster

The ScrumMaster is somewhat analogous to a Project Manager in traditional projects, but Schwaber is quick to note this is only an analogy. There are significant differences. The primary difference, and the key that makes Scrum (and other agile methodologies) work, is that the ScrumMaster does not manage the team—the team is self-managed. The ScrumMaster provides leadership to the project.

The key functions of the ScrumMaster are:

- Enforce the Scrum rules,
- Teach the concepts of Scrum,
- Shield the team from outside disturbances,
- Remove obstacles,
- Mold Scrum to the company culture,

• Provide Leadership.

The ScrumMaster must be dedicated to the project and continually observe the Team and their progress to determine where the Scrum rules are not being followed. Through case studies, Schwaber provides examples of common failures of ScrumMasters (including his own) to educate the reader on the process, hence providing a list of what a ScrumMaster is not. A ScrumMaster does not:

- Assign work to the team,
- Run the daily Scrum,
- Manage tasks done by the Team,
- Change priorities of the Team (inside or outside the Sprint).

Product Owner

The Product Owner (analogous to a Product Manager) manages the product and works with the stakeholders and the end user to define the final product and set priorities for feature development.

The key functions of the Product Owner are:

- Represent stakeholders and users,
- Secure funding,
- Define requirements,
- Set priorities,
- Determine return on investment.

The Team

Along with the ScrumMaster, the Team has the greatest change in responsibilities over traditional project management methodology. Tasks that the Team must do that may be new to them are estimations, self-management and self-organization. These tasks, often left to a traditional Project Manager, are daily tasks for a team using Scrum.

In the Sprint Planning Meeting, the team is provided a list of prioritized features that they can work on. They select the highest priority features that they feel they can build and complete ("complete" means fully tested and functional code that can be shipped to the customer) in that Sprint. This will create a list called the Sprint Backlog. This list may

change over the course of the Sprint adding items that are required to complete the agreed upon list. But, no new features may be added. Each feature will have an estimate of the hours to complete. Hours-to-complete will be updated daily.

Daily the team will meet for a time boxed 15-minute meeting and each team member will answer three questions to the rest of the team:

1. What was accomplished since yesterday's meeting?
2. What is planned to be done today?
3. What impediments need assistance in being resolved?

Although the questions are directed at the team, the last question needs to be addressed by the ScrumMaster, if for no other reason than to ensure it gets answered in a timely manner. If the issue is external to the group, it is the ScrumMaster's responsibility to resolve it.

The key responsibilities for the Team are:

- Building the functionality of the product,
- Self-organization of their work to achieve Sprint results,
- Self-management of their tasks,
- Perform cross-functional duties,
- Present **shippable** product at the Scrum Review,
- Run the daily Scrum meeting.

Reporting/Visibility

Reporting on Scrum projects is inherently different than traditional projects. The primary difference is that Scrum projects work on features not tasks. There are basic reports that are used and the ScrumMaster can modify them to the organization where they are being deployed. These reports are:

1. Product Backlog: The intended features to be in the product. This is a critical traceability report so there are subsets must be maintained and archived:
 - a) Previous Product Backlog: The backlog at the start of the previous Sprint,
 - b) Current Product Backlog: The backlog at the start of the current Sprint,

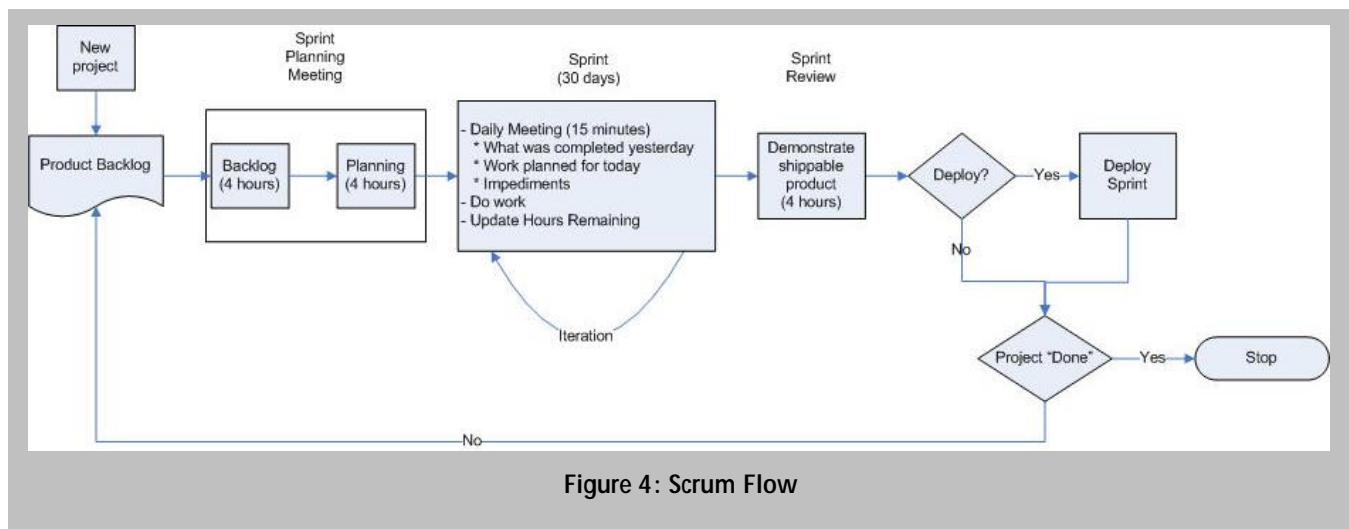


Figure 4: Scrum Flow

c) Changes in Product Backlog: the difference between current and previous backlog.

2. Sprint Backlog: What the team has committed to do in this Sprint (updated daily for hours-to-complete)

3. Feature Burn-down: A report to show features that have been completed.

4. Sprint Review: Although not a written report, this demonstration of shippable functionality provides the *fait accompli* status report.

Project Planning

Schwaber describes the tasks required to plan and set expectations for a Scrum project. He covers:

- What the funding party should expect,
- What progress will be seen in each Sprint,
- What the value of Scrum is and why stakeholders can expect successful delivery,
- What is meant by "Done", since an iterative process implies partial delivery and open ended,
- How a collaborative process works,
- The meaning of estimates and expectations.

Scaling Scrum

When scaling Scrum to larger projects Schwaber provides a few guidelines:

- Attempt to keep the team size to eight.
- Do not engage all the teams until the infrastructure is built. This may require the first few Sprints being done by

only one or two teams building primarily non-functional requirements.

- Divide the work into teams that logically represent the work and minimize the need for multiple assignments of people.
- Create a daily Scrum meeting of representatives of each Scrum, held after the daily Scrum.

Appendices

The appendix contains valuable material for anyone new to Scrum. "The Rules" enumerates the rules for each major activity in the Project—Sprint Planning Meeting, Daily Scrum Meeting, Sprint, Sprint Review Meeting and Sprint Retrospective Meeting.

Other appendices provide definitions and applicability to Scrum in specific project situations.

As a beginner book on Scrum this a very valuable text. As the name implies it is very narrow in scope. A project manager versed in agile will find this book very helpful. If you are new to agile or lean processes, your first book should be on the greater subject. Recommended first reading would be *The Toyota Way* (Liker), *Lean Thinking* (Womack) or *Agile Project Management: Creating Innovative Products* (Highsmith).

* * *

As with our entire set of book synopsis, fully referenced versions may be found on our website. This article can be found from the Books page under *Agile Project Management with Scrum* or directly at:

<http://www.ecaminc.com/Books/APMWithScrum.html> 

Resources and Templates

eCameron's website contains a large variety of reference materials on Project Management subjects. These include templates, processes and further discussions on a variety of topics. Please feel free to browse our site at <http://www.ecaminc.com>

Or contact: Todd C. Williams, Phone: 1.360.834.7361 e-mail: todd.williams@ecaminc.com

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