Software Project Risk Management Using ALM

By Duane Herberg

Goal

Provide a project risk and opportunity management process - tailored to Agile software development processes - that can be actively managed by the software team using their Application Lifecycle Management (ALM) Tools.

Motivation

Software risk management processes are often implemented in least-common-denominator tools such as Excel and are only minimally useful to software development.

Typical issues trying to adapt software into these tools include: not customizable for software content; no mechanism to show sprint by sprint status; not traceable to software work products; no easy way to translate the risk into an appropriate amount of contingency; not easily customized for reporting; not easily accessed or understood by software team members; not useful for identifying opportunities (the inverse of risk); difficult or cumbersome to assign individual actions for risk response; anchor values (schedule, quality, etc.) often don't make sense for software; cumbersome process discourages breaking risks down to appropriate detail and/or tracking smaller risks; creation of custom, divergent spreadsheets for each software project.

There are also some general issues with Excel such as: cumbersome UI; not easily version controlled; and no version history at the individual record level.

Premise

Managing the lifecycle of a software risk is at least as complex as managing a User Story, so use a similar process and the same tooling that is already well understood within software development. For environments where an ALM tool such as TFS or JIRA is being used, it is proposed that risk and opportunities be managed within the ALM tool itself.

Design

In the ALM tool, create a new type of Product Backlog Item (PBI) of "Risk" (in TFS, this would be a new Work Item Type and in JIRA, a new Issue Type). A Risk PBI can be used to encapsulate a given risk, which can be managed through a lifecycle very much like other PBIs. By assigning effort values such as Story Points or hours, risk items can be part of a project or iteration backlog, providing an appropriate buffer for planning. Task work item types can be assigned as children of the risk where specific actions are to be taken by specific people in response to a risk.

Opportunities may also be identified and managed, but now the signal is reversed, e.g., a schedule impact is now an opportunity to pull a schedule in vs. pushing it out.

The overall design is intended to emphasize the basic risk management process steps of **identifying** the risk, **assessing** the impact, **planning** a response, and **monitoring** the outcome. TABLE 1 describes some possible attributes to be tracked for a Risk PBI, with example values that might be used in a software project – these are examples only which would need to be tailored to the scale of a project and organizational needs. Example reports that may be generated are shown in FIGURE 1, FIGURE 2, and FIGURE 3. Opportunities could be reported in a parallel fashion.

Table 1 – Attributes for Each Process Step

Process Step	Attribute	Description	Type, Values
Identification	**Title**	A concise summary of the risk	Free form text
	Type	Is this a risk, or opportunity?	Pick List: Risk Opportunity
	Description	A detailed description of the risk written in a chain of cause, occurrence, consequence. Avoid writing the mitigation strategy into the risk description, e.g., Requirements have always been a problem in past projects within this organization. IF defective requirements are not discovered and corrected before design and coding; THEN requirements defects will migrate into the design and implementation causing rework, with cost and schedule impacts	Free form text
	Source	Identifies a software activity or condition giving rise to the risk. It is a structured list of both technical and non-technical sources of risk that can be used to categorize and analyze the set of risks for the software project. **Note**: The taxonomy is a simplified version of a taxonomy proposed by the Software Engineering Institute – see REFERENCE 2.	Pick list: Requirements Design Code and Unit Test Integration and Test Development Process Development Environment Management Work Environment Resources Contracts Organization
Assessment (of Impact)	**Schedule**	The potential impact to project schedule if the risk occurs	Pick list: 5 - above 180 days or 6 months 4 - between 3 and 6 months delay 3 - between 1 and 3 months delay 2 - between 1 and 4 weeks delay 1 - Less than 1 week of delay
	Quality	The potential impact to product quality if the risk occurs	Pick list: 5 - customer or regulatory agency rejects the product 4 - customer requests immediate corrective actions 3 - customer asks for action/information 2 - tolerable, no immediate action is needed 1 - imperceptible impact
	Cost	The potential impact to project cost if the risk occurs	Pick list: 5 - Variation above $50k 4 - Variation between $40k and $50k 3 - Variation between $20k and $30k 2 - Variation between $10k and $20k 1 - Variation less than $10k
	Proximity	The time horizon in which the risk is possible	Pick list: 5 - this sprint 4 - next sprint 3 - between 6 and 12 weeks 2 - between 3 and 6 months 1 - more than 6 months ahead

Process Step	Attribute	Description	Type, Values	
	Probability	The probability that the risk will occur	Pick list: 5 - if it does not occur it will be a surprise 4 - great chance of occurring 3 - can occur 2 - it will be a surprise if the event occurs 1 - practically impossible	
	Work Area	Many risks apply equally to all aspects of a software project, e.g., the development process. Other risks may be specific to only a subset of the project, e.g., a specific feature. This field allows project-specific classification of the areas impacted.	Pick list: [project-specific]	
Plan	**Strategy**	The method to be used to mitigate the risk, or take advantage of the opportunity	Pick list (Risk): Escalate Avoid Transfer Mitigate Accept	Pick list (Opportunity): Escalate Exploit Share Enhance Accept
	Response Plan	A summary of the plan to mitigate the risk. Individual actions may also be assigned using child Tasks for the PBI	Free form text	
	Assigned To	The person **accountable** for the Response Plan (though they are not necessarily **responsible** for all the work)	Pick list: [team members]	
	Contingency	An amount of work to be held in reserve as a buffer for the occurrence of the risk, or amount of work to realize the opportunity	Integer	
Monitor	**State**	Current state of the risk. See TABLE 2 – RISK STATES	Pick list: Identified Triggered Resolved Removed	
	Reason	The reason for a state transition.	Pick list: TABLE 3 – RISK STATE TRANSITIONS	
	Iteration	Iteration may be used to indicate where the risk might occur, or is occurring, so that the Contingency amount may be included in Sprint planning	Pick list : [Iterations]	
	Risk Value	This is used to provide a relative measure of all risks for purposes of ranking and trending overall risk over time.	Calculated field: Probability * Impact[1]	

[1] Where impact is the quadratic mean of the Impact dimensions (Schedule, Cost, Quality, Proximity) - See REFERENCE 1. The use of a consistent scale for the impact values provides a dimensionless relative scale that can be used to compare risk values one to another and track trends of risk values over time. Traditional methods for calculating risk values tend to lump large numbers of risks into a single value, making it difficult to rank the items relative to each other. The method proposed here produces a much greater range of distinct values that can be used to force rank the list of risks for action, similar to how a Stack Rank field might be used to plan software development work. This method also makes it easier to monitor trends in risk values over time, similar to the use of a burndown chart in development. See REFERENCE 3.

Table 2 – Risk States

State	Description
Identified	Risk is possible
Triggered	Risk is now happening
Resolved	Response actions are in place and effective and/or the item no longer needs to be monitored; risk probability or impact is acceptable
Removed	Not valid – probably entered in error, or never could have been an issue for this project

Table 3 – Risk State Transitions

Reason for transition	Next State			
Current State	**Identified**	**Triggered**	**Resolved**	**Removed**
Identified	n/a	Is happening	Response plan is working and/or no further need to monitor	Not valid
Triggered	Is not happening	n/a	Response plan is working and/or no further need to monitor	Not valid
Resolved	Response not effective	Is happening	n/a	Not valid
Removed	Is valid, reprocess	n/a	n/a	n/a

Figure 1 - Risk Value Burndown by Source or Work Area

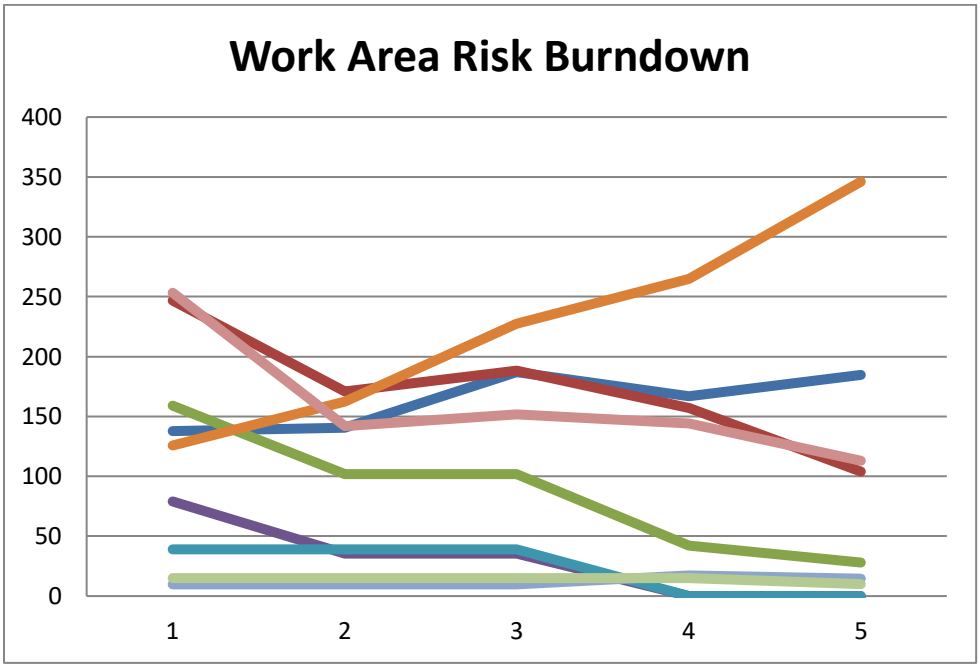


Figure 2 - Risk Distribution, by Source or Work Area

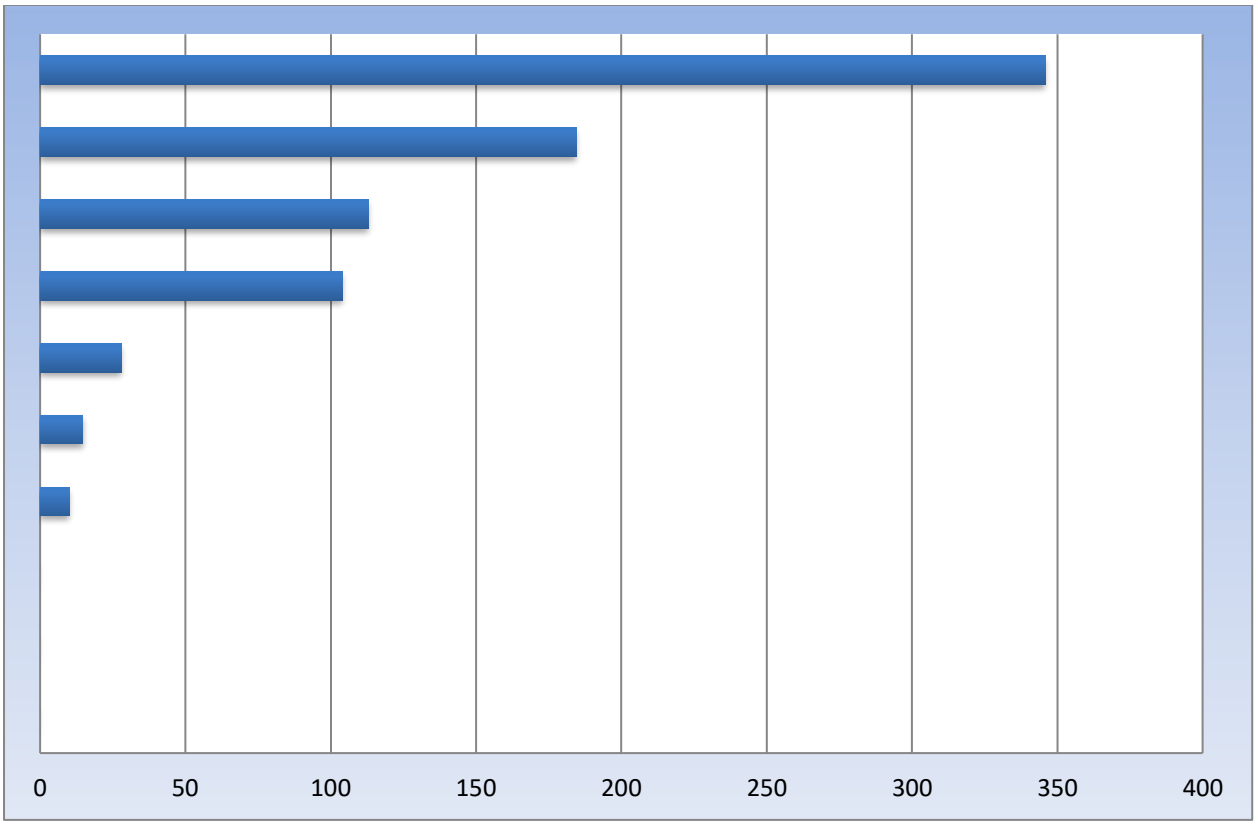
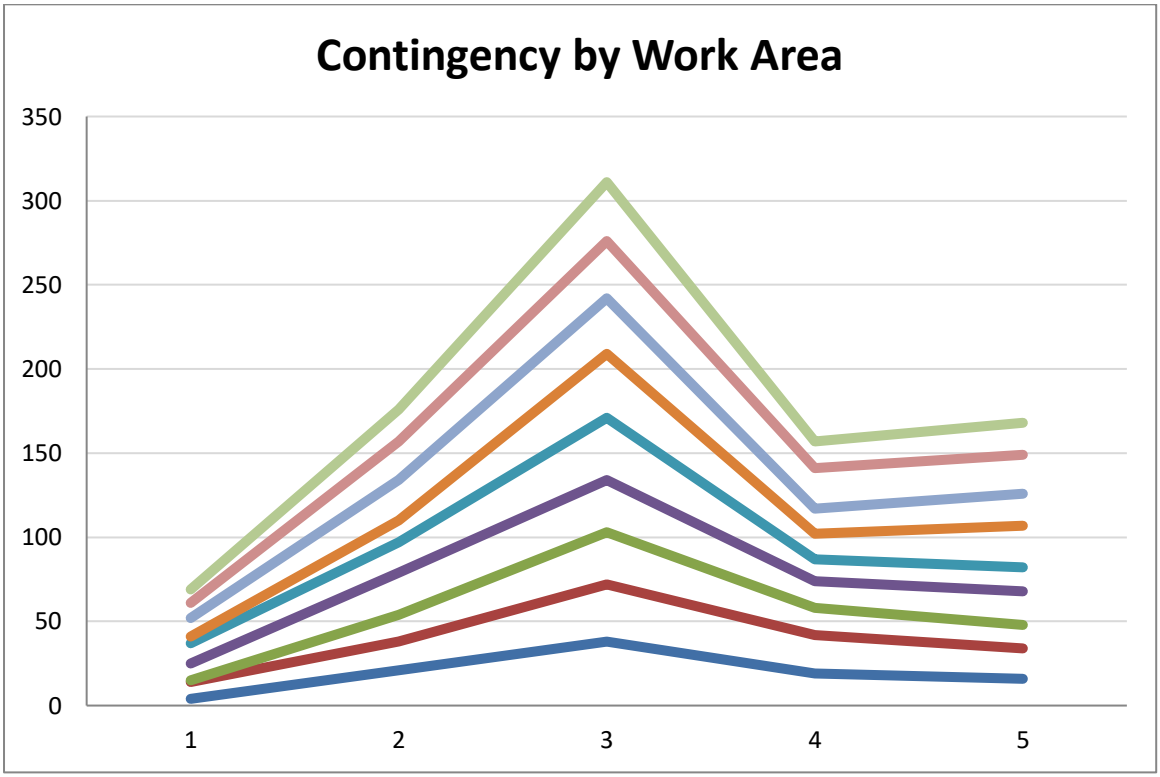


Figure 3 - Contingency by Work Area or Source
(Same as Burndown, but using the Contingency field instead of Risk Value, and using a stacked line to see the total contingency vs relative amounts)



References

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2. SEI Technical Report CMU/SEI-93-TR-6 ESC-TR-93-183 Taxonomy-Based Risk Identification
3. Risk Burndown chart: http://www.mountaingoatsoftware.com/blog/managing-risk-on-agile-projects-with-the-risk-burndown-chart