30TH ANNUAL PACIFIC NW SOFTWARE QUALITY CONFERENCE OCTOBER 8-10, 2012

An Action Model for Risk

30th Annual Pacific NW Software Quality Conference, 8-12 Oct 2012

Jeffrey A Robinson, Ph.D.

AQI Accelerated Quality Improvement, LLC

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About AQI

AQI is a leading management consulting firm, specializing in process improvement

Expertise

- Six Sigma, Lean, Kaizen Blitz, CMMI®, ITIL®, ISO 9000, TL 9000, and PMP® certification.

Services

- Assessments (Six Sigma, ISO 9000, etc)
- Process improvement consulting & facilitation
- Training (Free webinars, skill training, certification training, online training)
- Outsourced Six Sigma program support (jumpstarts, governance, project reviews, etc)
- Rent-a-Master-Black Belt

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Presenter

Dr Jeffrey Robinson

- Technologist
- Process and Quality expert
- Malcolm Baldrige, CMMI, ITIL
- Six Sigma Master Black Belt
- Vice President Technology AQI, Accelerated Quality Improvement

Risk

- Important factor in assessing and managing projects
- Primary measure of establishing the importance of projects
- Key factor in assigning priorities
- Value of an endeavor is often offset by risk
- Risk aversion can complicate or compromise effective decision making

Importance of Risk

- Each of us has likely been exposed to different tools, methods and techniques to deal with risk
- We evaluate Risk before projects begin
- We quantify Risk at the start of projects
- And may re-evaluate Risk at key phases or milestones in a project

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Quantitative Risk Assessment

Many techniques for quantifying risk:

- Expected Payoff Tables
- Opportunity Loss Tables
- Price of Perfect information
- Decision Trees
- Failure Mode Effects Analysis
- Fault Tree Analysis
- Ishikawa Diagrams
- Point Estimate (Best Case)
- What-if Analysis
- Sensitivity Analysis
- Scenario Analysis (Best Case/ Worst Case/ Most Likely)
- Simulation
- Bayesian Networks

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But what is Risk?

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Some define Risk as the combination of Impact and Probability (often called Criticality) and may be quantified as an RPN (Risk Priority Number)

Rubrics showing a taxonomy of Risk are common

	Low Probability	High Probability
High Impact	MED RISK	HIGH RISK
Low Impact	LOW RISK	MED RISK

Unfortunately such models are simplistic and are misleading, since they suggest that special methods be used or special analysis be performed when Risk is High

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Risk Assessment Tools (example)

PROJECT RISK ASSESSMENT TOOL

Place an "X" in the appropriate column (from pulldown tab)

#	Success Predictors	Yes 0	Partial 1	No 2
1	Project is a strategic priority, aligned with a Big Y	X		
2	Process Tailoring is minimal Yes = Standard Lifecycle; Partial = Some moderate tailoring; No = Extensive deviations and waivers			X
3	Team is familiar with processes, procedures	X		
4	There is a clear and measurable goal Yes = Clear Goals & Metrics; Partial = Goals & Metrics partially defined; No = Some golas/metrics remain to be defined			X
5	There is little new associated with this project Yes = Standard project; Partial = Some things are new; No = Much is new/groundbreaking			
6	Roles and responsbilities are clearlty defined and understood (including stakeholder roles)	X		
7	Several team members are top talent and innovative thinkers		X	
8	Management is willing to commit serious resources to solutions		X	
9	Project size is small Yes = Small/Team; Partial = Medium; No = Large Project/Team		X	
10	Full time, capable DSS advisor or full time Quality person assigned	X		
11	There are no unresolved "Critical Risks" or assumptions Yes = 0; Partial = 1; No = 2 or more			X
12	There no unresolved "High Risks" or assumptions Yes = 1 or less; Partial = 2 or 3; No = more than 3	X		
13	Requirements are stable and unchanging Yes = Requirements Volatility<10%; Partial = RV>10% but <20%; No = RV > 20%		X	
14	The commit/delivery date is reasonable and achievable Yes = >95% probability of ontime delivery; Partial 70-95% of ontime; No = <70% probability of ontime delivery	X		
15	Staff Loading is nominal Yes = <70% loading; Partial = 70-100% loading; No = greater than 100% loading	X		
16	Project has Low Complexity Yes = Relatively simple/straightforward; Partial = Somewhat complex; No = Very complex		X	
	* Any factor greater than 0 creates serious risk			

Score **11** **HIGH RISK**

High Risk (Low Probability of Success) = 11-32
Medium Risk (Medium Chance of Success) = 6-10
Low Risk (High Probability of Success) = 0-5

Too Much Analysis

Part of the problem is that the term Risk is used in different contexts.

- Sometimes it means the cost of failure (Impact)
- Sometimes is it used to refer to probabilistic loss (expected value or cost times probability)
- Sometimes uncertainty is considered a risk, since the presence of uncertainty means you might make the wrong decision

- These different usages lead people to misinterpret Risk and Uncertainty and lead practitioners (Project managers and quality engineers) to perform additional analysis when any of the above are evidenced

Paralysis of Analysis

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Many problem solving, project management, or quality frameworks thus spend too much time in Analysis

Often called the “Paralysis of Analysis”, this behavior can dramatically increase the amount of time spent on a project, delay implementation of solutions, and increase project costs.

DMAIC, DMADV, KT, CMMI, ITIL, etc.

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Risk versus Uncertainty

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Let's come up with Clear Definitions for

RISK

and

UNCERTAINTY

…since they both seem to be used as justifications for quantitative analysis

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Risk

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- Risk is potential loss, usually expressed in units of cost, dollars ($)
- It can be real estimates or probabilistic estimates (expected payoff)
- It is impact, the cost of acting or failing to act. If is how much you loss if an event occurs or how much you might lose by failing to take advantage of an opportunity (opportunity loss)
- It is the COST of Failure

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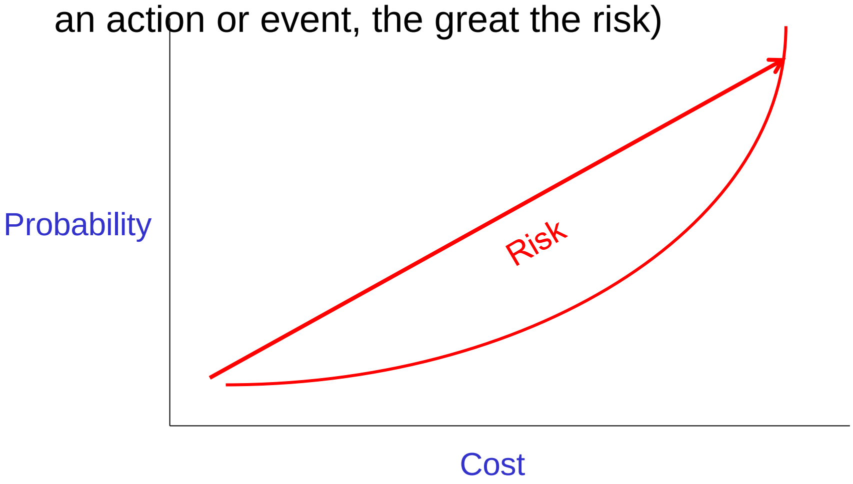
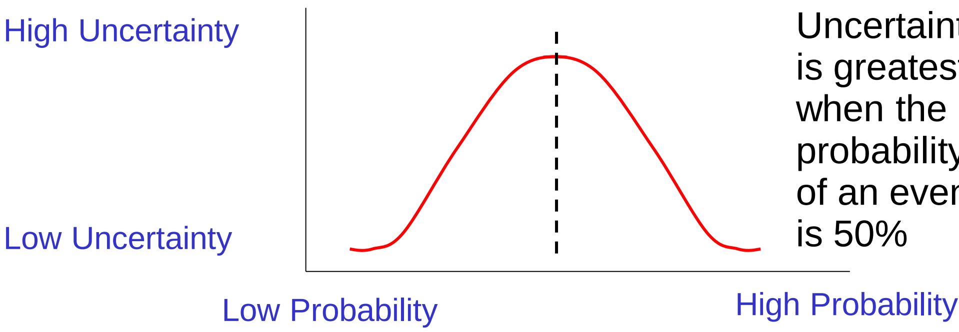
Risk

Risk is a mostly a linear metric (The greater the cost of an action or event, the great the risk)



Uncertainty

- Uncertainty, however, is different
- Uncertainty is a non-linear phenomenon
- Many people confuse uncertainty with probability, but they are very different



Uncertainty is greatest when the probability of an event is 50%

Confusing Risk and Uncertainty

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- The problem is that the terms Risk, Probability and Uncertainty become confused
- Thus whenever any of these factors are present practitioners often feel compelled to gather data and perform more analysis.
- Unfortunately this is not always necessary or appropriate
- Consider the following scenarios

An Action Model for Risk and Uncertainty

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	Low Risk	High Risk
High Uncertainty	CASE II	CASE IV
Low Uncertainty	CASE I	CASE III

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Case I – Low Risk/Low Uncertainty

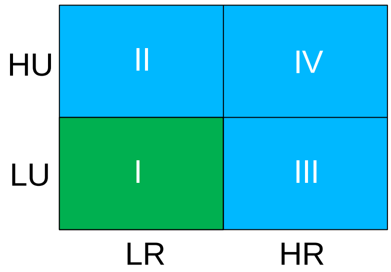
Scenario: System failure of large $100,000 SW system

Cause: bug in a subroutine; known cause; known fix; cost to fix < 1hr

Risk = Low; <1 man-hr

Uncertainty = Low; known fix

What is appropriate action?



Just DO IT

(no further analysis needed)

Case II – Low Risk/High Uncertainty

Scenario: System failure of large $100,000 SW system

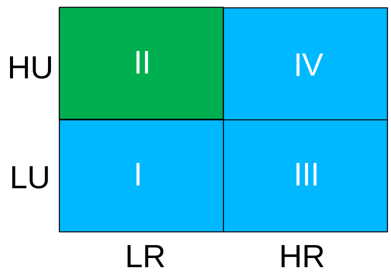
Cause: File sorts taking to long

Options: Alternative sort algorithms, but which one to use?

Risk = **Low**; effort < 2 hrs

Uncertainty = **High**; which is best

What action is appropriate?



Do a test of several choices; test for adequacy

No cost of failure, so the faster you test, the sooner you find the right size

Case III – High Risk/Low Uncertainty

Scenario: System failure of large $100,000 SW

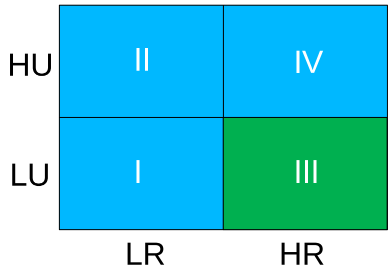
Cause: Underlying DBMS (old and obsolete)

Options: Any of several SQL compliant systems

Risk: **High**; >$50K but a relatively quick install

Uncertainty: **Low**; make and model known

What action is appropriate?



Perform a financial calculation to determine if the cost is justified; then make a decision

(no further analysis needed)

Case IV – High Risk/High Uncertainty

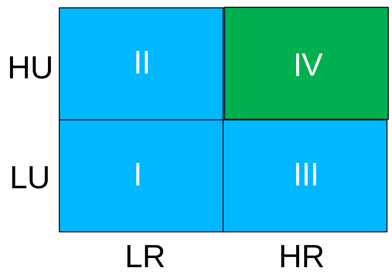
Scenario: System failure of large $100,000 SW

Cause: Failure of some part(s); cause unknown

Risk: Potentially **High**, up to $100,000

Uncertainty: **High**; failure cause unknown

What action is appropriate?



Conduct further analysis; not enough information to decide

Type of Analysis

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- Hypothesis Testing
- Tests of Statistical significance
- Principal Component Analysis / Factor Analysis
- Modeling and Design of Experiments (DOE)
- Scenario Analysis (“What if” simulation)
- Sensitivity Analysis
- Financial Analyses (CBA, ROI, etc.)
- Expected Payoff / Opportunity loss

Enhance understanding of causes and effects to make better predictions about outcomes

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Overview of Actions

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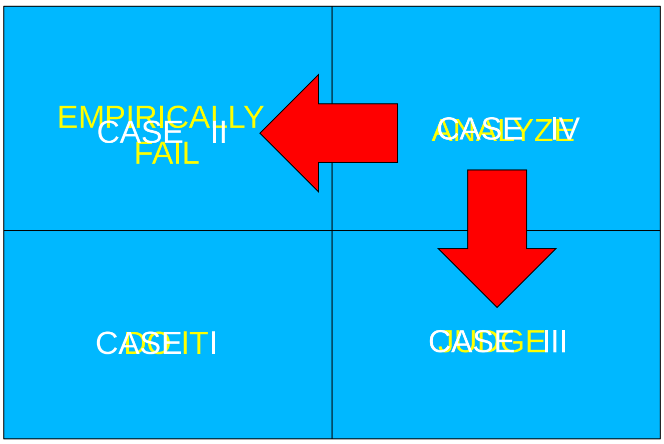
The purpose of Analysis is to reduce Risk (so you can test options) or to reduce Uncertainty (so you can select an option)

High Uncertainty

Low Uncertainty



Low Risk | High Risk

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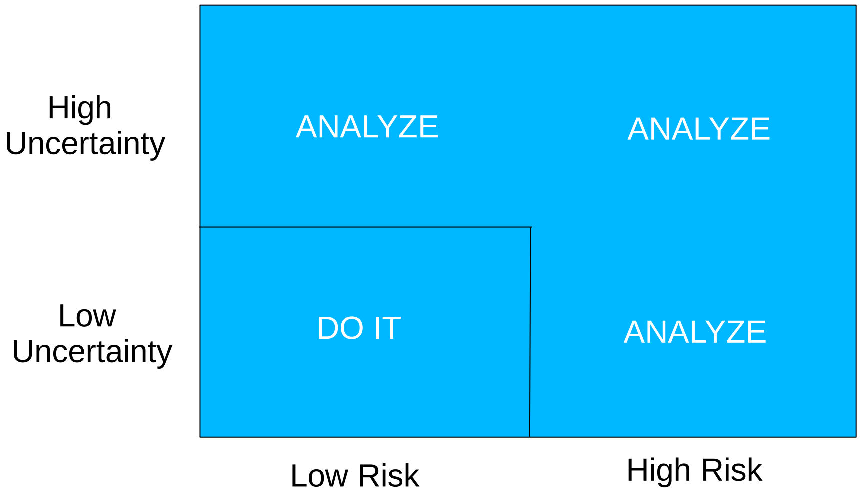
When Uncertainty and Risk are Confused

When Uncertainty and Risk are not clearly defined, people tend to spend too much time analyzing and not enough time acting.



When People are Risk Averse

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How This Model Can Be Used

- At the beginning of a project, assess both Risk (cost) and Uncertainty to determine:
  - Whether or not a project is needed (Case 1 is a Quick Win – Just Do It)
  - What kind of action is appropriate (Case II – Test Empirically or Case III – Perform a Cost Benefit Analysis)
  - Whether or not a Six Sigma project is warranted (Case IV only)
- Without a clearly defined action model, far too many projects may spawn far more analysis than is necessary (or become Six Sigma DMAIC projects)

Summary

- Analysis is not always warranted
- Analysis is not always necessary
- Analysis instead of action can equal costly delay
- In many cases, analysis is inappropriate and just increases project time and cost
- Even when called for there is a point where further analysis is not worthwhile (see Price of Perfect Information)
- Understanding the nature and differences between Risk and Uncertainty can help you determine when to Analyze and when to ACT

Questions / Comments

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Feedback

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About AQI

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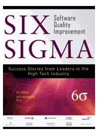
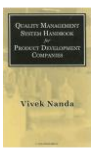
Books by AQI Co-founders:



Six Sigma Software Quality Improvement, McGraw Hill, March 2011



Quality Management System Handbook for Product Development Companies, CRC Press, 2005

ISO 9001: Achieving Compliance in Software Development Companies, ASQ, 2003 (also available in Spanish)

Locations:

Philadelphia, Pennsylvania

Phoenix, Arizona

aqionline.com

info@aqionline.com

+ 1 (623) 878 0906

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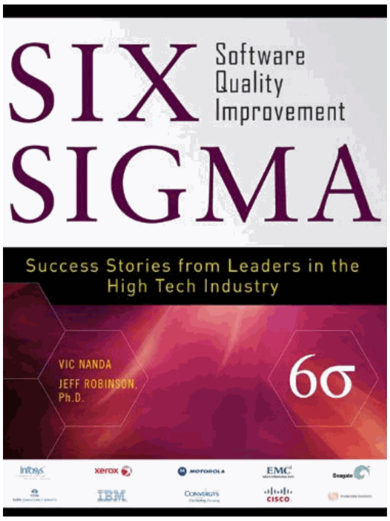
The Book

This webinar is based on a chapter from the book "Six Sigma Software Quality Improvement" from McGraw Hill and authored by

Jeff Robinson, Ph. D. and Vic Nanda



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Speaker Bio (Dr. Jeff Robinson)

Dr. Robinson is an IT technologist, project and program manager who has worked in Software Development, Computer Integrated Manufacturing, and Process and Quality for more than 25 years. He has been a CMM/CMMi assessor and Malcolm Baldrige Quality Assessor and is a certified IT Infrastructure Library (ITIL) practitioner as well.

A former USMCR jet fighter pilot, air traffic controller, and semiconductor device physicist before he ventured into IT programming and information systems, he enjoys solving problems of all kinds.

Dr. Robinson has been teaching graduate and undergraduate courses for over 21 years and has developed and taught numerous technology courses in computer science, programming, operating systems, quantitative statistics, database design, decision theory, project management, risk management, organizational design, networking, database administration, business intelligence, data mining, and multimedia graphics.

Vice President (Technology) and Co-founder of Accelerated Quality Improvement, LLC; http://aqlonline.com

Professional certifications:

- Six Sigma Black Belt and Master Black Belt
- CMMi Assessor
- ITIL Service Management Foundations (v2 and v3)

He is a frequent lecturer and an author of more than forty technical papers and holds four software patents in manufacturing control theory, as well. And has published one book,"Six Sigma Software Quality Improvement", McGraw Hill, March 2011 (co-authored with AQI co-founder, Vic Nanda)

As a certified Master Black Belt, he has been applying and teaching Six Sigma techniques for more than fifteen years in a broad range of environments from semiconductor manufacturing, medical device manufacturing, IT, automotive, and financial management systems.

As a consultant, he has worked with numerous companies, developing and delivering Six Sigma courses to improve process and quality programs.

He has served on the American Society of Mechanical Engineers (ASME), Subcommittee on Software V&V for NQA (Nuclear Quality Assurance)

Awards:
10 Silver Quill Awards (SPS, Motorola); Nov 1992, Mar 1993, Aug 1993, Jun 1997, Jun 1998, Sep 1998, Dec 1998, Apr 1999, Jun 1999, Jan 2000
• Best Paper Award, 1993 Winter Advanced Manufacturing Technology Conference, June 1993

He has a B.A. in Physics from Monmouth College, a B.S. in Electrical Engineering from the University of Illinois, an MBA from Central Michigan University, and a Ph.D. in Information Systems from Nova Southeastern.

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Behavioral Economics (example)

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