

Analyzing Risks “By the Numbers”: A “Quick & Easy” Approach to Quantifying Complexity ¹

Dr. Kenneth F. Smith, PMP

All too often Risk Analysis is given short shrift by impatient project sponsors, executives, and project managers who want to ‘get on with the job’ and defer worrying about possible problems until they arise. This stance is shared by fearful project planners with good intentions who -- in their desire to facilitate favorable approval -- paper over problems by distorting data to obscure or minimize negative aspects; or worse, utilize the bureaucratic ‘burial’ tactic of completely ignoring potential problems when presenting their proposals to higher levels.

Unfortunately, when known risks are trivialized during planning -- or ignored outright as ‘**black elephants**’²-- they do not cease to exist. Problems simply lurk, awaiting the opportunity to surface during implementation – which practitioners attribute to the ubiquitous gremlin “**Murphy**.” Any hitherto “unforeseen hazards” then have to be confronted and dealt with as ‘damage control’ by an unprepared Project Manager. This phenomenon occurs so often it has even been codified as “**Murphy’s Law**.”³ Then, as many a distracted, unprepared & ill-equipped manager has experienced and ruefully observed “*When you’re up to your ass in alligators, it’s easy to forget you came to drain the swamp!*” Such initial neglect usually necessitates project extension & cost increase; or even a **follow-on project** to clean-up and rectify any “unintended consequences.”

Apart from those black elephants -- which we may choose to ignore at our peril -- not all risks can be foreseen, anticipated and appropriate provision made in the project for their avoidance or mitigation. As the 18th Century Scottish poet Robert Burns once wrote “*The best laid schemes o’ mice an’ men gang aft a-gley;*”⁴ a sentiment about which the 19th Century Prussian military theoretician Carl von Clausewitz later penned “*three quarters of the factors on which action in war is based are wrapped in a fog of greater or lesser uncertainty.*” Today -- in harmony with the **black elephant** metaphor for foreseeable problems – the ‘fog of war’ phenomenon has morphed into ‘**black swans**’⁵ a-swimming in the project pool; defense against which the only recourse is provisioning a-forefront with indeterminate monetary reserves, and schedule buffering.⁶

¹ How to cite this article: Smith, K. F. (2022). Analyzing Risks “By the Numbers”: A “Quick & Easy” Approach to Quantifying Complexity, *PM World Journal*, Vol. XI, Issue VIII, August.

² **Black elephant**: a known problem we choose to ignore.

³ **Murphy’s Law**: *Anything that can go wrong will go wrong, and at the worst possible time.*”

⁴ **A-gley** – i.e. go awry

⁵ **Black swan**: an unknown problem – which consequently cannot be anticipated, and only dealt with after-the fact.

⁶ My May 2022 article **Schedule Slippages, Root Causes & Recommended Remedies**, *PM World Journal*, Vol. XI, Issue V, describes a tool and technique for partially addressing both of these types of problems.

To its credit, earlier editions of the **Project Management Institute’s “Guide to the Project Management Body of Knowledge” (PMBOK)** – *i.e. before the current 7th Edition* -- **did a good job of elucidating a systematic process for identifying and assessing risks, as well as some approaches for dealing with them.** So, rather than reiterate the PMBOK coverage, *my objective here is to supplement their recommended tools and procedures to facilitate understanding and application by others – based on my experience.*

The essence of **Risk Analysis** is **first** to determine the amount of ‘**Risk Exposure**’ presented by a particular situation – which is a function of **1) the probability of it occurring**, and **2) the extent of its impact** in some manner –*usually detrimental* – if it should occur, *viz.*

RISK EXPOSURE = Probability x Impact

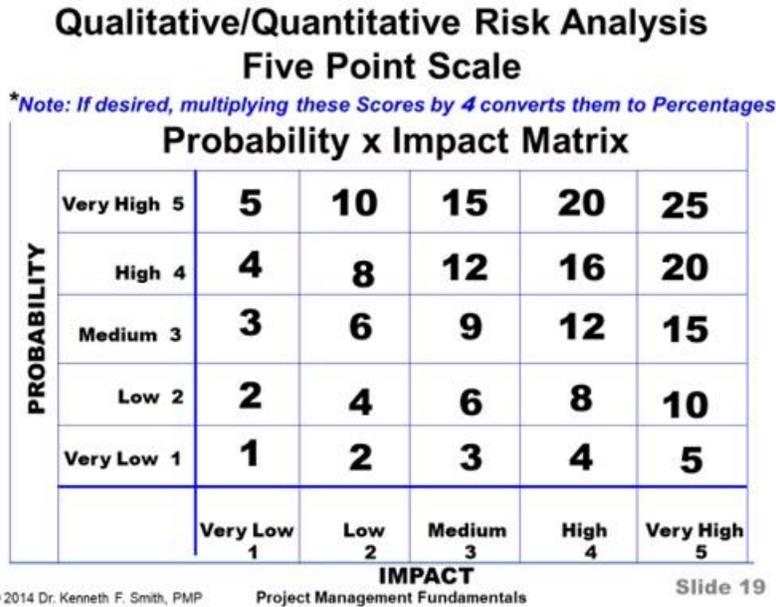
then (3) to prioritize the risks so identified by **ranking** them for appropriate disposition.

Since the probability of risk occurrence is usually highly subjective and impacts can take many different forms, **quantification of their qualitative nature** – *in some manner* – **is essential.**

The **PMBOK** advocates using a **Probability x Impact MATRIX** to develop a **quantitative Risk Exposure “PIM” score of pre-identified qualitative risks.** PMI further recommends such scores be presented *as percentages* for easy comparison, priority attention and management action. While the matrix approach *per se* is laudable for developing ratings and rankings, **I found that initial assessment of qualitative situations in percentage terms is impractical** -- being highly subjective by different raters, and consequently prone to disputation by others. It is impossible to discriminate between subjective differences on a 1 to 100 scale and attempting to ‘fine-tune’ distinctions between 76 and 79 percent – *for instance* -- in a subjective situation is simply ludicrous. Indeed, even the limited ‘**1 to 10 Pain Scale**’ employed by physicians is frequently abused by patients who -- *whenever their need for pain-alleviating medication is questioned* -- tend to over-react and report at the extremities rather than in the moderate middle ranges.

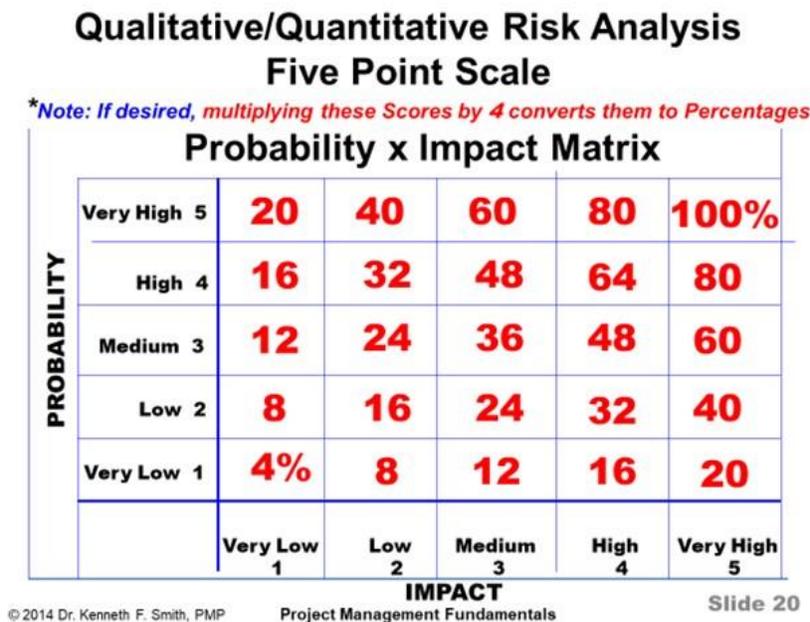
To resolve this issue, while simultaneously satisfying the desire to make assessments in percentage terms, I developed a simplified ‘5 point’ Probability x Impact matrix rating scale:

Figure 1



which – *if desired* – can then be scaled up to a *non-continuous* percentage Risk Exposure score.

Figure 2



Criteria for **Probability and Impact ratings** – *in the absence of specifics* – are suggested in Figures 3 & 4, as follows:

Figure 3

**Qualitative to Quantitative Risk
Probability – 5 Level Scale**

Level	Probability of Occurrence	Intervention Difficulty
1 Very Low	You would be surprised if this happened.	Your normal management processes should easily ensure an acceptable outcome.
2 Low	Less likely to happen than not.	Careful oversight of your normal management processes will probably bring about an acceptable outcome.
3 Medium	Just as likely to happen as not.	Additional time and effort will be required to move forward an acceptable outcome.
4 High	More likely to happen than not.	Your resources and authority are sufficient to permit only a minor effect on the outcome.
5 Very High	You would be surprised if this did not happen.	Your ability to affect the outcome is effectively zero.

© 2014 Dr. Kenneth F. Smith, PMP

Project Management Fundamentals

Slide 21

Figure 4

Qual – Quant Risk Impact – 5 Level Scale

	1 Very Low	2 Low	3 Medium	4 High	5 Very High
Cost	Insignificant cost increase	< 10% cost increase	10-20% cost increase	20-40% cost increase	>40% cost increase
Schedule	Insignificant schedule slippage	Overall project slippage < 5%	Overall project slippage 5 - 10%	Overall project slippage 10- 20%	Overall project slippage >20%
Scope	Scope decrease barely noticeable	Minor areas of scope are affected	Major areas of scope are affected	Scope reduction unacceptable to the client	Project end item is effectively useless
Quality	Quality degradation barely noticeable	Only very demanding applications are affected	Quality reduction requires sponsor's approval	Quality reduction unacceptable to sponsor	Project end item is effectively unusable

© 2014 Dr. Kenneth F. Smith, PMP

Project Management Fundamentals

Slide 22

NOTE: The percentages are discretionary in each case, rather than absolute.

In addition to *project-specific* risks, I also recommend consideration and rating of the following ten *generic* risks that almost every project faces:

Figure 5

INHERENT THREATS

Assess the Relative PROBABILITY and IMPACT of Risk in each of the following Project Aspects on a 5 point scale 1 = Low → 5 = High

1. CUSTOMER COMMITMENT:	[Appraisal: 5 = Weak; 1 = Strong]
*Exception to General Rating	
2. SCHEDULE: How timetable was established	[1=Bottom Up / 5=Top Down]
3. LENGTH: Project duration	[1 = Short/Low --> 5 = Long/High]
4. ORGANIZATIONAL EXPERIENCE with similar projects	[1= Much --> 5= None]
5. PARTICIPATION: Stakeholder involvement in project design	[1=Much --> 5=None]
6. RESOURCE COORDINATION: Number of Suppliers/Contractors	[1=Few --> 5=Many]
7. TIME for REQUIREMENTS APPRAISAL/ASSESSMENT	[1 = Long --> 5 = Short]
8. PROJECT TECHNOLOGY:	[1 = Simple --> 5 = Complex]
9. GEOGRAPHIC DISTRIBUTION:	[1 = Limited --> 5 = Extensive]
10. PROJECT FEASIBILITY ASSESSMENT:	[1 = Good --> 5 = Poor]

NOTE: Regarding #3, Before rating this item, get consensus from the assessment team whether a long project poses a greater risk because there is more time for things to go wrong, or whether a short project is the greater risk because there’s not enough time to deal with problems.

There are also opportunities that could redound to the implementing organization’s benefit to take into consideration.

Figure 6

OPPORTUNITIES

- Assess Both the Relative STRENGTH/PROBABILITY and IMPACT of each of the following Opportunities on a 5 point scale: 1 = Low → 5 = High
- GOAL: Consistency with Implementing Organization's Strategic Objectives
 - ECONOMIC IMPACT: Estimated Revenue Generation
 - SOCIAL BENEFIT for Targetted Beneficiaries
 - FUTURE POTENTIAL for IMPLEMENTING ORGANIZATION
 - IMPLEMENTING ORGANIZATION's STRENGTHENING / GROWTH
 - IMPLEMENTING ORGANIZATION's RESOURCE UTILIZATION
 - POLITICAL / CUSTOMER / PUBLIC PERCEPTION of the IMPLEMENTING ORGN
 - SUSTAINABILITY AFTER PROJECT COMPLETION
 - BUDGET: [Opposite Appraisal: i.e. Low Cost=5 ; High Cost =1 Exception to General Rating]
 - PROJECT MANAGER's ASSESSMENT of DESIRABILITY

© 2014 Dr. Kenneth F. Smith, PMP

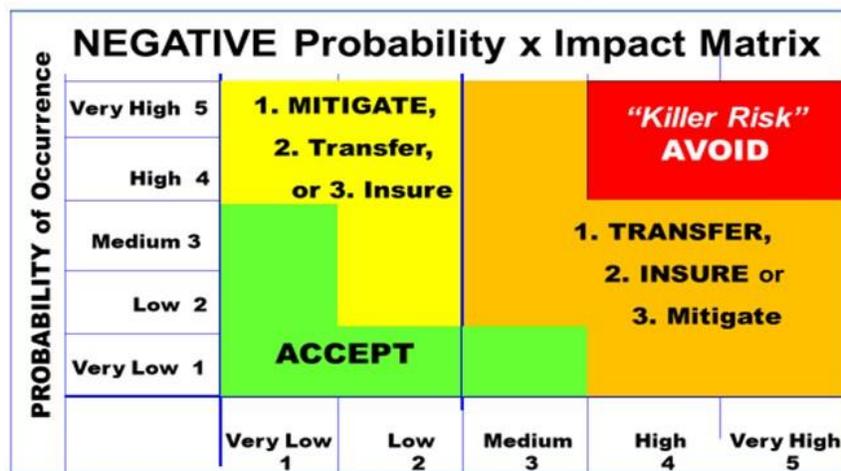
Project Management Fundamentals

Slide 30

Risks ranked in this manner, with guidance – *as indicated below* -- should give management sufficient comparative information to pore over, and ponder how best to deal with them.

Figure 7

Quantitative Risk Response



© 2014 Dr. Kenneth F. Smith, PMP

Project Management Fundamentals

Slide 37

After each identified risk – and opportunity -- has been assessed in this manner, they should be tallied and the **composite net effect** on the project summarized as a further aid to management decision making. I developed a couple of templates to facilitate this process; as illustrated in the following figures.

Figure 8

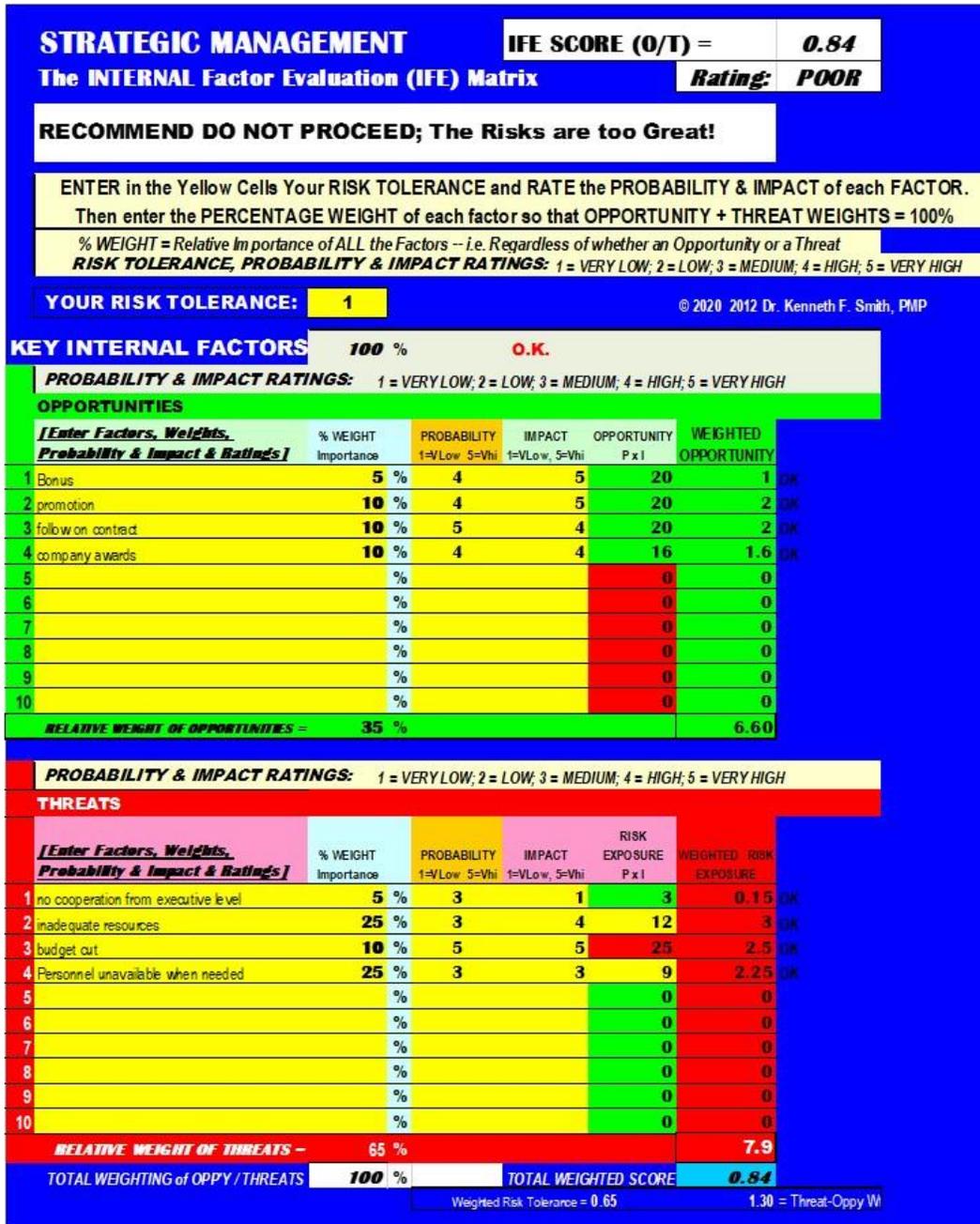


Figure 9

SWOT - UPP			
To Appraise the Strengths and Weaknesses of Opportunities & Threats for Undertaking a Proposed Project			
© 2020-2012, Dr. Kenneth F. Smith, PMP			
Enter Your Risk Tolerance & Assessments in the Yellow Cells Below from 1 = Weak, or Low to 5 = Strong or High			
5	= YOUR RISK TOLERANCE		
APPRAISAL = REALITY CHECK / Current Situation Assessment			Net
B	C		
OPPORTUNITY PROBABILITY	IMPORTANCE IMPACT		OPPORTUNITY SCORE
1=Weak to 5=Strong	1=Low to 5=HIGH	A. OPPORTUNITIES - for Implementing Organization &/or Target Beneficiary (Client)	OA x IW
		Assess the Relative STRENGTH and IMPORTANCE of each of the following on the 5 point scales	92
3	3	GOAL: Consistency with Implementing Organization's Strategic Objectives	9
3	3	ECONOMIC IMPACT: Estimated Revenue Generation	9
4	3	SOCIAL BENEFIT for Targetted Beneficiaries	12
4	3	FUTURE POTENTIAL for IMPLEMENTING ORGANIZATION	12
4	3	IMPLEMENTING ORGANIZATION'S STRENGTHENING / GROWTH	12
1	1	IMPLEMENTING ORGANIZATION'S RESOURCE UTILIZATION	1
1	1	POLITICAL / CUSTOMER / PUBLIC PERCEPTION of IMPLEMENTING ORGN	1
4	3	SUSTAINABILITY AFTER PROJECT COMPLETION	12
4	3	BUDGET: [Opposite Appraisal: i.e. Low Cost=5; High Cost=1 Exception to General Rating]	12
4	3	PROJECT MANAGER'S ASSESSMENT of DESIRABILITY	12
			NET THREAT SCORE
THREAT PROBABILITY	IMPORTANCE IMPACT	B. INHERENT THREATS (i.e. "Known" RISKS) in Implementing the Proposed Project	TA x IW
1=Weak to 5=Strong	1=Low to 5=HIGH	Those who fail to heed the lessons of "Experience" are doomed to repeat it!	132
		Assess the Relative STRENGTH and IMPORTANCE of each of the following on the 5 point scales	
4	3	CUSTOMER COMMITMENT: [TAppraisal: 5 = Weak; 1 = Strong *Exception to General Rating]	12
4	3	SCHEDULE: How timetable was established [Appraise: 1=Bottom Up / 5=Top Down]	12
4	3	LENGTH: Project duration [1 = Short/Low -> 5 = Long /High] or Reverse	12
4	3	ORGANIZATIONAL EXPERIENCE: With similar projects [1= Much -> 5= None]	12
	3	PARTICIPATION: Stakeholder involvement in project design [1=Much -> 5=None]	0
4	5	RESOURCE COORDINATION: Number of Suppliers/Contractors 1=Few -> 5=Many]	20
5	5	TIME for REQUIREMENTS APPRAISAL/ASSESSMENT [1 = Long -> 5 = Short]	25
5	3	PROJECT TECHNOLOGY: [1 = Simple -> 5 = Complex]	15
4	3	GEOGRAPHIC DISTRIBUTION: [1 = Limited -> 5 = Extensive]	12
4	3	PROJECT FEASIBILITY ASSESSMENT: [1 = Good -> 5 = Poor]	12
		Weighted Risk Tolerance =	250
"BOTTOM LINE" ANALYSIS			
OTR	0.70	=	OPPORTUNITY : THREAT RATIO (OTR) MARGINAL OPPORTUNITY GIVEN YOUR RISK TOLERANCE, GO FOR IT !!!

In conclusion, while far from a panacea, from past experience the 5-point qualitative rating scale – in concert with the project-specific and generic factor templates⁷⁷ -- considerably reduced the rancor, as well as facilitating the quantitative drudgery of my project risk analysis activities; and I recommend its adoption by other practitioners.

About the Author



Dr. Kenneth Smith

Honolulu, Hawaii
& Manila, The Philippines



Initially a US Civil Service Management Intern, then a management analyst & systems specialist with the US Defense Department, Ken subsequently had a career as a senior foreign service officer -- management & evaluation specialist, project manager, and in-house facilitator/trainer -- with the US Agency for International Development (USAID). Ken assisted host country governments in many countries to plan, monitor and evaluate projects in various technical sectors; working ‘hands-on’ with their officers as well as other USAID personnel, contractors and NGOs. Intermittently, he was also a team leader &/or team member to conduct project, program & and country-level portfolio analyses and evaluations.

Concurrently, Ken had an active dual career as Air Force ready-reservist in Asia (Japan, Korea, Vietnam, Thailand, Indonesia, Philippines) as well as the Washington D.C. area; was Chairman of a Congressional Services Academy Advisory Board (SAAB); and had additional duties as an Air Force Academy Liaison Officer. He retired as a ‘bird’ colonel.

After retirement from USAID, Ken was a project management consultant for ADB, the World Bank, UNDP and USAID.

He earned his DPA (Doctor of Public Administration) from the George Mason University (GMU) in Virginia, his MS from Massachusetts Institute of Technology (MIT Systems Analysis Fellow, Center for Advanced Engineering Study), and BA & MA degrees in Government &

⁷⁷ Available for free from kenfsmith@aol.com together with over 100 other templates for project planning, monitoring and evaluation, on proof of purchase of my book **Project Management PRAXIS**, at Amazon.

International Relations from the University of Connecticut (UCONN). A long-time member of the Project Management Institute (PMI) and IPMA-USA, Ken is a Certified Project Management Professional (PMP®) and a member of the PMI®-Honolulu and Philippines Chapters.

Ken’s book -- **Project Management PRAXIS** (available from Amazon) -- includes many innovative project management tools & techniques; and describes a “**Toolkit**” of related templates available directly from him at kenfsmith@aol.com on proof of purchase of PRAXIS.