

Fortunes Realised with Risk Reduction

Abstract

Fortunes Realised with Risk Reduction – Adverse risk is the multiplication of the chance of a bad event times the cost of the event when luck goes against you. As risk is lowered money is recovered into additional profits. If you can gauge the size of any risk reduction you can also gauge the size of the money you will get from the effort.

Keywords: business risk reduction, risk management, risk analysis, risk matrix

Luckily we are good at identifying risk. Not many of us will walk into the middle of a busy street if it's not safe to do so. For the people that work in engineering, maintenance, reliability and operations risk aversion is a characteristic you want to be employing for. You don't want brazen entrepreneurs in maintenance and production running around trying unproven ideas and changing things when they feel like it. That is way too risky to be successful for long.

I've got nothing against new ideas; they are critical for future success. It's just that you can't afford to find out the idea is wrong by destroying your business in the effort to prove it works. Before you try things you ought to know if it's even worth the effort. Luckily risk is useful to help us calculate what we will get back for the effort that needs to be put in.

Risk is commonly described by the equation below.

$$\text{Risk} = \text{Frequency of Occurrence (}/\text{yr)} \times \text{Consequence of Occurrence (\$)} \quad \text{Eq. 1}$$

Risk is equal to the frequency of an event occurring multiplied by its cost, should it occur. Frequency is the number of times an event actually happens during a period. Usually a year is used. An event that happens every five years has a frequency of 0.2 times a year. The consequence of an occurrence is the total business-wide financial impact of the event – its Defect and Failure Total (DAFT) Costs. You can learn more about the DAFT Costs that send companies broke from the article [Instantaneous Cost of Failure](#). By calculating the frequency of an event per year, and counting consequence of the occurrence in monetary value, the equation measures the annual cost of risk. It is a means to quantify the yearly cost to the organisation of every event it suffers, good or bad. It provides a figure to gauge one risk against another and so allows the setting of priorities for addressing risk.

Equations of the loss from risk type are power laws¹ and take the general form $x = z \cdot y^n$. For the standard risk equation the exponent 'n' is assumed to equal 1. When the exponent is '1' the risk curves look like those in Figures 1 on linear axes and Figure 2 on a log₁₀-log₁₀ plot. The actual exponent for an operation in a business can be calculated by using the failure history from the operation. By plotting the log of event frequencies per year and the log of the DAFT Costs of the events, the slope can be calculated and the risk equation exponent that applies to an operation identified. This is the quantitative approach to identifying risk and it uses statistical and probability mathematics.

¹ Robinson, Richard M., et al, 'Risk and Reliability: An Introductory Text', R2A Pty Ltd, 7th Edition

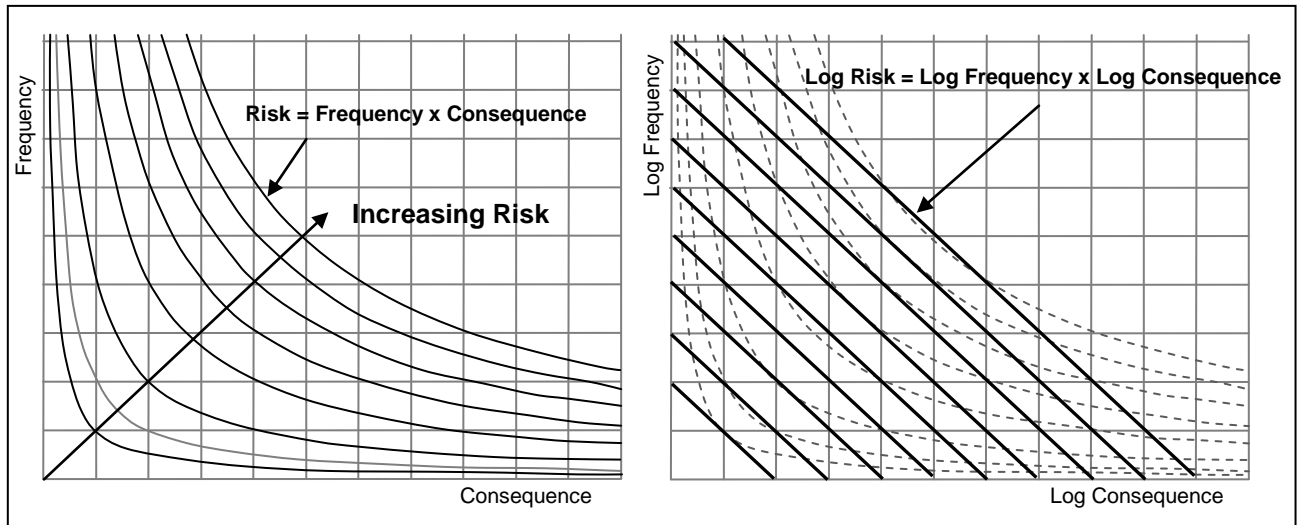


Figure 1 - Risk Curves on a Linear Graph

Figure 2 - Risk Lines on a Log-Log Graph

A risk matrix can be developed that does not use mathematics, but instead uses worded descriptions to explain the frequency of an event; this is the qualitative approach to risk analysis. A common form of the risk matrix is shown in Figure 3.

RISK MANAGEMENT PHILOSOPHY		Business-Wide Consequence					
		People	Injuries or ailments not requiring medical treatment.	Minor injury or First Aid Treatment Case.	Serious injury causing hospitalisation or multiple medical treatment cases.	Life threatening injury or multiple serious injuries causing hospitalisation.	Death or multiple life threatening injuries.
E - Extreme risk - detailed action plan approved by CEO		Reputation	Internal Review	Scrutiny required by internal committees or internal audit to prevent escalation.	Scrutiny required by clients or third parties etc.	Intense public, political and media scrutiny. E.g. front page headlines, TV, etc.	Legal action or Commission of inquiry or adverse national media.
H - High risk - specify responsibility to senior manager			Business Process & Systems	Minor errors in systems or processes requiring corrective action, or minor delay without impact on overall schedule.	Policy procedural rule occasionally not met or services do not fully meet needs.	One or more key accountability requirements not met. Inconvenient but not client welfare threatening.	Strategies not consistent with business objectives. Trends show service is degraded.
M - Medium risk - specify responsibility to department manager		Financial	\$5K	\$50K	\$100K	\$250K	\$500K
L- Low risk - manage by routine procedures			Insignificant	Minor	Moderate	Major	Catastrophic
Extreme or High risk must be reported to Senior Management and require detailed treatment plans to reduce the risk to Low or Medium		Historical Frequency:	1	2	3	4	5
Event will occur at this site annually or more often	6	Certain	M	H	H	E	E
Event regularly occurs at this site	5	Likely	M	M	H	H	E
Event is expected to occur on this site	4	Possible	L	M	M	H	E
Event occurs from time to time on this site	3	Unlikely	L	M	M	H	H
Event occurs in the industry, and could on this site, but doubtful	2	Rare	L	L	M	M	H
Event hardly heard of in the industry. May occur but in exceptional circumstances	1	Very Rare	L	L	L	M	H

Figure 3 – A Typical Risk Matrix

Many companies use a risk matrix to identify workplace safety risks and job hazard levels. A few use it to identify business risks. Very few companies use the risk matrix in reverse to determine what money they will make from reducing a risk.

Figure 4 is a risk matrix designed to show the quantum of money recovered by risk reduction efforts. The scales must follow log₁₀-log₁₀ numeration². The matrix shows this company's risk boundary as being \$10,000 per year per event. If a failure has a DAFT Cost of \$300,000 its consequence is C9 and if it occurs every 10 years its likelihood is L7. The annual cost of risk from such an event is 0.1 x \$300,000 = \$30,000 per year. Though the event historically happens only every decade and costs the whole company \$300,000 when it happens, the annualised cost is \$30,000.

Likelihood of Equipment Failure Event per Year			DAFT Cost per Event	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	Comments	
Event Count per Year	Time Scale	Descriptor Scale		\$50	\$100	\$500	\$1,000	\$5,000	\$10,000	\$50,000	\$100,000	\$500,000	\$1,000,000	\$5,000,000	\$10,000,000	\$50,000,000	\$100,000,000	\$500,000,000	\$1,000,000,000		
100	Twice per week		L13	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	DAFT Cost (Defect and Failure True Cost) is the total business-wide cost from the event
30	Once per fortnight		L12	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	
10	Once per month	Certain	L11	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	
0.3	Once per quarter		L10	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	
1	Once per year	Almost Certain	L9	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Event will occur on an annual basis
0.3	Once every 3 years	Likely	L8	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Even has occurred several times or more in a lifetime career
0.1	Once per 10 years	Possible	L7	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Event might occur once in a lifetime career
0.03	Once per 30 years	Unlikely	L6	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Event does occur somewhere from time to time
0.01	Once per 100 years	Rare	L5	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Heard of something like it occurring elsewhere
0.003	Once every 300 years		L4	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	
0.001	Once every 1,000 years	Very Rare	L3	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Never heard of this happening
0.0003	Once every 3,000 years		L2	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	
0.0001	Once every 10,000 years	Almost Incredible	L1	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Theoretically possible but not expected to occur
Note:																					
	Risk Level	1) Risk Boundary is set at 'LOW' Level																			
	Red = Extreme	2) Based on HB436:2004-Risk Management																			
	Amber = High	3) Identify 'Black Swan' events as B-S (A 'Black Swan' event is one that people say 'will not happen' because it has not yet happened)																			
	Yellow = Medium																				
	Green = Low																				
	Blue = Accepted																				

Figure 4 – A 'Money Recovery' Risk Matrix

With this matrix we can estimate how much money will be saved by reducing a risk. If the once a decade event above could be extended to once per 30 years, the annualised risk falls to 0.03 x \$300,000 = \$9,000 per year. Even before doing a scrap of work to reduce the risk we already know the scale of the business benefit the risk reduction initiatives provide if they were successful. Our job is then to identify the necessary steps to produce reduction in event frequency from 0.1 per year to 0.03 per year and put them into place for less than \$21,000 per year. If the necessary initiatives cost more than \$21,000 per year they are not worth doing because the mitigation costs more than the failure.

Even small failures that occur often can be justified for improvement. Say a repetitive failure occurred about every month and its DAFT Cost was \$3,000; a risk of 12 x \$3,000 = \$36,000 per year. That is a lot of money lost to the business year after year. You could justify spending a small fortune in risk reduction to get the problem down to once per year. If you successfully dropped the risk to once a year it would then cost only 1 x \$3,000 = \$3,000 per year, a huge

² AS4360:2004 Australian Risk Management Standard

saving of \$33,000 per year, less the cost of doing the mitigation. Any ideas that did that for a company would put a big smile on the faces of a lot of people.

The risk matrix is a tremendously powerful risk management decision making tool that is very easy for non-technical and non-financially literate people to use. It has a very practical business improvement use when it comes to deciding whether or not to do risk mitigation or whether to just live with the risk and pay for it when your luck runs out.

Best regards,

Mike Sondalini
www.lifetime-reliability.com