

R I S K



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Authors Note* This booklet is not about Risk Management or Hazard Analysis, it is written in order to describe what RISK really is, and the types of people that it affects.

What is RISK?

The **Oxford English Dictionary** cites the earliest use of the word in English (in the spelling of *risque* from its Arabic original "رزق") which means working to gain income gain and profit as of 1621, and the spelling as *risk* from 1655. It defines risk as:

(Exposure to) the possibility of loss, injury, or other adverse or unwelcome circumstance; a chance or situation involving such a possibility.

Risk is an uncertain event or condition that, if it occurs, has an effect on at least one objective.

1. The probability of something happening multiplied by the resulting cost or benefit if it does. (This concept is more properly known as the 'Expectation Value' or 'Risk Factor' and is used to compare levels of risk)

2. The probability or threat of quantifiable damage, injury, liability, loss, or any other negative occurrence that is caused by external or internal vulnerabilities, and that may be avoided through pre-emptive action.

3. **Finance:** The possibility that an actual return on an investment will be lower than the expected return.

4. **Insurance:** A situation where the probability of a variable (such as burning down of a building) is known but when a mode of occurrence or the actual value of the occurrence (whether the fire will occur at a particular property) is not. A risk is not an uncertainty (where neither the probability nor the mode of occurrence is known), a peril (cause of loss), or a hazard (something that makes the occurrence of a peril more likely or more severe).

5. **Workplace:** Product of the consequence and probability of a hazardous event or phenomenon. For example, the risk of developing cancer is estimated as the incremental probability of developing cancer over a lifetime as a result of exposure to potential carcinogens (cancer-causing substances).

Risk is the potential of losing something of value. Values (such as physical health, social status, emotional well being or financial wealth) can be gained or lost when taking risk resulting from a given action, activity and/or inaction, foreseen or unforeseen. Risk can also be defined as the intentional interaction with uncertainty. Risk perception is the subjective judgment people make about the severity and/or probability of a risk, and may vary person to person. Any human endeavor carries some risk, but some are much riskier than others.

One of the growing areas of focus in risk management is the field of human factors where behavioral and organizational psychologies underpin our understanding of risk based decision making. This field considers questions such as "how do we make risk based decisions?", "why are we irrationally more scared of sharks and terrorists than we are of motor vehicles and medications?"

In decision theory, regret (and anticipation of regret) can play a significant part in decision-making, distinct from risk aversion (preferring the status quo in case one becomes worse off).

Framing is a fundamental problem with all forms of risk assessment. In particular, because of bounded rationality (our brains get overloaded, so we take mental shortcuts), the risk of extreme events is discounted because the probability is too low to evaluate intuitively. As an example, one of the leading causes of death is road accidents caused by drunk driving – partly because any given driver frames the problem by largely or totally ignoring the risk of a serious or fatal accident.

For instance, an extremely disturbing event (an attack by hijacking, or moral hazards) may be ignored in analysis despite the fact it has occurred and has a nonzero probability. Or, an event that everyone agrees is inevitable may be ruled out of analysis due to greed or an unwillingness to admit that it is believed to be inevitable. These human tendencies for error and wishful thinking often affect even the most rigorous applications of the scientific method and are a major concern of the philosophy of science.

All decision-making under uncertainty must consider cognitive bias, cultural bias, and notational bias: No group of people assessing risk is immune to "groupthink": acceptance of obviously wrong answers simply because it is socially painful to disagree, where there are conflicts of interest.

Framing involves other information that affects the outcome of a risky decision. The right prefrontal cortex has been shown to take a more global perspective while greater left prefrontal activity relates to local or focal processing. From the Theory of Leaky Modules McElroy and Seta proposed that they could predictably alter the framing effect by the selective manipulation of regional prefrontal activity with finger tapping or monaural listening. The result was as expected. Rightward tapping or listening had the effect of narrowing attention such that the frame was ignored. This is a practical way of manipulating regional cortical activation to affect risky decisions, especially because directed tapping or listening is easily done.

Quantitative analysis

There are many formal methods used to "**measure**" risk. Often the probability of a negative event is estimated by using the frequency of past similar events. Probabilities for rare failures may be difficult to estimate. This makes risk assessment difficult in hazardous industries, for example nuclear energy, where the frequency of failures is rare, while harmful consequences of failure are severe.

Statistical methods may also require the use of a cost function, which in turn may require the calculation of the cost of loss of a human life. This is a difficult problem. One approach is to ask what people are willing to pay to insure against death or radiological release (e.g. GBq of radio-iodine) but as the answers depend very strongly on the circumstances it is not clear that this approach is effective.

Risk is often measured as the expected value of an undesirable outcome. This combines the probabilities of various possible events and some assessment of the corresponding harm into a single value. See also expected utility. The simplest case is a binary possibility of Accident or No accident. The associated formula for calculating risk is then: For example, if performing activity X has a probability of 0.01 of suffering an accident of A, with a loss of 1000, then total risk is a loss of 10, the product of 0.01 and 1000.

Situations are sometimes more complex than the simple binary possibility case. In a situation with several possible accidents, total risk is the sum of the risks for each different accident, provided that the outcomes are comparable:

For example, if performing activity X has a probability of 0.01 of suffering an accident of A, with a loss of 1000, and a probability of 0.000001 of suffering an accident of type B, with a loss of 2,000,000, then total loss expectancy is 12, which is equal to a loss of 10 from an accident of type A and 2 from an accident of type B.

One of the first major uses of this concept was for the planning of the Delta Works in 1953, a flood protection program in the Netherlands, with the aid of the mathematician David van Dantzig. The kind of risk analysis pioneered there has become common today in fields like nuclear power, aerospace and the chemical industry. In statistical decision theory, the risk function is defined as the expected value of a given loss function as a function of the decision rule used to make decisions in the face of uncertainty.

In my earlier book "Drilling Down Into Hazards & Risk" I looked at the hidden side of risk, in this book following on from the above, we shall explore the various types of risk, and try to analyze the groups of risk takers, to see if we can ascertain the reasons people take risks.

In order to fully understand what risk actually is, we must first disseminate the word into its compounds, and how and why these compounds act on our psyche.

There are two types of risk;

- 1. Controlled risk**
- 2. Uncontrolled risk**

I will be using analogies to explain what the different types are, and how different types of people see risk.

In life there are two different types of people;

- 3. Risk takers**
- 4. Non risk takers**

Although I have broken 3 & 4 down to a basic simplistic level, almost every person will blend a mixture of 1, 2, 3, & 4 at some point in their lives.

Age grouping also comes into play here, but is not a realistic indicator; it is generally thought that as one gets older, one tends to reevaluate risks in order to minimize the effects and exposure to it.

Let us for example take two men who walk tight ropes, both these men are experienced and have walked across the Grand Canyon, and often walk between the roofs of sky scrapers.

One is 30 years of age, the other is forty, both look at risks differently, they know the end result could be a fall and is high risk. One walks across the wire rope with only a balancing pole, the other uses the pole and is attached to a fall restraint harness, can you work out the biggest risk taker? You would be wrong if you said the younger man, he is the one with the fall restraint harness. In most cases it would have been the older man wearing the fall restraint harness, as he is thought to see risk in a different way to the younger man. This is often not the case, we all see risk differently. We can further break down the risk factor;

5. Calculated risk

6. Uncalculated risk

In calculated risk we have a parachutist (a), in order to calculate the risk involved, he will ensure that he jumps from a safe height and have a reserve chute.

In uncalculated risk we have a base jumper (b), he will jump from a high cliff face, but has not calculated the possibility of sudden wind gusts, or the possibility if this occurs, of being slammed into the side of the cliff face. He hopes that when he leaps, he will clear all obstacles and be able to open his chute to glide to the bottom.

We would call both the first scenario as a high risk endeavor, so if we were to calculate out the type of risk taker, the calculated risk would look like this; 1, 3, & 5 - And the uncalculated risk would be; 2, 3 & 6.

- (a) Would have a lesser likelihood of being killed because of the controls in place to minimize the risks.
- (b) Has a greater chance of being killed due to the uncontrolled and uncontrollable risk factors.

RISK is a perception, and everyone sees something different, but risks have outcomes if the controls fail. Albert Einstein once said "For every action, there is a reaction" it is up to the individual to calculate and minimize the reaction of the consequence of risk. Our two scenarios are based on two groups of high risk takers, but is the other, the non-risk taker any different? Some say they do not take risks, but is this always the case? Does this group over calculate risk? The answer is no, every human does something risky, it may be subliminal, or calculated, like just getting around the car you have been overtaking before oncoming traffic gets there. We are all risk takers, it is human nature to take risks, and we learn from these risks.

It is up to the individual to weigh up the risks in life, if they are lucky, and have established good controls to minimize the risk, then they will be safe, if not the opposite occurs. But we should learn from these experiences be they positive or negative in outcome.

Risk has many faces, not always coupled with safety, there are many areas in life where risk is taken without getting physically hurt, dabbling in the stock market, bonds, or any financial risk. It is up to the individual to weigh up the risks in life, by taking risks we learn, and if lucky the controls to minimize the risks have worked, and will see them safe, if not the opposite occurs, but we will learn from the experience, be it positive or negative.

There are literally thousands of examples and instances of people taking risks and controlling the risks, in a warzone, in sport or recreational activities, or even in our day to day lives, and that includes the workplace. Having good controls in place, means you negate the negative outcome of the risk, and get away without consequences, having bad controls that fail, or no controls at all, will mean you suffer the consequences, it is all relative to your preparedness and the controls you formulate to negate the impact of the risk, you might say that all this is about the psychology of risk,, but it is not, it is embedded in our DNA that we must take risks in order to learn, this includes at work, growing up or progress through life.

This will change with age groups, social groups and status, or work types, and has so many variables; it would be like trying to explain the function of the universe.

When risk is being calculated, we look at a set of possible resulting consequences, but we rarely calculate in unforeseen consequences or use these variables, these can lead to a chain reaction that will actually possibly negate controls that have been established, and are a chain reaction of negative value to the control of risk. So to explain, we need another example;

It is raining and a young driver is testing his driving skills in drifting and sliding through corners at high speed in a suburban area, he has taken into account the risk that he may hit a parked car should he lose control, he feels that the risk is worth taking as it is his belief that he is a good driver. He slides through a corner, hits a slippery spot on the road, he loses control of the slide and rebounds off a parked car, slams over a footpath, through a fence and into the side of a low set house, smashing through the brick work and kills a person sleeping in the room, this is an unforeseen consequence.

Every risk and every control has the ability to suffer from an unforeseen consequence occurring, it is like a domino effect with controls falling over in a row, every risk has hidden areas that few people even contemplate when establishing controls for risks, all these have their own consequences. (See "Drilling Down Into Hazards & Risk") I can hear people saying we are all doomed to risk failure, so I am not leaving the house! But we are not doomed, and staying in your house is dangerous and filled with risks as it is unregulated, possibly more so that when at work, at least at work you have a safety person who regulates the risks, if they are skilled in managing the risks in the workplace.

So can we categorize risk takers? We could analyze them through psychology or psychiatry, but I do not believe the result would show a common denominator, as there are far too many variables involved with a person's psyche. What we have managed to do, is grade risk takers into age brackets, that is why your motor vehicle insurance gets cheaper as you get older, as they have put people into age brackets consistent with the amount of accidents they have, and are graded as high or low risk takers. But really, this is a false assumption, as a lack of experience of risk controls can affect any age group. This experience comes from the risks we take and the controls we put into place, if it all works, we get away with the risk and we learn from the experience. So we need to involve ourselves in risk in order to learn, is this not what children do as they grow up?