Lab 4 Risk

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Risk of Disaster, The Challenger

The Challenger is a storied NASA tragedy that carried the first African American, first educator, and first female American astronaut into space in the 1980’s. Thus, it was heavily covered by the media when disaster struck, and the space shuttle unexpectedly exploded. However, not everyone was surprised by the accident. A group of engineers were concerned that the chilly conditions would compromise the O-ring seals. Indeed, the below freezing temperatures allowed heated gas to escape the seals on the right thruster, creating a mixture of hydrogen gas and liquid oxygen that blew up the fuel tank. With the benefit of insight, could the risks have been identified, quantified, and prevented? NASA could have first asked each group of contributing engineers to identify the most likely sources of risk for each of their components. Risk like weather, rust, wear, and temperature sensitivity might have been mapped out. Then, simulations could have been ran on the risks to determine probabilities of each occurring. For instance, a 40% chance of bad weather, 10% chance of rust, 15% chance of wear and 50% chance of integrity issues due to temperature could have been established. Then these probabilities could have been used to run an assessment on how often each risk would lead to disaster. These second probabilities would be critical, because if a 15% chance of wear led to a 99% chance of critical failure, or a 40% chance of bad weather led to a 0.5% chance of hail related explosions, appropriate action could have been taken. For example, the scenarios leading to catastrophe could have been modeled and diligently checked to ensure that reality wasn’t following a pathway to destruction. It’s important to keep in mind that this analysis has its own limitations; a small error in establishing the likelihood of any input will be exponential recorded in the final probability, and the models will be limited to the accuracy of all risks, no matter how small, being accounted for.

The theory of knowledge is the basis of all human endeavors. The way we categorize and conceptualize what we know and how we know it form the building blocks of thought and progress. Rumsielf categorizes knowledge into three different categories. There are known knowns, such as 2 + 2 = 4. I know that it is true and I know why it is true, 99.99%. Next, there are known unknowns. For example, I know that I don’t know how to use the Black-Scholes formula to calculate options price and run a portfolio. However, I know what it is and I am aware I don’t know it. I know about 1% of what there is to know about this formula. Unknown unknowns, however, are a different story. This is a class of knowledge that I am completely oblivious to, so much so that I am 99.99% unaware of my own ignorance. The nature of this category is such that I cannot give an example, however I am aware that it exists. These knowledge classes form the basis of learning, and what is currently unknown unknown will hopefully become a known unknown and finally a known known.

Black swan events are tail risk events that are impossible to predict. They are a unknown unknown. For example, covid was a mostly black swan event. Some experts had theorized a virus may come through with devastating effect, however the event of COVID-19 was not predicted. Some would also say that the financial crisis of 2008 was a black swan event, however Nassem Taleb, the author of *Black Swan*, disagrees, saying that it was predictable and boring. Perhaps in a spreadsheet, black swan events can be checked for by stress testing every single input variable and then applying a black swan factor, a multiple that non-linearly increases the impact of the worst case scenario. Taleb recommends using Mandelbrotian geometric distributions to model what he calls “Extremistan,” events that do not follow the Gaussian standard normal distribution.