Question 1

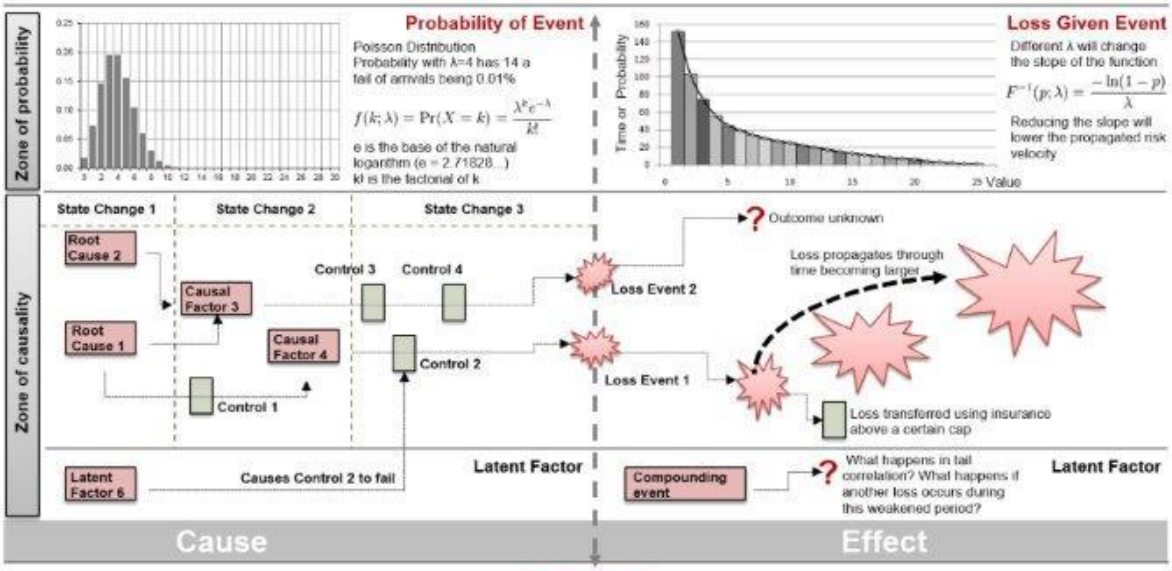
Your company MTech plc (Medical Technologies plc), based in the South West of the UK (10 miles South of Bristol), manufactures, markets, and sells sophisticated cancer screening instruments (CSI). MTech has a world-wide market for the CSI and manufactures between 500 and 600 sets per year. It also has a thriving business in calibration and repair of CSIs. A major sub-assembly of the CSI is a scanner unit (weighing 25kg with dimensions 1m x 1.5m x 0.75m and costs £15,000) that contains radio-active components and is purchased from a company in Germany (ScannerTech) which is located in a small town 5 kilometres north of Leipzig. The repair and calibration of the CSI always involves the fitting of a new scanner with MTech plc providing a guaranteed turnaround time of 10 days.

The managing director (MD) has asked you to undertake a risk assessment using the Bow-Tie method to ensure that the threats and risks are identified and preventative or mitigations measures are put in place. Brexit is a key driver for this assessment.

The MD has also asked if you can look at ways to add a quantitative method to the Bow-Tie in order to provide figures for an overall risk assessment. You are not expected to implement this extension to the Bow-Tie. See below.

Bow Tie Extended

A look at causality through the bow tie window



Tipping Point

Control Zone

Many of the controls in the causal zone are designed to prevent an event from occurring. These controls work on reducing the **Probability of Event**, however; that isn't always the case and some controls aim to reduce effects from large losses before they occur. Control arrangements can be serial or parallel in design but due to latent factors and randomness, no controlled path is 100% effective for all events. There are few places in this world that are zero risk.

Management Zone

ROLE of Auditors and compliance will find these groups of people spending much of their time focused on evaluating whether controls in the causal zone are being operated as designed.

ROLE of risk management is to design the most cost effective and efficient risk adjusted return for the business.

Tail Event Estimation

Tail event management has activities in the causal zone, where the risk manager will try to identify latent factors in the causal network and attempt to understand potential outcomes from these factors.

The ability to understand the likelihood that more than one random event may occur simultaneously also requires quantification. There are many ways of doing this where perhaps a conjugate variable λ within the Poisson function can result in a gamma like distribution or where events are sequenced up a level into a markov like arrangement. The use of extreme value theory can also assist here.

Once the inevitability or tipping point is reached, there will be a loss for the business. It is 'inevitable' but early loss management in the recovery zone should interfere with the loss propagation function if treatments in the event outcome space are effective.

In some cases losses will be transferred but not in all instances and the ability to transfer risk can vary from preconditions in the causal zone. Each risk identified by risk management can have different causal paths, playing out the same event in different ways.

Proactive risk management focusses on outcomes and resilience. That is, how will the business operate while a loss event is being endured. There will of course be less experience in the outcome operating space because its occurrence is most often lower than the causal zone. A sound business continuity management program and a solid stress testing program should describe how businesses are to endure, recover, change, transfer and absorb losses in this effect

Tail event management for the risk manager involves many activities in the effect zone, including some of the following:

[1] Attempting to dimension how outcomes physically play out.
[2] Measuring internal tail length for each single event space.
[3] Measuring correlation or compounding effects of multiple events.
[4] Defining the robustness of the institution to contain the slope of the propagated loss function or being able to contain "risk propagation velocity".