2017 International Symposium on Military Operational Research

Strategic Risk Framework

ALEPH INSIGHTS

Project Background

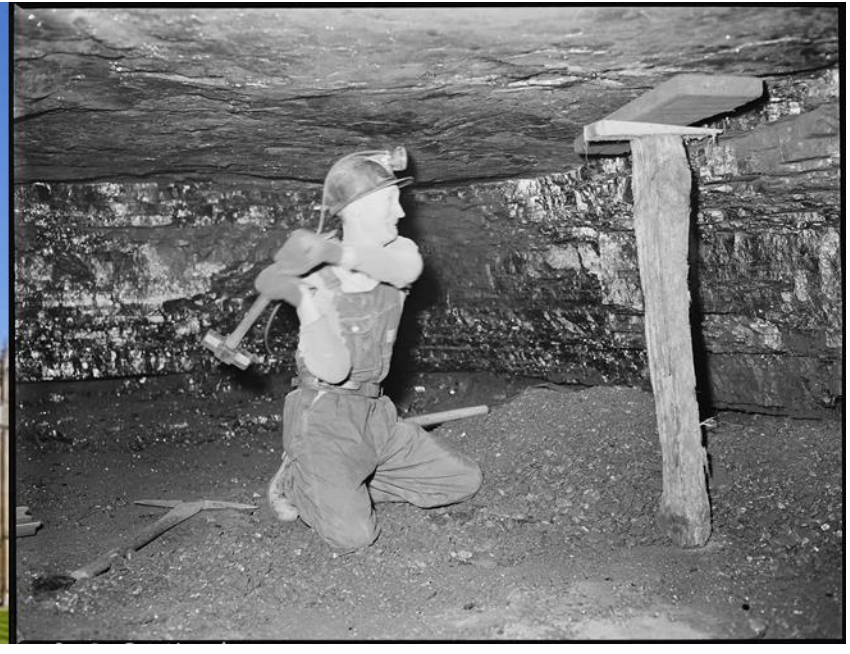
Study Objective

Requires a thorough review, evaluation and implementation of the Strategic Risk Framework (SRF), in context of the UK's assessment of cyber risk mitigation measures.

- Work Package 1a - Understand the SRF **– Theory**
  - Reviewing and testing the theory underpinning the SRF
- Work Package 1b - Trial the application of the SRF to cyber risks **– Practice**
  - Initial trial and assessment of its applicability to the proposed use;
- Work Package 2 - Evaluate the framework for HMG **- Pre-Deployment**
  - Practical trialling of the SRF methodology, evaluation and adaptation
- Work Package 3 - Development of a SRF analysis tool **– Deployment**
  - Development of a prototype analysis tool to enable testing/implementation by end users

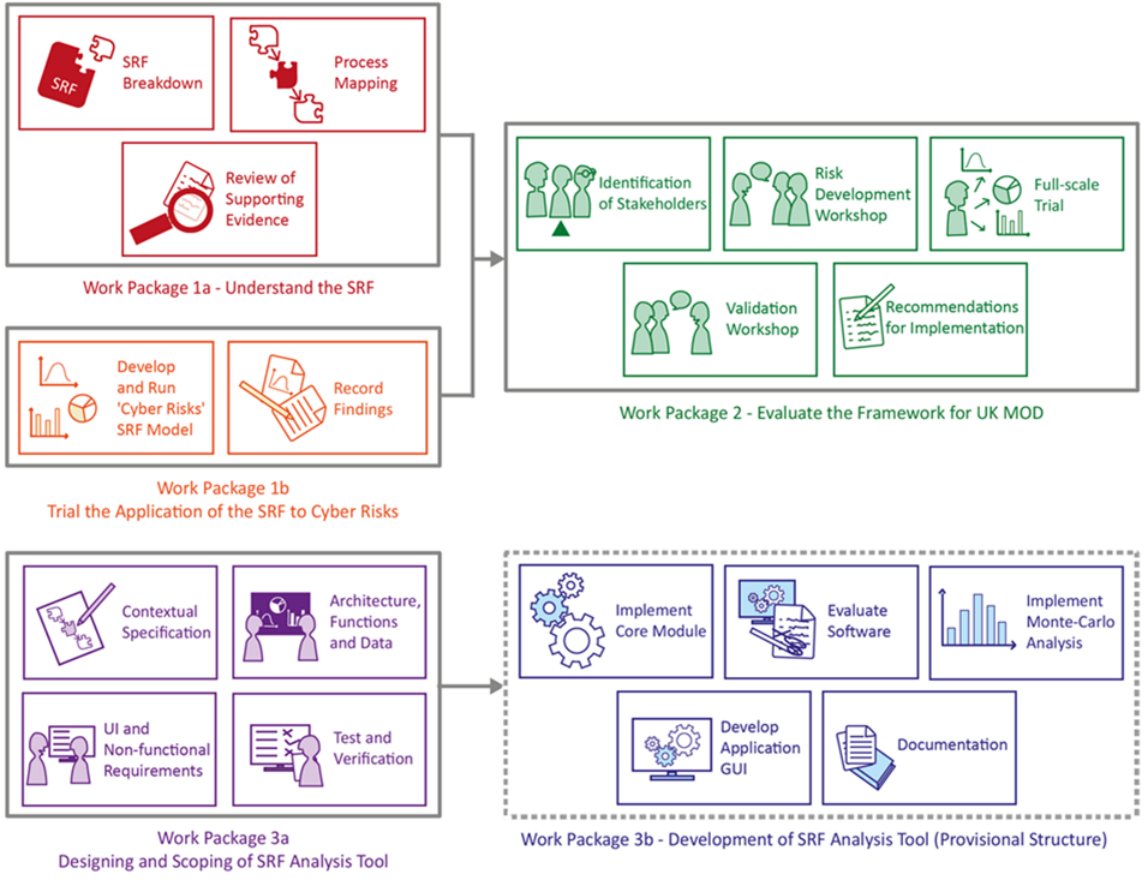
ALEPH INSIGHTS

Study Objective



ALEPH INSIGHTS

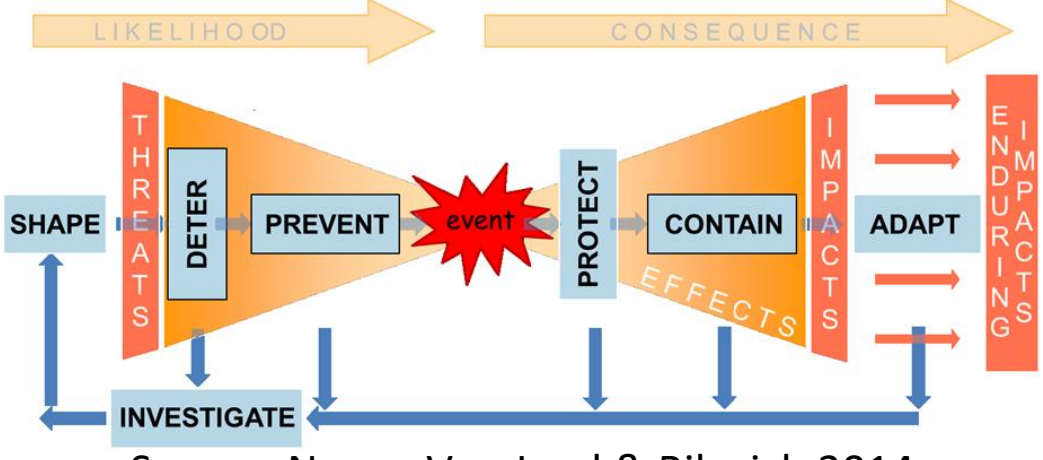
Study Objective



ALEPH INSIGHTS

The SRF

- SRF differs from risk matrix methodologies
- Rather than high impact/high likelihood risks, uses bowtie analysis to examine all risk pathways (threats-consequences)
- Allows evaluation of how much countermeasures reduce risk across all threat scenarios

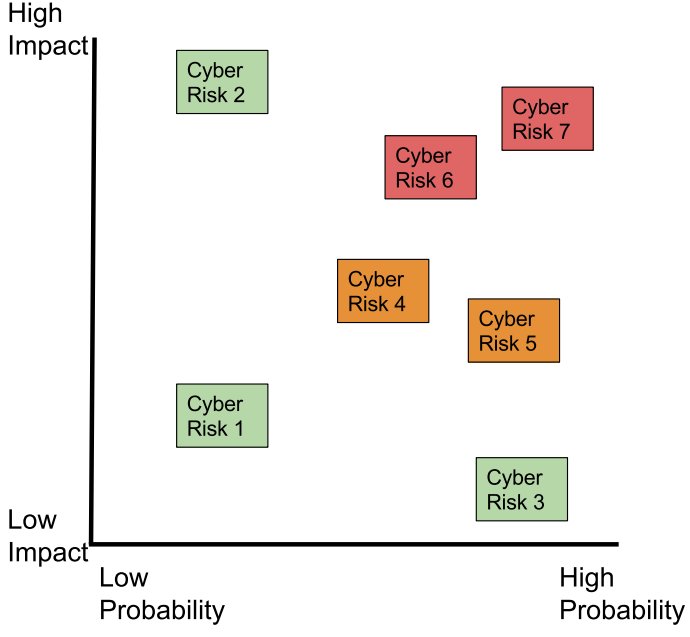


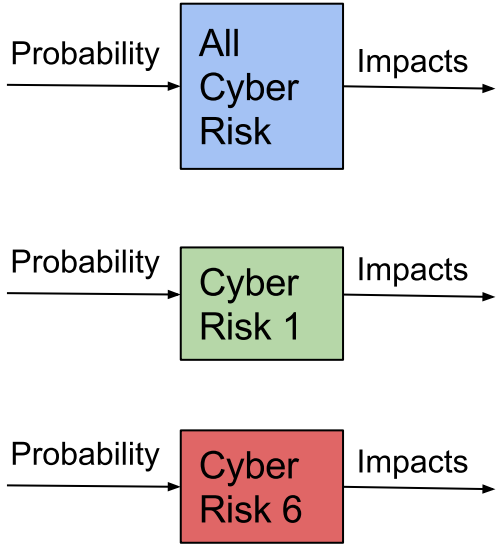
Source: Nunes-Vaz, Lord & Bilusich 2014

ALEPH INSIGHTS

Traditional Risk Assessment

- Rather than look at the entirety of cyber risk or complete risk events, the SRF looks at components of individual risk events – breaking down the judgements associated with risks.

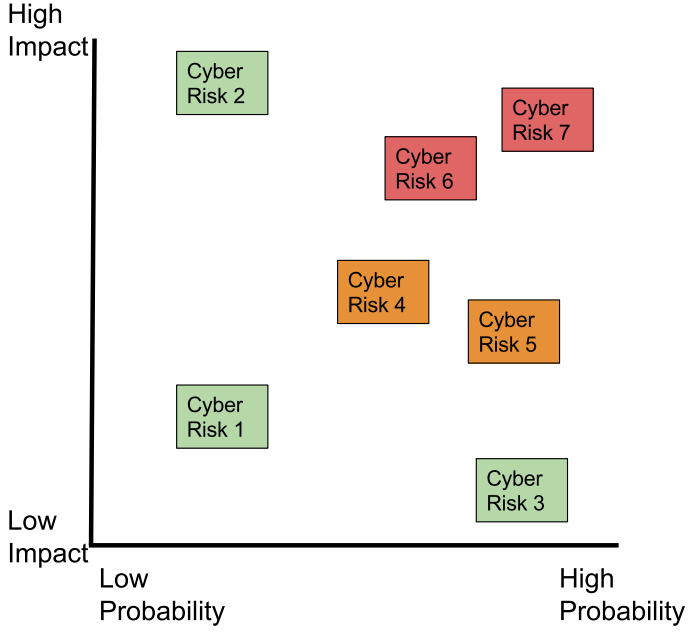


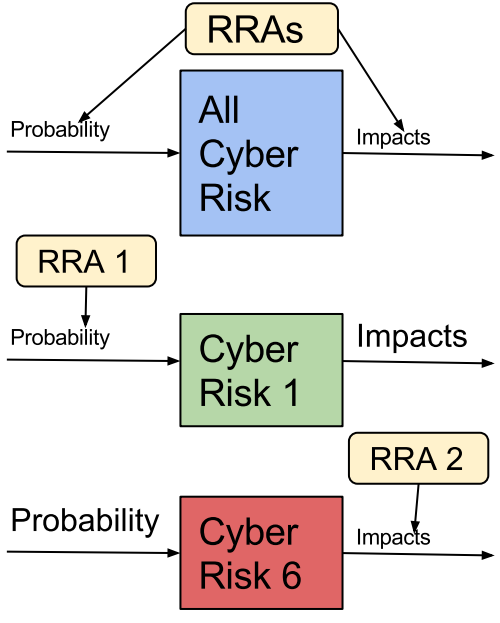


ALEPH INSIGHTS

Traditional Risk Assessment

- Rather than look at the entirety of cyber risk or complete risk events, the SRF looks at components of individual risk events – breaking down the judgements associated with risks.

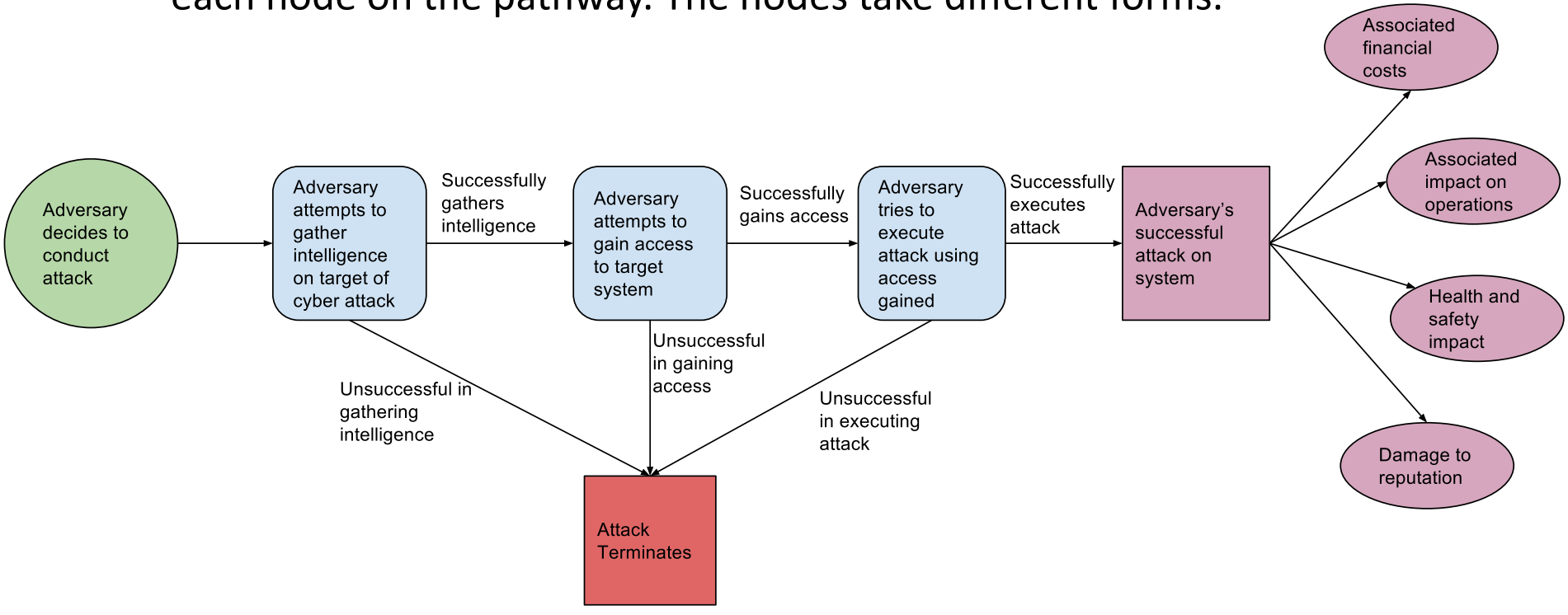




ALEPH INSIGHTS

The SRF Risk Pathways

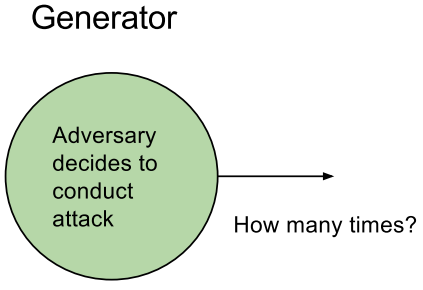
- Develops a risk pathway for each risk event and makes judgements for each node on the pathway. The nodes take different forms.



ALEPH INSIGHTS

Generators

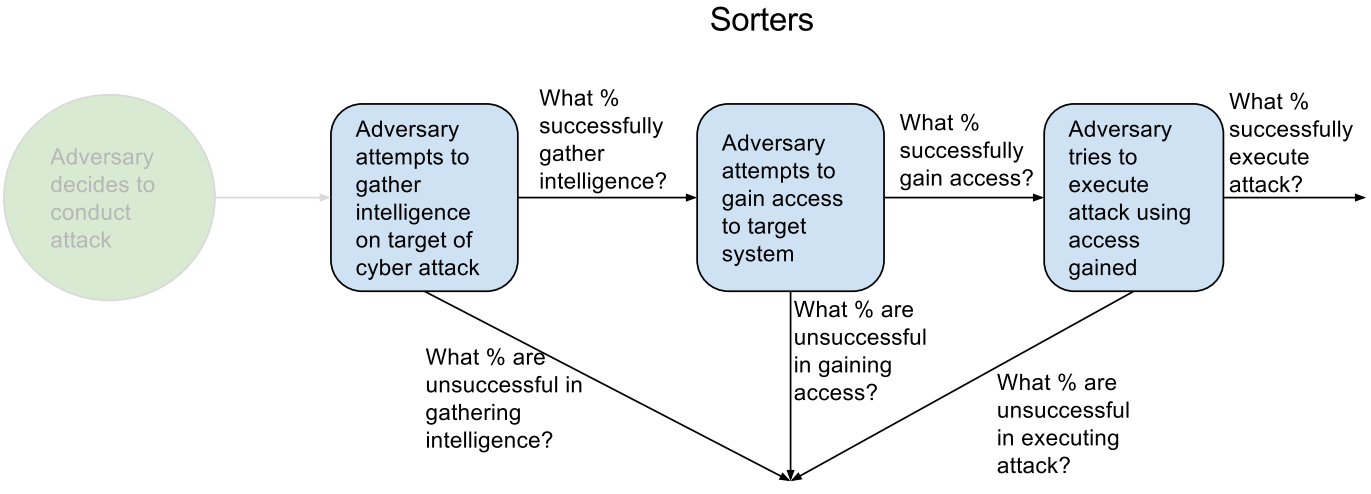
- Generators mark the beginning of the risk pathway and determine the number of potential risk events entering a pathway.



ALEPH INSIGHTS

Sorters

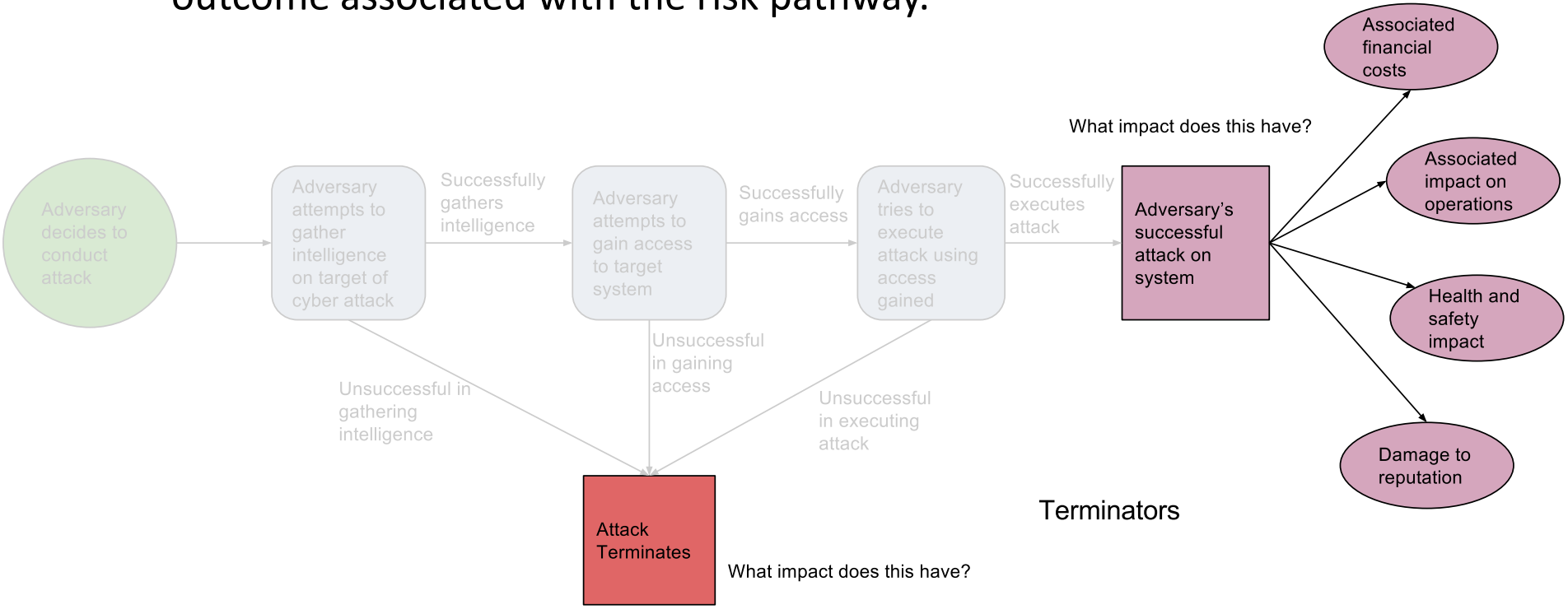
- Sorters determine the proportion of potential risk events that progress to the next stage of the risk pathway.



ALEPH INSIGHTS

Terminators

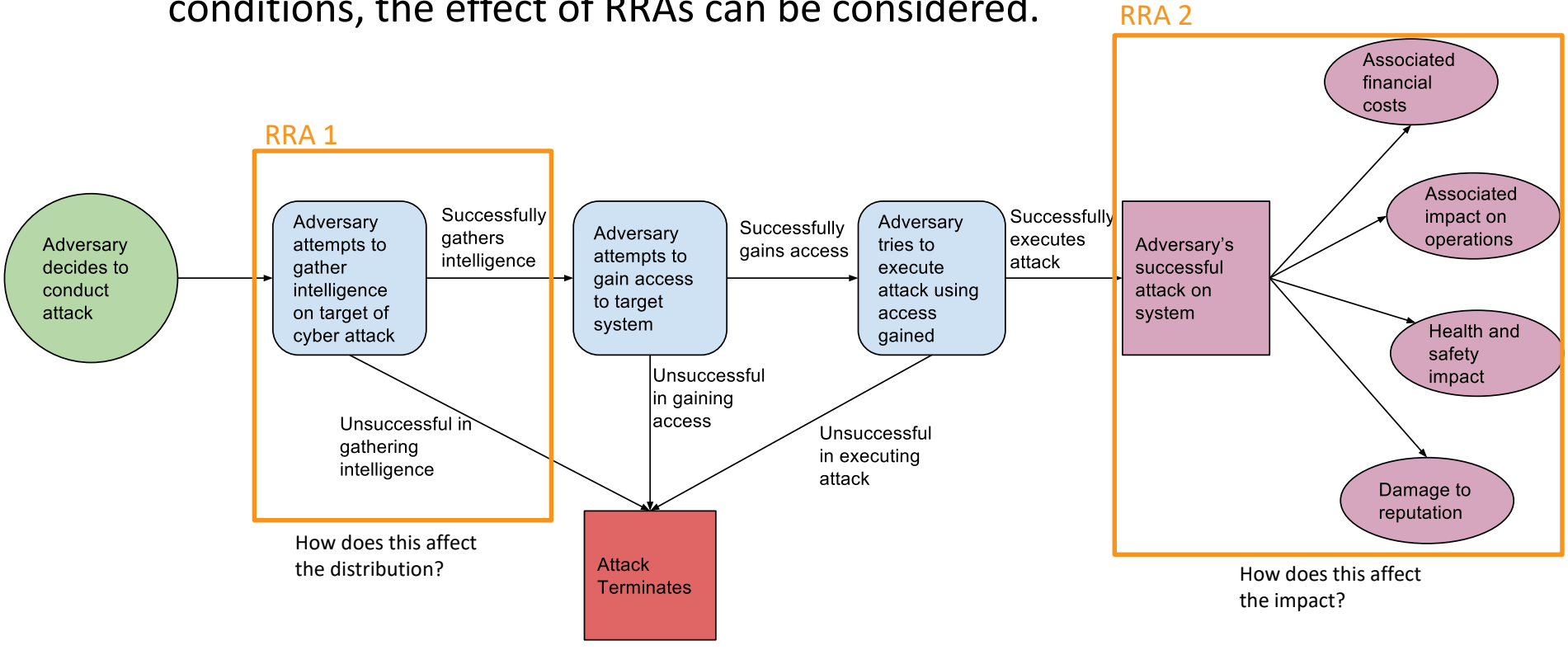
- Terminators represent the manifestation of the risk event, or some outcome associated with the risk pathway.



ALEPH INSIGHTS

Risk Reduction Activities (RRAs)

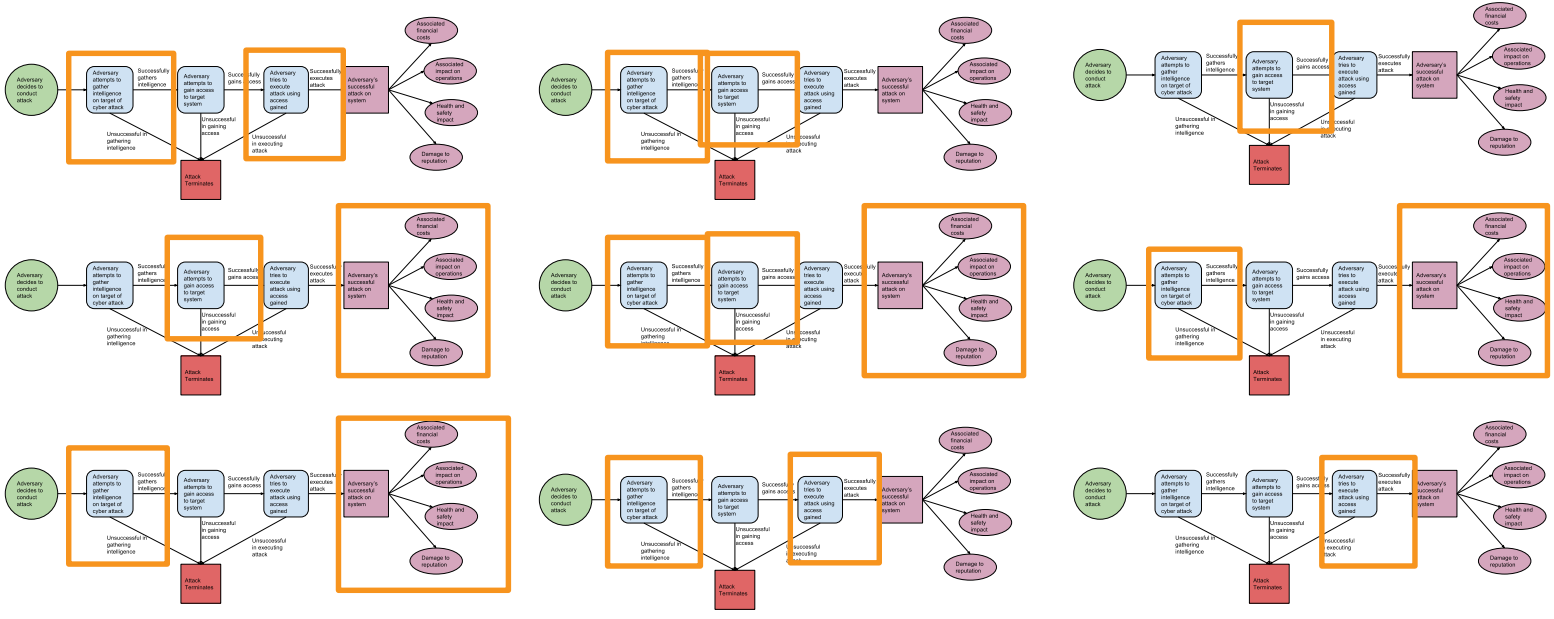
- Once judgements are made about the risk pathway under 'baseline' conditions, the effect of RRAs can be considered.



ALEPH INSIGHTS

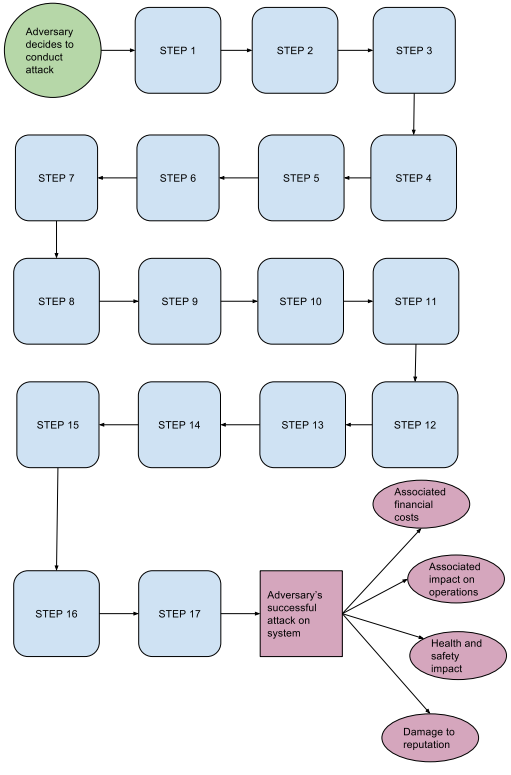
Considering Multiple Pathways

- Many risk pathways can be assessed together, considering the impact of many RRAs – this becomes conceptually and computationally complex.



Overburdening the Analyst

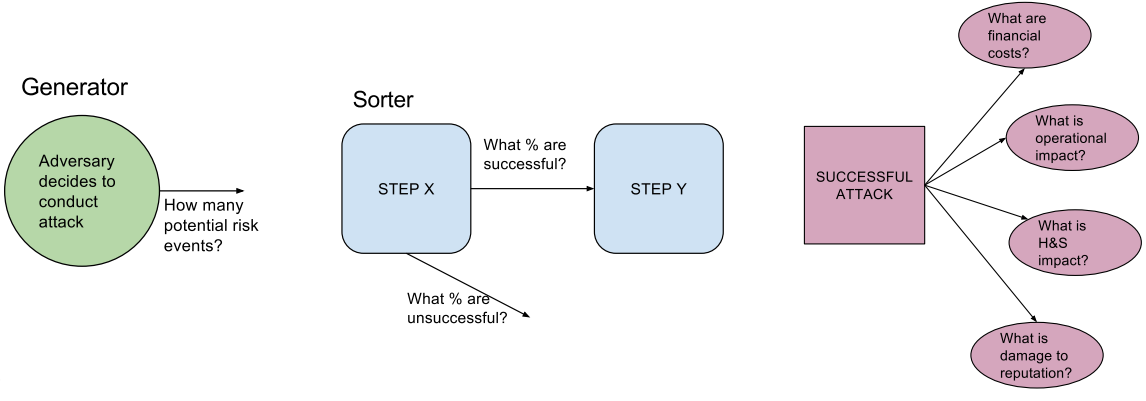
- Analytical judgement underpins the SRF, presenting too many pathways or pathways that are too long will overburden analysts.



ALEPH INSIGHTS

Analytical Questions

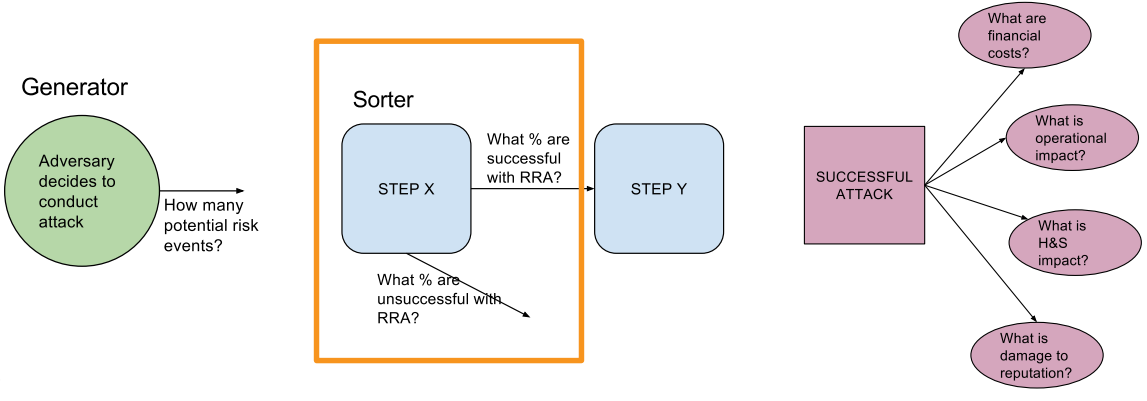
1. How many potential risk events (attacks per year)?
2. What proportion will progress to the next step of the risk pathway?
3. What impacts will an actual risk event have (measured using scales)?



ALEPH INSIGHTS

Analytical Questions

1. How many potential risk events (attacks per year)?
2. What proportion will progress to the next step of the risk pathway?
3. What impacts will an actual risk event have (measured using scales)?
4. What difference will the RRAs make (consider different possible worlds)?



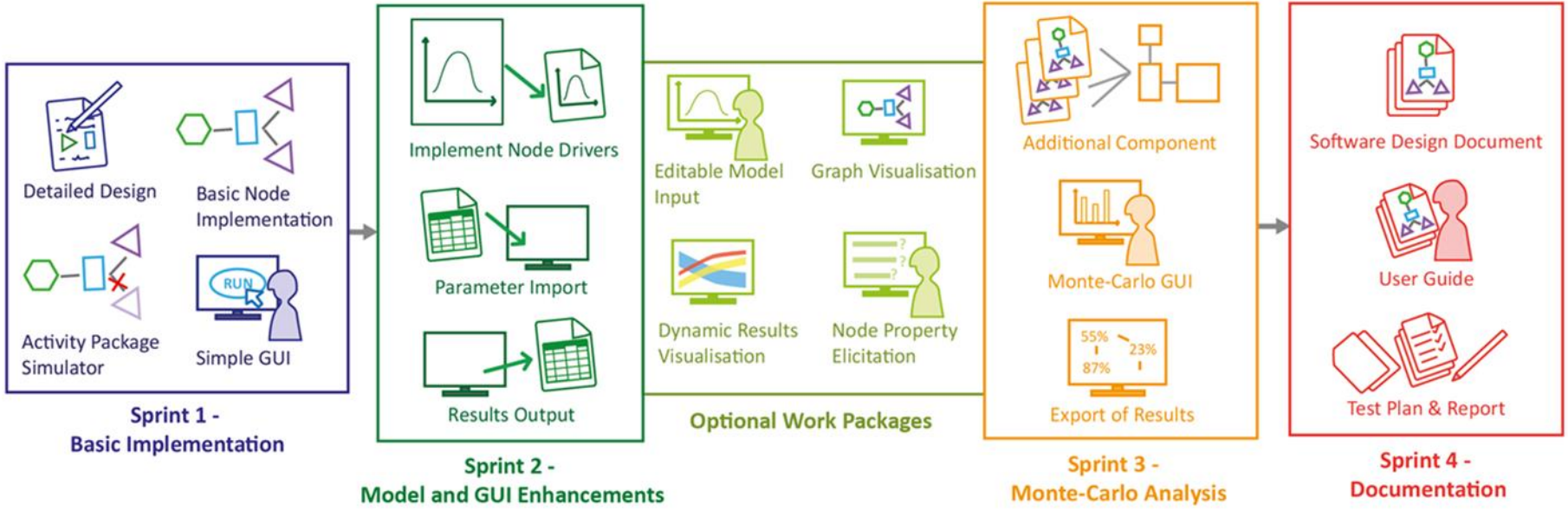
ALEPH INSIGHTS

Analytical Uncertainty

- Each analytical judgement carries some level of uncertainty depending on the availability of data, expertise and intelligence.
- This uncertainty is captured by using multiple analysts for judgements, using three point estimates (best guess, minimum and maximum) and developing appropriate distributions for the values associated with a node.
- The software developed in the project allows this uncertainty to be factored in as it runs simulations of possible outcomes (with and without different RRAs applied). It will support a number of analytical functions:
  - Risk pathway building/model construction
  - Model calculation and simulation
  - Results visualisation and analysis

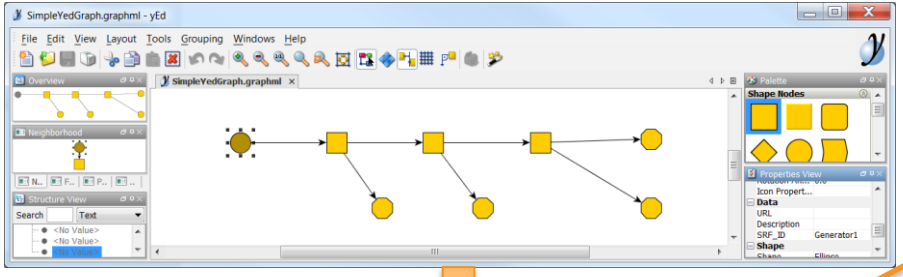
ALEPH INSIGHTS

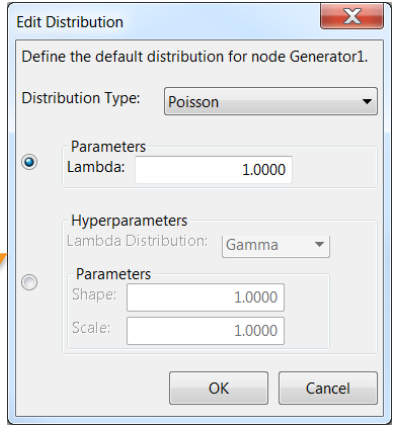
Software Tool

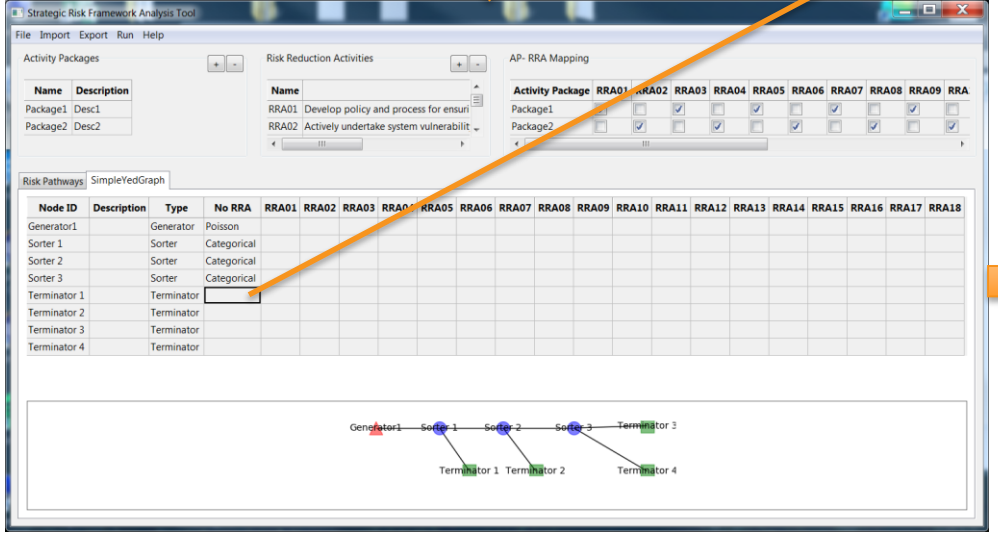


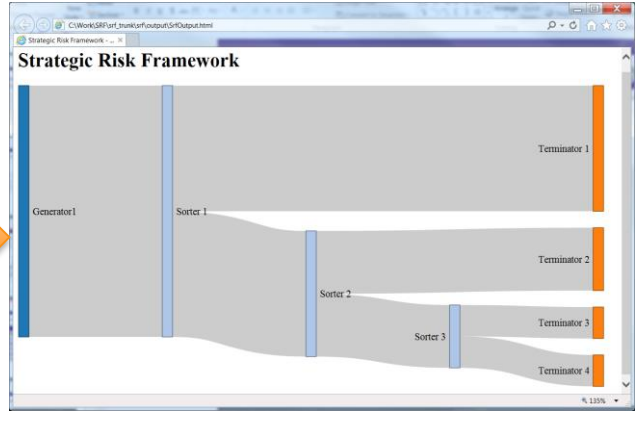
ALEPH INSIGHTS

Software Tool









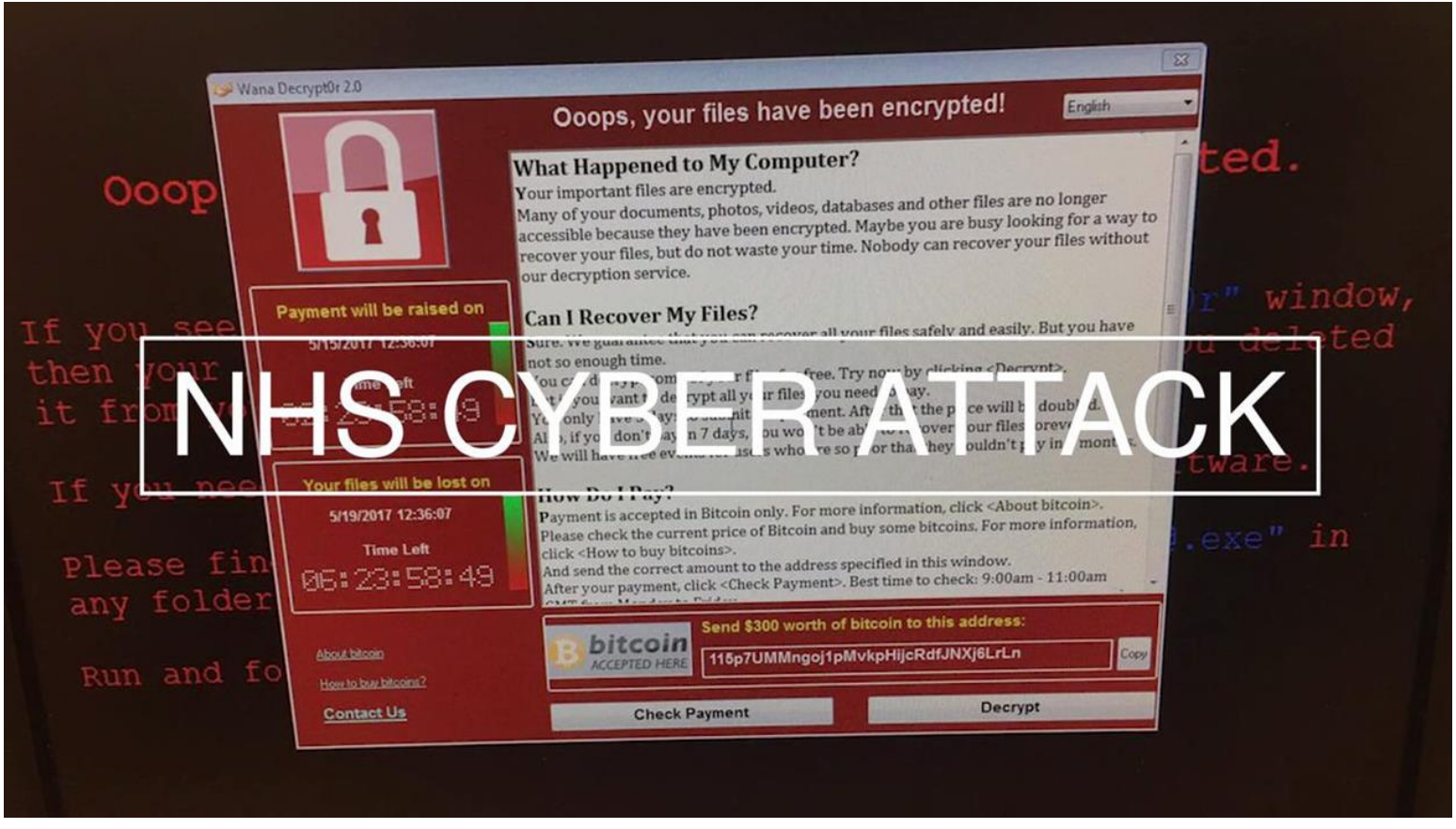
ALEPH INSIGHTS

SRF Evaluation Conclusions

Pros	Cons
Explicitly exposes assumptions	A significant cognitive burden
Provides standard method	Needs to be learnt
Helps to identify info gaps	Gaps in available data
Allows qualitative exploration	Results may be misinterpreted
Theoretically sound	Adaptations to method required
Could be managed in trial	Further resource would improve

ALEPH INSIGHTS

Further Applications



Source: Manchester Evening News

ALEPH INSIGHTS

References

- Nunes-Vaz, R., Lord, S. and Bilusich, D. (2014) *From Strategic Security Risks to National Capability Priorities.* Kingston ACT: Security Challenges
- Rowe, C., Zadeh, S.Z., Garanovich, I., Jiang, L., Bilusich, D., Nunes-Vaz, R. and Ween, A. (2017) *Prioritising Investment in Military Cyber Capability Using Risk Analysis*. Submitted to: Journal of Defense Modeling & Simulation: Applications, Methodology, Technology (JDMS), Special Issue: Cyber Modeling and Simulation
- Tate, J. and Jeffrey, C. (2016) *Developing an integrated approach to the analysis of MOD cyber-related risks*. ISMOR Proceedings 2016

ALEPH INSIGHTS

Source: Nunes-Vaz, Lord & Bilusich 2014

Questions/Discussion

ALEPH INSIGHTS