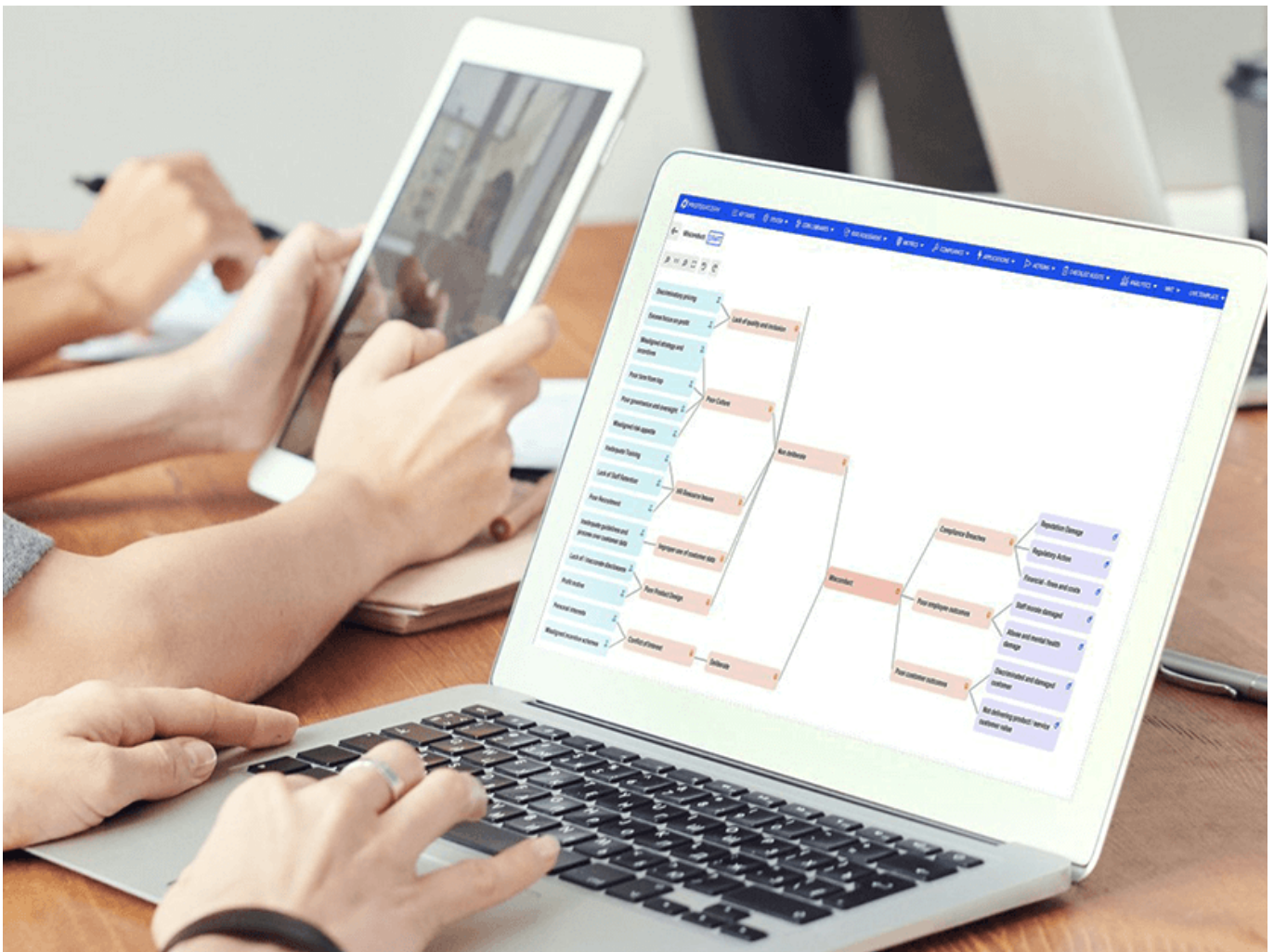




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# Risk Bow Tie Analysis

The key to analyzing, understanding, and managing risk



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# Overview

The earliest appearance of Risk Bow Tie Analysis appears to be at the University of Queensland, Australia in 1979. It then gained favor in the oil and gas industry, being specifically used to analyze the infamous Piper Alpha disaster in the English North Sea in 1988. Royal Dutch Shell then adopted and refined its use and since then, the technique has been widely used across mining, engineering and energy, predominantly for health and safety risks.

In the last decade, the technique has gained wider acceptance across the wider risk management arena, being applied to a wide range of strategic, financial and operational risks.

At The Protecht Group, we love Risk Bow Ties and consider them an integral and central part of a robust risk management framework. We do recognize that there are a number of alternative techniques but we like the universal application of the Bow Tie and its simplicity which leads to appeal across a wide range of users.

This eBook is aimed at providing you with an insight into the power of Bow Tie analysis and the value you can gain from its widespread use.

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*“Bow Tie analysis traces its roots back to the oil and gas industry in the 1980s.”*

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# 1. What is Risk Bow Tie Analysis?

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Risk is complex. Risk consists of four key components being causes, events, impacts and controls. These components are linked, often in many-to-many relationships.

A key step in managing risk is to firstly understand it. This requires an analysis of the risk in order to understand its components and how they fit together. This analysis needs to be fit for purpose at each level of the organization including Board, Management and Staff.

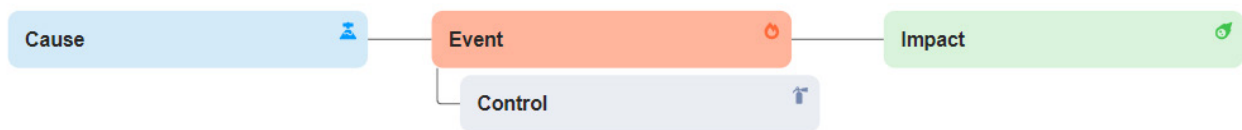
With this in mind, Risk Bow Tie analysis is a logical analysis of the components of risk showing the order in which they occur and how they are linked. The components identified and mapped are:

**The Risk Causes:** The starting point of the risk – where it all begins

**The Risk Events:** Things that then happen as a result of the cause(s) occurring

**The Risk Impacts:** The impact of the risk on the organization’s objectives

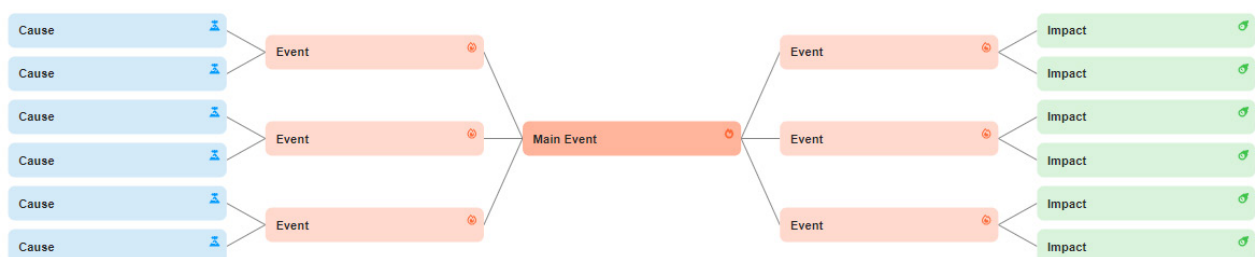
**Controls:** The mechanisms in place to mitigate the risk.



*The components of risk*

Within a risk, there can be multiple causes, multiple events, multiple impacts and multiple controls, so it can get complex!

The key focus of the analysis is the point in the life of the risk where we lose control of the situation, i.e. the point where our day goes from good to bad! We call this the “Main Event” and it represents the central focal point of our analysis. This “Main Event” should be the short name we give to the risk in our risk register and risk reporting.



*Bow Tie without controls*

We now have the classic Bow Tie shape that gives the technique its name.

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## 2. The Value and Uses of Risk Bow Ties

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Bow Tie analysis is one of many techniques that can be used for analyzing risk. Other techniques include:

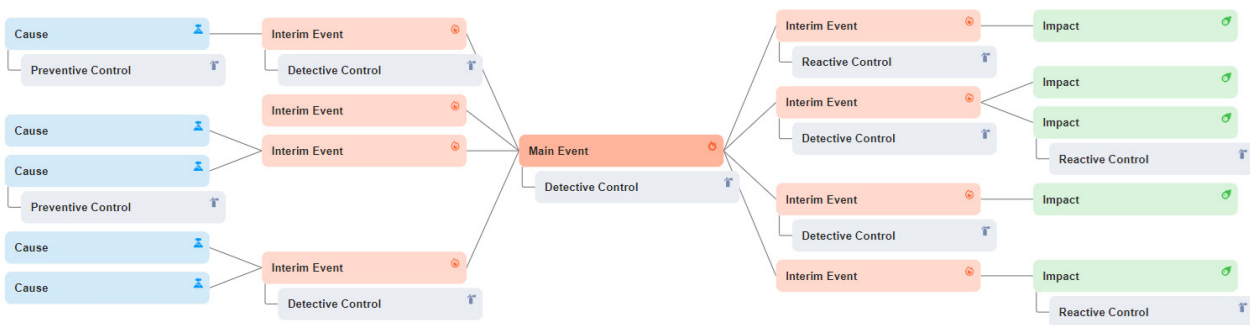
- Ishikawa diagrams otherwise known as fishbone diagrams
- Failure Mode and Effect Analysis (FMEA)
- Fault Tree Analysis
- Root Cause Analysis
- Cause, Event, Effect Analysis

A comprehensive summary of risk assessment techniques can be found in the **ISO 31010 Standard: Risk Assessment Techniques**. These techniques follow similar principles. Protecht favors Bow Tie analysis as it is simple to understand and as a result engages easily with non-risk people.

Bow Tie analysis allows us to understand risk. We can use it for many purposes including:

- **Analyzing incidents.** Analyzing incidents that have happened to understand why and how they have happened. An incident is the actual occurrence of a risk and is ideally suited to Bow Tie analysis. It assists in our understanding of how the incident occurred and the impacts caused by the incident. From the analysis we can identify the root causes and then assess the control framework so that we can learn from mistakes and weaknesses in processes and controls and put in place remediations to better manage the risk.
- **Root Cause Analysis.** Root cause analysis is often conducted as part of analyzing incidents.
- **Exploring, understanding and assessing risks that have not yet happened.** Bow Tie allows us to explore, analyze and understand risks that have not yet happened. This is particularly useful as part of the Risk and Control Self-Assessment process as well as for mapping and analyzing stress scenarios, including Business Impact Analysis, as part of disaster recovering and business continuity planning.

- Assisting in identifying Risk Metrics and Key Risk Indicators.**  
 The Bow Tie allows us to identify evidence, symptoms and red flags displayed as the risk passes through its life and as a result we are able to identify appropriate key risk indicators, especially leading indicators near to the cause(s) of the risk.
- Assisting in assessing controls.** The assessment of a group of controls over a risk requires us to understand how the controls in aggregate mitigate the risk. We therefore need a complete picture of the risk together with the related controls. The Bow Tie allows us to view the risk in its entirety and how the controls relate the different parts of the risk.



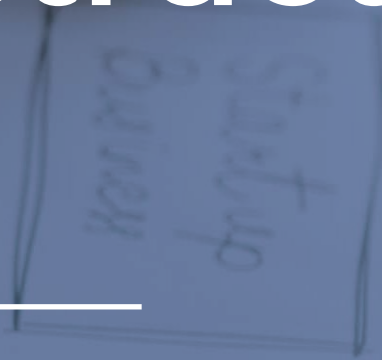
*Bow Tie with controls*



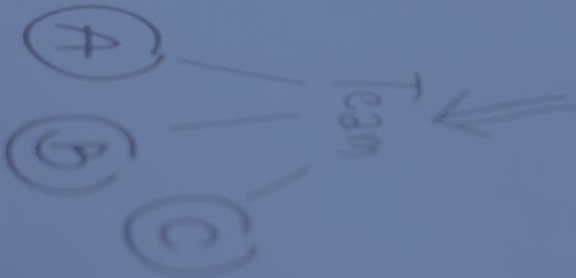
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# 3. Risk Bow Tie Construction

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Strategy



There is no one specific approach to constructing a Risk Bow Tie. You should tailor your approach to the specific situation and purpose at the time. However, some basic principles guide the construction.

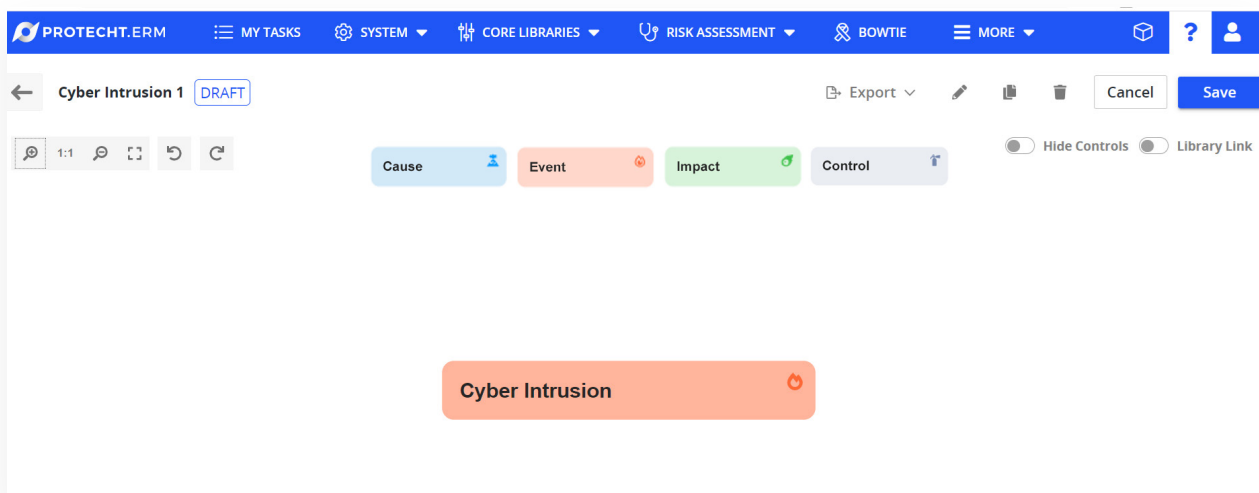
The basic steps in carrying out Bow Tie analysis are:

## A) IDENTIFY THE MAIN EVENT

The first step typically is to identify the “Main Event”. The Main Event is:

- the point at which “control” over the situation is lost. Practically speaking, it is the point at which your day goes from good to bad. When dealing with work, health and safety risks, we often say it is the point at which uncontrolled energy is released.
- usually the first thing to be called out when you ask a person for a risk.

In our example, we will use “Cyber Intrusion”. This is the point that a cyber attack has resulted in intrusion into our systems.



*The Main Event: Start your Bow Tie analysis by identifying a “Main Event”*

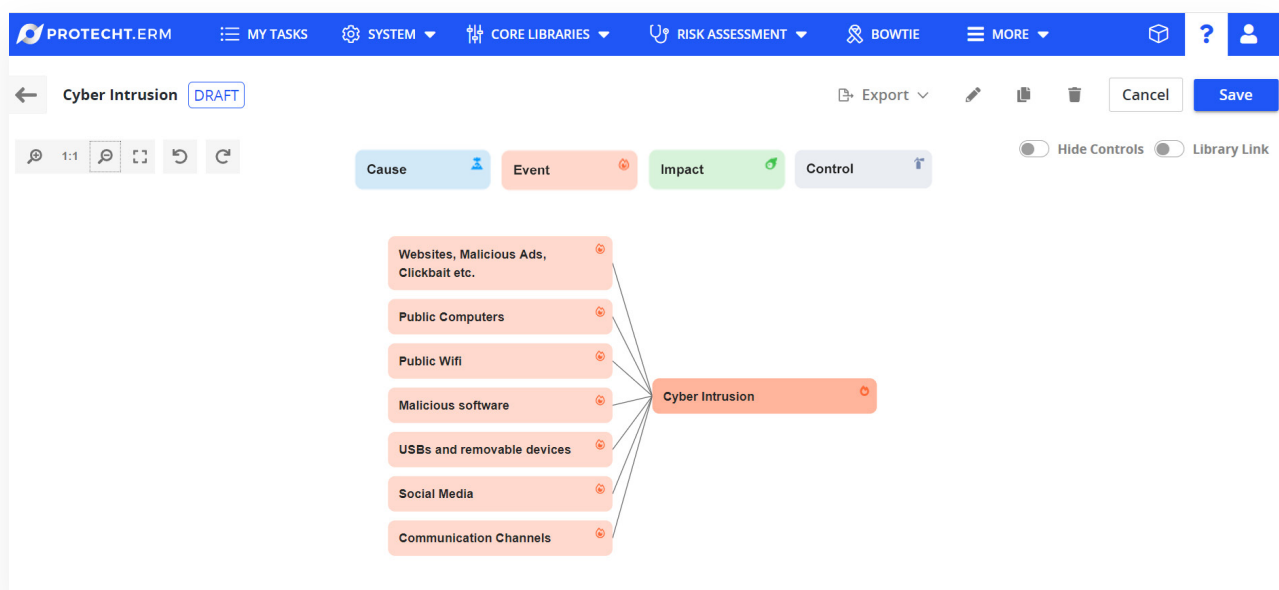
## B) TRACE TO THE ROOT CAUSE(S)

The second step is to ask

- If analyzing an actual incident “But why or how did this event occur?”
- If analyzing a potential incident “But why or how could this event occur?”

There will likely be more than one answer and this means that multiple cause pathways will be created.

Using the Cyber Risk example, the next level describes how / why a cyber intrusion may occur and highlights the different avenues of access.

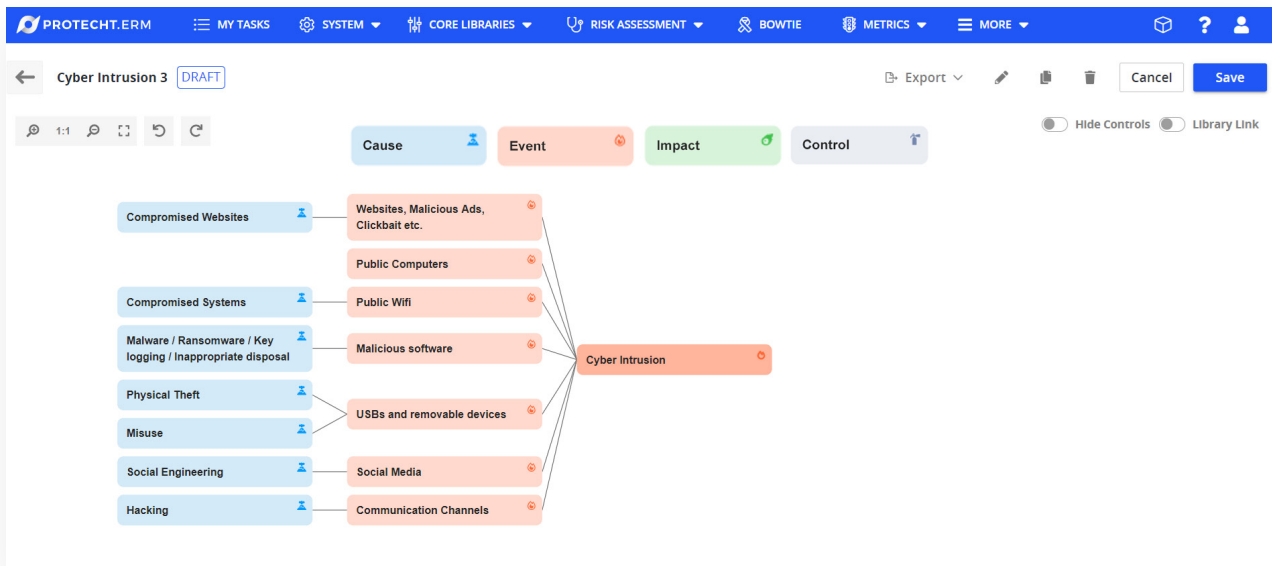


*Interim Events: Your main event can have multiple related events*

For each of these prior “events”, we ask “But why or how?” again and again until the answer is:

- It just is, or
- The answer is outside of your (or your business area’s) influence

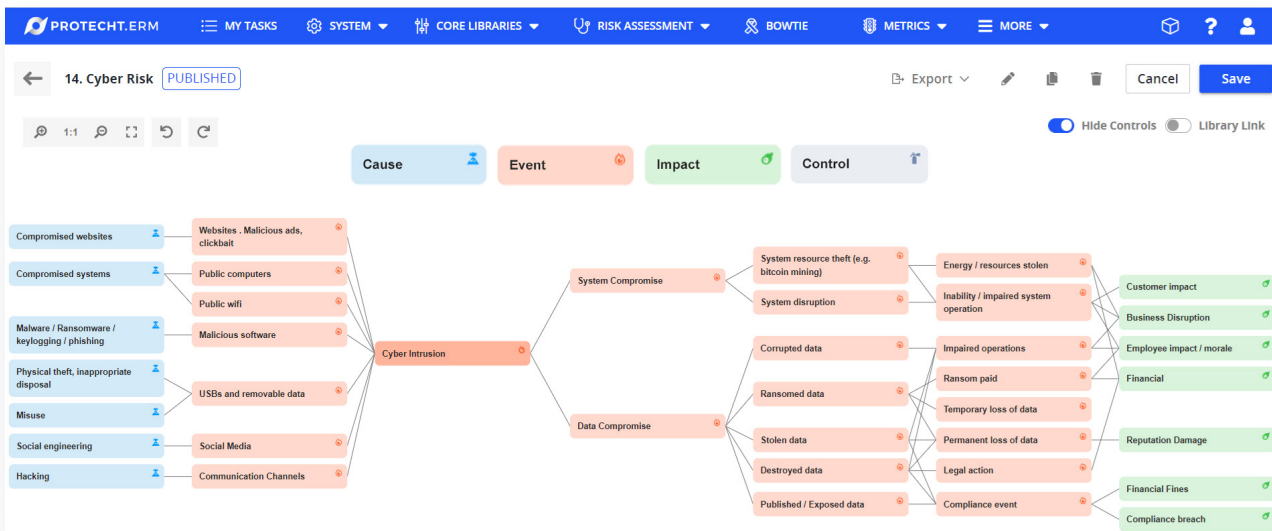
Once we reach either of these two points, we have identified the cause(s).



Tracing to Causes: Keep asking "But why?" to identify your causes

### C) TRACE TO THE IMPACT(S)

Go back to the main event and then ask "What happens next?". Keep asking this until the answer is an impact on one or more of your objectives. Once we reach this point, we have identified the impact(s).

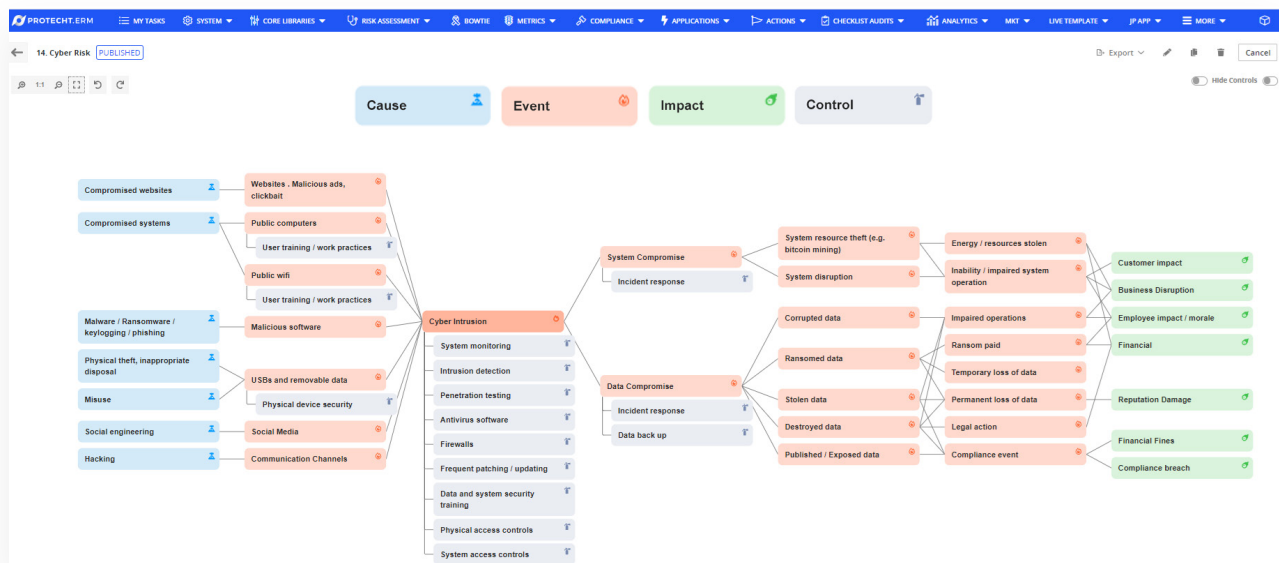


Tracing to Impacts: Identify your impacts by asking yourself "What happens next?".

At this stage you have created the Inherent Risk Bow Tie as the analysis has not mentioned controls at this point.

## D) IDENTIFY THE CONTROLS

We now identify the controls. These should be attached to the node in the Bow Tie to which they relate. **Preventive controls** will attach more to the left hand side of the analysis. **Detective controls** will attach more to the middle of the analysis and **Reactive / Corrective** controls will attach more to the right hand side of the analysis.



*Adding Controls: The Residual Risk Bow Tie includes events, causes, impacts and controls*

This analysis now represents the residual risk, which includes controls.

The key elements to concentrate on in order to conduct strong Bow Tie analysis are:

- Ensure that you ask “But why or how?” enough to ensure you get back to the root cause. There is a tendency to call out the cause too early.
- Ensure that all of the interim events are called out and no major leaps occur across multiple events.
- Ensure that the impact side of the analysis traces all the way to when the objectives of the process or business area in which the analysis is being performed are impacted. Remember – risk is the effect of uncertainty on objectives.

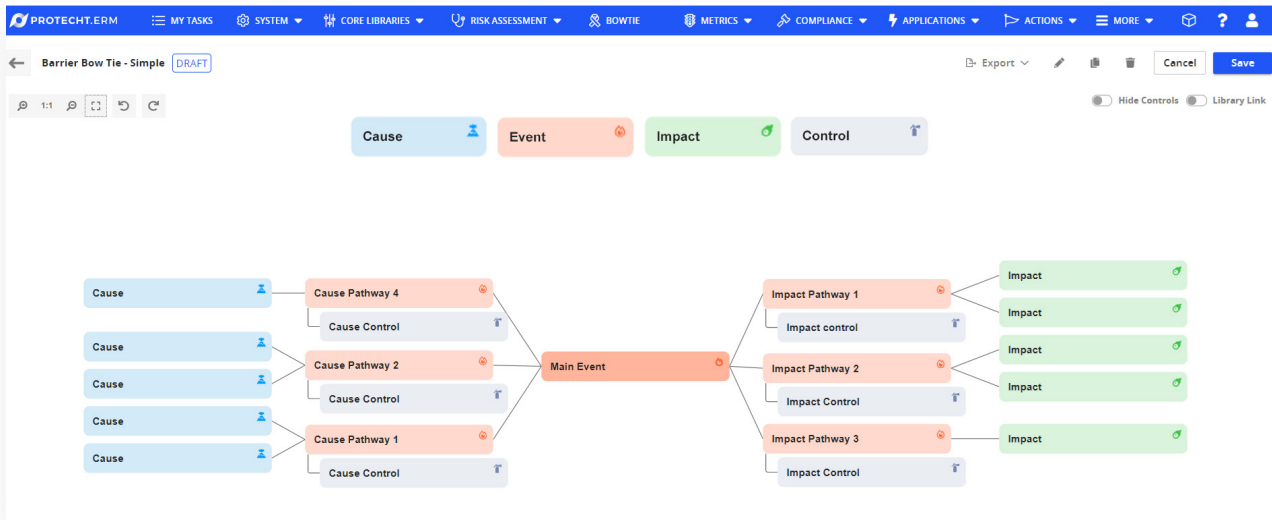
- When you develop the inherent risk Bow Tie, be careful not to blame failed or adequate controls as the reason the risk occurred. Controls, and the assessment of their effectiveness, come later.

## E) GRANULARITY OF ANALYSIS

The level of granularity within a Bow Tie needs to be considered based on:

1. **The audience.** e.g. Is it for the Board or for line management?
2. **The purpose.** Is it to provide a high level understanding of the risk or a detailed analysis of a specific incident?
3. **The trade off between complexity and understandability.**

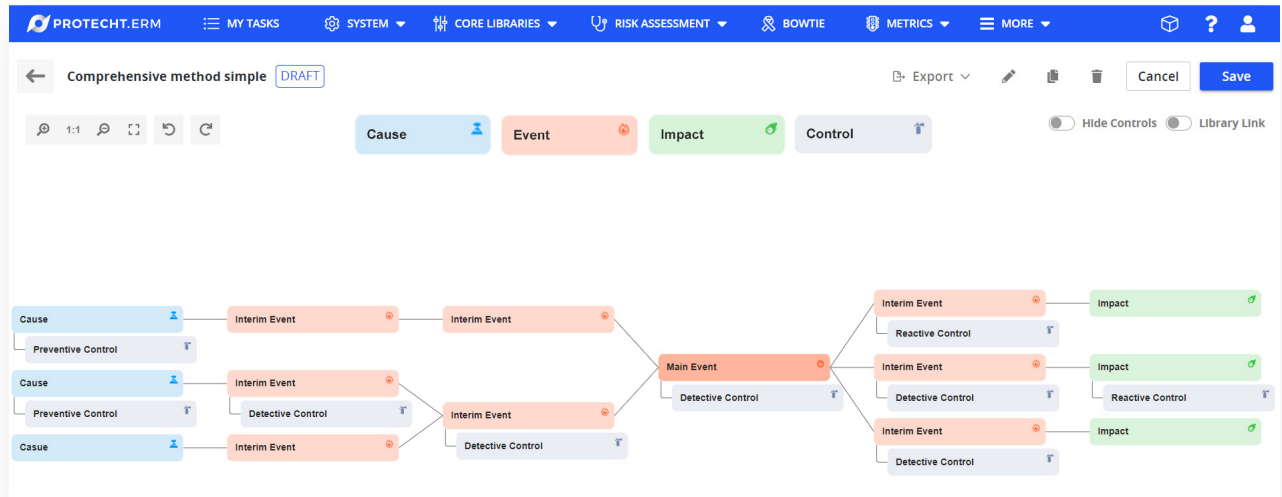
The simplest form of the Bow Tie uses the Barrier Method.



*The Barrier Method*

This method involves identifying the Main Event, the related Causes and the resulting Impacts. The pathways between the Causes and the Main Event and the Main Event and the Impacts are mapped and the related “Cause Controls” and “Impact Controls” are shown as “barriers” on those pathways. This method does not specifically identify any interim events on these pathways.

The more comprehensive method specifically identifies the interim events between the Cause and Main Event and Main Event and Impacts.



*The Comprehensive Method*

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# 4. Integrating Bow Tie Analysis into your ERM Framework

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Bow Tie Analysis can, and often is, used as a standalone tool to support incident management and to analyze risks.

However, its true power is unleashed when it is embedded as an integral tool within your Enterprise Risk Management (ERM) framework and practices.

The following are the key elements to consider in achieving that integration:

1. Create Risk Bow Ties for each of the risks in your central risk taxonomy / classification. These are then used to ensure common understanding of the organization's key risks from the Board through to staff.
2. Use Risk Bow Ties to support the key risks in each business area's risk register / risk assessment. These should be a tailored more granular version of the Risk Taxonomy Bow Ties.
3. Use Risk Bow Ties to assist in assessing the Likelihood and Impact of a risk by better understanding the likelihood drivers (cause pathways) and the impact drivers (impact pathways).
4. Use Risk Bow Ties to identify any issues and the related recommended actions for risks that are outside of appetite, not at the targeted level or the control framework is not efficient. This will include identification of:
  - a. Where "Inadequate Processes" are a cause and as a result where process improvement / re-engineering would be most effective.
  - b. Where there are "control gaps". This is where material cause and / or impact pathways have no controls on them. The solution is to add additional control(s).
  - c. Where the existing controls are less than effective. The solution is to remediate / strengthen the controls(s).
  - d. Where the risk is over-controlled and too many controls are being used. The solution is to reduce the controls.

- e. Where the mix between Preventive, Detective and Reactive / Corrective controls is sub optimal. This usually occurs where there is an excess of Reactive / Corrective controls leading to a reactive firefighting approach to risk management rather than a proactive preventive approach. The solution is to shift the control effort earlier in the life of risk, from reactive to preventive.
5. Use Risk Bow Tie Analysis to support all material incidents and to carry out root cause analysis. This information should be used to update the risk register Bow Ties to ensure learnings are taken from incidents that occur.
6. Use Risk Bow Ties to identify a strong suite of risk metrics by understanding each key pathway within the Bow Tie and ensuring the right mix of metrics are put in place to cover all key pathways and an appropriate mix between leading and lagging metrics.
7. Use Risk Bow Ties to support Controls Assessment by being able to view a risk together with its related controls to evaluate the extent to which the group of controls manage the risk.
8. Use Risk Bow Ties to create an integrated, dynamic risk profile. This uses the Risk Bow Tie as a “wire frame” for the risk and then the various risk data connected to that risk can be consolidated and aggregated to provide a complete integrated risk profile.

The risk information may include:

- Risk Assessment
- Risk Metrics / Key Risk Indicators
- Incident history
- Controls assurance and assessment results
- Control and obligations attestations
- Outstanding issues and actions
- Internal Audit findings

An example of this is Protecht's "Risk in Motion™" reporting which links all risk information to each key risk.

Risk Event	Risk Assessment		Control Testing		Compliance		Key Risk Indicators		Actions		Internal Audit Findings		Incidents	
	Inherent Rating	Residual Rating	Tests Performed	Tests Failed	Total Questions	Non Compliance	KRI Count	Red KRI	Open	Overdue	Findings	Overdue	Number of Incidents	Estimated Direct Loss
<b>Finance</b>														
Continuous disclosure	Moderate	Moderate			27	2	30	11					1	\$2,000
Inaccurate information used for decision making	High	Low												
Inadequate insurance coverage	High	Low			4		19							
<b>Information Technology</b>														
Data compromise	High	Moderate					38	4						
External cyber attacks, virus, malware and denial of service	High	Moderate			29	4	38	9			1	1	1	\$800,000
Failure of third party service providers	High	Low					57	5						
Internet, telecommunications and other public utility outage	High	Low					19	1						
IT change management failure	High	Moderate					38	1						
Unauthorized access to sensitive and employee data	High	Low			38	6	41	2	2	1			1	\$500,000
Unavailability of IT systems, services or data	High	Moderate					114	8						
<b>Marketing</b>														
Misleading marketing material	High	Moderate					19	1						
Negative social media exposure	High	Moderate					19	2						
Unauthorised disclosure to media	High	Low					19							
<b>Treasury</b>														
Erroneous financial position reporting	High	Low											1	\$1,000,000
Interest rate risk	High	Low					18							
Misuse of models and spreadsheets	High	Low	4	1	8	3	19	7			1	1	2	\$558,178
Rogue trading	High	Moderate					38	2						
Wholesale counterparty credit default	High	Moderate					18							

Example of Integrated Dynamic Risk Reporting – Protecht's Risk in Motion™ Reporting

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# 5. What's next for Bow Tie Analysis?

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From the origins of Risk Bow Tie Analysis in the late 70's, through its comprehensive adoption in the Health and Safety field, to its current resurgence as a tool for all risks, the Bow Tie keeps on giving!

At Protecht we believe its appeal is in its simplicity and logic as well as its ability to be used for every risk type imaginable. It truly can become the tool of choice for the Enterprise Risk Manager.

In terms of what's next?

1. The Bow Tie will become embedded as an integral tool within risk frameworks to be used at every level of the organization.
2. It will become accepted as the "go to" tool for incident managers as well as those responsible for maintaining risk registers and carrying out risk assessments.
3. The Bow Tie will be progressively used for supporting integrated risk reporting by acting as a consolidator of risk information across the Bow Tie.
4. The method will be progressively used for risk quantification. At the most basic level it will support a better assessment of likelihood and impact as part of risk assessment and at a more developed level, for the basis of more sophisticated quantification using such techniques as Monte Carlo or Bayesian Networks.



# About the Author



David Tattam

*CHIEF RESEARCH AND CONTENT OFFICER*

David Tattam is the Chief Research & Content Officer and co-founder of the Protecht Group. David's vision is to redefine the way the world thinks about risk and to pioneer the development of risk management to its rightful place as a key driver of value creation in each of Protecht's clients. David is the driving force behind Protecht's risk thinking, pushing risk management to the frontiers of what is possible. He is also focused on driving the uplift of people risk capability through training and content.

David is passionate about risk and risk management and in reaping the value that risk and good risk management can create for any organisation willing to embrace it. He is particularly passionate about risk management research and is prolific in creating a wide range of content delivered in blogs, ebooks, webinars and training courses. He has developed Protecht's comprehensive suite of risk management training courses and has, and continues, to train many thousands of risk practitioners across the globe. David also manages Protecht's consulting business offering a range of risk consulting capabilities from Risk Management Framework to Risk Appetite Statement development.

He is also the author of "A Short Guide to Operational Risk".

Prior to co-founding Protecht, David was the Chief Risk Officer and Head of Operations for the Australian operations of two global banks. He started his career as a Chartered Accountant and Auditor with Grant Thornton and PwC. David is an Associate of the Institute of Chartered Accountants in Australia and New Zealand and a Senior Fellow of the Financial Services Institute of Australia.

# About Protecht

## Redefining the way the world thinks about risk.

While others fear risk, we embrace it. For over 20 years, we have redefined the way people think about risk management with the most complete, cutting-edge and cost-effective solutions.

Protecht helps companies increase performance and achieve strategic objectives through better understanding, monitoring and management of risk. We provide the complete risk solution, comprised of world class enterprise risk management (Protecht.ERM), compliance, training and advisory services to large government organizations, key regulators and businesses of all sizes across the world.

Dynamically manage all your risks in a single platform: Risks, Compliance, Health and Safety, Internal Audit, Incidents, KRIs, BCP, and more.

We're with our clients for their full risk journey. Let's transform the way you understand and manage your risk to create exciting opportunities for growth.



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