Enterprise Risk Management
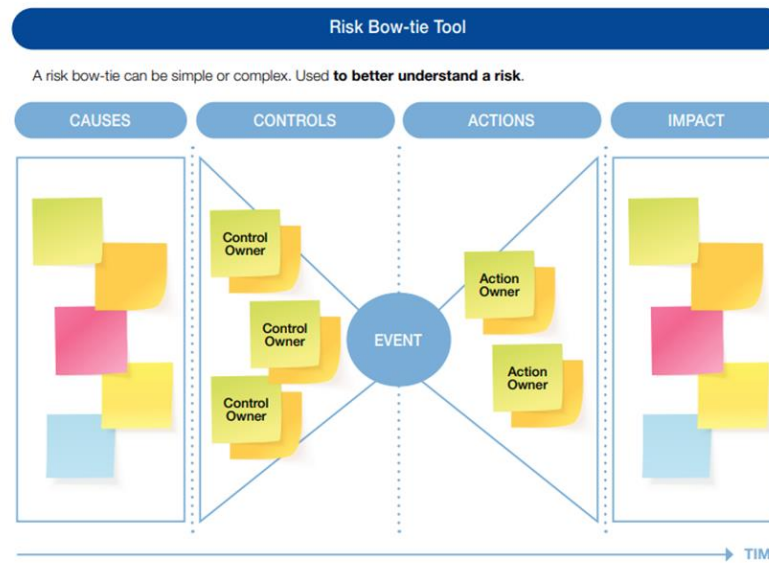
HSE Supporting Tool: Bow-Tie Analysis

HSE Enterprise Risk Management Policy and Procedures 2023

Risk is the effect of uncertainty on objectives.

Figure 18: Illustrative example of a Bow-tie analysis

Risk Bow-tie Tool

A risk bow-tie can be simple or complex. Used **to better understand a risk**.

| CAUSES | CONTROLS | ACTIONS | IMPACT |

Control Owner

Control Owner

Control Owner

EVENT

Action Owner

Action Owner

TIME

Instructions

- The play button for audio needs to be selected on each slide to listen to the audio content.

- The black arrow on the side moves through the various sections of the module.

- At the end of each section, please scroll down to click on the 'Continue' button to move to the next section. The 'start again' option on the last slide of the will bring you back to the beginning of the section.

- The magnifying glass indicates that you can click on the slide to expand the view.

Learning Objective

To become familiar with what Bow-Tie Analysis is as a supporting tool within the risk management process.

Module Content

✓What is Bow-Tie Analysis ?

✓How Bow-Tie Analysis relates to risk management?

✓Illustrative examples

✓Bow-Tie Analysis Engagement Framework

What is Bow-Tie Analysis ?

HSE Enterprise Risk Management Policy and Procedures 2023

Risk is the effect of uncertainty on objectives.

Bow-Tie Analysis can be used to support risk identification and risk assessment. It helps in identifying the risk event, the potential causes and impacts, as well as the controls (proactive and reactive) in place.

HSE Definition: A tool used to better understand the identified risk event, causes, impacts/consequences and proactive and reactive controls.

Page 56 Table 10 ERM Policy and Procedures 2023

Definitions of Bow-Tie Analysis

Bow tie analysis makes sources of risk (hazards), the effectiveness of controls (protective barriers) against harm, the potential outcomes (consequences) of a specific event (top event), and gaps in risk management strategies easily visualisable to and understandable by a wide range of audiences.

A bow tie is a graphical depiction of pathways from the causes of an event to its consequences. It shows the controls that modify the likelihood of the event and those that modify the consequences if the event occurs. It can be considered as a simplified representation of a fault tree or success tree (analysing the cause of an event) and an event tree (analysing the consequences). Bow tie diagrams can be constructed starting from fault and event trees, but are more often drawn directly by a team in a workshop scenario.
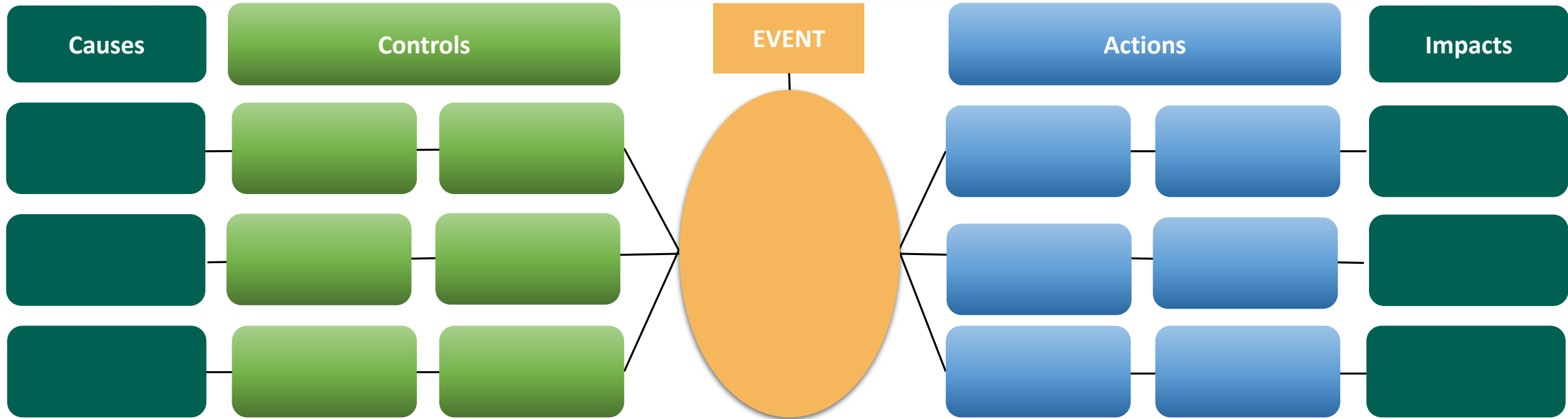*(31010:2019, Risk management - Risk assessment techniques)*

HSE Bow-Tie Analysis Template
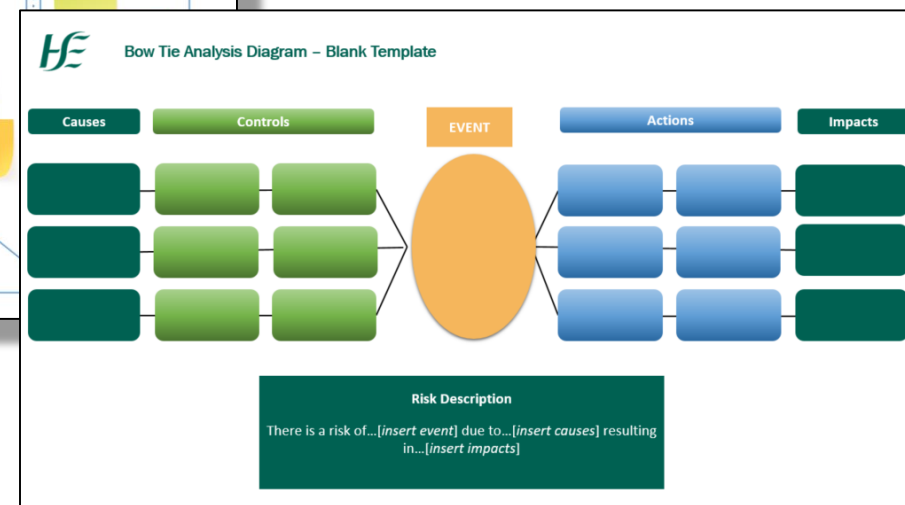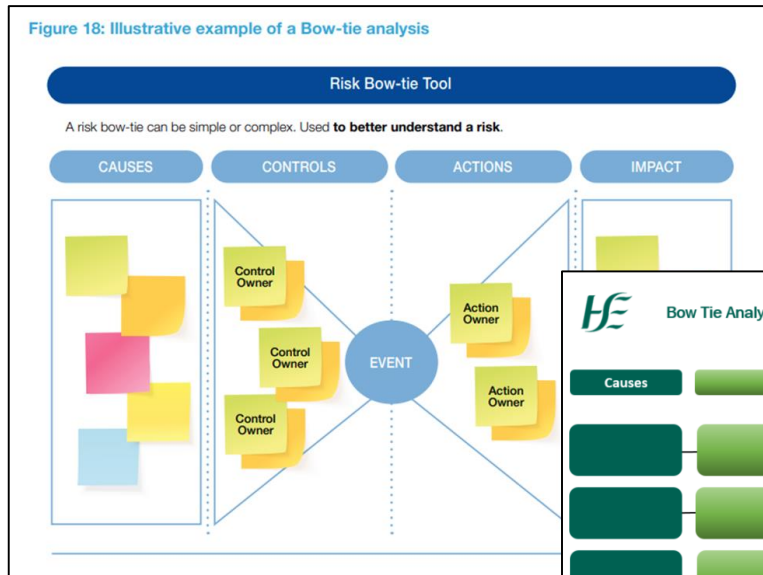
Supporting Tools: https://www.hse.ie/eng/about/who/riskmanagement/risk-management-documentation/hse-enterprise-risk-management-supporting-tools/

What is Bow-Tie Analysis

Recap

How Bow-Tie Analysis relates to risk management

**HSE Enterprise Risk Management Policy and Procedures 2023**

Risk is the effect of uncertainty on objectives.

Table 2: Sources and Approaches for Identifying Risks

Potential Sources of Information	
Risk Registers	Complaints/Surveys/Investigation Reports
Internal and External Audit Reports	Incident/Near Miss Tracking and Trending
Press	Incident Review Reports
Reviews	Non-conformance reports/performance reports
Policies, Procedures, Protocols and Guidelines	

Examples of Approaches to Identifying Risks	
PESTLE analysis	Benchmarking
Bow-tie Analysis	Meetings/committees
Risk assessment workshops	Data Protection Impact Assessment
Brainstorming	Horizon Scanning
Questionnaires/Surveys	

Risk Identification
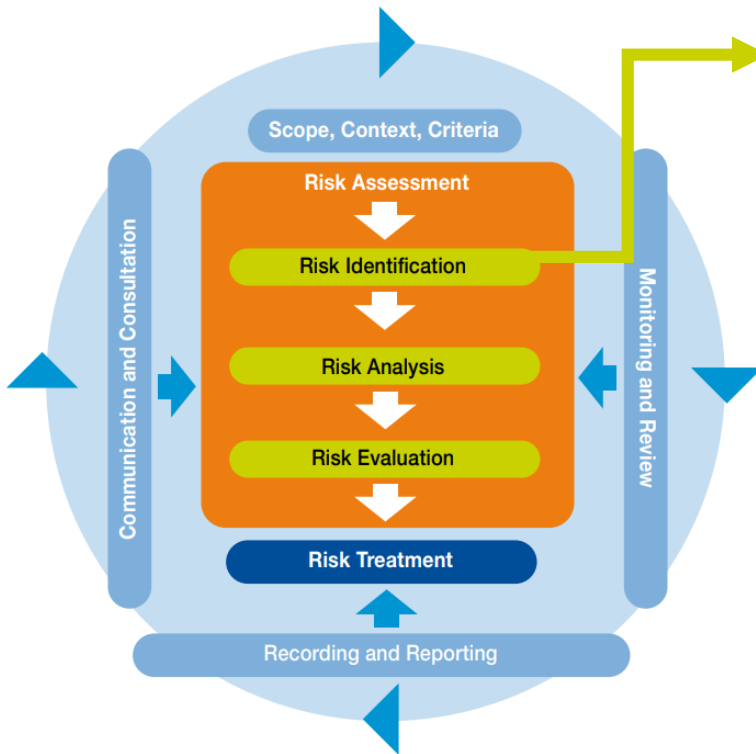
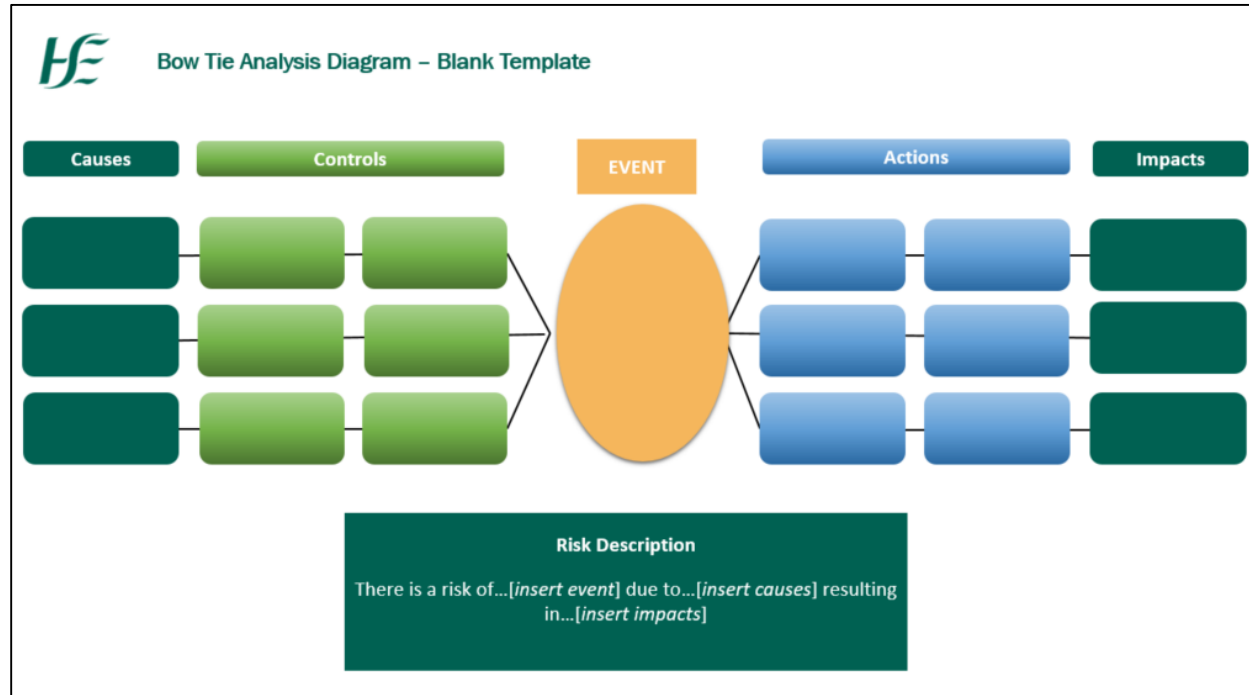## Risk Identification (Section 2.2.1)

This step involves identifying risks that could affect the achievement of objectives.

Bow-Tie Analysis is used to map out the cause, impacts and associated controls of identified risk events.

Risk Identification

Figure 18: Illustrative example of a Bow-tie analysis
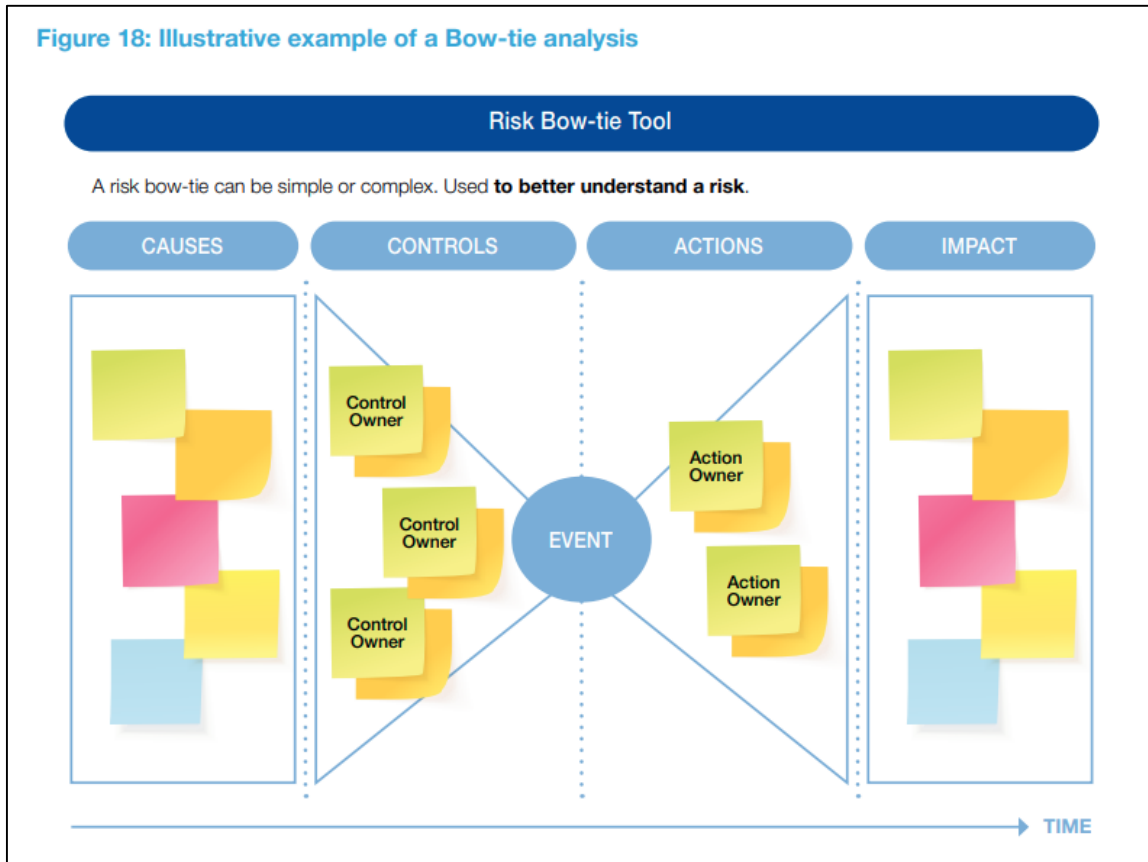
Risk Assessment
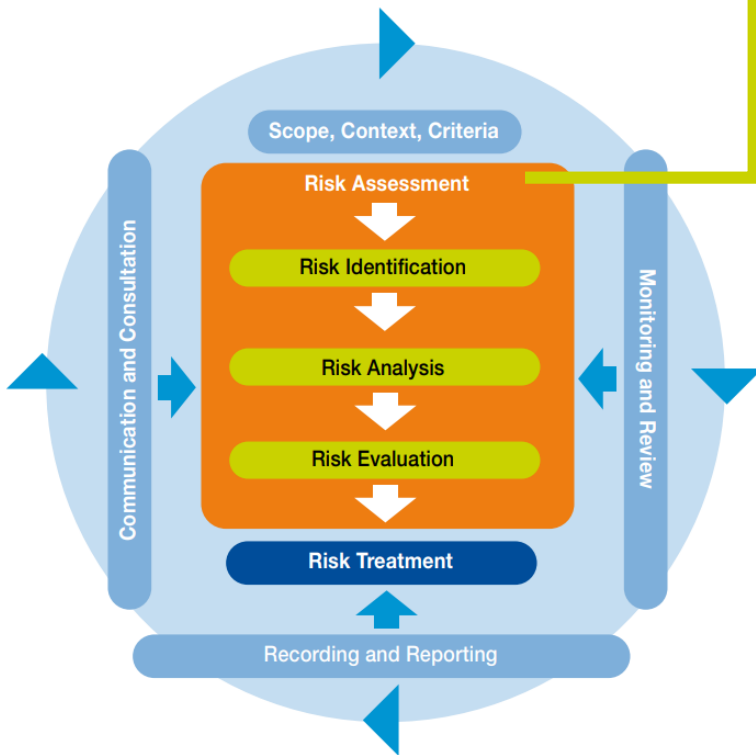
Risk Assessment (Sections 2.2.1; 2.2.2; 2.2.3)

The assessment process evaluates the likelihood and impact of risks. Bow-Tie Analysis supports the identification of controls (preventive and reactive) and understanding the potential severity of impacts if those controls fail, which assists in the evaluation of the strength of the controls and the evaluation of the risk rating.
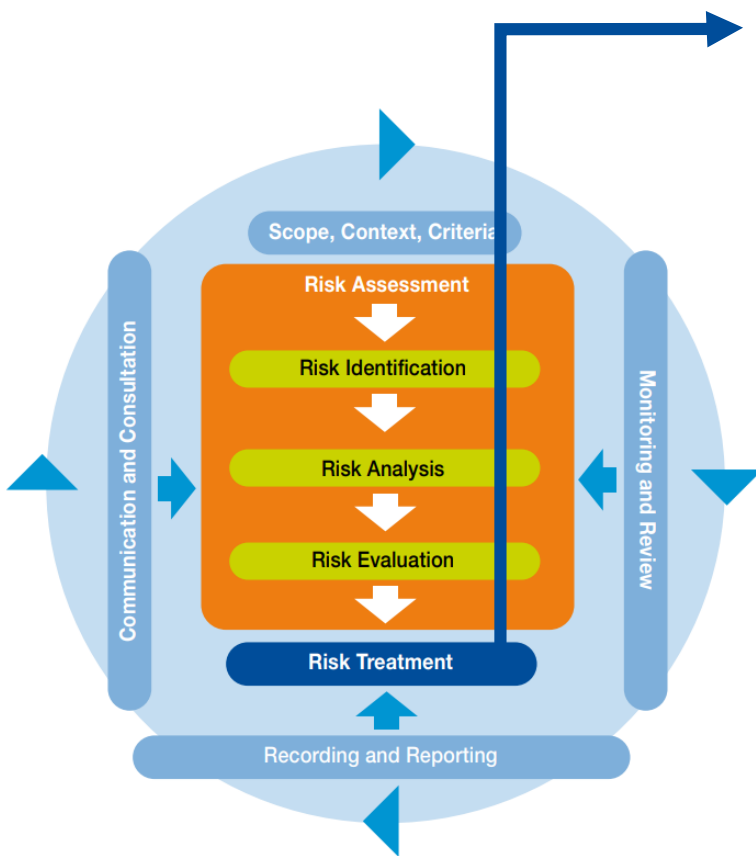
Risk Treatment (Section 2.3)

This section outlines how the organisation responds to identified risks, including risk treatment approaches.

The Bow-Tie Analysis plays an important part in risk treatment by highlighting where additional controls might be needed. It helps in deciding whether to terminate, accept, transfer or reduce the risk by visualising the effectiveness of existing controls and the potential need for new controls.

Monitoring and Review
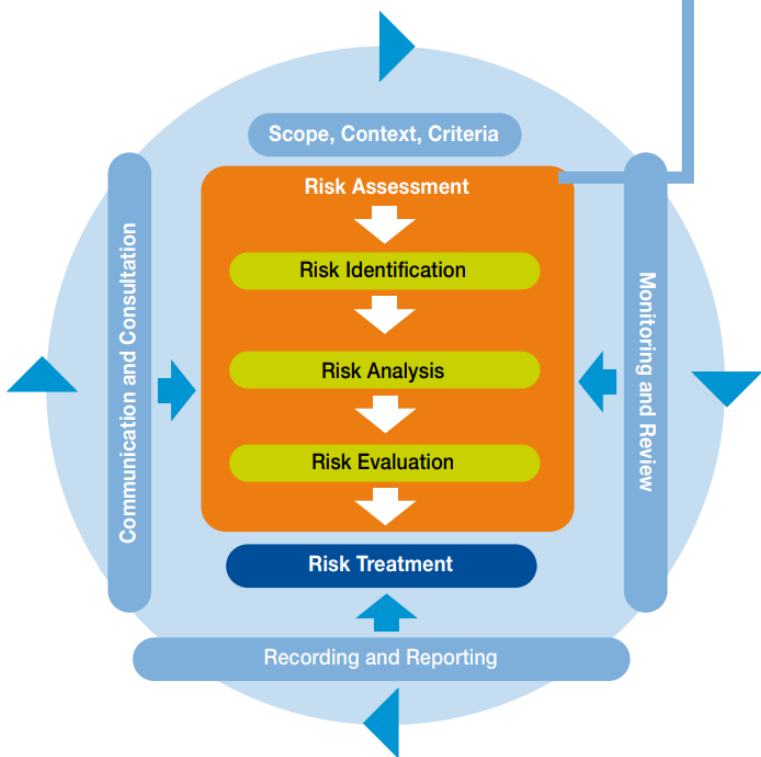
Monitoring and Review (Sections 2.6 & 3.8)

This section discusses the ongoing monitoring and reporting of risks.

Bow-Tie diagrams can be used as part of the monitoring process to continuously monitor the status of controls. They provide a visual tool for reporting on risk, making it easier to communicate with stakeholders.

- Bow-Tie Analysis is performed by senior management and department heads/managers with the involvement of key stakeholders to include advisors, healthcare professionals, and frontline staff who provide valuable insights from their experience.

- Regular reviews of Bow-Tie diagrams should be included in this process, ensuring that they remain up-to-date with the latest risk information and that controls are still effective.

How Bow-Tie Analysis relates to risk management - Recap

Illustrative Examples

1. Add Event in the centre box.

2. List causes of the Event in the Causes section on the left hand side.

3. List impacts of the Event in the Impact section on the right hand side.

4. List the controls – proactive [pre-event] and reactive [post-event].

5. Link proactive controls and causes.

6. Link reactive controls and impacts.

7. Look for causes with no controls.

8. Consider if causes with no controls should become an action, that is, to put a future control in place.

9. Only list as a control if it is in place and working effectively to reduce either the cause or the impact.

10. Allocate an action owner for each action plan.

Example 1 – for illustrative purposes only

Risk Event – Unauthorised Access to Patient Data

Causes	Reactive Controls
- Phishing Attack - Insider Threat - Weak Passwords	- Incident Response Plan - Access revocation and account locking - Regular Audits
Proactive Controls	**Impacts**
- Employee Training - Multi-Factor Authentication (MFA) - Password Management Policies	- Loss of trust - Regulatory Fines - Operational Disruption

Example: Unauthorised Access to Patient Data

Causes

Controls

EVENT

Actions

Impacts

Phishing Attack

Weak Passwords

External Threat

Mandatory HSE Cyber Security awareness training

Simulated phishing campaigns to raise awareness

HSE Password Standards Policy

Data Encryption

Firewalls

Multi-Factor Authentication (MFA)

Cyber Security protection products

Business Continuity Plan

Incident Response Plan

Access revocation and account locking

Regular Audits

Unauthorised access to patient data

Schedule simulated phishing campaigns to raise awareness

Control access to systems

Wi-Fi Security maintenance

Test the Business Continuity Plan

All employees to complete Cyber Security awareness training

Keep software and systems fully up to date

Ensure Endpoint Protection

Backup data daily

Loss of trust

Regulatory Fines

Operational Disruption

Loss of valuable information

Risk Description

There is a risk of unauthorised access to patient data due to 1] Phishing attack. 2] Weak passwords 3] External threat; resulting in a] loss of valuable information. b] Regulatory fines. c] Operational disruption and c] Loss of trust

Example 2 – for illustrative purposes only

Risk Event – Inadequate Response to a Pandemic Outbreak

Causes	Reactive Controls
- Inadequate Stockpile of PPE - Slow Government Response - Poor Communication	- Crisis Communication Plan - Flexible Workforce Planning - Telemedicine Infrastructure
Proactive Controls	**Impacts**
- Preparedness Planning - Supply Chain Management - Early Warning Systems	- High Mortality Rates - Healthcare System Overload - Economic Impact

Example 2 completed: Inadequate preparedness for a Pandemic

Causes

Controls

EVENT

Actions

Impacts

Inadequate Stockpile of PPE

Absence of contingency plan

Poor Communication

Inadequate surveillance system

Supply Chain Management

Telemedicine Infrastructure

Emergency Response Plan

Flexible Workforce Planning

Crisis Communication Plan

Early Warning Systems

Inadequate preparedness for a Pandemic

Plan for surge capacity in health-care facilities

Revisit and update crisis and continuity plans

Identify potential points of failure

Review workforce locations and travel

Use scenario analysis

Evaluate the supply chain

High Mortality Rates

Healthcare System Overload

Economic Impact

Risk Description

There is a risk of inadequate preparedness for a Pandemic due to 1] Inadequate Stockpile of PPE 2] Absence of contingency plan 3] Poor communications. 4] Inadequate surveillance system, resulting in a] High mortality rates. b] Healthcare system overload. c] Economic impact.

Illustrative Examples Recap

Bow-Tie Analysis Engagement Framework
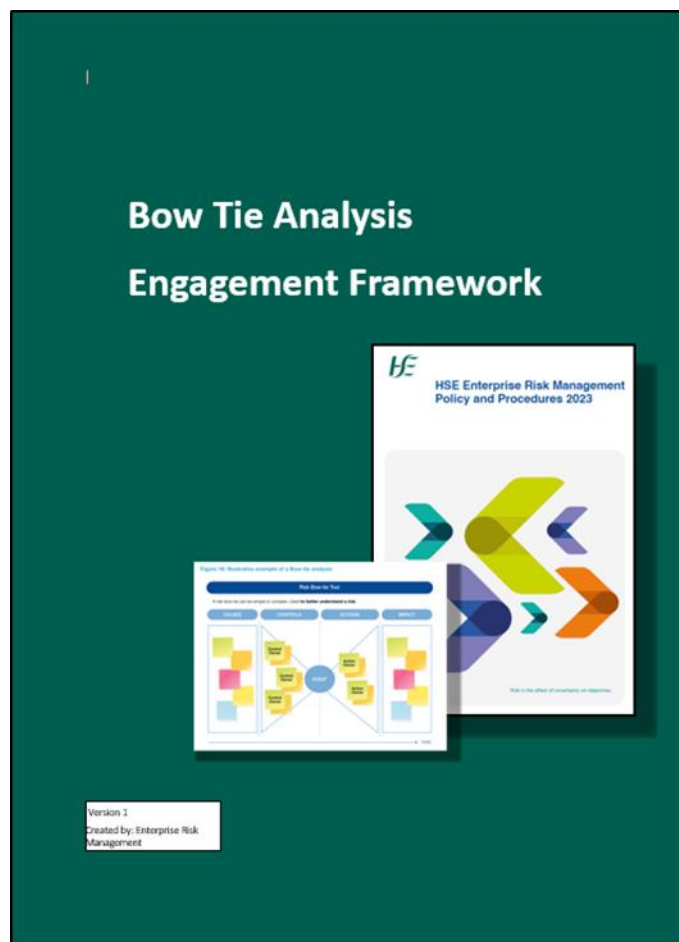
Engagement Framework: For trainers.

Online Training: An overview of Bowtie Analysis and its importance in healthcare risk management, including a walkthrough of the Bowtie diagram components with healthcare-specific examples.

Hands-On Exercise: Group activity to create a Bowtie Diagram for a chosen scenario [see notes below and suggested answers] and discussion and feedback.

Additional Resources: Link to supporting tools.

Facilitation Guide: For trainers.

Supporting Tools:

https://www.hse.ie/eng/about/who/riskmanagement/risk-management-documentation/hse-enterprise-risk-management-supporting-tools/

erm.queries@hse.ie

HSE Enterprise Risk Management Policy and Procedures 2023

Risk is the effect of uncertainty on objectives.

Bow-Tie Analysis
Engagement Framework
Recap

Thank you

Assessment Questions?