國立臺北大學自然資源與環境管理研究所
110 學年度第二學期『環境災害與風險管理』

課程講義（13）：職安衛管理系統與風險管理國際標準
Occupational Health and Safety Management System; Risk Management System

- **INTRODUCTION**
  - 勞動部勞動及職業安全衛生研究所 => 簡介
- Occupational Health and Safety => Occupational Safety and Occupational Hygiene
  - ⇨ Occupational Safety => Policy and Regulation; Technology, Equipment, and System
  - ⇨ Occupational Hygiene => Occupational Health Management System, Ergonomics Musculoskeletal Injury Prevention (MSD)
  - ⇨ Safety Engineering and Ergonomics
- Occupational Hazards Assessment
- More on Table-based Hazard (Risk) Analysis Methods
  - ⇨ Table-based qualitative reliability methods: HAZID, HAZOP, SWIFT
  - ⇨ Table-based semi-quantitative reliability methods: FMEA, FMECA => FMMA

| **Hazard and operability analysis (HAZOP)** |
| --- |
| Step 1: Establish study scope and objectives |
| Step 2: Form HAZOP team |
| Step 3: Collect relevant information |
| Step 4: Conduct analysis of all major pieces of equipment and supporting items |
| Step 5: Document the study |
| **Failure modes and effect analysis (FMEA)** |
| Step 1: Define system boundaries and its associated requirements. |
| Step 2: List system subsystems and components. |
| Step 3: List each component's failure modes, the description, and the identification. |
| Step 4: Assign failure occurrence probability/rate to each component failure mode. |
| Step 5: List each failure mode effect/effects on subsystem(s), system, and plant. |
| Step 6: Enter necessary remarks for each failure mode. |
| Step 7: Review each critical failure mode and take necessary action |

  - ⇨ Diagrammatic qualitative reliability methods: Cause and effect diagram (Fish-bone diagram); FTA, ETA, Bow-tie analysis (BTA), the Strengths, Weaknesses, Opportunities, and Threats (SWOT).

Components of a bowtie analysis (BTA).
https://www.researchgate.net/figure/Components-of-a-bowtie-analysis-BTA_fig7_305114732
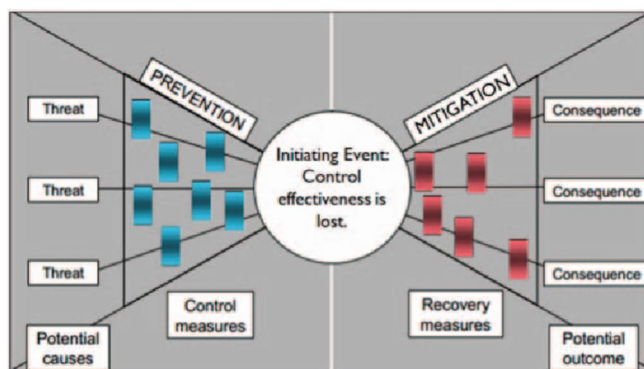
- OHSAS 18001:2007 => ISO 45001:2018
  - OHSAS 18000 (Occupational Health and Safety Assessment Series 18000) 由英國標準協會協同 SGS 等全球主要標準制定機構、驗證機構與專業組織整合諸多安衛管理系統標準（如 BS 8800、ISA 2000、AS/NZ4801 等）共同發展而成。
    - ⇨ Management Systems: QMS, EMS, OHSMS, FSMS and ISMS
    - ⇨ OHSAS 18001:2007 Occupational Health and Safety Management System -- Specification（職業安全衛生管理系統－要求）驗證用之標準=> CNS 15506
    - ⇨ OHSAS 18002:2008 Guidelines for the implementation of OHSAS 18001（職業安全衛生管理系統－指導綱要）=> CNS 15507
  - Migration to ISO 45001:2018 from OHSAS 18001:2007
    新版 ISO 45001 職業安全衛生管理系統轉換計畫 - 財團法人全國認證基金會
    - ⇨ 淺談職業安全衛生管理系統由 OHSAS 18001:2007 移轉為 ISO45001: 2018 年版之紀要 - myMKC 管理知識中心
  - ISO 45001 Occupational Health and Safety Management System
    - ⇨ ISO 45001:2018 Occupational health and safety management systems -- Requirements with guidance for use
    - ⇨ ISO/PAS 45005:2020 Occupational health and safety management -- General guidelines for safe working during the COVID-19 pandemic
    - ⇨ High Level Structure (HLS) => 高階架構（High Level Structure） => Annex SL

1.範圍（Scope）	6.規劃（Planning）
2.相關標準（Normative references）	7.支援（Support）
3.名詞與定義（Terms and definitions）	8.營運作業（Operation）
4.組織環境（Context of the Organization）	9.績效評估（Performance evaluation）
5.領導（Leadership）	10.改進（Improvement）

4.組織前後環節 　4.1 瞭解組織及其前後環節 　4.2 瞭解工作者及其他各利害相關者之需求與期望 　4.3 決定職業安全衛生管理系統之範圍 　4.4 職業安全衛生管理系統 5.領導及工作者參與 　5.1 領導與承諾 　5.2 職業安全衛生政策 　5.3 組織之角色、責任及職權 　5.4 工作者之咨詢及參與 6.規劃 　6.1 處理風險與機會之措施 　6.2 職業安全衛生目標及其達成規劃	7.支援 　7.1 資源 　7.2 適任性 　7.3 認知 　7.4 溝通 　7.5 文件化資訊 8.運作 　8.1 運作之規劃及管制 　8.2 緊急準備與應變 9.績效評估 　9.1 監督、量測、分析及績效評估 　9.2 內部稽核 　9.3 管理階層審查 10.改進 　10.1 一般 　10.2 事故、不符合事項及矯正措施 　10.3 持續改進

- ⇨ [Free ISO 45001 PDF Downloads | Advisera](#) (ISO 45001 materials)
- ⇨ [(PDF) 14. ISO 45001 (researchgate.net)](#)
- ⇨ [PECB - ISO 45001 Occupational Health and Safety Management System Requirements](#)
  https://pecb.com/en/whitepaperDownloadImage?file=38-whitepaper-iso-45001-
  occupational-health-and-safety-management-
  system_v2_9B24527DB1464BD3985994234EF6F3C7.pdf

- ● TOSHMS AND REGULATIONS RELATED TO OCCUPATIONAL SAFETY AND HYGIENE
  - □ TOSHMS (Taiwan Occupational Safety and Health Management System)：
    - ⇨ 勞動部職業安全衛生署為鼓勵並輔導事業單位建立自主性安全衛生管理體制,持續改進安全衛生設施,以發揮自主管理功能,自 1994 年即推動自主性評鑑管理制度,然而職場安全衛生之提昇,有賴企業比照品質、環境等管理系統,自主建構周延且完整的職業安全衛生管理系統(Occupational Safety and Health Management System, OSHMS),透過規劃（Plan）、執行（Do）、查核（Check）與改善（Act）的管理循環模式,提供工作者安全健康的工作環境,方能達預防職業災害發生之目標。
    - ⇨ 臺灣職業安全衛生管理系統 http://www.toshms.org.tw/
    - ⇨ [https://www.osha.gov.tw/media/7188655/toshms 宣導懶人包.pdf](#)
    - ⇨ [臺灣職業安全衛生管理系統指引](#)
    - ⇨ [臺灣職業安全衛生管理系統驗證指導要點](#)
  - □ 職業安全衛生法
  - □ 職業安全衛生管理辦法
    - ⇨ 設置安全衛生組織及人員 => 職業安全衛生管理單位、業務主管及管理人員
    - ⇨ 建立職業安全衛生管理系統 => 雇主應依國家標準 CNS 45001 同等以上規定,建置適合該事業單位之職業安全衛生管理系統
    - ⇨ [https://www.osha.gov.tw/media/風險評估技術指引.pdf](#)
    - ⇨ https://docs.tnaa.org.tw/main_frame_02_files/archi/archi_add/0980121-職業安全衛生管理系統(TOSHMS)相關技術指引.pdf
    - ⇨ 危害辨識：物理性、化學性、生物性、人因工程、心理性等五大類危害

風險等級分析	嚴重度分級				
	災難性的 5	重大 4	中等 3	較低 2	可忽略的 1
可能性分級 幾可確定 5	25	20	15	10	5
極有可能 4	20	16	12	8	4
可能 3	15	12	9	6	3
不太可能 2	10	8	6	4	2
幾乎不可能 1	5	4	3	2	1

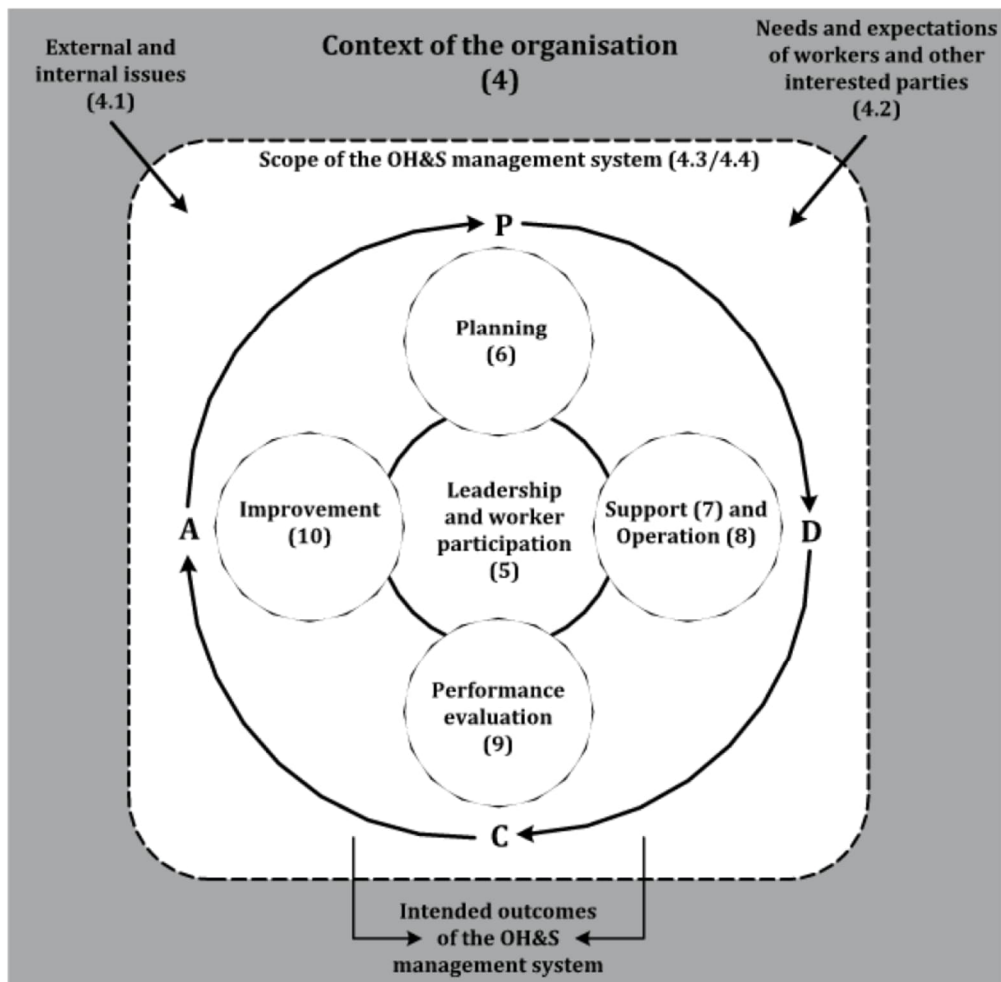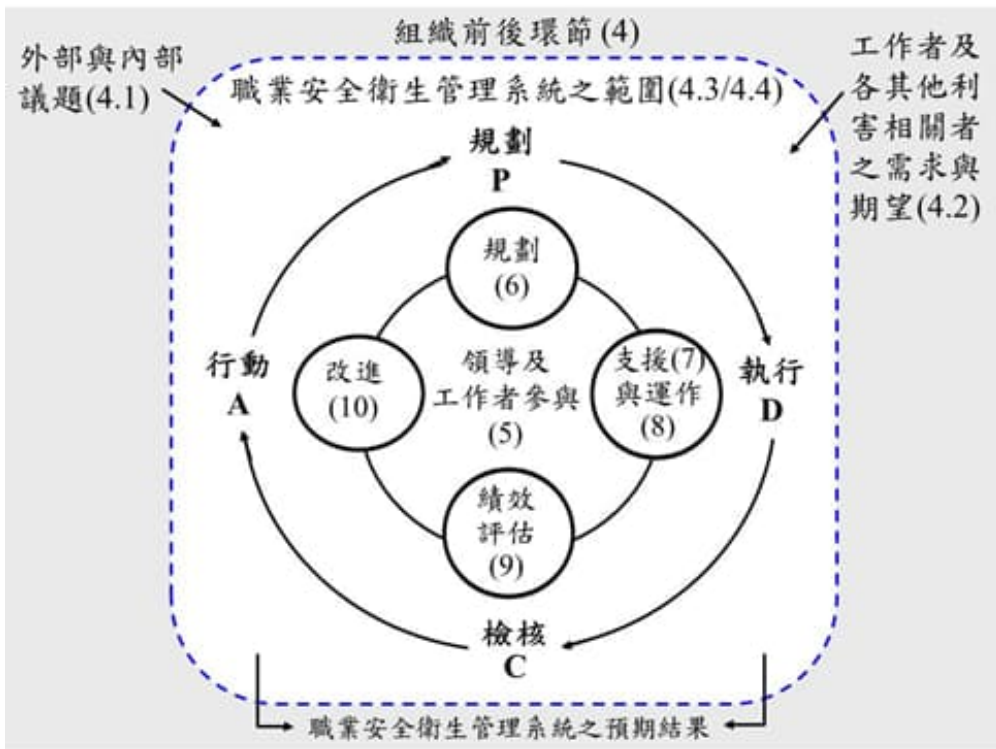極高風險 (20-25) 　高度風險 (10-16) 　中度風險 (4-9) 　低度風險 (1-3)

  - □ "TOSHMS 2.0"
    - ⇨ [臺灣職業安全衛生管理系統 - 領導力企管](#) - 什麼是 TOSHMS 2.0？
    - ⇨ [淺談 TOSHMS 台灣職業安全衛生管理系統與 ISO 45001/CNS 45001 之發展](#)
    - ⇨ [臺灣職業安全衛生管理系統資訊網 - 系統簡介 (osha.gov.tw)](#)
    - ⇨ 自願性管理系統建置 vs. 法規要求強制要求

Context of the organisation (4)

External and
internal issues
(4.1)

Needs and expectations
of workers and other
interested parties
(4.2)

Scope of the OH&S management system (4.3/4.4)

P

Planning
(6)

A

Improvement
(10)

Leadership
and worker
participation
(5)

Support (7) and
Operation (8)

D

Performance
evaluation
(9)

C

Intended outcomes
of the OH&S
management system

TOSHMS 驗證標準(CNS 45001 / ISO 45001)之管理模式

- ISO 31000: RISK MANAGEMENT
  - Historical Aspects
    - ⇨ AS/NZS 4360:1999 Risk Management Standard
    - ⇨ JIS Q 2001:2001 Guidelines for Development and Implementation of Risk Management System
    - ⇨ AS/NZS 4360:2004 (Revision) => HB 436 Risk Management Guidelines
    - ⇨ BS 31100:2008 Risk Management – Code of practice
    - ⇨ ISO 31000:2009 Risk Management – Principles and guidelines
    - ⇨ ISO/IEC 31010:2009 Risk management – Risk assessment techniques
  - Standard Deviations: A Risk Practitioner Guide to ISO 31000 (theirm.org) https://www.theirm.org/media/6907/irm-report-iso-31000-2018-v2.pdf
  - Principles of Risk Management
    1. Framework and processes should be customised and proportionate. (P)
    2. Appropriate and timely involvement of stakeholders is necessary. (A)
    3. Structured and comprehensive approach is required. (C)
    4. Risk management is an integral part of all organisational activities. (E)
    5. Risk management anticipates, detects, acknowledges and responds to changes. (D)
    6. Risk management explicitly considers any limitations of available information.
    7. Human and cultural factors influence all aspects of risk management.
    8. Risk management is continually improved through learning and experience.
    => PACED: Proportionate, Aligned, Comprehensive, Embedded, Dynamic
  - Risk Management Framework
    - ⇨ Risk management architecture
    - ⇨ Risk management protocols
    - ⇨ Risk management protocols
  - Risk Management Process
    (1) Scope, context, and criteria;
    (2) Communication and consultation;
    (3) Monitoring and review; and
    (4) Recording and reporting.
  - Mapping of ISO 31000 against Annex SL
    ISO has published guidance on the format for management system standards as Annex SL and this format has been adopted for the most recent version of the quality standard ISO 9001:2015 Quality management systems - Requirements. Annex SL provides information on the components that are required in a full management system standard.
  - 營造工程風險評估技術指引(1100217)
    - ⇨ https://www.osha.gov.tw/media/7187969/1100217 營造工程風險評估技術指引-網路版.pdf
    - ⇨ 參照 ISO 31000:2018、ISO 45001:2018 修正風險辨識、風險分析等內容。另依實際需求檢討修正風險分析之評分及分級,提供 3 等級及 5 等級風險分析參考指標、3X3 及 5X5 風險矩陣表,並以 3~5 風險等級呈現。
      => https://www.osha.gov.tw/media/7188763/1100827 勘誤表-營造工程風險評估技術指引.pdf
    - ⇨ 圖 2. ISO 31000:2018 風險管理原則、架構及程序
    - ⇨ 風險辨識、風險分析、風險評量 => 風險處理
    - ⇨ 5W1H and 5M1E

Table 1: Principles of risk management

Principle	Description
Proportionate	Risk management activities must be proportionate to the level of risk faced by the organisation.
Aligned	Risk management activities need to be aligned with the other activities in the organisation.
Comprehensive	In order to be fully effective, the risk management approach must be comprehensive.
Embedded	Risk management activities need to be embedded within the organisation.
Dynamic	Risk management activities must be dynamic and responsive to emerging and changing risks.

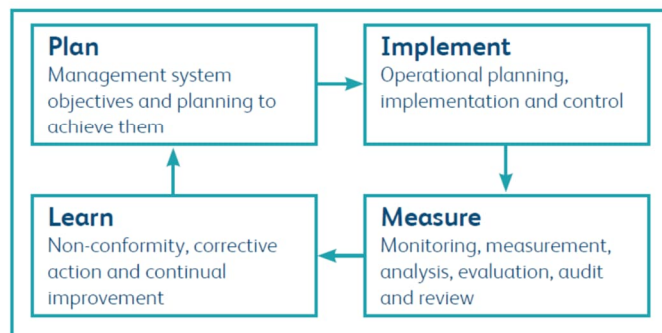| Risk Management Framework |
|---|
| Risk Management Architecture

• Committee structure and terms of reference

• Roles and responsibilities

• Internal reporting requirements

• External reporting controls

• Risk management assurance arrangements

Risk Management Strategy

• Risk management philosophy

• Arrangements for embedding risk management

• Risk appetite and attitude to risk

• Benchmark tests for significance

• Specific risk statements/policies

• Risk assessment techniques

• Risk priorities for the present year

Risk Management Protocols

• Tools and techniques

• Risk classification system

• Risk assessment procedures

• Risk control rules and procedures

• Responding to incidents, issues and events

• Documentation and record keeping

• Training and communications

• Audit procedures and protocols

• Reporting/disclosures/certification |

Table 3: Mapping of ISO 31000 against Annex SL

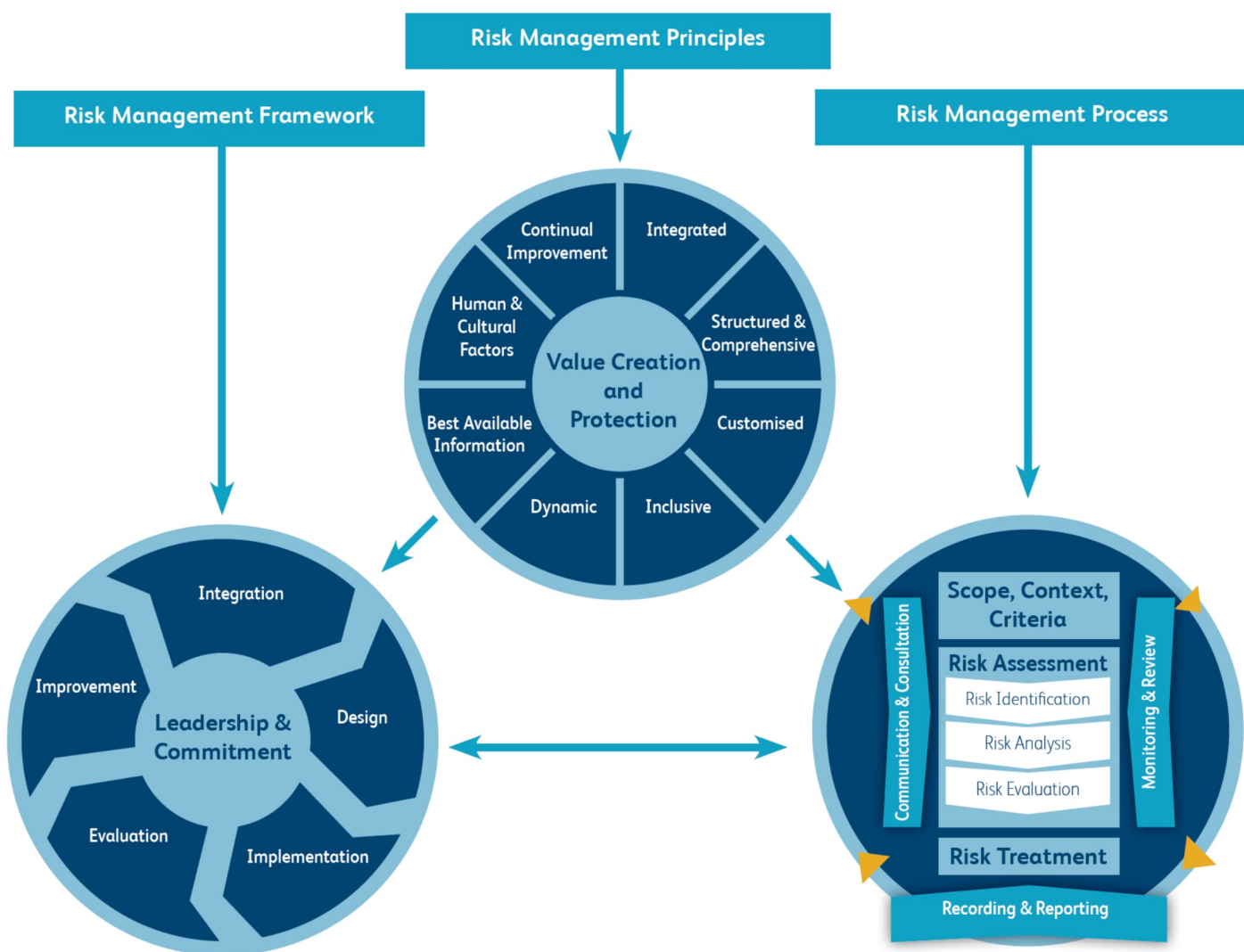| Clause	Annex SL heading	ISO 31000 (2018)
1.	**Scope**	
2.	**Normative references**	
3.	**Terms and definitions**	
4.	**Context of the organisation**	
4.1	Understanding the organisation and its context	Component 2 of the Framework: 'Integration' includes determining oversight roles and responsibilities and ensuring RM is part of all aspects of the organisation
4.2	Understanding the needs and expectations of interested parties	
4.3	Determining the scope of the management system	Component 2 of the Process: 'Scope, context and criteria' includes purpose and scope of RM, defining risk criteria and risk decision-making
4.4	The management system	
5.	**Leadership**	
5.1	Leadership and commitment	Component 1 of the Framework: 'Leadership and commitment' includes aligning RM, policy statement, resources and risk appetite
5.2	Policy	
5.3	Organisational roles, responsibilities and authorities	Component 3 of the Framework: 'Design' includes internal and external context, roles and responsibilities, and communications and consultation
6.	**Planning**	
6.1	Actions to address risks and opportunities	Component 1 of the Framework: 'Leadership and commitment' includes aligning RM, policy statement, resources and risk appetite
6.2	Management system objectives and planning to achieve them	Component 3 of the Framework: 'Design' includes internal and external context, roles and responsibilities, and communications and consultation
7.	**Support**	
7.1	Resources	Component 1 of the Process: 'Communication and consultation' includes involvement, risk information and ownership of risk
7.2	Competence	
7.3	Awareness	
7.4	Communication	Component 6 of the Process: 'Recording and reporting' includes information for decision-making and risk information for stakeholders
7.5	Documented information	
8.	**Operation**	
8.1	Operational planning and control	Component 4 of the Framework: 'Implementation' includes implementation deadlines, decision-making and implementation responsibilities
		Component 3 of the Process: 'Risk assessment' includes description of the identification, analysis and evaluation stages of risk assessment
		Component 4 of the Process: 'Risk treatment' includes the selection, design and implementation of risk treatment options
9.	**Performance evaluation**	
9.1	Monitoring, measurement, analysis and evaluation	Component 5 of the Framework: 'Evaluation' includes measuring framework performance and continued suitability of the framework
9.2	Internal audit	
9.3	Management review	Component 5 of the Process: 'Monitoring and review' includes monitoring RM outcomes, and inclusion of risk within performance reports
10.	**Improvement**	
10.1	Non-conformity and corrective action	Component 6 of the Framework: 'Improvement' includes value of RM, adapting the framework and integration of RM activities
10.2	Continual improvement	

Figure 1: Scope and design components of management systems

Context
Organisation, stakeholder expectations and scope of the management system

Support
Resources, competence, awareness, communication and documentation

Leadership
Commitment, policy and organisational roles and responsibilities

Figure 2: Control and develop components of management systems

Plan
Management system objectives and planning to achieve them

Implement
Operational planning, implementation and control

Learn
Non-conformity, corrective action and continual improvement

Measure
Monitoring, measurement, analysis, evaluation, audit and review

Figure 3: Principles, framework and risk management process from ISO 31000

Risk Management Principles

Risk Management Framework

Risk Management Process

Continual Improvement
Integrated
Human & Cultural Factors
Structured & Comprehensive
Value Creation and Protection
Best Available Information
Customised
Dynamic
Inclusive

Integration
Improvement
Design
Leadership & Commitment
Evaluation
Implementation

Communication & Consultation
Monitoring & Review
Scope, Context, Criteria
Risk Assessment
Risk Identification
Risk Analysis
Risk Evaluation
Risk Treatment
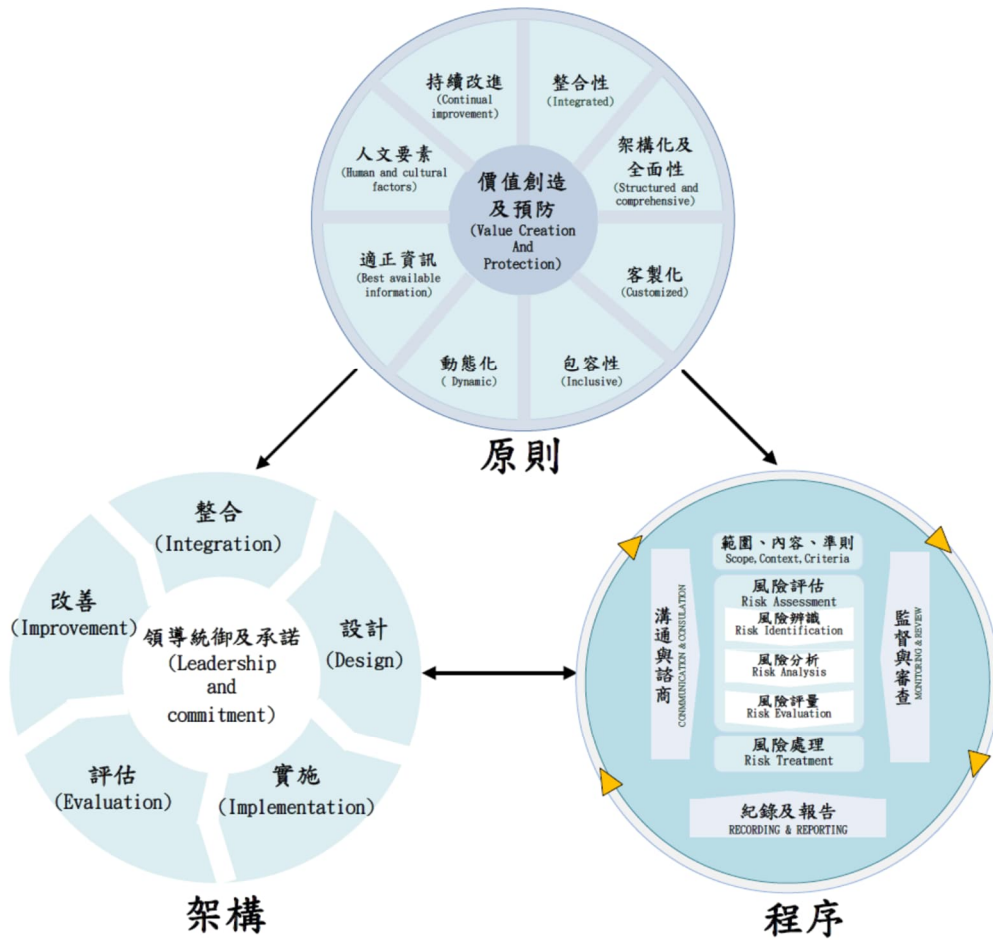Recording & Reporting

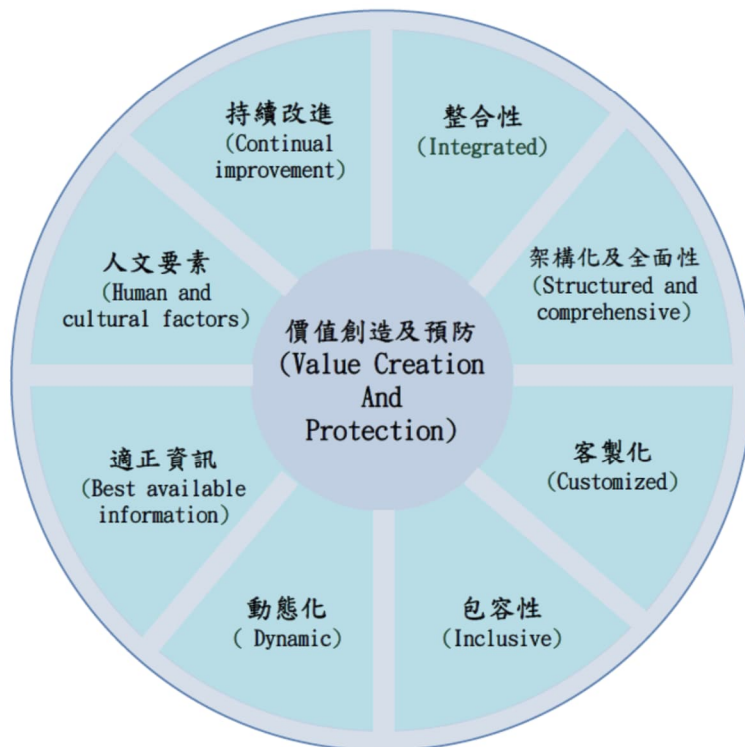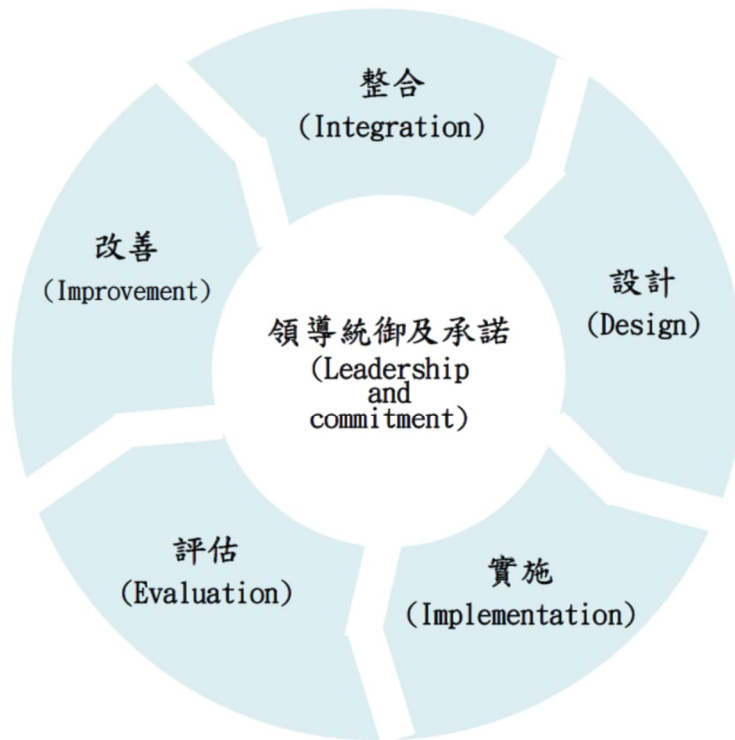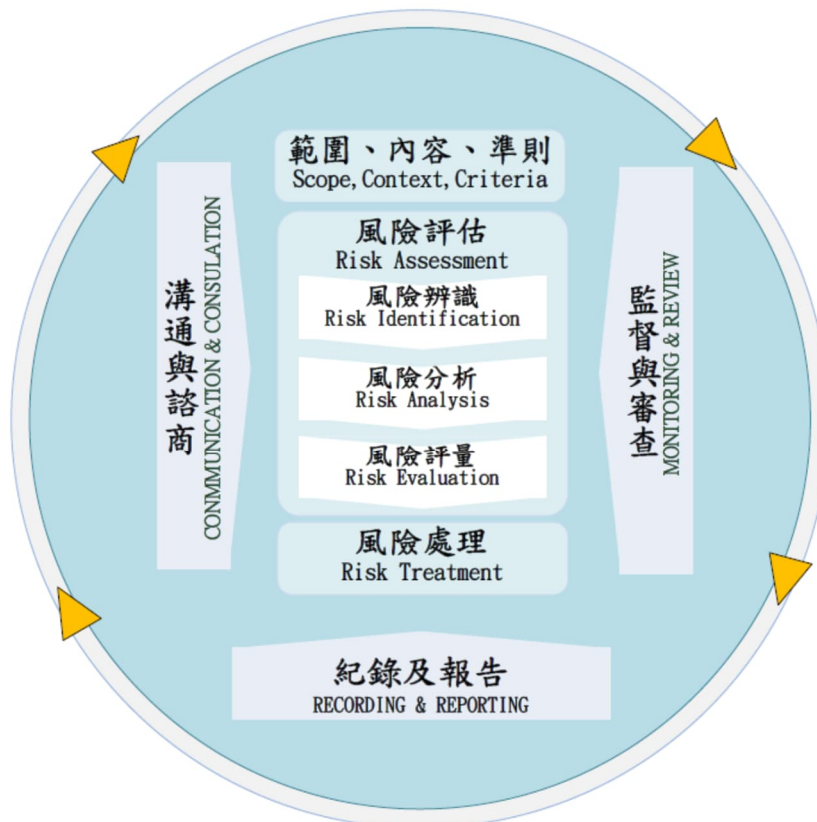圖 2. ISO31000：2018 風險管理原則、架構及程序

圖 3. ISO31000：2018 風險管理實施原則

圖 4. ISO31000：2018 風險管理架構

圖 5. ISO31000：2018 風險評估及管理程序