



RISK MANAGEMENT APPLIED TO CYBERSECURITY AND PRIVACY WITH ISO27001, ISO27701 AND ISO 27005

Dr. João Paulo Rodrigues

4th of December 2024

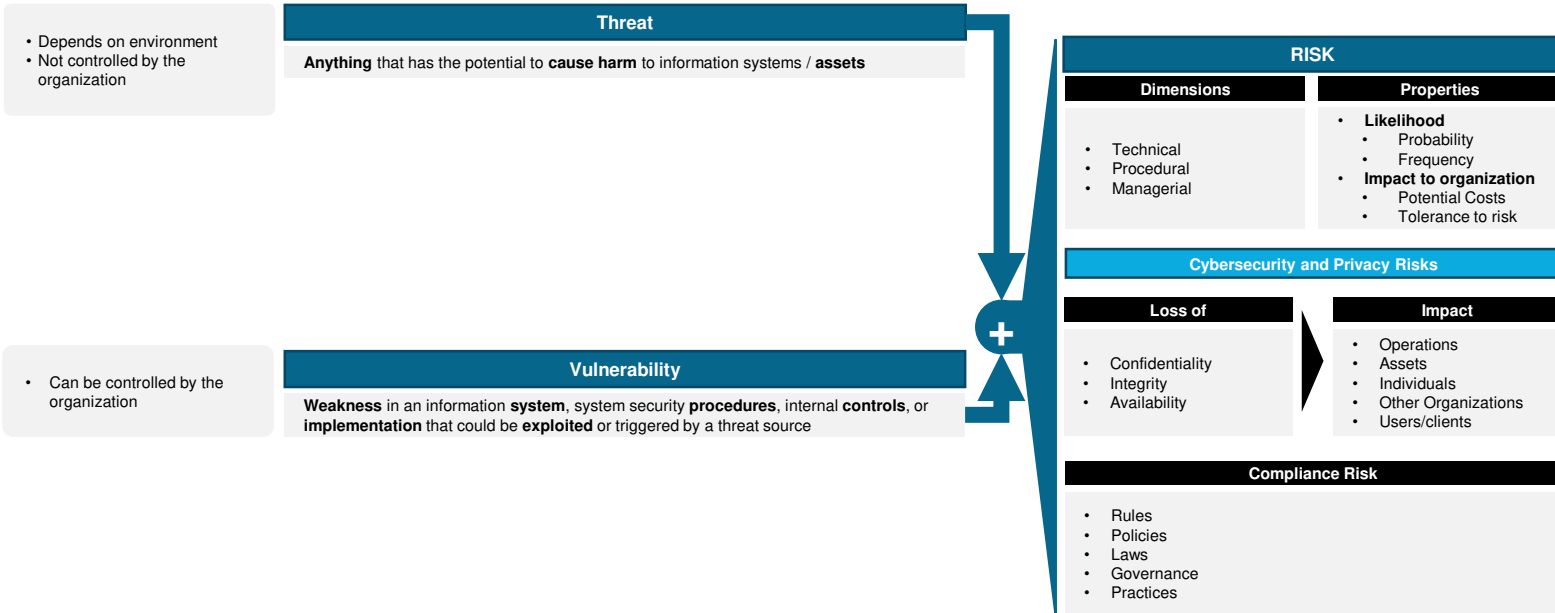
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- What is Risk and how it is managed
- ISO/IEC 27001:2022 Information Security, Cybersecurity and Privacy Protection – Information Security Management Systems – Requirements
- ISO/IEC 27701:2019 – Security Techniques – Extension to ISO/IEC 27001 and ISO/IEC 27002 for privacy information management – Requirements and guidelines
- ISO 27005:2022 – Information Security, Cybersecurity and Privacy Protection – Guidance on managing Information security risks

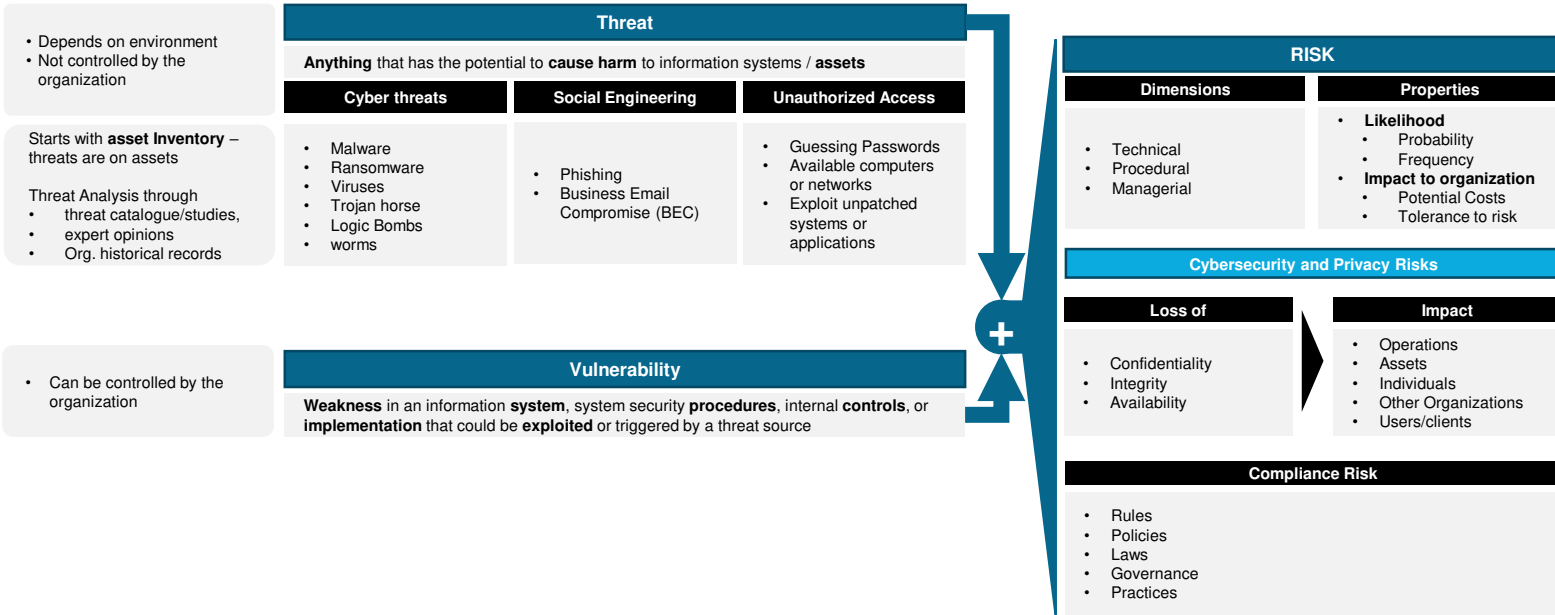


WHAT IS RISK AND HOW IT IS MANAGED

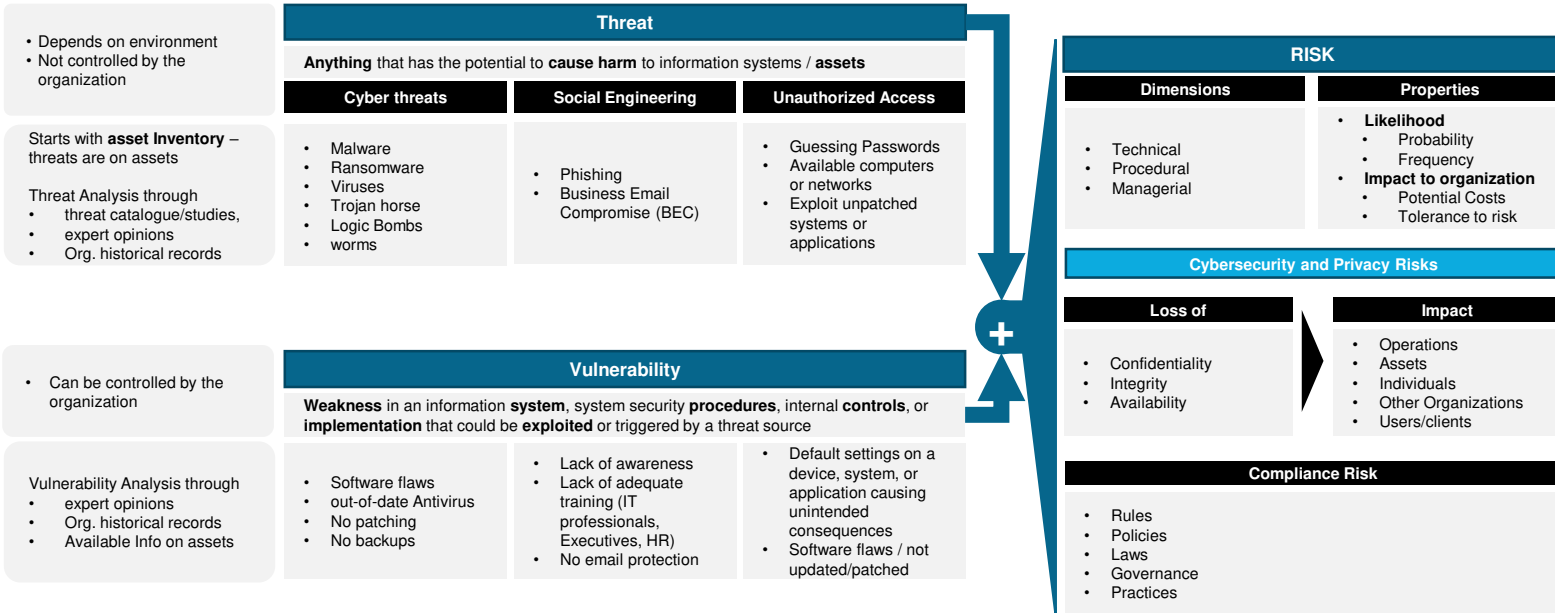
WHAT IS RISK



WHAT IS RISK – THREAT ANALYSIS



WHAT IS RISK – VULNERABILITY ANALYSIS



WHAT IS RISK – RISK EVALUATION



CYLCOMED

RISK CRITERIA/TOLERANCE

Determined by business leaders

Likelihood	Descriptor
1	Rare
2	Unlikely
3	Possible
4	Likely
5	Almost Certain

Factors	Consequence Score				
	1	2	3	4	5
Safety					
Service/Facility					
Compliance					
Complaint					
Performance Rating					
Image					
Key Objectives delivery					
Claims					
Environment					
Budget					
Contracts					

Likelihood	Consequence Score				
	1	2	3	4	5
5					
4					
3					
2					
1					

Threat

Anything that has the potential to **cause harm** to information systems / **assets**

Cyber threats	Social Engineering	Unauthorized Access
<ul style="list-style-type: none"> Malware Ransomware Viruses Trojan horse Logic Bombs worms 	<ul style="list-style-type: none"> Phishing Business Email Compromise (BEC) 	<ul style="list-style-type: none"> Guessing Passwords Available computers or networks Exploit unpatched systems or applications

Vulnerability

Weakness in an information **system**, system security **procedures**, internal **controls**, or **implementation** that could be **exploited** or triggered by a threat source

<ul style="list-style-type: none"> Software flaws out-of-date Antivirus No patching No backups 	<ul style="list-style-type: none"> Lack of awareness Lack of adequate training (IT professionals, Executives, HR) No email protection 	<ul style="list-style-type: none"> Default settings on a device, system, or application causing unintended consequences Software flaws / not updated/patched
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RISK

Dimensions	Properties
<ul style="list-style-type: none"> Technical Procedural Managerial 	<ul style="list-style-type: none"> Likelihood <ul style="list-style-type: none"> Probability Frequency Impact to organization <ul style="list-style-type: none"> Potential Costs Tolerance to risk

Cybersecurity and Privacy Risks

Loss of	Impact
<ul style="list-style-type: none"> Confidentiality Integrity Availability 	<ul style="list-style-type: none"> Operations Assets Individuals Other Organizations Users/clients

Compliance Risk

<ul style="list-style-type: none"> Rules Policies Laws Governance Practices
--

- Depends on environment
- Not controlled by the organization

Starts with **asset Inventory** – threats are on assets

Threat Analysis through

- threat catalogue/studies,
- expert opinions
- Org. historical records

- Can be controlled by the organization

Vulnerability Analysis through

- expert opinions
- Org. historical records
- Available Info on assets

Risk not justified in any circumstances
Tolerable if risk reduction is impracticable
Tolerable. Cost to reduce does not compensate risk
Assure risk remains at this level

WHAT IS RISK – CONTROLLING THE RISK



CYLCOMED

RISK CRITERIA/TOLERANCE

Determined by business leaders

Likelihood	Descriptor
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Controls

A measure that modifies threat exposure – controls the vulnerability

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- Not controlled by the organization

Starts with **asset Inventory** – threats are on assets

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 - Org. historical records

- Can be controlled by the organization

- Vulnerability Analysis through
- expert opinions
 - Org. historical records
 - Available Info on assets

- Needs resources
- Needs governance
- Needs approval
- Needs monitoring

RISK

Dimensions	Properties
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Compliance Risk

- Rules
- Policies
- Laws
- Governance
- Practices

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Social Engineering

- Phishing
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Unauthorized Access

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Controls

A measure that modifies threat exposure – controls the vulnerability

- Frequent software updates
- Frequent Antivirus Update
- Auto Patching mechanisms
- Backup servers

- Awareness training
- Proper training programs
- Spam protection / attachment removal, etc...

- Change default settings to a secure one
- Frequent software patches/updates

RISK

Dimensions

- Technical
- Procedural
- Managerial

Properties

- Likelihood**
 - Probability
 - Frequency
- Impact to organization**
 - Potential Costs
 - Tolerance to risk

Cybersecurity and Privacy Risks

Loss of

- Confidentiality
- Integrity
- Availability

Impact

- Operations
- Assets
- Individuals
- Other Organizations
- Users/clients

Compliance Risk

- Rules
- Policies
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- Practices

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WHAT IS RISK – CONSIDER RANSOMWARE ATTACK



CYLCOMED

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Controls selected by experts, following standards and technologies best practices ex.: ISO 27001, ISO 27701

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- worms

Social Engineering

- Phishing
- Business Email Compromise (BEC)

Unauthorized Access

- Guessing Passwords
- Available computers or networks
- Exploit unpatched systems or applications

Vulnerability

Weakness in an information system, system security **procedures**, internal **controls**, or **implementation** that could be **exploited** or triggered by a threat source

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RISK

Dimensions

- Technical
- Procedural
- Managerial

Properties

- Likelihood**
 - Probability
 - Frequency
- Impact to organization**
 - Potential Costs
 - Tolerance to risk

Cybersecurity and Privacy Risks

Loss of

- Confidentiality
- Integrity**
- Availability**

Impact

- Operations
- Assets
- Individuals
- Other Organizations
- Users/clients

Compliance Risk

- Rules
- Policies
- Laws
- Governance
- Practices

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Anything that has the potential to **cause harm** to information systems / assets

Cyber threats

- Malware
- Ransomware**
- Viruses
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- Business Email Compromise (BEC)

Unauthorized Access

- Guessing Passwords
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Controls

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- Awareness training
- Proper training programs
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RISK

Dimensions

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Cybersecurity and Privacy Risks

Loss of

- Confidentiality
- Integrity**
- Availability**

Impact

- Operations**
- Assets**
- Individuals**
- Other Organizations**
- Users/clients**

Compliance Risk

- Rules**
- Policies**
- Laws**
- Governance**
- Practices**

- Depends on environment
- Not controlled by the organization

Starts with **asset Inventory** – threats are on assets

- Threat Analysis through
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- Vulnerability Analysis through
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 - Org. historical records
 - Available Info on assets

- Needs resources
- Needs governance
- Needs approval
- Needs monitoring

Controls selected by experts, following standards and technologies best practices ex.: ISO 27001, ISO 27701

Risk not justified in any circumstances

Tolerable if risk reduction is impracticable

Tolerable. Cost to reduce does not compensate risk

Assure risk remains at this level

WHAT IS RISK – CONSIDER RANSOMWARE ATTACK ON HOTEL



CYLCOMED

RISK CRITERIA/TOLERANCE

Determined by business leaders

Likelihood	Descriptor
1	Rare
2	Unlikely
3	Possible
4	Likely
5	Almost Certain

Factors	Consequence Score				
	1	2	3	4	5
Safety	1	2	3	4	5
Service/Facility	1	2	3	4	5
Compliance	1	2	3	4	5
Complaint	1	2	3	4	5
Performance Rating	1	2	3	4	5
Image	1	2	3	4	5
Key Objectives delivery	1	2	3	4	5
Claims	1	2	3	4	5
Environment	1	2	3	4	5
Budget	1	2	3	4	5
Contracts	1	2	3	4	5

Likelihood	Consequence Score				
	1	2	3	4	5
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Compliance Risk

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Assure risk remains at this level

WHAT IS RISK – CONSIDER RANSOMWARE ATTACK ON HOSPITAL WITH RISK CONTROL



CYLCOMED

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Service/Facility					
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Complaint					
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Social Engineering

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- Business Email Compromise (BEC)

Unauthorized Access

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Compliance					
Complaint					
Performance Rating					
Image					
Key Objectives delivery					
Claims					
Environment					
Budget					
Contracts					

Likelihood	Consequence Score				
	1	2	3	4	5
5					
4					
3					
2					
1					

Threat

Anything that has the potential to **cause harm** to information systems / assets

Cyber threats

- Malware
- Ransomware**
- Viruses
- Trojan horse
- Logic Bombs
- worms

Social Engineering

- Phishing
- Business Email Compromise (BEC)

Unauthorized Access

- Guessing Passwords
- Available computers or networks
- Exploit unpatched systems or applications

Vulnerability

Weakness in an information system, system security procedures, internal controls, or implementation that could be **exploited** or triggered by a threat source

- Software flaws
- out-of-date Antivirus
- No patching
- No-backups**

- Lack of awareness
- Lack of adequate training (IT professionals, Executives, HR)
- No email protection

- Default settings on a device, system, or application causing unintended consequences
- Software flaws / not updated/patched

Controls

A measure that modifies threat exposure – controls the vulnerability

- Frequent software updates
- Frequent Antivirus Update
- Auto Patching mechanisms
- Backup servers**

- Awareness training
- Proper training programs
- Spam protection / attachment removal, etc...

- Change default settings to a secure one
- Frequent software patches/updates

RISK

Dimensions

- Technical
- Procedural
- Managerial

Properties

- Likelihood**
 - Probability
 - Frequency
- Impact to organization**
 - Potential Costs
 - Tolerance to risk

Cybersecurity and Privacy Risks

Loss of

- Confidentiality
- Integrity**
- Availability**

Impact

- Operations**
- Assets**
- Individuals**
- Other Organizations**
- Users/clients**

Compliance Risk

- Rules**
- Policies**
- Laws**
- Governance**
- Practices**

- Risk not justified in any circumstances
- Tolerable if risk reduction is impracticable
- Tolerable. Cost to reduce does not compensate risk
- Assure risk remains at this level

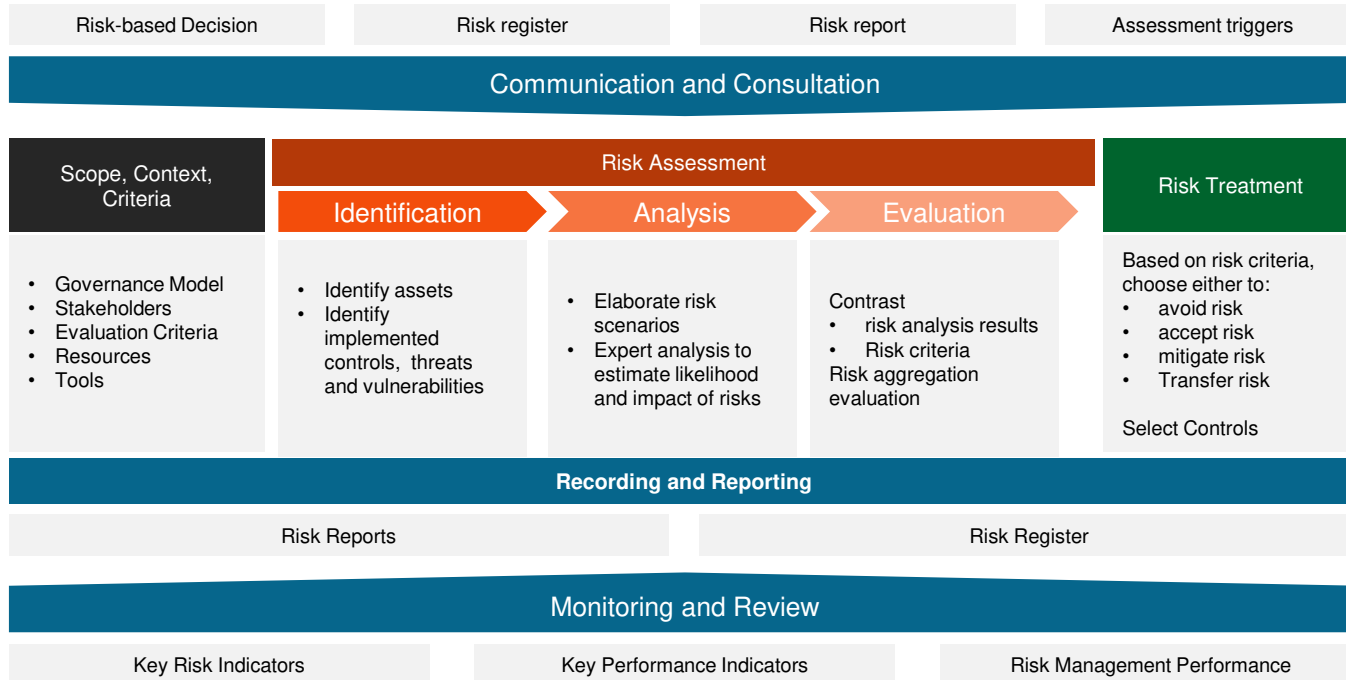
NHS RISK REGISTER REPORT - CONSEQUENCES SCORE AND FACTORS



Factors	Consequence Score				
	Negligible 1	Minor 2	Moderate 3	Major 4	Catastrophic 5
Patient Safety	Minimal injury requiring no/minimal intervention or treatment.	Minor implications for patient safety if unresolved	Treatment or service has significantly reduced effectiveness Major patient safety implications if findings are not acted on	Major injury leading to long-term incapacity/disability	An issue which impacts on a large number of patients, increased probability of death or irreversible health effects.
Service/Facility	Peripheral element of treatment or service suboptimal	Overall treatment or service suboptimal Loss/interruption of more than 8 hours	Treatment or service has significantly reduced effectiveness		An issue which impacts on a large number of patients, increased probability of death or irreversible health effects. Permanent loss of service or facility
Compliance		single failure to meet internal standards Breach of statutory legislation	Repeated failure to meet statutory or contractual standards Challenging external recommendations/improvement notice	Non-compliance with national standards with significant risk to patients if unresolved Enforcement action Multiple breeches in statutory duty Improvement notices	Gross failure to meet national standards Multiple breeches in statutory or regulatory duty Prosecution
Complaint	Informal complaint/inquiry			Multiple complaints/independent review	
Performance Rating		Reduced performance rating if unresolved		Low performance rating	
Image		Elements of public expectation not being met	Local media coverage - long-term reduction in public confidence	National media coverage with less than 3 days service well below reasonable public expectation	National media coverage with greater than 3 days service well below reasonable public expectation
Key Objectives delivery				Uncertain delivery of key objective/service due to lack of staff	
Claims		Claim less than £10,000		Claim(s) between £100,000 and £1 million	Claim(s) > £1 million
Environment		Minor impact on environment			Catastrophic impact on environment
Budget		loss of 01-0.25 per cent of budget	Loss of 0.25 - 0.5 per cent of budget	Non-compliance with national 10-25 per cent over project budget Uncertain delivery of key objective/Loss of 0.5 - 1.0 per cent of budget	Incident leading to greater than 25 per cent over project budget
Contracts					Loss of contract / payment by results

Likelihood Score	Descriptor	Frequency - How often might it/does it happen
1	Rare	- This will probably never happen/occur - Not expected to occur for years
2	Unlikely	- Do not expect it to happen/occur but it is possible it may do so - expected to occur at least annually
3	Possible	- Might happen or recur occasionally - Expected to occur monthly
4	Likely	- Will probably happen/recur but it is not a persisting issue - Expected to occur weekly
5	Almost Certain	- Will undoubtedly happen/occur, possibly frequently - Expected to occur daily

SIMPLIFIED PROCESS FLOW DIAGRAM OF ISO 31000 – RISK MANAGEMENT GUIDELINES





**ISO 27005:2022 – INFORMATION SECURITY,
CYBERSECURITY AND PRIVACY PROTECTION
– GUIDANCE ON MANAGING INFORMATION
SECURITY RISKS**



Risk-based Decision

Risk register

Risk report

Assessment triggers

Communication and Consultation

Establish Context

Decision people, methods and resources

- Int./Ext. Stakeholders
- Governance Model
- Roles and Resp.
- Tools
- Resources

Risk Evaluation Criteria

Based on:

- Stakeholders expectations
- Processes strategic value
- Asset Criticality
- Commercial and operational importance of information
- Other Context relevant considerations

Impact Criteria

Determine level of damage or costs taking into account indicators:

- Asset Importance Classification
- Infosec failures (CIA)
- Costs for the organization
- Planning and deadline disruptions
- Reputation Damage
- Others (e.g., safety, health, etc)

Risk Acceptance Criteria

Identify risk level threshold from which executive approval is needed:

- Activity factors
- Operational factors
- Financial factors
- Technological factors
- Operational factors
- Social and humanitarian factors

Identify Risk

Asset Identification

Identify RM system assets

- Technology (hardware, software)
- Network devices
- People
- Location
- etc.

Threat Identification

- Incidents history
- Asset responsible
- Infosec. specialists
- Legal department
- Threat catalogues / studies

Control Identification

- Implemented controls docs
- Consult infosec. responsible
- Evaluate the controls implementation

Vulnerabilities Identification

- to organization
- to processes and procedures
- to management routine
- to human resources
- to physical locations
- to systems configuration
- to hardware, software and network equipment
- external parties dependencies

Risk Analysis

Impact Survey

List of:

- Relevant Incident Scenarios
- Identified threats and vulnerabilities
- Affected assets
- Consequences for the assets and processes

Impact Evaluation

Impact considerations

- CIA;
- Org. Services;

perspectives:

- Technical
- Financial
- Human
- Reputation
- Other relevant persp. (e.g., health, safety)

Asset Evaluation

Based on importance for org.'s business goals

Based on:

- Asset restitution
- Operational consequences

Probability Analysis

Risk occurrence probability should be evaluated based on:

- Threats
- Vulnerabilities
- List of incidents (lessons learned docs.)

Consider

- applicable statistics and experience
- human threats
- environmental threats
- vulnerabilities (individually and in conjunction)

Evaluate

- Threat frequency of occurrence
- Ease of exploiting vulnerabilities

Risk Evaluation

Estimation vs Criteria

Compare:

- Estimated Risk
- Risk Evaluation Criteria

Risk Aggregation

Aggregate risks that can be combined together to form a risk of higher score.

Risk Evaluation Decisions

Should be based on:

- Acceptable risk levels
- Impacts
- Probabilities
- Confidence levels on the performed risk identification and analysis

Risk Prioritization

Should be based on:

- Evaluation Criteria
- Identified Scenarios
- Identified risks

Risk Treatment

Risk Treatment

Avoid Risk

- Lower probability or impact to zero
- make incident occurrence more difficult
- Totally eliminate the impact

Accept Risk

- The organization formally accept the risk

Mitigate Risk

- reduce probability and/or impact of an adverse event to acceptable levels
- through controls and countermeasures implementation

Transfer Risk

- Transfer the impact of a threat, totally or partially, to a third party (e.g., insurance)

<ul style="list-style-type: none"> Minutes risk follow-up plan progress reports 	<ul style="list-style-type: none"> Risk Evaluation Criteria Risk Impact Criteria Risk Acceptance Criteria 	<ul style="list-style-type: none"> Asset Inventory Controls associated to each asset Threats associated to each asset Vulnerabilities associated to each asset risk associated to each asset 	<ul style="list-style-type: none"> Incident Scenarios and affected assets Consequences for assets and respective processes 	<ul style="list-style-type: none"> Impact evaluation Asset Evaluation Probability Analysis 	<ul style="list-style-type: none"> Risk Level Estimation 	<ul style="list-style-type: none"> Evaluation of Risk Estimation vs. Risk Criteria Risk aggregation evaluation Risk Evaluation decisions Risk Prioritization 	<ul style="list-style-type: none"> Risk Treatment
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Recording and Reporting

Monitoring and Review

Key Risk Indicators

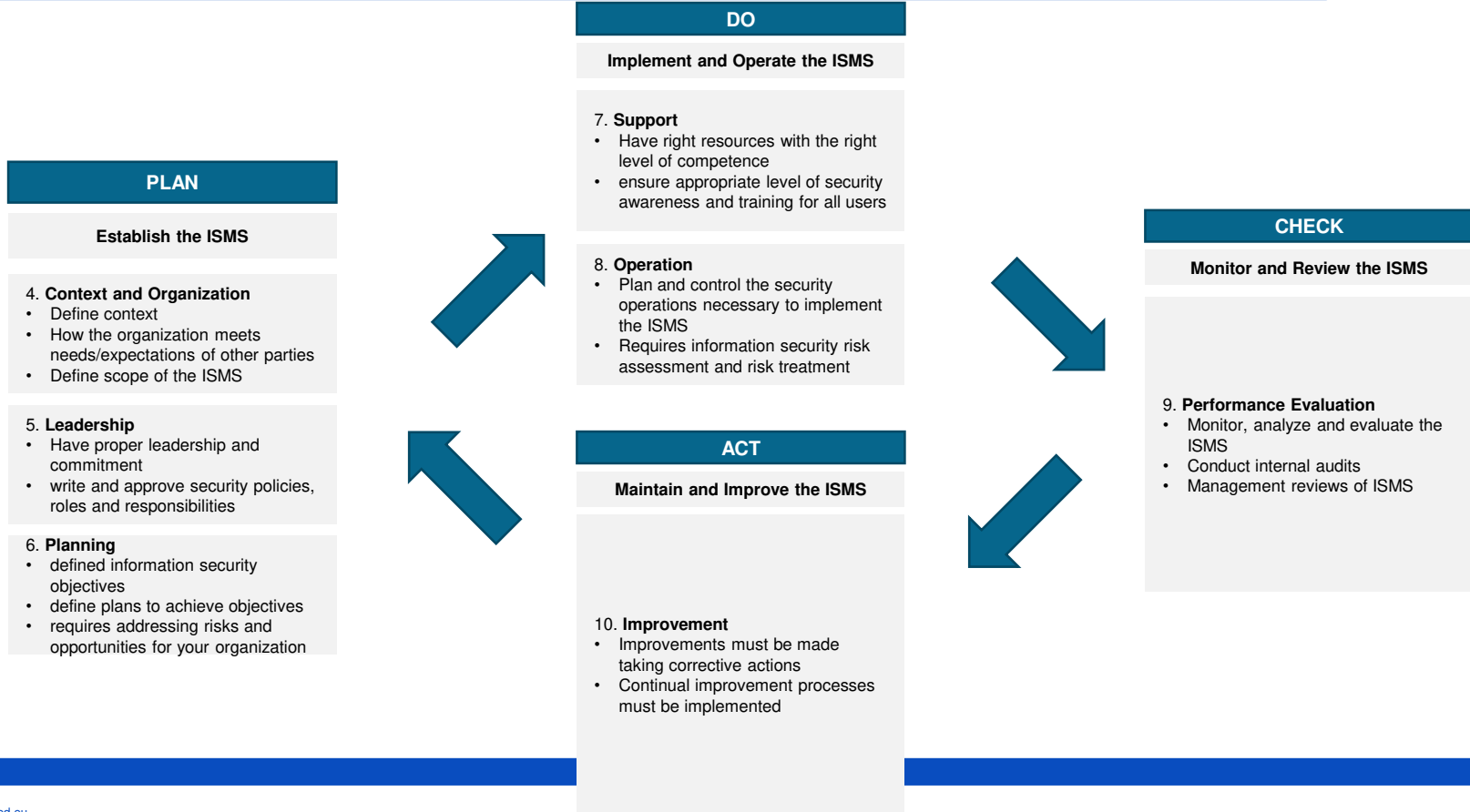
Key Performance Indicators

Risk Management Performance



**ISO/IEC 27001:2022 INFORMATION
SECURITY, CYBERSECURITY AND PRIVACY
PROTECTION – INFORMATION SECURITY
MANAGEMENT SYSTEMS - REQUIREMENTS**

- ISO/IEC 27001 specifies the requirements for establishing, implementing, maintaining and continually improving an Information Security Management System (ISMS) within an organization.

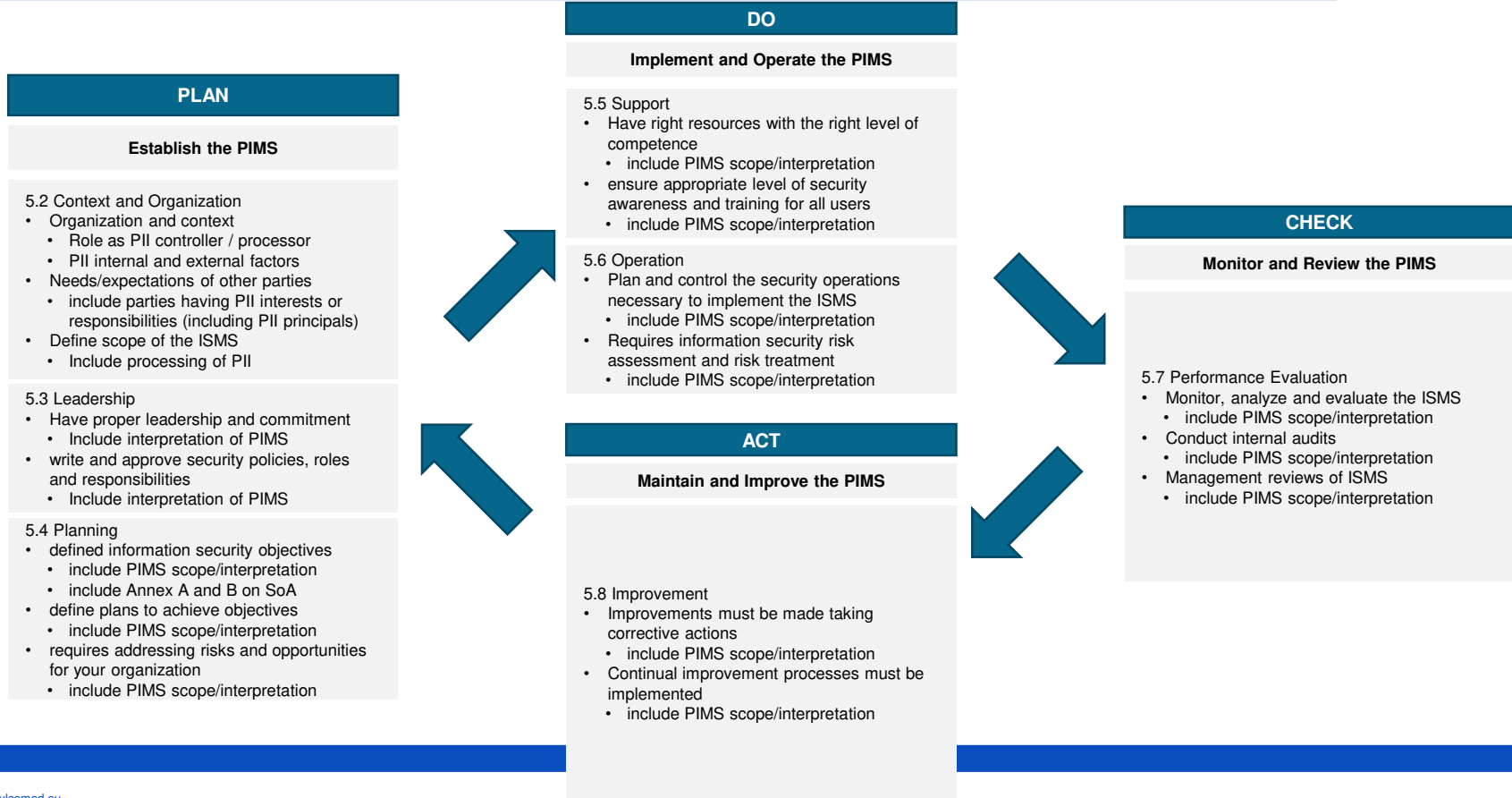


Organizational	People	Physical	Technical
<ol style="list-style-type: none"> 1. Policies for Information Security 2. Information Security Roles and responsibilities 3. Segregation of Duties 4. Management Responsibilities 5. Contact with Authorities 6. Contact with Special Interest Groups 7. Threat Intelligence 8. Information Security in Project Management 9. Inventory of Information and Other Associated Assets 10. Acceptable Use of Information and Other Associated Assets 11. Return of Assets 12. Classification of Information 	<ol style="list-style-type: none"> 1. Screening 2. Terms and Conditions of Employment 3. Information Security Awareness, Education and training 	<ol style="list-style-type: none"> 1. Physical Security Perimeters 2. Physical Entry 3. Security Offices, Rooms and Facilities 4. Physical Security Monitoring 5. Protecting Against Physical and Environmental Threats 	<ol style="list-style-type: none"> 13. Labelling of Information 14. Information transfer 15. Access Control 16. identity Management 17. Authentication Information 18. Access rights 19. Information Security in Supplier Relationships 20. Addressing Information Security Within Supplier Agreements 21. Managing Information Security in the ICT Supply Chain 22. Monitoring, Review and Change Management of Supplier Services 23. Information Security for Use of Cloud Services 24. Information Security Incident Management planning and Preparation
	<ol style="list-style-type: none"> 4. Disciplinary Process 5. Responsibilities After termination or Change of Employment 6. Confidentiality or Non-Disclosure Agreements 		<ol style="list-style-type: none"> 25. Assessment and Decision on Information Security Events 26. Response to Information Security Incidents 27. Learning from Information Security Incidents 28. Collection of Evidence 29. Information Security During Disruption 30. ICT Readiness for Business Continuity 31. Legal, Statutory, Regulatory and Contractual Requirements 32. Intellectual Property Rights 33. Protection of Records 34. Privacy and Protection of PII 35. Independent review of Information Security 36. Compliance with Policies, Rules and Standards for Information Security 37. Documented Operating Procedures
	<ol style="list-style-type: none"> 7. Remote Working 8. Information Security Event Reporting 		
		<ol style="list-style-type: none"> 6. Working In Secure Areas 7. Clear Desk and Clear Screen 8. Equipment Siting and Protection 9. Security of Assets Off-Premise 10. Storage Media 	<ol style="list-style-type: none"> 11. Supporting Utilities 12. Cabling Security 13. Equipment Maintenance 14. Secure Disposal or Re-Use of Equipment
			<ol style="list-style-type: none"> 25. Secure Development Life Cycle 26. Application Security Requirements 27. Secure System Architecture and Engineering Principles 28. Secure Coding 29. Secure Testing in Development and Acceptance 30. Outsourced Development 31. Separation of Development, Test and Production Environments 32. Change Management 33. Test Information 34. Protection of Information Systems During Audit Testing
	<ol style="list-style-type: none"> 1. User Endpoint Devices 2. Privileged Access Rights 3. Information Access Restriction 4. Access to Source Code 5. Secure Authentication 6. Capacity Management 7. Protection Against Malware 8. Management of technical Vulnerabilities 9. Configuration Management 10. Information Deletion 11. Data Masking 12. Data Leakage Prevention 	<ol style="list-style-type: none"> 13. Information Backup 14. Redundancy of Information Processing Facilities 15. Logging 16. Monitoring Activities 17. Clock Synchronization 18. Use of Privileged Utility Programs 19. Installation of Software on Operational Systems 20. Networks Security 21. Security of Network Devices 22. Segregation of Networks 23. Web Filtering 24. Use of Cryptography 	



**ISO/IEC 27701 – SECURITY TECHNIQUES –
EXTENSION TO ISO/IEC 27001 AND ISO/IEC
27002 FOR PRIVACY INFORMATION
MANAGEMENT – REQUIREMENTS AND
GUIDELINES**

- ISO 27701 extends the ISO 27001 standard for privacy information management. It specifies requirements and provides guidance for establishing, implementing, maintaining and continually improving a Privacy Information Management System (PIMS).
- It provides PIMS-related requirements and provides guidance for PII controllers and PII processors holding responsibility and accountability for PII processing.



	PII Controller	PII Processor
Conditions for collection and processing	<ol style="list-style-type: none"> 1. Identify and document purpose 2. Identify lawful basis 3. Determine when and how consent is to be obtained 4. Obtain and record consent 5. Privacy impact assessment 6. Contractors with PII processors 7. Joint PII controller 8. Records related to processing PII 	<ol style="list-style-type: none"> 1. Customer agreement 2. Organization's purposes 3. Marketing and advertising use 4. Infringing instruction 5. Customer obligations 6. Records related to processing PII
Obligations to PII principals	<ol style="list-style-type: none"> 1. Determine and fulfilling obligations to PII principals 2. Determine information for PII principals 3. Providing information to PII principals 4. Providing mechanism to modify or withdraw consent 5. Providing mechanism to object to PII processing 6. Access, correction and/or erasure 7. PII controllers' obligations to inform third parties 8. Providing copy of PII processed 9. Handling requests 10. Automated decision making 	<ol style="list-style-type: none"> 1. Obligations to PII principals
Privacy by design and privacy by default	<ol style="list-style-type: none"> 1. Limit collection 2. Limit processing 3. Accuracy and quality 4. PII minimization objectives 5. PII de-identification and deletion at the end of processing 6. Temporary files retention 7. Disposal 9. PII transmission controls 	<ol style="list-style-type: none"> 1. Temporary files 2. Return, transfer or disposal of PII 3. PII transmission controls
PII sharing, transfer and disclosure	<ol style="list-style-type: none"> 1. Identify basis for PII transfer between jurisdictions 2. Countries and international organizations to which PII can be transferred 3. Records of transfer of PII 4. Records of PII disclosure to third parties 	<ol style="list-style-type: none"> 1. Basis for PII transfer between jurisdictions 2. Countries and international organizations to which PII can be transferred 3. Records of PII disclosure to third parties 4. Notification of PII disclosure requests 5. Legally binding PII disclosures 6. Disclosure of sub-contractors used to process PII 7. Engagement of a subcontractor to process PII 8. Change of subcontractor to process PII



Q & A



THANK YOU FOR YOUR ATTENTION



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