Module Learning Objectives

- Know, comprehensively understand and operate effectively within the context in which Information Risk Management is conducted
- Know, understand and apply the principles and philosophies which underlie successful information risk management and security governance
- Have theoretical and practical knowledge and understanding of the interactions between security concerns and business objectives and organisational processes
- Have knowledge, understanding and the ability to systematically apply techniques to evaluate security risk and ensure compliance with principles of governance
- Plan and implement a risk management strategy

Day 3 Learning Objectives

- To understand the motivations for the practice of information risk management within an enterprise
- To understand key concepts and the information risk management lifecycle
- To develop an awareness of how to perform a risk assessment
- To continue to develop an awareness of the main international standards and methodologies

Session Overview

- Why do we have to manage information risk
- What are the enterprise drivers
- What is the relationship with key enterprise business processes

Why

- Existing and growing dependency upon information infrastructure and digital assets
  - Rapidly growing with pace of technology change
- Both the dependency and the assets have value which is exposed to risk and so may require protecting
- Protection costs, is not 100% effective, and risk varies over time, so an understanding of the risks faced and a plan to manage them is required
  - Where manage may involve accepting and tolerating some risks whilst attempting to remove or reduce others or even avoiding them altogether

YouTube incident coverage

- Grocery Store 2008
- Facebook 2012
- Sony 2011
- Stuxnet 2010 The Loop, Stuxnet 2010 Symantec
- http://www.youtube.com/watch?v=-Adg4chwKkM&feature=related

Enterprise Drivers

- Maximise output in the face of risk
  - Outputs include services, products, revenue
- Information Security can enable business objectives which depend in some way upon information infrastructure and assets
  - E.g. customer retention, market growth and position, efficiency, agility…

Relationship to process

- Information infrastructure and services likely to be used by majority of key business processes
  - Finance and Administration
  - Supply Chain Management
  - Customer Relationship Management
  - Information and Technology Services
  - Sales
  - Logistics
  - Communications and PR
  - ….

Syndicate Exercise 1

- Consider the exposure of a student to information risk day-to-day in normal life, student life and family life.
  - What are the key assets?
  - How might they be of interest to a threat?
  - What would be the impact to the student and their family should access be denied to assets, or assets loose integrity, or confidential assets become compromised?

Definitions

- Information Security Management entails the identification of an organisations information assets and the development, documentation, and implementation of policies, standards, procedures, and guidelines, which ensure their availability, integrity and confidentiality.
- Risk management is the identification, measurement, control, and minimisation of loss associated with uncertain events or risks.

Official (ISC)^2 Guide To The Certified Information Systems Security Professional Exam

Definitions

- Availability: ensuring that access is granted to authorised users as required, within expected and declared parameters
- Integrity: ensuring that changes to assets can only be made by authorised users
  - Not the same as quality
- Confidentiality: ensuring that only authorised users can access or view assets
- Non-repudiation / accountability: ensuring that users can be held to account for their actions in respects of assets
- Possible privacy issues not covered by confidentiality

Definitions

- Assets
- Threats
- Vulnerability
- Exploits and Attack Vectors
- Likelihood
- Impact
- Mitigation and control
- Residual risk

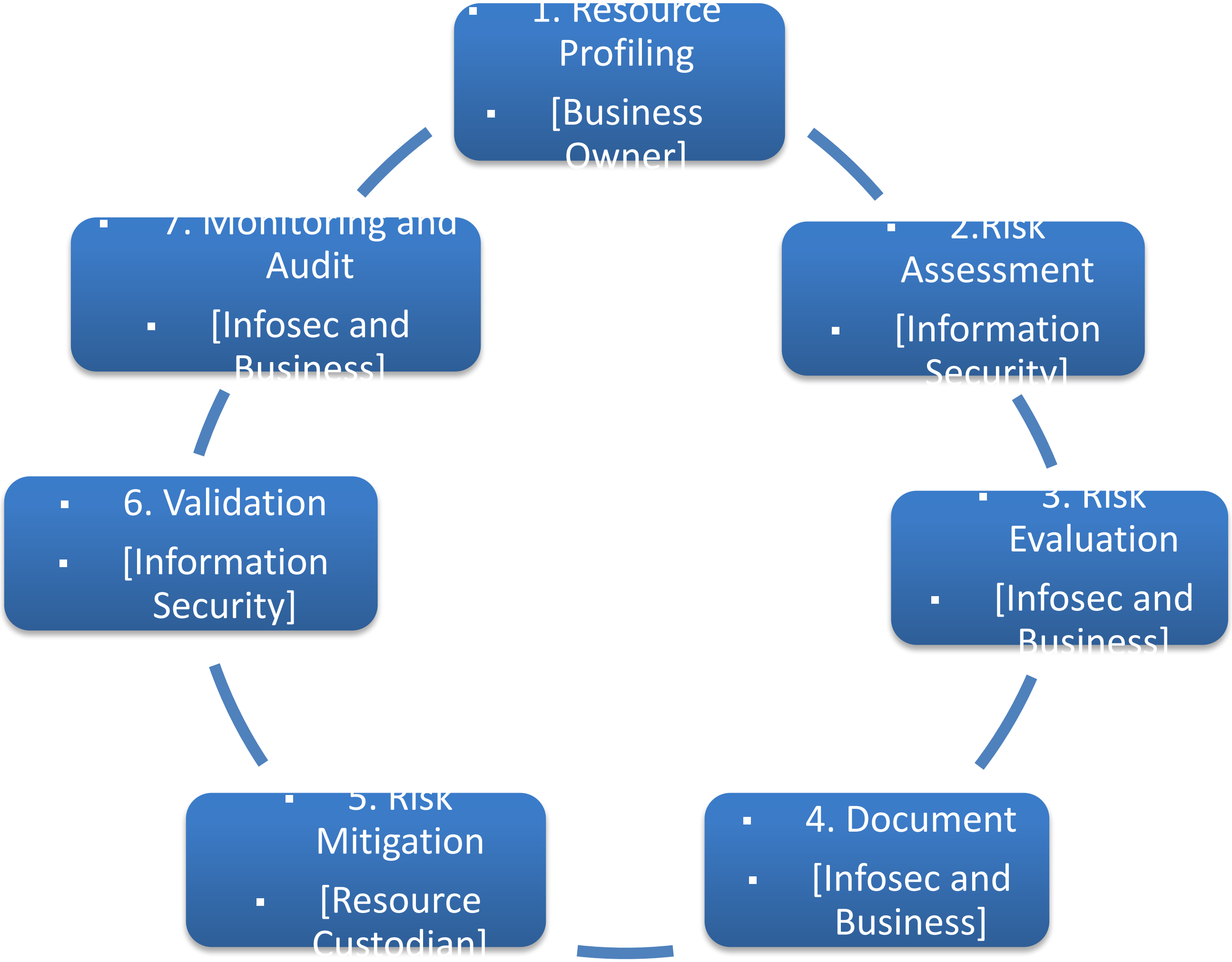
Definitions

- Risk Analysis: Process of analysing risk for a particular environment (organisation, project, business unit…) resulting in the risk assessment
- Risk Management: Incorporates the risk assessment but includes the resulting activities associated with mitigating the risks overtime, including detecting new ones

Definitions

- Qualitative risk analysis
  - A relative scale: low, medium, high.., 1,2,3,4…
  - Appropriate where no accurate data exists or when new to discipline of risk analysis
  - Highly subjective, hard to baseline, imprecise
- Quantitative risk analysis
  - Uses numbers and calculations to determine exposure in a £ value
  - Often utilises probability theory and statistical models
    - *E.g. Single Loss Expectancy X Average Annual Loss = Annualised Loss Expectancy*
  - Very difficult to quantify value of loss when so much is intangible (e.g. loss to reputation)

Information Risk Management Lifecycle



From Security Risk Management, Evan Wheeler

Resource Profiling

- The act of identifying the assets and resources requiring protection
- Need to understand relative importance, to underpin future prioritisation of effort
  - By importance to output or by impact if security breached
  - Might include a single system, an entire facility, business unit, 3rd party supplier service….
- Security Risk Profile captures the data required to judge an assets sensitivity to security risk

Risk Assessment

- For the critical assets:
  - Identify the presence of threat
  - Relate the threat to potential vulnerabilities
  - For each threat x vulnerability pair, identify potential harm or impact (sometimes referred to as risk exposure) and likelihood of breach to calculate risk
  - Likelihood must consider the presence of existing security controls
  - Raw risk – controls and mitigations – residual risk

Example Risk Exposure

- “..communications could be intercepted in transit and decrypted by a malicious party resulting in an unauthorised disclosure of sensitive data for all customers in the UK, which would require a breach notification to regulators and affected clients, costing the organisation $2 million in lost revenue and financial sanctions.”

From Security Risk Management, Evan Wheeler

Risk Evaluation

- The process by which the risks output from the assessment are balanced and prioritised, and the response identified:
  - Avoid: no longer engaging in the activity
  - Mitigate: attempt to limit the impact
  - Transfer: moving the responsibility to a 3rd party (and possibly the liability)
  - Accept: live with it
- As this is a cost / benefit decision some knowledge of potential mitigations is required

Document

- The results of the risk assessment and the evaluation along with key points of rationale
  - The world changes and should you experience a breach you need to understand where you went wrong in the analysis in order to do better
  - You may wish to demonstrate compliance to a standard, which will require evidence
  - Often you need/want to show process to a regulator, customer, or other stakeholder
  - You may need to obtain senior management approval for the actions resulting from the evaluation (including the ‘accept’ category), which will require exposure of the rationale and justification

Risk Mitigation and Remediation

- Implementing the plan.
- Options (for any particular risk) are:
  - Limit the severity of impact on system
    - Contain through detection and response
  - Decrease the sensitivity of the resource
    - Move the data it holds to another part of the system
  - Reduce the likelihood of occurrence
    - Control the attack surface using firewalls etc
- Risk remediation would involve removal of the vulnerability either through patching or removal of asset

Validation

- Verify adequacy of controls:
  - Design review
  - Configuration review
  - Policy review
  - Role and responsibility awareness review
  - Penetration testing
  - Vulnerability scanning
- Often before ‘go-live’ for any particular system or major upgrade

Monitoring and Audit

- Through-life aspects:
  - Log and audit network activity and security appliance alerts to maintain situational awareness
  - Monitor trends in threat
  - Monitor attack surface and vulnerability posture
  - Re-assessing risk in face of significant business change

Methods, Standards, Regulation

- Risk Assessment and Management Methodologies:
  - HP Business Risk Assessment
  - OCTAVE, DBSy, CRAMM, COBIT, RISK-IT
- Standards:
  - ISO27001/2/5
  - NISTSP800-37
- Regional laws and regulations associated with data handling and privacy

The OCTAVE Principals

- Organisational and Cultural
  - Open communication, global perspective, teamwork
- Risk Management Principals
  - Forward-looking view, focus on the critical few, integrated management
- Information Security Risk Evaluation Principles
  - Self-direction, adaptable measures, defined process, foundation for a continuous process

Basic Risk Assessment

- Create resource profiles
  - Identify critical assets
  - Understand the security requirements for critical assets
    - Security properties and organisational sensitivity
- Identify threats to critical assets
- Identify current security practices and organisational vulnerabilities
- Identify information infrastructure vulnerabilities
- Assess impact and likelihood of risks and prioritise

Types of Assets

- Information and data (paper or electronic), including intellectual property
- Information systems and services (some combination of assets)
- Software
- Hardware (in so far as it relates to information)
- People
- Other special circumstances
- Assets may be independent or related

Prioritising Assets

- Rank in relation to business objectives or business sensitivity (or some other measure such as regulatory compliance)
  - Note that people will have differing views on this
- Identify the subset which are most important
- Document the rationale

The Input Challenge

- Understanding the critical assets will require input from senior and middle management, since it necessarily relates to business priorities
  - Both now and in future
- Therefore, critical to the resource profiling will be the facilitation of workshops or interactions with the stakeholders
  - Can be difficult when they do not have a common view on priority
  - Board, senior management, security and technology operations, and more general staff are all likely to contribute differing view points

Identify Threat

- Consider threat sources in relation to the high priority assets, and the range of negative impacts a successful breach could result in
- OCTAVE Threat Sources: deliberate actions by external or internal people; accidental actions by people; malware; system outage; natural disasters and interdependency on 3rd parties
  - Note some are malicious threats and some are not
- OCTAVE Threat Outcomes: Disclosure, Modification, Loss / Destruction, Interruption

Assess Consequence

- For each asset and threat outcome determine potential impact on organisation
  - There may be multiple potential impacts, which will need to be enumerated
  - People may have differing views
- Determine potential impact, likelihood
  - Low: Maybe deviation from best practice but no direct exposure of critical assets
  - Moderate: May indirectly contribute to unauthorised activity, or degrade service performance
  - High: May allow limited unauthorised access
  - Critical: May allow full access to system or prolonged outage of service

Tabulate

New product development data store			
Threat	**Incident**	**Impact Description**	**Impact**
Insider deliberate exfiltration of data	Disclosure of corporate IP	Failure to safeguard privacy of data would result in competitors compromising competitive edge	H

Incorporate Probability

- Assess how likely a particular threat will attempt a breach:
  - Level of motivation (reward or incentive)
  - Capability (for insider or outsider)
  - Opportunity (how vulnerable might the asset be)
- Produce probability evaluation criteria
  - Negligible: Significant insider knowledge required, existing controls require direct physical access
  - Low: Threat source lacks motivation or capability
  - Moderate: Threat source motivated and capable but controls in place which limit ability to attack
  - High: Threat source is motivated and sufficiently capable and controls are considered highly effective
  - Very High: System vulnerability accessible publicly on the Internet, exploits exist in the open, threat is motivated

Combine for Risk

	Severity			
	Critical	**High**	**Moderate**	**Low**
Likelihood				
Very High	Critical	Critical	High	Moderate
High	Critical	Critical	High	Low
Moderate	High	High	Moderate	Low
Low	Moderate	Moderate	Low	Low
Negligible	Low	Low	Low	Low

Scenario – Assisted Living

- Local health authority has urgent requirement to deliver more health services direct to patients in their homes
  - Frail and elderly people find it more difficult to travel to health centres
  - Hospital represents a source of potential complications (infections) and cost, often when it is solely observation that is required
  - Continuous monitoring could allow earlier interventions and reduce total costs of healthcare
- A variety of sensors will be deployed in homes of patients, linked to healthcare workers via the Internet monitoring
  - Mobility of patients
  - Drug usage
  - Nutrition levels
  - Vital life signs

Assisted Living Example Risks

Incident	Impact	Likelihood	Measure of Risk
Intermittent interruption of monitoring	L (localised)	M (probably accidental)	M
	M (general)	L (probably accidental)	M
Prolonged interruption of monitoring	M (localised)	L (unless malicious intent)	M
	H (general)	M (control centre attack)	M-H
Misleading monitoring measurements	H (localised)	L (unless terrorist /organising crime)	M-H
	VH (general)	L (unless terrorist /organising crime)	M-H
Patient privacy compromise	M (localised)	M	M
	VH (general)	M	H

Identify Security Requirements

- For risks determine security requirements, in terms of
  - does it contain personally identifiable information, in which case it will be subject to regulation and law
  - any other requirements to control access
  - requirements for availability, take into consideration commitments made to customers where appropriate
  - requirements for accuracy (integrity), and where they may be time-bounded
  - requirements for controls to meet standards

Prioritize Security Requirements

- Rank risks with critical at top
- What is the relative ranking of the security requirements (across the entire asset set)
  - Or, for a subset prioritised further by business priority
- Often a difficult task
  - '..they are all important…"
- Develop mitigations which reflect the needs identified by the risk assessment

ASSET	THREAT	EXISTING CONTROL	LIKELIHOOD	CONSEQUENCE	LEVEL OF RISK	RISK PRIORITY	MITIGATION

- Asset: A description of the asset under threat
- Threat: Specific threat to the asset
- Existing Control: Mechanism under place today to handle the threat, if any.
- Likelihood: The probability of the occurrence of the threat i.e., possible, unlikely, highly likely etc.
- Consequences: The impact should this event actually occur i.e., minor, major, medium etc.
- Level of Risk: Low, Medium, High based on the product of likelihood and consequence.
- Risk Priority: A number from 1 to the number of threats where 1 is the highest risk.
- Mitigation: how you will solve the current problem

You may have more than one solution