

CISM STUDY GUIDE

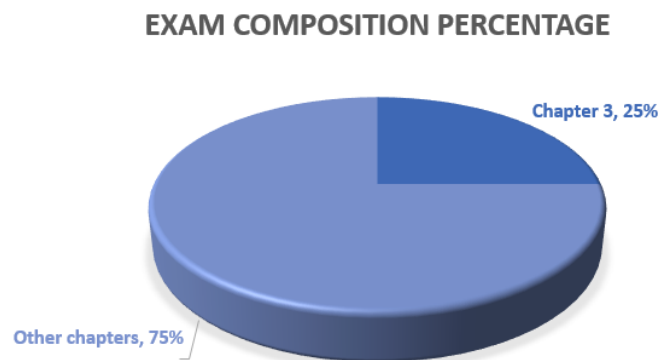
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CHAPTER 3:

Information Security Program Development and Management

Exam Relevance: 25% (approximately 50 questions)



Objective

Ensure that the information security manager understands the broad requirements and activities needed to establish and manage the **information security program** in alignment with the **information security strategy**.

Information Security Program Management Overview

The three elements essential to ensure successful security program design, implementation and ongoing management:

- The **execution** of a well-developed information security strategy
- Must be well-designed with cooperation and **support from management** and stakeholders
- **Effective metrics** must be developed

The ISM must realize that the objectives and expected benefits will work best if defined in **business terms**.

- **Importance of Information Security Program**
 - A well-executed security program will serve to effectively:
 - Design, implement, manage and monitor the security program, transforming strategy into actuality.
 - Provide the capabilities to meet security objectives.
 - Accommodate changes in security requirements.

- **Outcomes of Information Security Program Management**
 - Objectives for information security governance include:
 - Strategic alignment
 - Risk management
 - Value delivery
 - Resource management
 - Assurance process integration
 - Performance measurement

Information Security Program Objectives

- Execute the information security strategy in the most **cost-effective** manner
- Maximize **support of business functions**
- Minimize **business disruptions**

Information security program management uses a structured grouping of projects to produce clearly identified **business value**.

Information Security Program Concepts

A **security program implementation** effort should include a series of specific control objectives:

- Technical
- Procedural
- Physical

Concepts

Implementing and managing a security program will require the information security manager to understand and have a working knowledge of a number of management and process concepts including:

- System development life cycles (SDLCs)
- Requirements development
- Specification development
- Control objectives
- Control design and development

- Control implementation and testing
- Control monitoring and metrics
- Architectures
- Documentation
- Quality Assurance
- Project management
- Business case development
- Business process reengineering
- Budgeting, costing and financial issues
- Deployment and integration strategies
- Training needs assessments and approaches
- Communications
- Problem resolution
- Variance and noncompliance resolution
- Risk management
- Compliance monitoring and enforcement
- Personnel issues

Technology Resources

Technology itself is not a control - technology is used to *implement* controls:

- It is essential that the Information Security Manager understands where a given technology fits into the basic prevention, detection containment, reaction and recovery framework.

There are numerous technologies related directly to information security with which the ISM should be familiar including:

- Firewalls
- Routers and switches
- IDS, NIDS, HIDS
- Cryptographic techniques (PKI, AES)
- Digital signatures
- Smart cards

Scope and Charter of an Information Security Program

- Since the scope and charter are generally not explicitly stated, the ISM must gain a thorough understanding of the organization's:
 - Goals
 - Risk appetite and tolerance
 - Principles, Policies, Frameworks
 - Processes
 - Organizational Structures
 - Culture, Ethics and Behaviors
 - Information

- Services, Infrastructure and Applications
- People, Skills and Competencies
- The ISM must try to integrate information security policy into existing sets of people following established processes and policies using existing systems.
- The ISM must also identify the technologies in use that process the information covered by the information security policy

The Information Security Management Framework

- Should fundamentally describe the information security management components and their interactions.
- Information security management components include:
 - Roles
 - Policies
 - Standard operating procedures
 - Management procedures
 - Security architectures, etc.
- **Cobit 5**

The ISM should understand the benefits of the following principles as they apply to an information security management framework:

 - Meeting Stakeholder Needs
 - Covering the Enterprise End-to-End
 - Applying a Single, Integrated Framework
 - Enabling a Holistic Approach
 - Separating Governance from Management
- **ISO/IEC 27001:2013**

The ISM should be aware of the breadth of the following information security management control areas:

 - Information security policies
 - Organization of information security
 - Human resource security (controls that are applied before during or after employment)
 - Asset management
 - Access control
 - Cryptography
 - Physical and environmental security
 - Operation security
 - Communications security
 - System acquisition, development and maintenance

- Supplier relationships
- Information security incident management
- Information security aspects of business continuity management
- Compliance (with internal requirements, such as policies, and with external requirements, such as laws)

Operational Components

- Operational components are ongoing activities that must be performed because of information security requirements
- Operational components that are part of an information security program include:
 - Standard operating procedures (**SOPs**)
 - Business operations **security practices**
 - **Maintenance and administration** of security technologies (e.g., identity management, access control administration, and SIEM monitoring and analysis)
- The ISM should determine the operational components needed to implement policies and standards:
 - Should then plan for deployment, monitoring and management of operational components
- Because many operational components fall outside of the information security domain (e.g., patching procedures), the ISM should leverage IT, business units and other resources to ensure that operational needs are thoroughly covered.
- For each operational component, the ISM should:
 - **Identify** the component owner
 - **Collaborate** to document key information needed for component effectiveness

Management Components

- **Sets the stage** for the information security program
- Takes place **less frequently** than operational components
- Are often responsibility of **middle and senior management**
- Issues can be escalated to the **board level** (e.g., oversight)
- Include:
 - **Standards development** or modification
 - **Policy reviews**
 - **Oversight** of initiatives or program executions
- **Management objectives, requirements and policies** are key in shaping the rest of the information security program
- The information security manager must ensure that this process is executed with **appropriate consideration to legal, regulatory, risk and resource issues** as well as a suite of metrics needed for decision support

- Ongoing or **periodic analysis** of assets, threats, risks and organizational impacts must continue to be the basis for modifying security policies and developing or modifying standards
- The information security manager is well advised to exercise flexibility in making adjustments to standards and policy interpretation during the initial stages of a security program
- It is important that there is **management oversight** ensuring fulfillment of requirements and consistency with strategic direction

Administrative Components

- The ISM must **ensure effective administration** of the information security program including matters related to:
 - Finance
 - HR
 - Support functions
- Strong working **rapport with Finance and HR departments** will help facilitate an effective information security program execution
- The ISM must balance project efforts and ongoing operational overhead with:
 - Staff headcount
 - Utilization levels
 - External resources
- Resource utilization must be prioritized based on guidance from:
 - **Steering committee**
 - **Executive management**
- **Workload balancing** and **external resources** help addresses planned/unplanned spikes in activity
- Roles and responsibilities:
 - The ISM must:
 - Ensure that **executive management** understands the risk implications of starting an initiative without full security diligence
 - Executive management must:
 - **Decide** if the initiative is important enough to warrant the risk

Educational and Informational Components

- Training and Education:
 - Can be considered **preventive measures**
 - Educate employees on:
 - Threats and risks
 - Appropriate practices
 - Repercussions of non-compliance
 - Include:

- Organizational policies and procedures
- Appropriate Use Policy
- Protection of Proprietary Information (POPI) Policy
- Employee monitoring
- Generally communicated and administered by HR function

Defining an Information Security Program Road Map

- Key goals are universal and include:
 - Strategic alignment
 - Risk optimization
 - Resource optimization
 - Benefits realization
 - Value delivery
- An ISM road map helps define what each process means to a given organization.
- Because the ISM rarely begins with a blank slate, the ISM must be able to review and evaluate the security level of existing:
 - Data
 - Applications
 - Systems
 - Facilities
 - Processes

*Security reviews need to have an objective, scope, constraints, approach and result

Gap Analysis – Basis for an Action Plan

- The ISM must:
 - Identify where **control objectives** are not adequately supported by control activities
 - Establish procedures for **continuously monitoring** achievement of control objectives
 - Design an information security with the flexibility to **evolve** and **mature**

Information Infrastructure and Architecture

- **Infrastructure:** the underlying base or foundation upon which information systems are deployed

- **Security infrastructure:** the foundation that enables security resources to be deployed
- When infrastructure is designed and implemented to support policies and standards, the infrastructure is said to be secure

Enterprise Information Security Architecture

- Information security architecture includes multiple layers ranging from **contextual to physical**
- The design is tightly aligned with the purpose. **Good architecture** is an articulation of policy

Objectives of Information Security Architectures

Architecture:

- Helps manage complexity by acting as an integrated road map for projects and services
 - Provides simplicity and clarity through layering and modularization
 - Take into account organizational:
 - Goals
 - Environment
 - Technical (and business) capabilities
 - Is broader than “technology”
 - Has a **business** focus
- The underlying principle for architecture is that the objectives of **complex systems** must:
 - Be comprehensively **defined**
 - Have **precise specifications** developed
 - Have their structures engineered and **tested** for form, fit and function
 - Have their performance **monitored and measured** in terms of the original design objectives and specification

Architecture Implementation

- Development of comprehensive enterprise security architecture
- Approach
- Framework considerations

- Numerous architectural frameworks have been developed to address the need for overall comprehensive model for information systems:
 - COBIT
 - ITIL
 - ISO/IEC 27001:2013
 - SABSA

Personnel, Roles and Responsibilities and Skills

- **Personnel:**
 - Architects, designers, builders, developers, testers and others involved in the construction of the information security program
 - Likely to be different from the personnel that will administer systems once they are functioning
- **Roles:**
 - Responsibilities and/or **access rights** assigned according to function
- Personnel and skills differ for:
 - Development of the ISM Program
 - Architects
 - Designers
 - Builders
 - Developers
 - Testers
 - Operations of the ISM Program
 - Security analysts
 - Database administrators
 - Network administrators
- **Role:** A designation assigned to an individual by virtue of a job function responsibilities
- **Responsibility:** A description of some procedure or function related to the role that someone is accountable to perform
- **Skills:** Training, expertise and experience held by the personnel for a given job function
- **Culture:**
 - Represents the organizational behavior:
 - Methods for navigating and influencing the organization's formal and informal structures
 - Attitudes
 - Norms
 - Level of teamwork
 - Existence or lack of turf issues
 - Geographic dispersion

Security Awareness, Training and Education

- **Background and training** is necessary for execution of tasks
- Training classes should be tailored for those with security job responsibilities
- An information security **awareness program** must also include end-user training
- Topics for awareness training can include topics such as:
 - **Choosing passwords** wisely and protecting them from exposure
 - Avoiding e-mail and web-based **malware**
 - Recognizing **social engineering** attacks
 - Recognizing and **reporting** security incidents
 - Securing **electronic and paper media** against theft and exposure
 - Spotting malware that could lead to identity theft and desktop spying
 - **Backing up** work-related files

Documentation

- Primary documentation used to implement the information security program include:
 - Policies
 - Standards
 - Procedures
 - Guidelines
- Some of the documentation required will typically include:
 - Program objectives
 - Road maps
 - Business cases
 - Resources required
 - Controls
 - Budgets
 - Systems designs/ architectures
 - Policies, standards, procedures, guidelines
 - Project plan milestones, time lines
 - KGIs, KPIs, critical success factors (CSFs), other metrics
 - Training and awareness requirements
 - Business impact and risk analysis
 - Service level agreements (SLAs)
 - Severity criteria
 - Declaration criteria

Program Development and Project Management

- A **gap analysis** will identify a series of projects that will improve the information security program
 - Each project must:
 - Have a **defined time, budget and measurable objectives**
 - Make the environment more secure without otherwise causing control weaknesses in other areas
- The ISM prioritizes the portfolio of projects so that:
 - **Interdependent projects** do not delay each other
 - Resources are optimally allocated
 - Results are smoothly integrated into existing operations
- The ISM should employ generally accepted project management techniques, such as:
 - Goal setting
 - Progress monitoring
 - Tracking deadlines
 - Assigning responsibilities

Risk Management

- Virtually all aspects of the information security management (ISM) program aim to reduce risk to an **acceptable level**
- One risk management aspect of the ISM program is **incident management**
- The ISM must understand and develop the requisite skills to:
 - Identify
 - Evaluate/analyze
 - Manage (respond to) risk
- Knowledge and skills to manage risk as part of the ISM program may include:
 - Program development life cycle risk
 - Program management risk
 - Project risk
 - Vulnerability assessment methods
 - Threats specific to the information security manager's organization
 - Risk analysis approaches
 - Risk response options
 - Ability to understand and assess potential impacts if risk are exploited
 - Risk monitoring and reporting
 - Threat analysis

Business Case Development

- Purpose of a **Business case**
 - Obtain support of **influencers and decision makers**
 - Require those proposing projects to provide a clear value proposition
 - Enable:
 - Comparison between competing projects/proposals
 - Objective decision-making
 - Measurability of project success against projection

- Business case content:
 - Reference
 - Context
 - Value proposition
 - Focus
 - Deliverables
 - Dependencies
 - Project metrics
 - Workload
 - Required resources
 - Commitments

- Objectives of the **business case process** is to be:
 - Adaptable
 - Consistent
 - Business oriented
 - Comprehensive
 - Understandable
 - Measurable
 - Transparent
 - Accountable

Program Budgeting

- Program budget has a significant impact on program success. Project budget elements to be considered include:
 - Employee time
 - Contractor and consultant fees
 - Equipment
 - Space requirements
 - Testing resources
 - Support documentation
 - Ongoing maintenance
 - Contingencies for unexpected costs

General Rules of Use/Acceptable Use Policy

- Rules for all personnel include policies and standards for:
 - Access control
 - Classification
 - Marking and handling of documents and information
 - Reporting requirements
 - Disclosure constraints

Information Security Problem Management Practices

- Requires a systematic approach to:
 - Understanding the aspects of the issue
 - Defining the problem
 - Designing an action program
 - Assigning responsibilities and due dates for resolution

Vendor Management

- ISM is responsible for the **oversight and monitoring** of external providers.

Program Management Evaluation

- Evaluation of program management components will reveal the extent of **management support** and the overall depth of the program:
 - Very technical, tactically-driven programs are **weak** in management components
- Considerations of program management components include:
 - Is there thorough documentation of the program itself?
Have key policies, standards and procedures been reduced to accessible operating guidelines and distributed to responsible parties?
 - Do responsible individuals understand their roles and responsibilities?
Are roles and responsibilities defined for members of senior management, boards, etc.? Do these entities understand and engage their responsibilities?
 - Are responsibilities for information security represented in business manager's individual objectives and part of their individual performance rating?

- Are policies and standards defined, formally approved and distributed?
- Are business unit managers involved in guiding and supporting information security program activities?
- Is there a formal steering committee?
- How is the program positioned within the organization?
- To whom is the program accountable?
- Does this positioning impart an appropriate level of authority and visibility for the objectives that the program must fulfill?
- Does the program implement effective administration functions?
- Are meaningful metrics used to evaluate program performance? Are these metrics regularly collected and reported?
- Are there forums and mechanisms for regular management oversight of program activities? Does management regularly reassess program effectiveness?

Information Security Liaison Responsibilities

- Physical/Corporate Security
- IT Audit
- Information Technology Unit
- Business Unit Management
- Human Resources
- Legal Department
- Employees
- Procurement
- Compliance
- Privacy
- Training
- Quality Assurance
- Insurance
- Third Party Management
- Project Management Office

Other Security Program Services and Operational Activities

- Cross-organizational responsibilities
- Incident Response
- Security Reviews and Audits
- Management of Security Technology
- Due Diligence
- Compliance Monitoring and Enforcement

- Assessment of Risk and Impact
- Outsourcing and Service Providers
- Cloud Computing
- Integration with IT Processes

Controls and Countermeasures

- A vital element of an information security program is a **roles and responsibilities matrix**.
- An ISM must understand the **general risk appetite** of an organization to determine whether gaps in an information security program exist have reached acceptable levels.
- Key criteria in selecting technical elements of an information security road map are thus:
 - Adoption of a security architecture
 - The ability of formally delegate responsibility for operating within it

Control Categories

- Control categories include:
 - Preventive
 - Detective
 - Corrective
 - Compensatory
 - Deterrent

Other Control and Countermeasures

- Control Design Considerations
- Control Strength
- Control Methods
- Control Recommendations
- Countermeasures
- Physical and Environmental Controls
- Control Technology Categories
- Technical Control Components and Architecture
- Control Testing and Modification
- Baseline Controls

Control Technology Categories

- **Native control technologies** comprise an essential part of the technology environment:
 - **Out-of-the-box security features** can be integrated with business information systems
 - Generally configured and operated by IT
- Supplemental control technologies can also be used:
 - Components can be added on to an information systems environment
 - Usually provide some function that is not available on the native components (network intrusion detection), or that is more appropriate to implement outside of primary business application systems
 - Tend to be more specialized than native control technologies
- Management support technologies are frequently used:
 - Can automate security-related procedures, provide management information processing, and/or increase management efficiency
 - Examples include security information management (SIM) tools, compliance monitoring scanners and security event analysis systems
 - Are often used by information security group independently of information technology

Technical Control Components and Architecture

- Analysis of technical components and architecture must be performed:
 - When analyzing **technical security architecture**, the ISM must use a clearly defined set of measurable criteria to enable tracking of performance metrics
 - A few possible criteria for analyzing technical security architecture and components might include
 - Control placement
 - Control effectiveness
 - Control efficiency
 - Control policy
 - Control implementation

Security Program Metrics and Monitoring

- Used to track and guide a program with the following:
 - Metrics Development
 - Monitoring Approaches
 - Measuring Information Security Management Performance
 - Measuring Information Security Risk and Loss
 - Measuring Support of Organizational Objectives
 - Measuring Compliance
 - Measuring Operational Productivity
 - Measuring Security Cost Effectiveness
 - Measuring Organizational Awareness
 - Measuring the Effectiveness of Technical Security Architecture
 - Measuring the Effectiveness of Management Framework and Resources
 - Measuring Operational Performance
 - Monitoring and Communication

Common Information Security Program Challenges

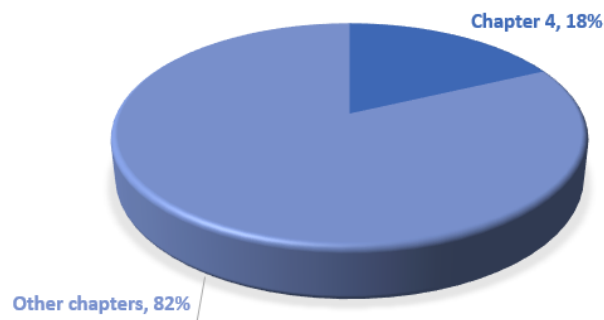
- Management Support
- Funding
- Staffing

CHAPTER 4:

Information Security Incident Management

Exam Relevance: 18% (approximately 36 questions)

EXAM COMPOSITION PERCENTAGE



Objective

Ensure that the information security manager has the knowledge and understanding necessary to **plan, establish and manage** the capability to **detect, investigate, respond** to and **recover** from information security incidents to **minimize business impact**.

Incident Management Overview

- Purpose is to **manage** the impact of unexpected disruptive events to **acceptable levels**
- Possible disruptions may be:
 - Technical
 - Physical
 - Environmental
- Any type of incident that can significantly affect an organization's **ability to operate** or that **may cause damage** must be considered by the ISM
- Goals for incident management:

- **Detect** incidents quickly
- **Diagnose** incidents accurately
- **Manage** incidents properly
- **Contain** and minimize damage
- **Restore** affected services
- Determine **root causes**
- Implement improvements to **prevent recurrence**
- **Document** and report

Incident Response Procedures

- **Incident response** procedure (IRP) enable a business to:
 - Respond effectively when an incident occurs
 - To continue operations in the event of disruption
 - Survive interruptions or security breaches in information systems
- Plans must be:
 - Clearly documented
 - Readily accessible
 - Based on the long-range IT plan
 - Consistent with the overall business continuity and security strategies
- As a part of the planning process, a number of decisions must be **made by the stakeholders and ratified by senior management**. These will include:
 - Incident detection capabilities
 - Clearly defined severity criteria
 - Assessment and triage capabilities
 - Declaration criteria
 - Scope of incident management
 - Response capabilities
- The process of developing and maintaining an appropriate plan for the defined scope of incident management and response should include:
 - Incident Response Planning
 - Disaster Recovery Planning
 - Business Continuity Planning

Importance of Incident Management

- The following factors have contributed to the criticality of incident management and response:
 - The **trend** of both increased occurrences and escalating losses resulting from information security incidents
 - The **increase of vulnerabilities** in software or systems can affect large parts of an organization's infrastructure and impact operations

- **Failure of security controls** to prevent incidents
- **Legal and regulatory** groups requiring the development of an incident management capability
- The **growing sophistication** and capabilities of profit-oriented attackers
- Advanced persistent threats (**APTs**)

Outcomes of Incident Management

- Outcomes of good incident management and response include an organization that:
 - Can deal effectively with **unanticipated** events
 - Has sufficient **detection and monitoring** capabilities
 - Has well defined **severity and declaration criteria** as well as defined **escalation and notification processes**
 - Has response capabilities that demonstrably **support the business strategy**
 - **Proactively** manage risks of incidents appropriately
 - **Periodically tests** its capabilities
 - Provide **monitoring and metrics** to gauge performance of incident management and response capabilities

Concepts

- **Incident handling** is one service that involves all the processes or tasks associated with handling events and incidents. It involves multiple functions:
 - Detection and reporting
 - Triage
 - Analysis
 - Incident response
- Effective incident management will ensure that incidents are
 - Detected
 - Recorded
 - Managed to limit impacts
- **Incident response** is the last step in an incident handling process

It encompasses:

 - Planning, coordination, and execution of any appropriate mitigation
 - Recovery strategies and actions

Incident Management Systems

- **Incident management systems** automate many manual processes:
 - Can deliver only **filtered information** indicating an incident to be handled by the incident management team (IMT)
 - Can be **distributed or centralized**
- An effective incident management system should:
 - Consolidate inputs from multiple systems
 - Identify incidents or potential incidents
 - Prioritize incidents based on business impact
 - Track incidents until they are closed
 - Provide status tracking and notifications
 - Integrate with major IT management systems
 - Implement good practices guidelines

Incident Management Organization

- **Incident management** is a component of risk management
- Activities in incident management include meeting with emergency management personnel
- Emergency management activities focus around activities that happen **after the event**

Responsibilities

- The ISM's incident response-related responsibilities include:
 - Developing the information security incident management and response plans
 - Handling and coordinating information security incident response activities effectively and efficiently
 - Validating, verifying and reporting of protective or countermeasure solutions, both technical and administrative
 - Planning, budgeting and program development for all matters related to information security incident management and response
- Incident response goals include:
 - **Containing** and minimizing the effects of the incident so that damage and losses do not escalate out of control
 - **Notifying** the appropriate people for the purpose of recovery or to provide needed information

- **Recovering** quickly and efficiently from security incidents
 - **Responding** systematically and decreasing the likelihood of recurrence
 - Balancing operational and security processes
 - Dealing with legal and law enforcement-related issues
- The ISM must define what constitutes a security-related incident:
 - Malicious code attacks
 - Unauthorized access to IT or information resources
 - Unauthorized utilization of services
 - Unauthorized changes to systems, network devices or information
 - Denial of service
 - Misuse
 - Surveillance and espionage
 - Hoaxes/social engineering

Senior Management Commitment

- Senior management commitment is **critical to the success** of incident management and response.
- Incident management and response:
 - Is a component of risk management
 - Needs the same level of support from the top

Incident Management Resources

- Develop a clear scope and objective
- Develop an implementation strategy

Policies and Standards

- The incident response plan must be backed up with well-defined policies, standards and procedures. This helps:
 - Ensure activities are aligned with IMT mission
 - Set correct expectations
 - Provide guidance on operational needs
 - Maintain consistency and reliability of services
 - Clearly understand roles and responsibilities
 - Set requirements for identified alternates for all important functions

Incident Response Technology Concepts

- IRT members should be familiar with:
 - Basic Security Principles
- IRT members must understand the impact to organizational systems, including:
 - Security vulnerabilities/weaknesses
 - Internet
 - Operating system(s)
 - Malicious code
 - Programming skills

Personnel

- Composition of IMT
 - Information Security Manager
 - Steering Committee/Advisory Board
 - Perm/Dedicated Team Members
 - Virtual/Temp Team Members
- Team organizational types:
 - Centralized IRT
 - Distributed IRT
 - Coordinating IRT
 - Outsourced IRT
- Factors for team composition:
 - Mission and goals of program
 - Nature and range of services offered
 - Available staff expertise
 - Consistency size and technology base
 - Anticipated incident load
 - Severity or complexity of incident reports
 - Funding

Roles

- **Security steering group**- highest structure of an organization's functions related to information security
- **Information security manager**-IMT leader and main interface to SSG
- **Incident response manager**-IRT leader

- **Incident handler**-IMT/IRT team member
- **Investigator**-IMT/IRT team member
- **It security specialist**-IMT/IRT team member
- **Business managers**-business functions owners; information assets/system owners
- **IT specialists/representatives**-subject matter experts in IT services
- **Legal representative**-subject matter expert in legal
- **HR**-subject matter expert in HR area
- **Public relations (PR) representative**-subject matter expert in PR area
- **Risk management specialist**-subject matter expert in risk management
- **Physical security/facilities manager**-knowledgeable about physical plant and emergency capabilities

Skills

Team member skills include:

- Personal skills:
 - Communication
 - Leadership
 - Presentation
 - Ability to follow policies and procedures
 - Team
 - Integrity
 - Self-understanding
 - Coping with stress
 - Problem solving
 - Time management
- Technical skills:
 - Technical Foundation
 - Incident Handling

Awareness and Education

Incident response training must include the following target groups:

- End users
- Management
- IMT team
- General IT team

Audits

- Are performed to verify the incident response process conformance to
 - Policies
 - Standards
 - Guidelines
 - Procedures
- Provide an **objective view** of the overall completeness and functionality of the incident response plans
- Provide assurance that major gaps in the processes do not exist
- Audits can be **internal or external**:
 - **Internal audits** are conducted by control specialists within the organization
 - **External audits** are performed by a third party and provide additional independence

Defining Objectives

The objectives of incident management are:

- **Handle incidents when they occur** so that the exposure can be contained or eradicated to enable recovery within an AIW
- Prevent previous incidents from recurring by **documenting** and **learning** from past incidents
- Deploy **proactive countermeasures** to prevent/minimize the probability of incidents from taking place

The Desired State

Incident management and response requires:

- Well-developed **monitoring capabilities** for key controls
- **Personnel trained** in assessing the situation, capable of providing triage, and managing effective responses
- Managers who:
 - Know when a disaster is imminent
 - Have well-defined criteria
 - Have the experience, knowledge and the authority to invoke the disaster recovery processes necessary to maintain or recover operational status

Strategic Alignment

Incident management must be aligned with an **organization's strategic plan**:

- **Constituency**-to whom does the IMT provide service?
- **Mission**-defines the purpose of the team

- **Services**-services should be clearly defined
- **Organizational structure**-the structure of the IMT should support the organizational structure
- **Resources**-sufficient staffing is necessary for effectiveness
- **Funding**-sufficient funding is required to ensure continuity of services
- **Management buy-in**-senior management buy-in is essential

Risk Management

- Successful outcomes of risk management include effective incident management and response capabilities
- Any **risk that materializes** that is not prevented by controls will constitute an **incident** that must be managed and responded to with the intent that it does not escalate into a disaster

Value Delivery

To deliver value, incident management should:

- **Integrate with business processes** and structures as seamlessly as possible
- Improve the capability of businesses to **manage risk and provide assurance** to stakeholders
- Integrate with **BCP**
- Become part of an **organization's overall strategy** and effort to protect and secure critical business function and assets
- Provide the backstop and optimize risk management efforts

Resource Management

- Optimizes **resource utilization** to meet objective within resource constraints
- Spans
 - Time
 - People
 - Budget
 - Technology
 - And other factors

Performance Measurement

- Performance measurements for incident management and response will focus on achieving the defined objective and optimizing effectiveness

- **KPIs and KGIs** should be defined and agreed upon by stakeholders and ratified by senior management

Defining Incident Management Procedures

The two most commonly used approaches are by

- **CMU/SEI**
 - Computer Emergency Response Team (CERT)
- **SANS Institute**
 - Computer Incident Advisory Center (CIAC)

Detailed Plan of Action for Incident Management

- The incident management action plan is also known as the **incident response plan (IRP)**
- In the CMU/SEI technical report titled *Defining Incident Management Processes*, the approach is as follows:
 - **Prepare/improve/sustain** sub process includes:
 - Coordinating planning and design:
 - Identify incident management requirements
 - Establish vision and mission
 - Obtain funding and sponsorship
 - Develop implementation plan
 - Coordinate implementation:
 - Develop policies, processes and plans
 - Establish incident handling criteria
 - Implement define resources
 - Evaluate incident management capability
 - Conduct postmortem review
 - Determine incident management process changes
 - Implement incident management process changes
 - **Protect** infrastructure sub process includes:
 - Implement changes to computing infrastructure protection improvements from postmortem reviews or other process improvement mechanisms
 - Evaluate computing infrastructure by performing proactive security assessment and evaluation
 - Provide input to detect process on incidents/potential incidents
 - **Detect** events sub process includes:
 - Proactive detection-the detect process is conducted regularly prior to incident

- Reactive detection-the detect process is conducted when there are reports from system users or other organizations
- **Triage** events
 - Can be done on two levels:
 - Tactical, based on a set of criteria
 - Strategic, based on the impact of business
 - Sub process includes
 - Categorization:
 - Denial of service
 - Malicious code
 - Unauthorized access
 - Inappropriate usage
 - Multiple components (Correlation, Prioritization, Assignment)
- **Respond** sub process includes:
 - Technical response:
 - Collecting data for further analysis
 - Analyzing incident supporting information such as log files
 - Technical mitigation strategies and recovery options
 - Phone or e-mail technical assistance
 - On-site assistance
 - Analysis of logs
 - Development and deployment of patches and workarounds
 - Management response
 - Legal response

Current State of Incident Response Capability

Ways to identify the current state of incident response capability include:

- Survey of senior management, business managers and IT representatives
- Self-assessment
- External assessment or audit

History of Incidents

Past incidents:

- Provide valuable information on trends, types and business impacts
- Are an input into the assessment of the types of incidents that must be considered and planned for

Threats

Threats are any event that may cause harm to an organization's assets, operations or personnel. There are a number of threats that must be considered including:

- Environmental
- Technical
- Man-made

Vulnerabilities

- **Vulnerabilities** are weaknesses in a system, technology, process, people or control that can be exploited and result in exposure
- **Vulnerability management** is the proactive identification, monitoring and fixing of relevant weaknesses

Developing an Incident Response Plan

CIAC (and later the SANS Institute) propose the following incident response phase:

- **Preparation**
 - This phase prepares an organization to develop an incident response plan prior to an incident. Sufficient preparation facilitates smooth execution
 - Activities in this phase include:
 - Establishing an approach to handle incidents
 - Establishing policy and warning banners in information systems to deter intruders and allow information collection
 - Establishing communication plan to stake holders
 - Developing criteria on when to report incident to authorities
 - Developing a process to activate the incident management team
 - Establishing a secure location to execute the incident response plan
 - Ensuring equipment needed is available
- **Identification**
 - This phase aims **to verify** if an incident has happened and find out more details about the incident. Reports on possible incidents may come from information systems, end users or other organizations. Not all reports are valid incidents, as they may be false alarms or may not qualify as an incident.
 - Activities in this phase include:
 - Assigning ownership of an incident or potential incident to an incident handler
 - Verifying that reports or events qualify as an incident
 - Establishing chain of custody during identification when handling potential evidence

- Determining the severity of an incident and escalating it as necessary
- **Containment**
 - After an incident has been identified and confirmed, the IMT is activated and information from the incident handler is shared
 - The team will conduct a detailed assessment and contact the system owner or business manager of the affected information systems/assets to coordinate further action
 - The action taken in this phase is **to limit the exposure**. Activities in this phase include:
 - Activating the incident management/response team to contain the incident
 - Notifying appropriate stakeholders affected by the incident
 - Obtaining agreement on actions taken that may affect availability of a service or risks of the containment process
 - Getting the IT representative and relevant virtual team members involved to implement containment procedures
 - Obtaining and preserving evidence
 - Documenting and taking backups of actions from this phase onward
 - Controlling and managing communication to the public by the public relations team
- **Eradication**
 - When containment measures have been deployed, it is time to determine the **root cause** of the incident and eradicate it
 - Eradication can be done in a number of ways:
 - Restoring backups to achieve a clean state of the system
 - Removing the root cause
 - Improving defenses
 - Performing vulnerability analysis to find further potential damage from the same root cause
 - Activities in this phase include:
 - Determining the signs and cause of incidents
 - Locating the most recent version of backups or alternative solutions
 - Removing the root cause. In the event of worm virus infection, it can be removed by deploying appropriate patches and updated antivirus software
 - Improving defenses by implementing protection techniques
 - Performing vulnerability analysis to find new vulnerabilities introduced by the root cause
- **Recovery**
 - This phase ensures that affected systems or services are restored to a condition specified in the service delivery objectives (SDO) or business

continuity plan (BCP). The time constraint up to this phase is documented in the RTO.

- Activities in this phase include:
 - Restoring operations to normal
 - Validating that actions taken on restored systems were successful
 - Getting involvement of system owners to declare normal operation
- **Lessons learned**
 - At the end of the incident response process, a report should be developed to share what has happened, what measures were taken and the results after the plan was executed
 - The report should contain lessons learned that provide the IMT and other stakeholders valuable learning points of what could have been done better
 - These lessons should be developed onto a plan to enhance the incident management capability and the documentation of the incident response plan.
 - Writing the incident report
 - Analyzing issues encountered during incident response efforts
 - Proposing improvement based on issues encountered
 - Presenting the report to relevant stakeholders

Gap Analysis-Basis for an Incident Response Plan

- **Gap analysis**-compares current incident response capabilities with the desired level
- By comparing the two levels, the following may be identified:
 - Processes that need to be improved to be more efficient and effective
 - Resources needed to achieve the objectives for the incident response capability

Business Impact Assessment

- A BIA should:
 - **Determine the loss** to the organization resulting from a function being unavailable
 - Establish the **escalation** of that loss over time
 - Identify the minimum resources needed for recovery
 - Prioritize the recovery of processes and supporting systems
- Create report to aide stakeholders in understanding what impact an incident would have on the business
- A successful BIA requires participation from:
 - Senior management
 - IT

- End-user personnel
- BIA goals
 - Critically prioritization
 - Downtime estimation
 - Resource requirement
- A BIA includes the following activities:
 - Gathering assessment material
 - Analyzing the information compiled
 - Documenting the result and presenting recommendations

Elements include:

- Business/ department mission
- Functions that characterize each business function
- Dependencies-inputs and outputs
- Identify critical processing cycles
- Estimated impact of various incidents
- Identify resources and activities required for restoration
- Determine work-around possibilities
- Estimate recovery time

Benefits include

- Increased understanding of potential loss
- Common facilitation of all response activities
- Raising awareness of response management in organizations

Escalation Process for Effective Incident Management

- Implement escalation process to establish the events to be managed
- For each event, a list of actions should be described in the sequence to be performed
- Each event should be assigned a criticality/sensitivity level
- The ISM should consult others in the development of escalation procedures

Incident Management and Response Teams

Number of teams depends upon **size of organization** and **magnitude** of operations-examples include:

- The emergency action team
- Damage assessment team
- Emergency management team
- Relocation team
- Security team

Organizing, Training and Equipping the Response Staff

Every IMT member should get the following types of training:

- Induction to IMT-basic information about the team and its operations
- Mentoring regarding team's roles, responsibilities and procedures
- On-the-job training
- Formal training

Challenges in Developing an Incident Management Plan

Unanticipated challenges may be the result of:

- **Lack of management buy-in** and organizational consensus
- **Mismatch** to organizational goals and structure
- IMT member **turnover**
- **Lack of communication** process
- **Complex** and wide plan

Business Continuity and Disaster Recovery Procedures

Considerations when developing response and recovery plans include:

- Available resources
- Expected services
- Types, kinds, and severity of threats faced by the organization

Recovery Planning and Business Recovery Process

- **Disaster recovery** has traditionally been defined as the recovery of IT systems after disruptive events
- **Business recovery** is defined as the recovery of the critical business processes necessary to continue or resume operations

Each of these planning processes typically includes several main phases, including:

- Risk and business impact **assessment**
- **Response and recovery** strategy definition
- **Documenting** response and recovery plans
- **Testing** response and recovery plans
- **Auditing** response and recovery plans

Recovery Strategies

- The most appropriate strategy is likely to be one that demonstrably addresses probable events with acceptable recovery times at a reasonable cost
- The development of an incident management and response plan is likely to be a difficult and expensive process that may take considerable time:
 - Requires the development of several alternative strategies
 - It may be prudent to consider outsourcing some or all of the needed capabilities

Addressing Threats

In the case of threats, some possible strategies to consider may include:

- **Eliminate** or neutralize a threat
- **Minimize the likelihood** of a threat's occurrence
- **Minimize the effects** of a threat if an incident occurs

Recovery Sites

Types of offsite backup hardware facilities available include:

- Hot sites
- Warm sites
- Cold sites
- Mobile sites
- Duplicate sites
- Mirror sites

Criteria for selecting alternate sites include:

- The site should not be subject to the same natural disaster(s) as the primary site
- Ability to coordinate hardware/software strategies
- Assurance of resource ability
- Ability to agree concerning the priority of adding applications (workloads) until all the recovery resources are fully utilized
- Ability to test regularly

Basis for Recovery Site Selections

Response and recovery strategy should be based on the following considerations:

- Interruption window

- RTOs
- RPOs
- Services delivery objectives (SDOs)
- Maximum tolerable outages (MTOs)
- Proximity factors
- Location
- Nature of probable disruptions

Reciprocal Agreements

Alternatives available for securing backup hardware and physical facilities include:

- A vendor or third party
- Off-the-shelf-to make use of this approach, several strategies must be employed:
 - Avoiding the use of unusual and hard-to-get equipment
 - Regularly updating equipment to keep current
 - Maintaining software compatibility to permit the operation of newer equipment
- **Recovery of IT facilities** involves telecommunications and network recovery
- Methods used are:
 - Alternative routing
 - Diverse routing
 - Long-haul network diversity
 - Protection of local resources
 - Voice recovery
 - Availability of appropriate circuits and adequate bandwidth
 - Availability of out-of-band communications in case of failure of primary communications methods
- **Recovery strategies** must work for the entire period of recovery until all facilities are restored
- Strategies may include:
 - **Doing nothing** until recovery facilities are ready
 - Using **manual** procedures
 - **Focusing** on the most important customers, suppliers, products, and systems with resources that are still available
 - **Using PC-based systems** to capture data for later processing or performing simple local processing

Strategy Implementation

Plan development factors include:

- Pre-incident readiness
- Evacuation procedures

- How to declare a disaster
- Identification of the business processes and IT resources that should be recovered
- Identification of the responsibilities in the plan
- Identification of contact information
- The step-by-step explanation of the recovery options
- Identification of the various resources required for recovery and continued operations
- Ensuring that other logistics such as personnel relocation and temporary housing are considered

Integrating Recovery Objectives and Impact Analysis with Incident Response

Risk

- Is the combination of the probability of an event and its consequence (ISO/IEC 73)
- A basic understanding of security risk analysis and the effects on organizations of various types of risk are important components of incident management

Risk Tolerance

- Is the acceptable level of variation that management is willing to allow for any risk as the enterprise pursues its objectives
- Is the same as acceptable risk
- Must be determined by management

The ISM needs to:

- Oversee the development of response and recovery plans to ensure that they are properly designed and implemented
- Ensure resources required to continue the business are identified and recorded
- Identify and validate response and recovery strategies
- Obtain **senior management approval** of strategies
- Oversee the development of comprehensive response and recovery plans
- **Recovery time objective** is defined as the amount of time allowed for recovery of a business function or resource after a disaster occurs.
- Effective incident management includes resolving incidents with the **acceptable interruption window (AIW)**.
- A **recovery point objective (RPO)** is a measurement of the point prior to an outage to which data are to be restored.

Notification Requirements

Plan should include a **call tree** with prioritized list of contacts:

- Representatives of equipment and software **vendors**
- **Contacts within companies** that have been designated to provide supplies and equipment or services
- **Contacts at recovery facilities**, including hot site representatives or predefined network communications rerouting services
- **Contacts at offsite** media storage facilities and the contacts within the company who are authorized to retrieve media from the offsite facility
- **Insurance** company agents
- Contact information for **regulatory bodies**
- Contacts at **human resources (HR)** and/or contract personnel services
- **Law enforcement** contacts

Methods for Providing Continuity of Network Services

- Redundancy
- Alternate routing
- Diverse routing
- Long-haul diversity
- Last mile circuit protection
- Voice recovery

High-Availability Considerations

Plan must also address fault tolerant systems:

- Fail safe servers using clusters or load balancing
- Redundant array of Inexpensive Disks (RAID)

Insurance

Types of insurance coverage:

- IT equipment and facilities
- Media (software) reconstruction
- Extra expense
- Business interruption
- Valuable papers and record

- Errors and omissions
- Fidelity coverage
- Media transportation

Periodic Testing of the Response and Recovery Plans

Testing must include:

- Developing test objectives
- Executing the test
- Evaluating the test
- Developing recommendations to improve the effectiveness of testing processes as well as response and recovery plans
- Implementing a follow-up process to ensure that the recommendations are implemented

Testing for Infrastructure and Critical Business Applications

After test objectives have been defined, the ISM must:

- Ensure that an independent third-party observer is present to monitor and evaluate the test
- Implement a tracking process to ensure that any recommendations resulting from testing are implemented in a timely fashion
- Know about disaster recovery testing for infrastructure and critical business applications

Types of Tests

Tests that are progressively more challenging can include:

- **Table-top walk-through** of the plans
- Table-top walk-through with mock disaster scenarios
- **Testing the infrastructure** and communication components of the recovery plan
- Testing the infrastructure and recovery of the critical applications
- Testing the infrastructure, critical applications and involvement of the end users
- **Full restoration and recovery tests** with some personnel unfamiliar with the systems
- **Surprise tests**

Test Results

The test should strive to, at a minimum, accomplish the following tasks:

- **Verify the completeness** and precision of the response and recovery plan
- **Evaluate the performance** of the personnel involved in the exercise
- **Appraise** the demonstrated level of training and awareness of individuals who are not part of the recovery/response team
- Evaluate the coordination among the team members and external vendors and suppliers
- Measure the ability and capacity of the backup site to perform prescribed processing
- Assess the vital records retrieval capability
- Evaluate the state and quantity of equipment and supplies that have been relocated to the recovery site
- Measure the overall performance of operational and information systems processing activities related to maintaining the business entity

Ensuring Execution as Required

- A **facilitator-director** is needed to:
 - Direct the tasks within the plans
 - Oversee plan execution
 - Liaise with senior management
 - Make decisions as necessary
- Defining appropriate recovery strategies and alternatives is important in the overall process
- **Imperative plan maintenance** activities include:
 - Developing a schedule for periodic review and maintenance of the plan, and advising all personnel of their roles and the deadline for receiving revisions and comments
 - Calling for revisions out of schedule when significant changes have occurred
 - Reviewing revisions and comments, and updating the plan within a reasonable period after the review date
 - Arranging and coordinating scheduled and unscheduled tests of the plan to evaluate its adequacy
 - Participating in scheduled plan tests, which should be performed at least once each year
 - Developing a schedule for training personnel in emergency end recovery procedures, as set forth in the plan
 - Maintaining records of plan maintenance activities-testing, training and reviews

- Updating, at least quarterly, the notification directory to include all personnel changes, including phone numbers and responsibilities or status within the company

Post-Incident Activities and Investigation

- **Post-event reviews** are a very critical part of the incident management process
- The ISM should:
 - Manage post-event reviews to **learn from the completed tasks** and to use the information to improve the IMT's response procedures
 - Consider enlisting the help of **third-party specialists if detailed forensic skills are needed**

Establishing Procedures

If an incident occurs:

- The information security staff needs documented procedures so that information can be properly recorded and preserved
- The ISM should develop data/evidence preservation procedures
- The information systems staff must understand basic procedures, including taking no action that could change/modify/contaminate potential or actual evidence

The **initial response** by the system administrator should include:

- Retrieving information needed to confirm an incident
- Identifying the scope and size of the affected environment (e.g., networks, systems, applications)
- Determining the degree of loss, modification or damage (if any)
- Identifying the possible path or means of attack

Requirements for Evidence

The ISM must know:

- Requirements for collecting and presenting evidence
- Rules for evidence, admissibility of evidence, and quality and completeness of evidence
- The consequences of any contamination of evidence following a security incident

-END-