Information Security

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Chapter 2

Personnel Security and Risk Management Concepts

Risk Management

Risk management is a detailed process of identifying factors that could damage or disclose data, evaluating those factors in light of data value and countermeasure cost, and implementing cost-effective solutions for mitigating or reducing risk. The overall process of risk management is used to develop and implement information security strategies. The goal of these strategies is to reduce risk and to support the mission of the organization.

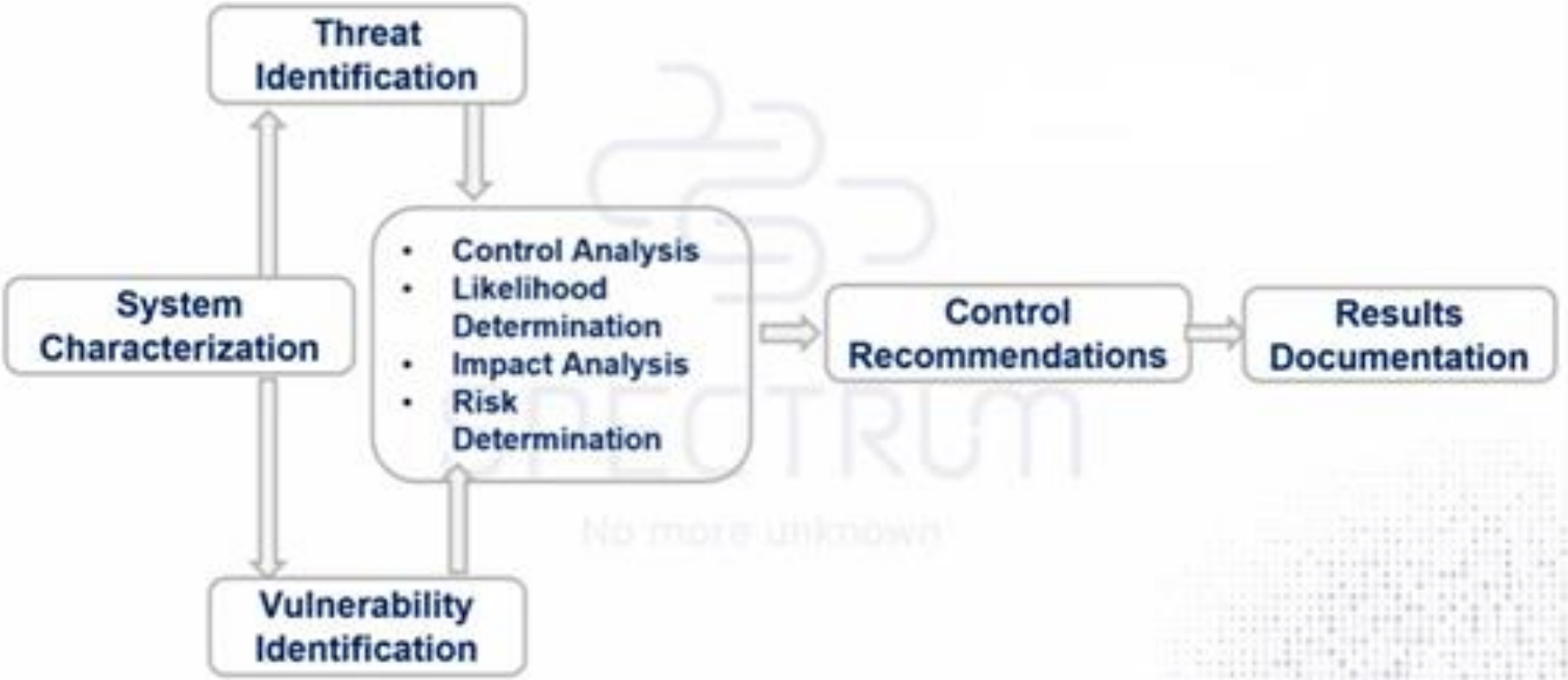
The primary goal of risk management is to reduce risk to an acceptable level. What that level actually is depends on the organization, the value of its assets, the size of its budget, and many other factors. What is deemed acceptable risk to one organization may be an unreasonably high level of risk to another. It is impossible to design and deploy a totally risk-free environment; however, significant risk reduction is possible, often with little effort.

Risks to an IT infrastructure are not all computer based. In fact, many risks come from non computer sources. It is important to consider all possible risks when performing risk evaluation for an organization. Failing to properly evaluate and respond to all forms of risk will leave a company vulnerable. Keep in mind that IT security, commonly referred to as logical or technical security, can provide protection only against logical or technical attacks. To protect IT against physical attacks, physical protections must be erected.

The process by which the goals of risk management are achieved is known as **risk analysis**. It includes examining an environment for risks, evaluating each threat event as to its likelihood of occurring and the cost of the damage it would cause if it did occur, assessing the cost of various countermeasures for each risk, and creating a cost/benefit report for safeguards to present to upper management.

In addition to these risk-focused activities, risk management requires evaluation, assessment, and the assignment of value for all assets within the organization. Without proper asset valuations, it is not possible to prioritize and compare risks with possible losses.

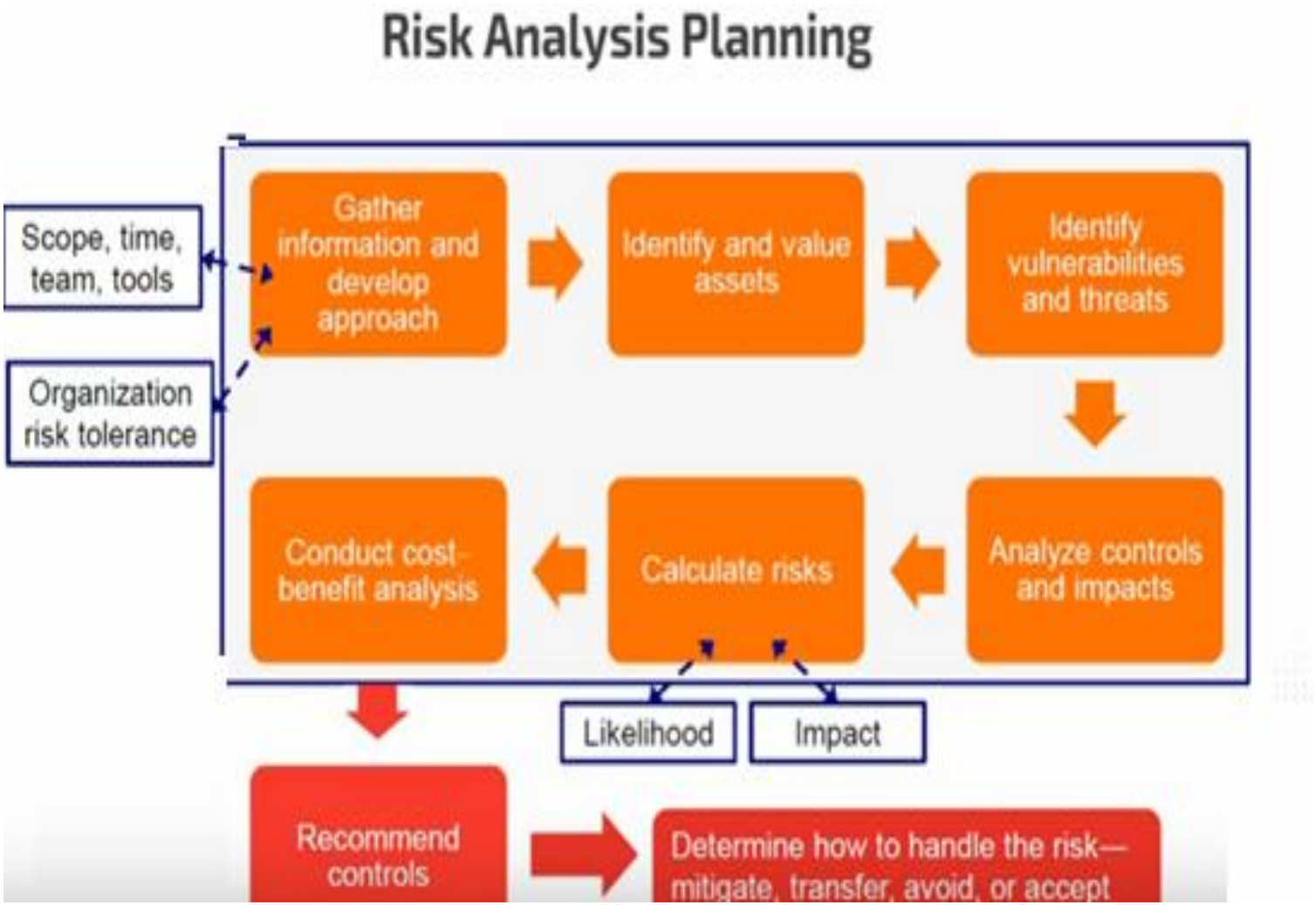
Risk Analysis



An essential part of risk management is identifying and examining threats. This involves creating an exhaustive list of all possible threats for the organization's identified assets.

The list should include threat agents as well as threat events. It is important to keep in mind that threats can come from anywhere.

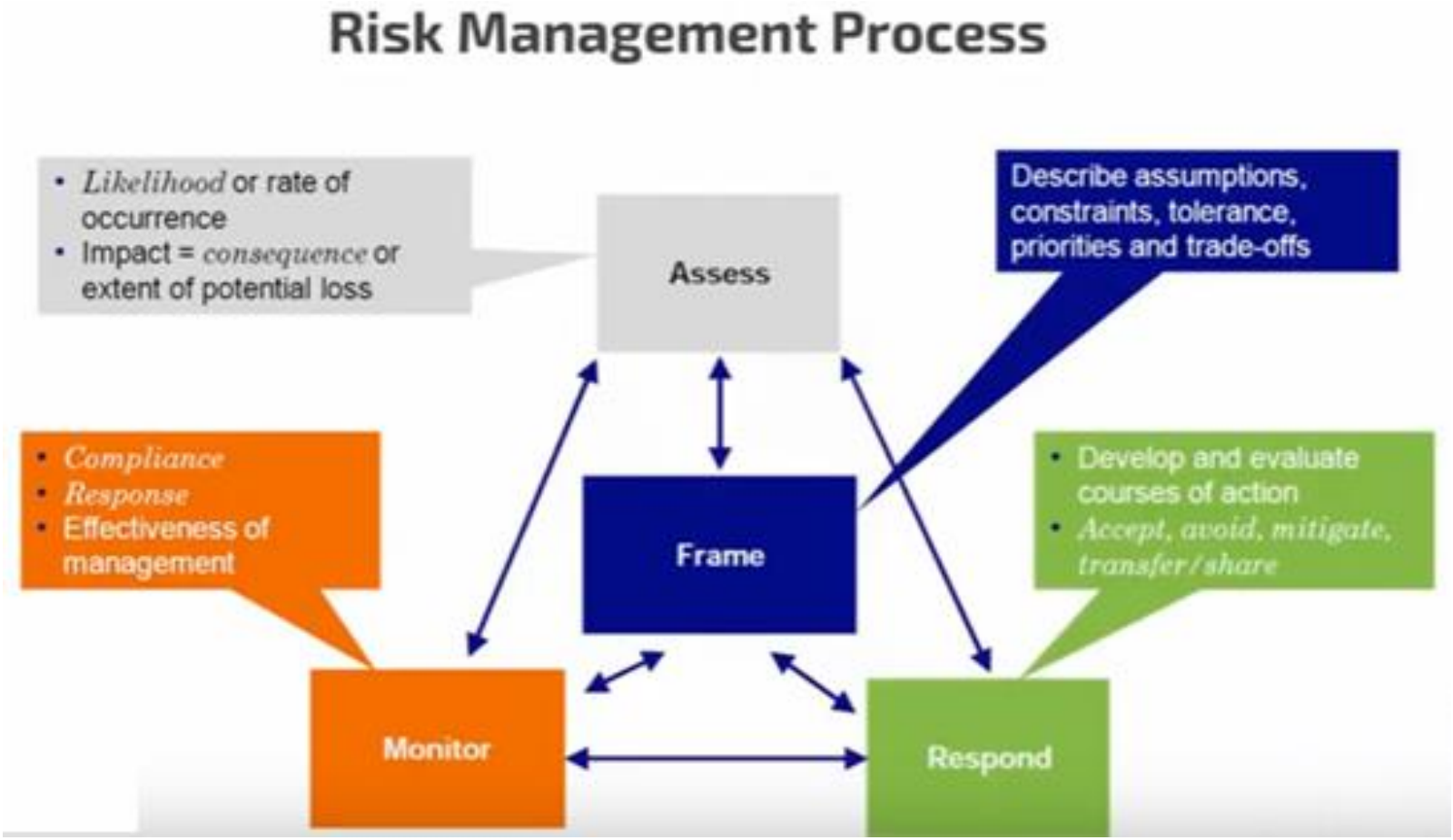
In most cases, a team rather than a single individual should perform risk assessment and analysis. Also, the team members should be from various departments within the organization. It is not usually a requirement that all team members be security professionals or even network/system administrators. The diversity of the team based on the demographics of the organization will help to exhaustively identify and address all possible threats and risks.


Risk Analysis Planning
Scope, time, team, tools
Organization risk tolerance
Gather information and develop approach
Identify and value assets
Identify vulnerabilities and threats
Analyze controls and impacts
Calculate risks
Conduct cost-benefit analysis
Likelihood
Impact
Recommend controls
Determine how to handle the risk—mitigate, transfer, avoid, or accept

Once the risk analysis is complete, management must address each specific risk. There are four possible responses to risk:

- Reduce or mitigate
- Assign or transfer
- Accept
- Reject or ignore

Risk Management Process



Risk Mitigation Reducing risk, or risk mitigation, is the implementation of safeguards and countermeasures to eliminate vulnerabilities or block threats. Picking the most cost effective or beneficial countermeasure is part of risk management, but it is not an element of risk assessment. In fact, countermeasure selection is a post-risk-assessment or post-risk-analysis activity. Another potential variation of risk mitigation is risk avoidance. The risk is avoided by eliminating the risk cause. A simple example is removing the FTP protocol from a server to avoid FTP attacks.

Risk Assignment Assigning risk or transferring risk is the placement of the cost of loss a risk represents onto another entity or organization. Purchasing insurance and outsourcing are common forms of assigning or transferring risk.

Risk Acceptance Accepting risk, or acceptance of risk, is the valuation by management of the cost/benefit analysis of possible safeguards and the determination that the cost of the countermeasure greatly outweighs the possible cost of loss due to a risk. It also means that management has agreed to accept the consequences and the loss if the risk is realized.

In most cases, accepting risk requires a clearly written statement that indicates why a safeguard was not implemented, who is responsible for the decision, and who will be responsible for the loss if the risk is realized, usually in the form of a sign-off letter. An organization's decision to accept risk is based on its risk tolerance. Risk tolerance is the ability of an organization to absorb the losses associated with realized risks. This is also known as risk tolerance or risk appetite.

Risk Rejection A final but unacceptable possible response to risk is to reject or ignore risk. Denying that a risk exists and hoping that it will never be realized are not valid or prudent due-care responses to risk.

Monitoring and Measurement Security controls should provide benefits that can be monitored and measured. If a security control's benefits cannot be quantified, evaluated, or compared, then it does not actually provide any security. A security control may provide native or internal monitoring, or external monitoring might be required. You should take this into consideration when making initial countermeasure selections.

Measuring the effectiveness of a countermeasure is not always an absolute value. Many countermeasures offer degrees of improvement rather than specific hard numbers as to the number of breaches prevented or attack attempts thwarted. Often to obtain countermeasure success or failure measurements, monitoring and recording of events both prior to and after safeguard installation is necessary. Benefits can only be accurately measured if the starting point (that is, the normal point or initial risk level) is known.

Part of the cost/benefit equation takes countermeasure monitoring and measurement into account. Just because a security control provides some level of increased security does not necessarily mean that the benefit gained is cost effective. A significant improvement in security should be identified to clearly justify the expense of new countermeasure deployment.

Risk Terminology

Asset Valuation Asset valuation is a dollar value assigned to an asset based on actual cost and nonmonetary expenses. These can include costs to develop, maintain, administer, advertise, support, repair, and replace an asset; they can also include more elusive values, such as public confidence, industry support, productivity enhancement, knowledge equity, and ownership benefits.

Threats Any potential occurrence that may cause an undesirable or unwanted outcome for an organization or for a specific asset is a threat. Threats are any action or inaction that could cause damage, destruction, alteration, loss, or disclosure of assets or that could block access to or prevent maintenance of assets.

Vulnerability The weakness in an asset or the absence or the weakness of a safeguard or countermeasure is a vulnerability. In other words, a vulnerability is a flaw, loophole, oversight, error, limitation, frailty, or susceptibility in the IT infrastructure or any other aspect of an organization. If a vulnerability is exploited, loss or damage to assets can occur.

Risk is the possibility or likelihood that a threat will exploit a vulnerability to cause harm to an asset. It is an assessment of probability, possibility, or chance. The more likely it is that a threat event will occur, the greater the risk. Every instance of exposure is a risk. When written as a formula, risk can be defined as follows:

risk = threat * vulnerability

Thus, reducing either the threat agent or the vulnerability directly results in a reduction in risk.

Safeguards A safeguard, or countermeasure, is anything that removes or reduces a vulnerability or protects against one or more specific threats. A safeguard can be installing a software patch, making a configuration change, hiring security guards, altering the infrastructure, modifying processes, improving the security policy, training personnel more effectively, electrifying a perimeter fence, installing lights, and so on.

It is any action or product that reduces risk through the elimination or lessening of a threat or a vulnerability anywhere within an organization. Safeguards are the only means by which risk is mitigated or removed. It is important to remember that a safeguard, security control, or countermeasure need not involve the purchase of a new product; reconfiguring existing elements and even removing elements from the infrastructure are also valid safeguards.

Attack An attack is the exploitation of a vulnerability by a threat agent. In other words, an attack is any intentional attempt to exploit a vulnerability of an organization's security infrastructure to cause damage, loss, or disclosure of assets. An attack can also be viewed as any violation or failure to adhere to an organization's security policy.

The elements of risk

Personal Security Policies

Humans are the weakest element in any security solution. No matter what physical or logical controls are deployed, humans can discover ways to avoid them, circumvent or subvert them, or disable them. Thus, it is important to take into account the humanity of your users when designing and deploying security solutions for your environment.

Issues, problems, and compromises related to humans occur at all stages of a security solution development. This is because humans are involved throughout the development, deployment, and ongoing administration of any solution. Therefore, you must evaluate the effect users, designers, programmers, developers, managers, and implementers have on the process.

Hiring new staff typically involves several distinct steps: **creating a job description**, setting a classification for the job, screening employment candidates, and hiring and training the one best suited for the job. Without a job description, there is no consensus on what type of individual should be hired. Thus, crafting job descriptions is the first step in defining security needs related to personnel and being able to seek out new hires.

In effect, the job description defines the roles to which an employee needs to be assigned to perform their work tasks. The job description should define the type and extent of access the position requires on the secured network. Once these issues have been resolved, assigning a security classification to the job description is fairly standard.

Separation of Duties Separation of duties is the security concept in which critical, significant, and sensitive work tasks are divided among several individual administrators or high-level operators. This prevents any one person from having the ability to undermine or subvert vital security mechanisms.

Think of separation of duties as the application of the principle of least privilege to administrators. Separation of duties is also a protection against collusion, which is the occurrence of negative activity undertaken by two or more people, often for the purposes of fraud, theft, or espionage.

Admin Tasks	Database Management	Firewall Management	User Account Management	File Management	Network Management
Assigned to Admins	Admin 1	Admin 2	Admin 3 & 4	Admin 5	Admin 6 & 7

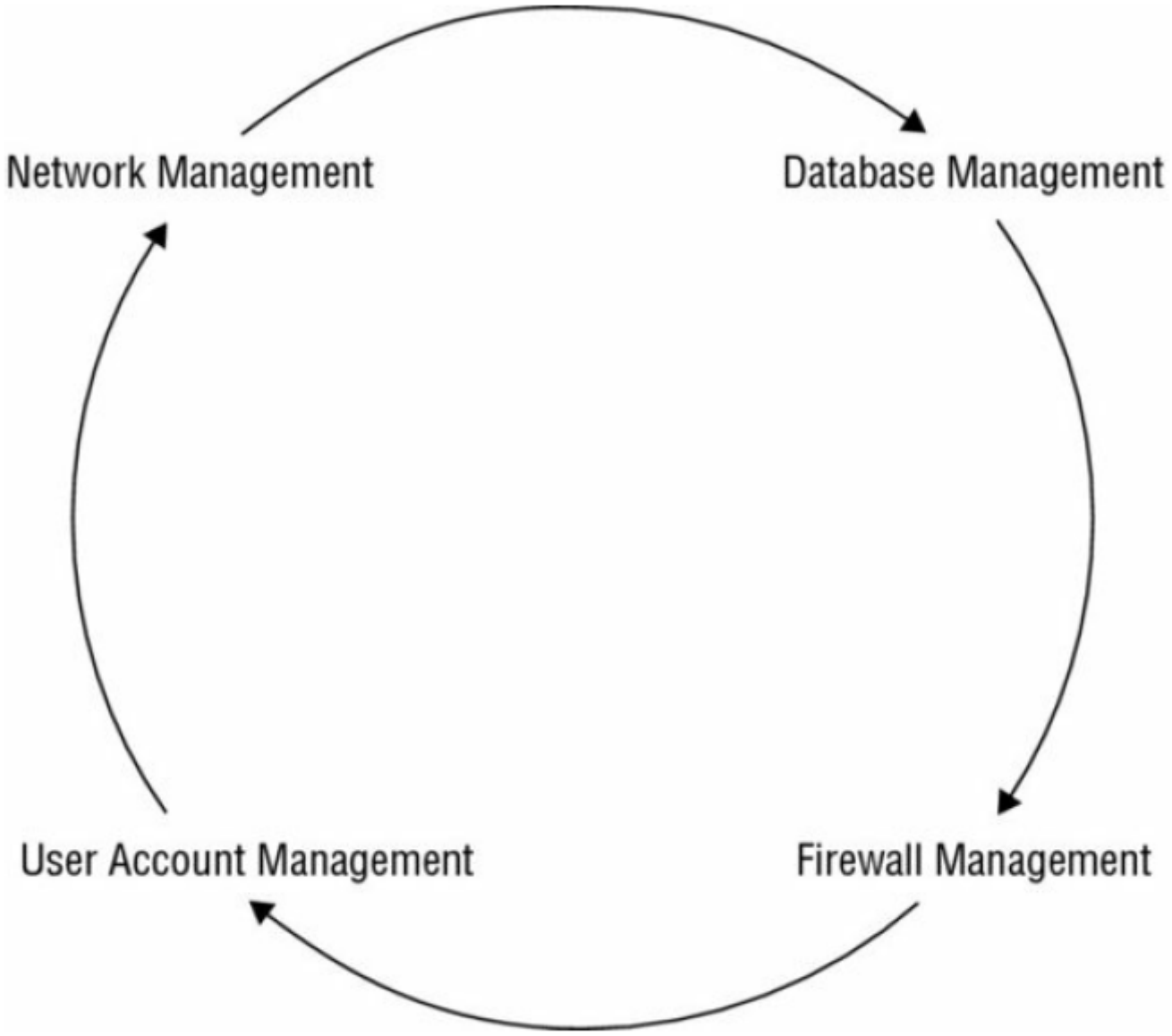
An example of separation of duties related to five admin tasks and seven administrators

Job Responsibilities Job responsibilities are the specific work tasks an employee is required to perform on a regular basis. Depending on their responsibilities, employees require access to various objects, resources, and services. On a secured network, users must be granted access privileges for those elements related to their work tasks. To maintain the greatest security, access should be assigned according to the principle of least privilege.

The **principle of least privilege** states that in a secured environment, users should be granted the minimum amount of access necessary for them to complete their required work tasks or job responsibilities. True application of this principle requires low level granular access control over all resources and functions.

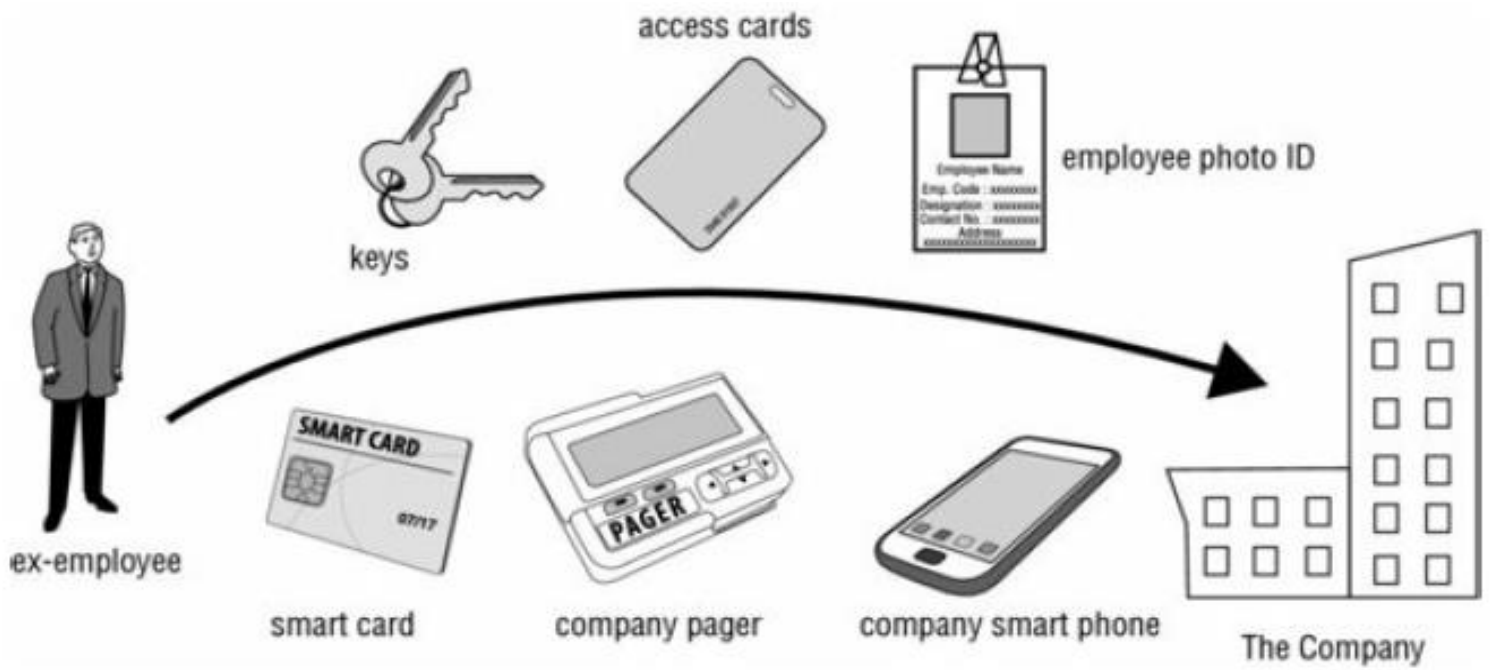
Job descriptions are not used exclusively for the hiring process; they should be maintained throughout the life of the organization. Only through detailed job descriptions can a comparison be made between what a person should be responsible for and what they actually are responsible for. It is a managerial task to ensure that job descriptions overlap as little as possible and that one worker's responsibilities do not drift or encroach on those of another. Likewise, managers should audit privilege assignments to ensure that workers do not obtain access that is not strictly required for them to accomplish their work tasks.

Job Rotation Job rotation, or rotating employees among multiple job positions, is simply a means by which an organization improves its overall security. Job rotation serves two functions. First, it provides a type of knowledge redundancy. When multiple employees are all capable of performing the work tasks required by several job positions, the organization is less likely to experience serious downtime or loss in productivity if an illness or other incident keeps one or more employees out of work for an extended period of time.



An example of job rotation among management positions

When an employee must be terminated, numerous issues must be addressed. A strong relationship between the security department and HR is essential to maintain control and minimize risks during termination. An employee termination process or procedure policy is essential to maintaining a secure environment when a disgruntled employee must be removed from the organization. The reactions of terminated employees can range from calm, understanding acceptance to violent, destructive rage. A sensible procedure for handling terminations must be designed and implemented to reduce incidents.



Ex-employees must return all company property.