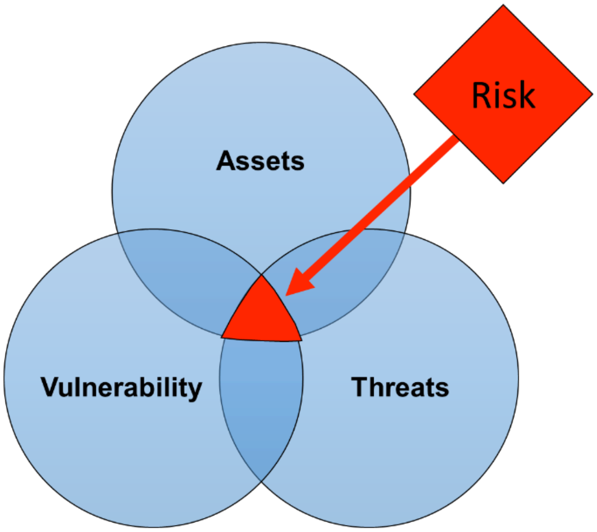
Risk Management for Cybersecurity and IT Managers Study Guide

- **Welcome**
  - **What does this class cover?**
    - What is risk?
    - What happens when risk management fails?
    - What can you do with risk?
    - How do you calculate risk?

- **What is Risk?**

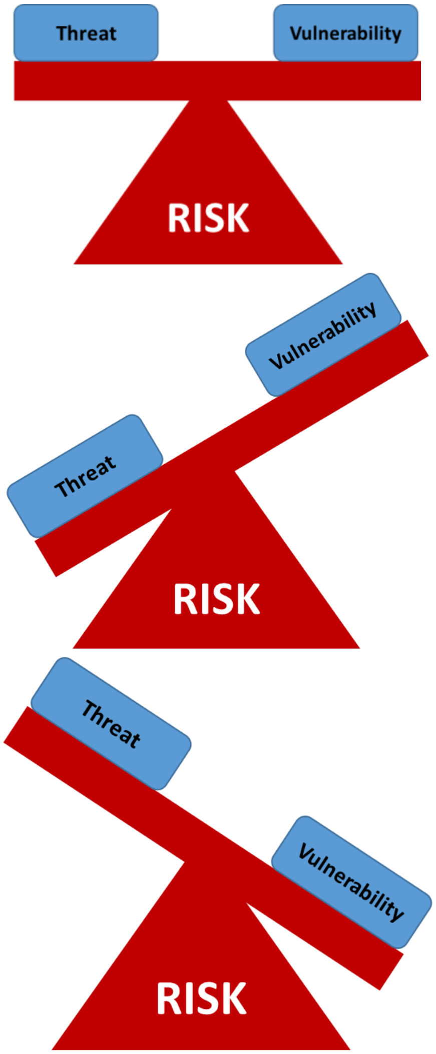


  - **Assets**
    - Any item that has a value to the organization

  - **Vulnerabilities**
    - Any weakness in the system design, implementation, software code, or lack of preventative mechanisms
    - Cybersecurity and IT professionals are in control of vulnerabilities in their platforms
    - Vulnerabilities are internal factors
  - **Threats**
    - Any condition that could cause harm, loss, damage, or compromise to an asset
    - Cybersecurity and IT professionals cannot control threats in their platforms
      - Can only manage and mitigate them
    - Threats are external factors
  - **What is RISK?**
    - Probability of the realization of a threat

- There is no risk if a vulnerability AND a threat do not exist

RISK = Vulnerability X Threat



- **Types of Risk**
    - **Strategic Risk**
        - Resulting directly from operating within a specific industry at a specific time
        - Shifts in consumer preference or new technologies can make your product lines obsolete
        - Counteract by putting mitigations in place to detect changes early
    - **Compliance Risk**
        - Legislative laws and bureaucratic regulations are another form of risk for our organizations
        - Compliance is required with laws but also introduces risks to the organization
    - **Financial Risk**
        - How does your organization handle money?
        - How do you allow your customers to pay you?
        - Do you extend credit to them?
        - Also takes into account interest rates and foreign exchange rates
    - **Operational Risks**
        - Result from internal failures from internal processes, people, or systems
        - Can result from unforeseen external events like power outage or cyber attack
    - **Reputational Risk**
        - Loss of a company's reputation or community standing from product failures, lawsuits, or negative publicity
        - Reputations take a long time to build, only a day to lose…
    - **Other Risks**
        - Much more difficult to categorize
        - Environmental
            - Natural Disasters
        - Employee Management
            - Maintaining a trained staff with up-to-date skills
        - Political Instability
            - Change in laws and regulations

- **Types of Threats**
    - **Adversarial Threats**
        - Consider their capability, intent, and likelihood
        - Examples:
            - Trusted insiders
            - Competitors

- Suppliers
- Customers
- Business partners
- Nation states

- **Accidental Threats**
  - Occurs when someone makes a mistake that hurts the security of the system
  - Example:
    - System administrator accidentally takes servers offline, causing loss of availability
- **Structural Threats**
  - Occurs when equipment, software, or environmental controls fail
  - Example:
    - IT server fails due to hard drive failure
    - Servers fail due to overheating (HVAC fail)
    - Software failure (OS bug or crash)
- **Environmental Threats**
  - Occurs when natural or man-made disasters occur
  - Example:
    - Fires
    - Flooding
    - Severe storms
    - Loss of power from the city power grid
    - Fiber or telecommunication lines cut
- **Always Remember**…
  - Threats come from both external and internal sources, but most risk assessors think of internal sources first…
  - We aren't just worried about hackers, but also the trusted insider…
  - As you design security controls, don't forget to think about disgruntled employees, inept administrators, or the insider threat!

- **When Risk Management Fails?**
  - **When Risk Management Fails**…
    - Amazon Web Services (Feb 28, 2017)
    - 100s of websites were taken offline
    - Technician utilized an SOP to take a small number of servers offline, but input the command incorrectly
    - It took down the entire US-EAST-1 region!
    - Employees were debugging an issue with the billing system and accidentally took more servers offline than intended

    - The error started a domino effect that took down two other server subsystems
  - **Accidental Threats**
    - Removing a significant portion of the capacity caused each of these systems to require a full restart
    - While the subsystems were restarted, S3 was unable to service requests
    - Other AWS services in the US-EAST-1 Region that rely on S3 for storage, including the S3 console, EC2, EBS, and Lambda were impacted
  - **What Concepts Are Illustrated?**
    - Accidental threat
      - Someone made a mistake, hurting the system
    - Employee Risk Management
      - Maintaining a trained staff with up-to-date skills
    - Operational Risk
      - Internal failure from internal processes and people

- **What Can You Do With Risk?**
  - **Management's Responsibility**
    - Cybersecurity and IT managers minimize risk to the organization by choosing the appropriate controls
  - **What Can You Do With Risk?**
    - Risk Mitigation
    - Risk Transference
    - Risk Avoidance
    - Risk Acceptance

- **Risk Mitigation**
  - **Risk Mitigation**
    - Main goal of security is to minimize risk to an acceptable level
    - Our goal is not necessarily to eliminate all risks…
    - By adding risk controls, we can mitigate the risk down to an acceptable level

- **Risk Transference**
  - **Risk Transference**
    - If the organization cannot afford to accept, avoid, or mitigate the risk, they can transfer the risk to another business
    - Example:
      - If the organization is concerned that it would be too costly to recover from a flood, they can purchase flood insurance

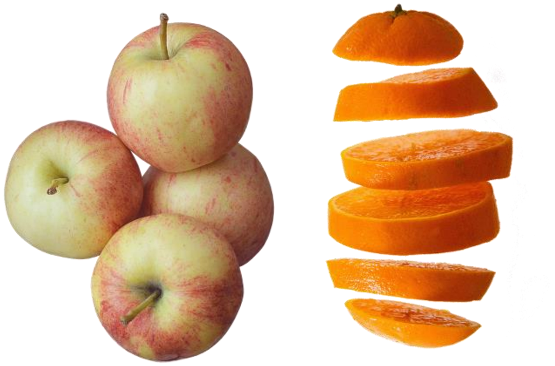
- **Risk Avoidance**
    - **Risk Avoidance**
        - Risk is too high to accept, so the system configuration or design is changed to avoid the risk associated with a specific vulnerability
        - Example:
            - Utilizing Windows XP is too dangerous, so we install Windows 10 instead to avoid the risk of an unsupported operating system

- **Risk Acceptance**
    - **Risk Acceptance**
        - Organization accepts the risk associated with a system's vulnerabilities and their associated risks
        - Risk acceptance is common when the risk is low enough to not apply countermeasures, or adequate countermeasures have already been applied

- **Risk Controls**
    - **Risk Control**
        - Technical controls
        - Operational controls
    - **Technical Controls**
        - Systems, devices, software, and settings used to enforce CIA requirements
        - Examples
            - Using firewalls, IDS, and IPS
            - Installing antivirus and endpoint security
    - **Operational Controls**
        - Practices and procedures to increase security
        - Examples
            - Conducting penetration tests
            - Utilizing standard operating procedures

- **Calculating Risk**
    - **Calculating Risk**
        - Senior executives are always looking to compare one risk against another in order to make the best resourcing decisions
        - Should I fix this vulnerability or those multiple vulnerabilities?
        - We need to have a way to compare…

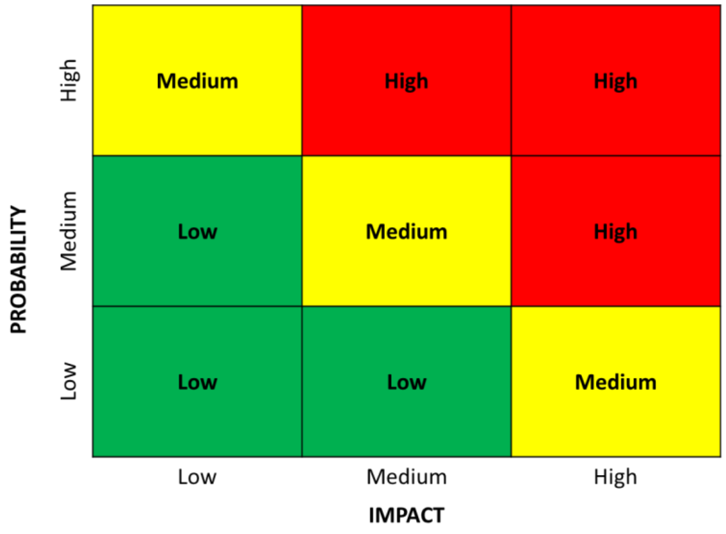
Apples & Oranges



- **Measuring Risk**
  - Qualitative is subjective
  - Quantitative is countable

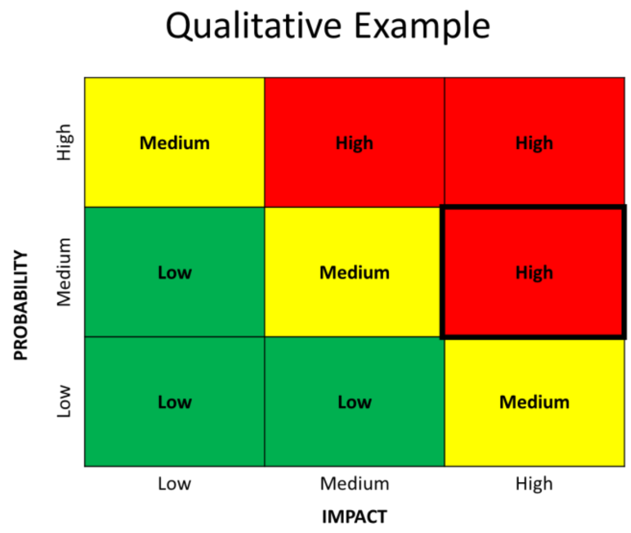
- **Qualitative Risk Measurement**
  - **Qualitative Risk**
    - Used when there aren't any precise values
    - Measures the probability of occurrence and the impact if it occurred
    - Subjective in nature
    - Most commonly used with a risk matrix

Qualitative Example



PROBABILITY			
High	Medium	High	High
Medium	Low	Medium	High
Low	Low	Low	Medium
	Low	Medium	High
		IMPACT	

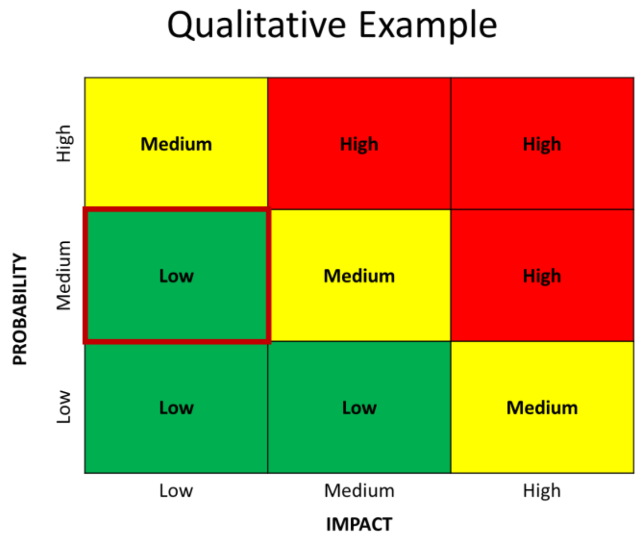
- **Qualitative Risk Example**
  - Considering allowing a BYOD policy
  - You will save $$$ on buying devices
  - But, inherit the risk of employee devices
  - What is the risk associated with a cyber attack caused by your BYOD policy?



Qualitative Example

PROBABILITY \ IMPACT	Low	Medium	High
High	Medium	High	High
Medium	Low	Medium	High
Low	Low	Low	Medium

  - You purchased data breach insurance
  - Insurance transfers risk of loss
  - But, can't transfer the negative affects to your reputation if a breach occurs…
  - What is the risk to your reputation if a data breach occurred?



Qualitative Example

PROBABILITY \ IMPACT	Low	Medium	High
High	Medium	High	High
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- **Quantitative Risk Measurement**
  - **Quantitative**
    - Seeks to numerically assess the risk
    - Known as Probabilistic Risk Analysis
    - Measures the probability of occurrence and the impact if it occurred
    - Describes the consequences in dollars, time, lives lost, or other metrics
  - **Single Loss Expectancy**

SLE =
Asset Value X Exposure Factor

    - Exposure Factor (EF) is the percentage of an asset lost during an event
    - EF is 1.0 if the asset loses all value
  - **Annual Loss Expectancy**
    - Common calculation to determine the cost associated with a particular risk
    - Used by executives in determining when to mitigate, transfer, avoid, or accept the risk

ALE = Cost X Occurrences

If a risk would be actualized 3 times a year, then Occurrences equals 3.0.
If a risk would be actualized once ever 3 years, then Occurrences equals 0.33.

  - **Quantitative Example**
    - Assume that an organization will suffer one (1) data breach every three (3) years
    - Chief Security Officer suggests budgeting $524k annually to provide data security protections
    - Each breach is estimated to cost your organization $103k
    - Should you authorize the budget?

Annual Loss Expectancy

ALE = SLE X Occurrences
ALE = $103k X 0.33
ALE = $34k

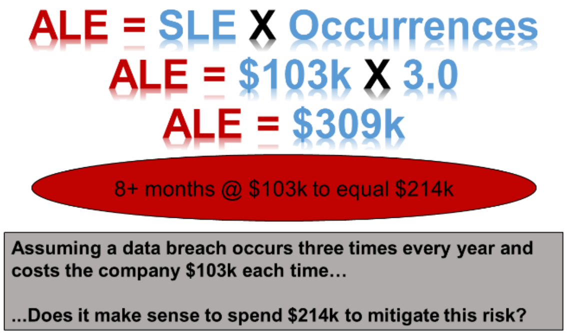
15+ Years @ $34k to equal $524k

Assuming a data breach occurs once every three years and costs the company $103k each time…

…Does it make sense to spend $524k to mitigate this risk?

        - Assume that an organization will suffer three (3) data breach every year
        - Chief Security Officer suggests budgeting $214k annual to provides data security protections
        - Each breach is estimated to cost your organization $103k
        - Should you authorize the budget?

Annual Loss Expectancy



ALE = SLE X Occurrences

ALE = $103k X 3.0

ALE = $309k

8+ months @ $103k to equal $214k

Assuming a data breach occurs three times every year and costs the company $103k each time…

…Does it make sense to spend $214k to mitigate this risk?

- **Case Study (Equifax)**
    - **Equifax Data Breach**
        - 145 million Equifax customers affected
        - Data breach occurred in July 2017
        - Attackers used a vulnerability in Apache Struts
    - **CVE-2017-5638 (Released 3/6/17)**
        - Apache Struts 2 framework vulnerability
        - Over the first 6 days of the vulnerability being discovered, thousands of attacks occurred
    - **How to Mitigate Vulnerability?**
        - Upgrade Apache Struts to either version 2.3.32 or 2.5.10.1, or a different multipart parser
        - Requires rewriting, retesting, and redeploying their code
        - Assumed cost:
            - $3.5 million (man-hours & downtime)
    - **What's At Risk?**
        - Social Security Numbers
        - Dates of Birth
        - Names
        - Addresses
    - **How Much is Security Worth?**
        - In FY17-Q3, Equifax spent…
            - Security Products ($55.5 million)

        - Consulting Fee ($17.1 million)
        - Consumer Support ($14.9 million)
        - Estimate additional costs still coming ($56 million to $110 million)

- **Conclusion**
    - **What did this class cover?**
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