CYBER SECURITY






UNIT 1

An Introduction to Information Systems

An information system is a set of interrelated components that collect, manipulate, store data and disseminate information and provide a feedback mechanism to monitor performance.

An organized combination of people, hardware, software, communications networks, and data resources that collects data, transforms it, and disseminates information.

Data Vs. Information

Data: Raw unorganized facts

Information:

A collection of facts organized in such a way that they have additional value beyond the value of the facts themselves.

- Defining and organizing relationships among data creates information.

Information Concepts

Process:

A set of logically related tasks performed to achieve a defined outcome.

Knowledge:

An awareness and understanding of a set of information and ways that information can be made useful to support a specific task or reach a decision

The Value of Information

The value of Information
is directly linked to how
it helps decision makers
achieve their organization's
goals.

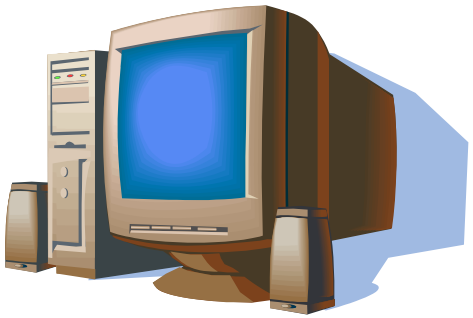
System

A **system** is a set of elements or components that interact to accomplish goals.

Components of Information System

Hardware:

Computer Equipment



Software:

Computer Programs

Databases:

An organized collections of facts

Components of Information System(cont..)

Telecommunications:

Electronic transmission of signals for communication

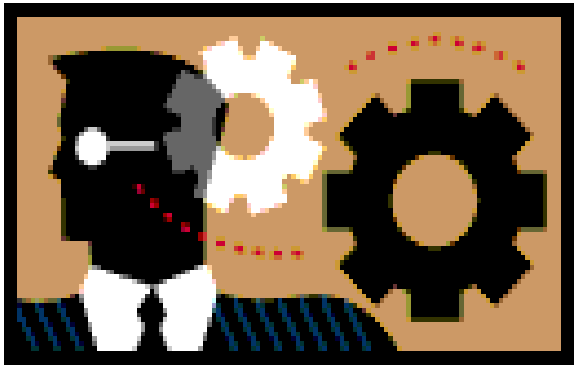
- **Networks**: Distant electronic communication
- **Internet**: Interconnected Networks
- **Intranet**: Internal Corporate Network
- **Extranet**: Linked Intranets

Components of Information System(cont..)

People

Procedures:

Strategies, policies, methods, and rules for using a CBIS.



Electronic and Mobile Commerce

E-Commerce:

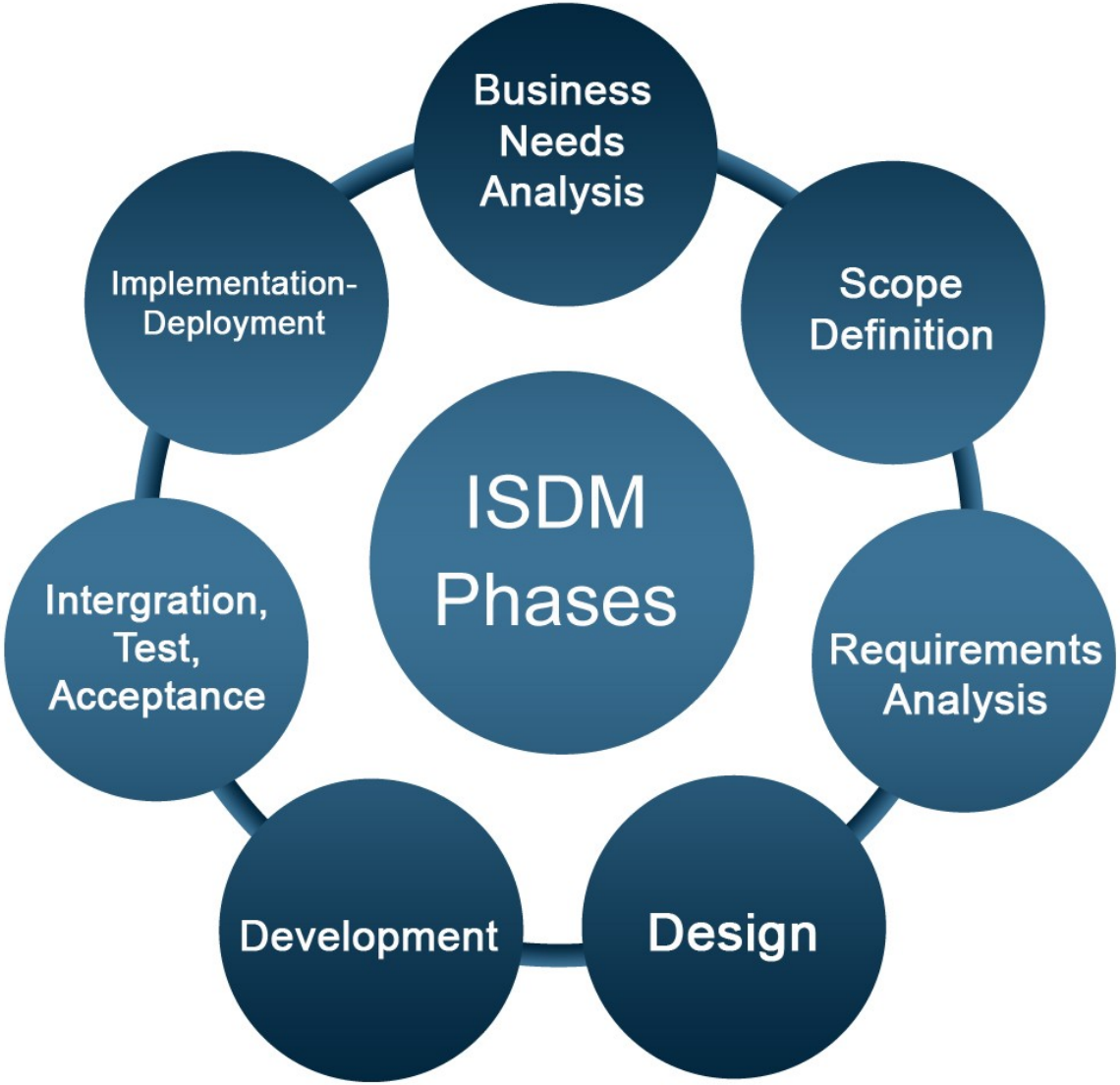
Any business transaction executed electronically

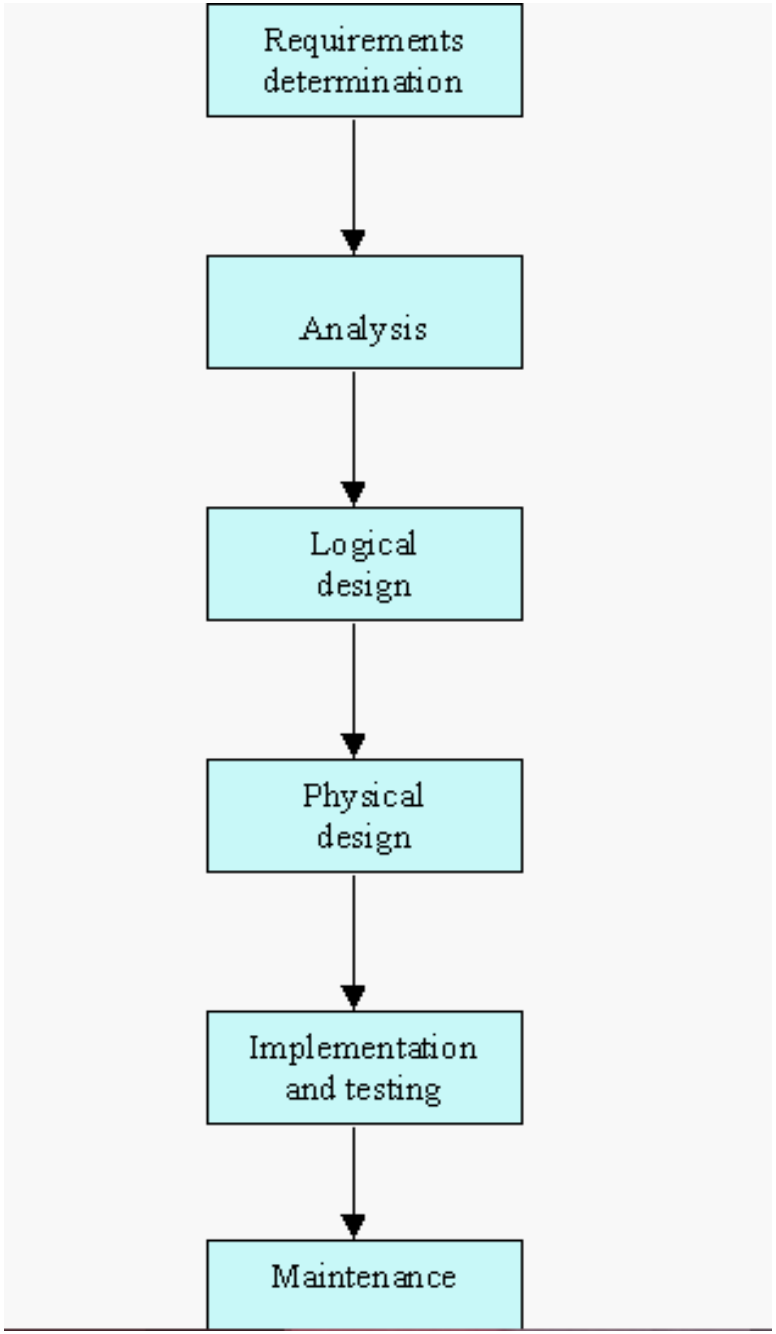
M-Commerce:

Transactions conducted anywhere, anytime

- Relies on wireless communications

Development of Information System




Requirements determination
Analysis
Logical design
Physical design
Implementation and testing
Maintenance

Requirements Determination

This stage consists of obtaining user needs and requirements which reflect the user-expectations from the IS being developed. It consists of several stages:

1) Problem definition
2) Feasibility Study
3) Requirements Acquisition
4) Requirements Analysis

- The problem definition and feasibility study stages consist of definition of a bare outline of the desired system.
- The Problem Definition Stage defines to a high level of detail the application for the desired IS and an indication of the advantages that will result from its implementation.
- The Feasibility Stage is the examination of the different alternatives with which a solution can be found for the design of the desired system.
- The Requirements Acquisition Stage results in a "statement of requirements".
- The Requirements Analysis stage produces the "requirements specification".
- Using the 'statement of requirements' as the main input the aim of the requirements specification is to act as an overview of the desired system in a structured form.

Analysis Phase

- This phase analyzes the requirements from the previous phase and converts them into components, which are used to build a 'specification' of the desired system.
- The specification is more precise than in the previous phase and adds more detail, at the same time retaining user semantics, so that the description would be recognizable to the user. However the model is at an abstract level, that is, with no details concerning data representation or computer implementation.

Logical design

This phase produces a design of the desired system that will serve as a basis for computer implementation. There are two major tasks in logic design. Firstly the specification from the analysis phase is transferred and secondly the human computer system is designed.

Physical design

- This is the last of the design phases. We may consider it as consisting of 3 components: Hardware, software and human-computer systems.
- The hardware design consists of a description of the computers, storage devices, input/output devices and possibly networking devices required for the desired system.
- Software consists of the programs that run on the hardware. The physical design of data needs to be considered as the kind of data invariably affects the programs that process the data. It will be necessary to decide on the appropriate types of applications software, including languages and packages as well as systems software required for supporting the event

Implementation And Testing

The major output of the implementation and testing phase is a physical information system and not a design. Of course the physical and earlier designs remain available for reference, as they form the specification. The major tasks consist of:

- Acquiring and integrating hardware, producing software, generating data for the files or databases and producing the human-computer system.
- System is tested, user comments are evaluated, perhaps to redesign the system.
- The operation of the implemented system in the user-organization if monitored closely for a limited period.

Maintenance

The maintenance phase consists of correcting errors in the system or responding to changes in the user requirement, due, for example, to environmental changes or personal preferences for system operation and it may require reworking of all the previous phases for the part of the system that requires changing.

Kinds of Information Systems

Transaction Processing Systems

- A computerized system that performs and records daily routine transactions necessary to the conduct of the business

- TPSs are information systems that process data resulting from the occurrence of business transactions

- Functions
  - ✓Validation
  - ✓Sorting
  - ✓Listing
  - ✓Merging
  - ✓Updating
  - ✓Calculation

- Examples:
  - ✓Payroll systems
  - ✓Order processing systems
  - ✓Reservation systems
  - ✓Stock control systems
  - ✓Systems for payments and funds transfers

Five Stages Of Transaction Processing

- Data Entry
- Processing
- Database Maintenance
- Document And Report Generation
- Inquiry Processing

Management Information Systems

- Management Information Systems are management-level systems that are used by middle managers to help ensure the smooth running of the organization in the short to medium term.
- The highly structured information provided by these systems allows managers to evaluate an organization's performance by comparing current with previous outputs.

- FUNCTIONS
  - ✓Sorting
  - ✓Merging
  - ✓Summarizing

- EXAMPLES
  - ✓Sales management systems
  - ✓Inventory control systems
  - ✓Budgeting systems
  - ✓Personnel (HRM) systems

Decision Support System

- Analyzes business data and presents it so that users can make business decisions more easily.

- These systems are often used to analyse existing structured information and allow managers to project the potential effects of their decisions into the future. Such systems are usually interactive and are used to solve ill structured problems. They offer access to databases, analytical tools, allow "what if" simulations, and may support the exchange of information within the organization.

- A Decision Support System can be seen as a knowledge based system, used by senior managers, which facilitates the creation of knowledge and allow its integration into the organization.

- an interactive information system that provides information, models, and data manipulation tools to help make decisions in semi-structured and unstructured situations

- FUNCTIONS
  - ✓Modelling
  - ✓Simulation
  - ✓Analysis
  - ✓Summarizing

- EXAMPLE
  - ✓A recruitment company may use a Decision Support System to help match their clients with suitable employees.

Executive Information Systems

- Strategic-level information systems that are found at the top of the Pyramid.
- They help executives and senior managers analyse the environment in which the organization operates, to identify long-term trends, and to plan appropriate courses of action.
- The information in such systems is often weakly structured and comes from both internal and external sources.

- EIS organizes and presents data and information from both external data sources and internal MIS or TPS in order to support and extend the inherent capabilities of senior executives.

- A highly interactive system that provides a flexible access to information for monitoring results and general business conditions

TPS and ERP

- Transaction
  - business related exchange
  - Evidence of a business event
- Transaction Processing System (TPS)
  - A system which records completed business transactions
- Enterprise Resource Planning (ERP)
  - A set of integrated programs for managing the entire business operations

Business Information Systems

Management Information System:

A system used to provide routine information to managers and decision makers

Decision Support System:

A system used to support problem-specific decision making

Specialized Business I.S.

Artificial Intelligence (AI):

A field in which the computer takes on the characteristics of human intelligence

Expert System:

A system that gives a computer the ability to make suggestions and act like an expert in a particular field.

Knowledge Base:

The collection of data, rules, procedures, and relationships that must be followed to achieve value or the proper outcome.

Virtual Reality:

The simulation of a real or imagined environment that can be experienced visually in three dimensions

Systems Development:

The activity of creating or modifying existing business information systems

Systems Investigation and Analysis

- Understand the problem and potential solutions

Systems Design, Implementation, Maintenance and Review

- Determine how the new system will meet business needs
- Put the new system into operation
- Ensure the system continues to meet changing business needs

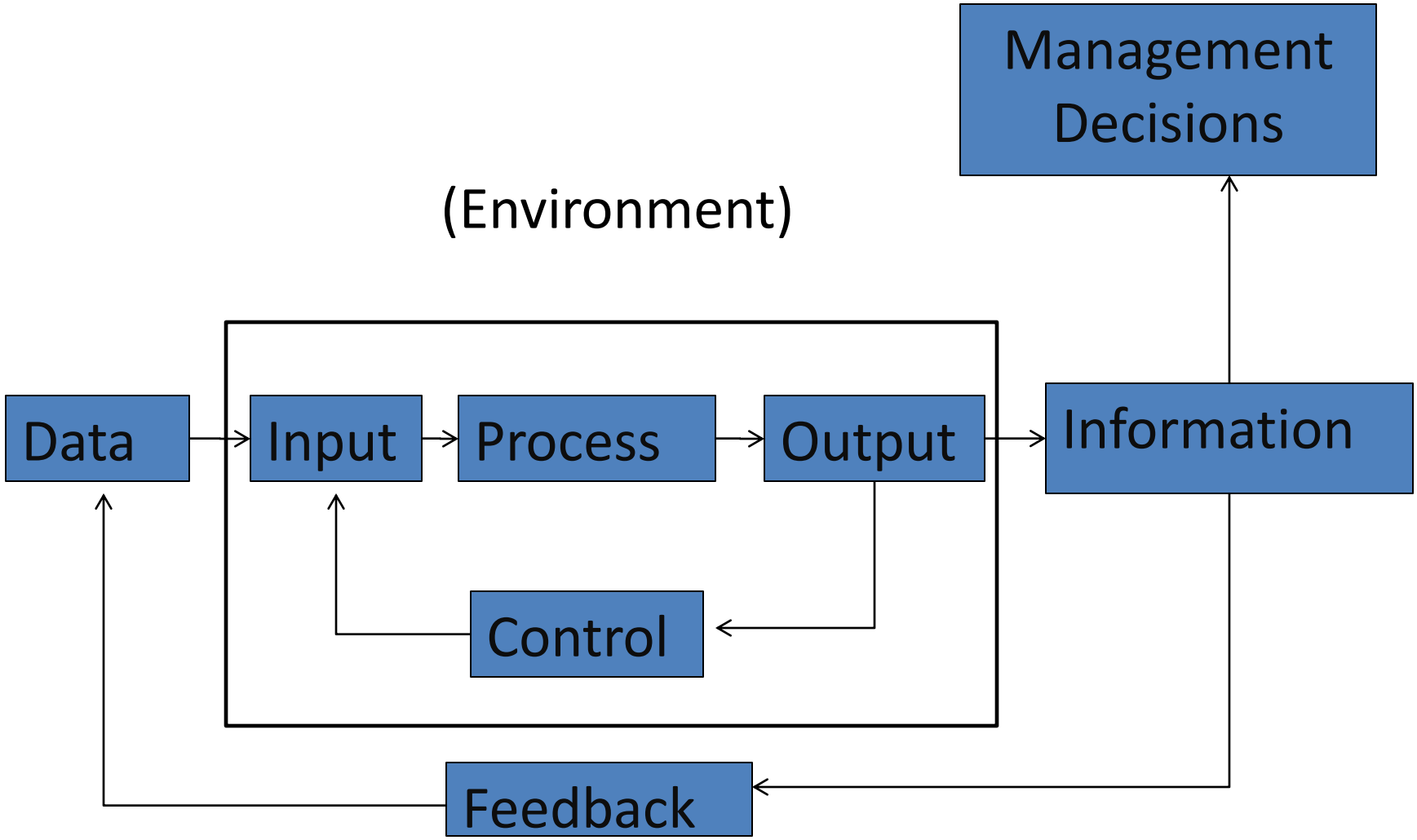
Information Systems in Society

Security, **Privacy**, **Ethical Issues** in Information Systems and ***the Internet***.

Computer Literacy:

Knowledge of computer systems and equipment and the ways they function

General Information Systems Diagram



Information System Activities

1. Input of Data Resources
2. Process Data into Information
3. Output of Information

Input of Data Resources

- Data entry
- Editing
- Machine readable
- Source documents
  - Formal record of a transaction
- User interface
  - How users interact with information system
  - Optical scanning; menu; prompts; fill in blanks

Process Data into Information

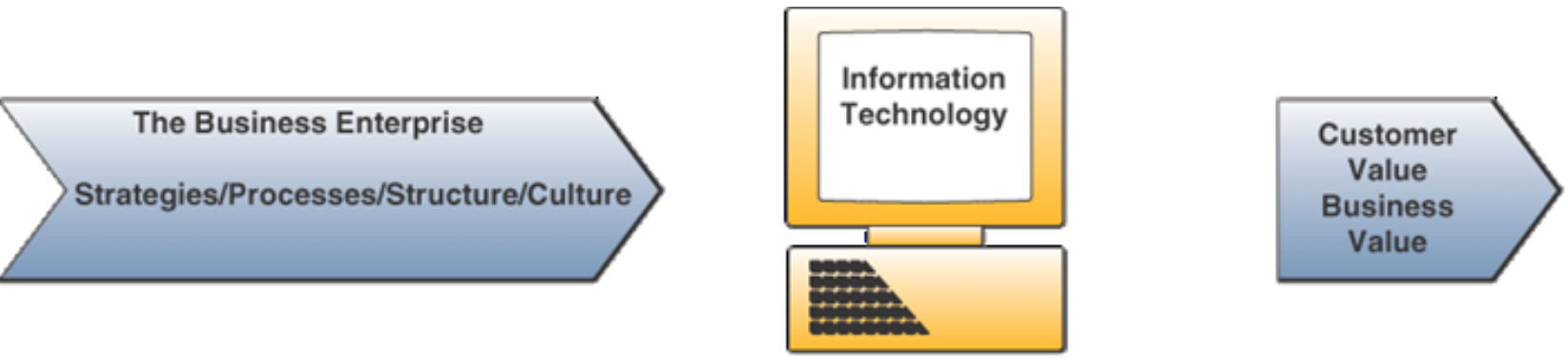
- Calculate
- Compare
- Sort
- Classify
- Summarize

The quality of the data must be maintained by a continual process of correcting and updating activities

Output of Information

- Transmit information to users
  - Display; paper; audio
- Storage of data
  - Data are retained in an organized manner
    - Fields; records; files; data bases
- Control of system performance
  - Feedback must be monitored and evaluated to determine if the information system is meeting established performance standards

Challenges and Opportunities of IT



Business / IT Challenges

- Speed and flexibility requirements of product development, manufacturing, and delivery cycles.
- Reengineering and cross-functional integration of business processes using Internet technologies.
- Integration of e-business and e-commerce into the organization's strategies, processes, structure, and culture.

Business / IT Developments

- Use of the Internet, Intranets, extranets, and the Web as the primary IT infrastructure.
- Diffusion of Web technology to internetwork employees, customers, and suppliers.
- Global networked computing, collaboration, and decision support systems.

Business / IT Goals

- Give customers what they want, when and how they want it, at the lowest cost.
- Coordination of manufacturing and business processes with suppliers and customers.
- Marketing channel partnerships with suppliers and distributors.

Measuring success of an IS

- Efficiency
  - Minimize cost, time and use of information resources
- Effectiveness
  - Support business strategies
  - Enable business processes
  - Enhance organizational structure and culture
  - Increase the customer and business value

Threats to Information Systems

- Natural Threats: These can best be thought of as threats caused by Mother Nature—floods, quakes, tornadoes, temperature extremes, hurricanes, and storms are all examples.
- Intentional Threats: Computer crimes are the best examples of intentional threats, or when someone purposely damages property or information. Computer crimes include espionage, identity theft, child pornography, and credit card crime.
- Unintentional Threats: These threats basically include the unauthorized or accidental modification of software. Have you ever accidentally deleted an important file, or tripped over a power cord?

Cyber Security

- Cyber-safety is a common term used to describe a set of practices, measures and/or actions you can take to protect personal information and your computer from attacks.

Security Risk Analysis

- Security risk analysis, otherwise known as risk assessment, is fundamental to the security of any organization. It is essential in ensuring that controls and expenditure are fully commensurate with the risks to which the organization is exposed.

Quantitative Risk Analysis

- This approach employs two fundamental elements; the probability of an event occurring and the likely loss should it occur.
- Quantitative risk analysis makes use of a single figure produced from these elements. This is called the 'Annual Loss Expectancy (ALE)' or the 'Estimated Annual Cost (EAC)'. This is calculated for an event by simply multiplying the potential loss by the probability.
- It is thus theoretically possible to rank events in order of risk (ALE) and to make decisions based upon this.
- The problems with this type of risk analysis are usually associated with the unreliability and inaccuracy of the data. Probability can rarely be precise and can, in some cases, promote complacency. In addition, controls and countermeasures often tackle a number of potential events and the events themselves are frequently interrelated.
- Notwithstanding the drawbacks, a number of organisations have successfully adopted quantitative risk analysis.

Qualitative Risk Analysis

- This is by far the most widely used approach to risk analysis. Probability data is not required and only estimated potential loss is used.
- Most qualitative risk analysis methodologies make use of a number of interrelated elements:

- THREATS

These are things that can go wrong or that can 'attack' the system. Examples might include fire or fraud. Threats are ever present for every system.

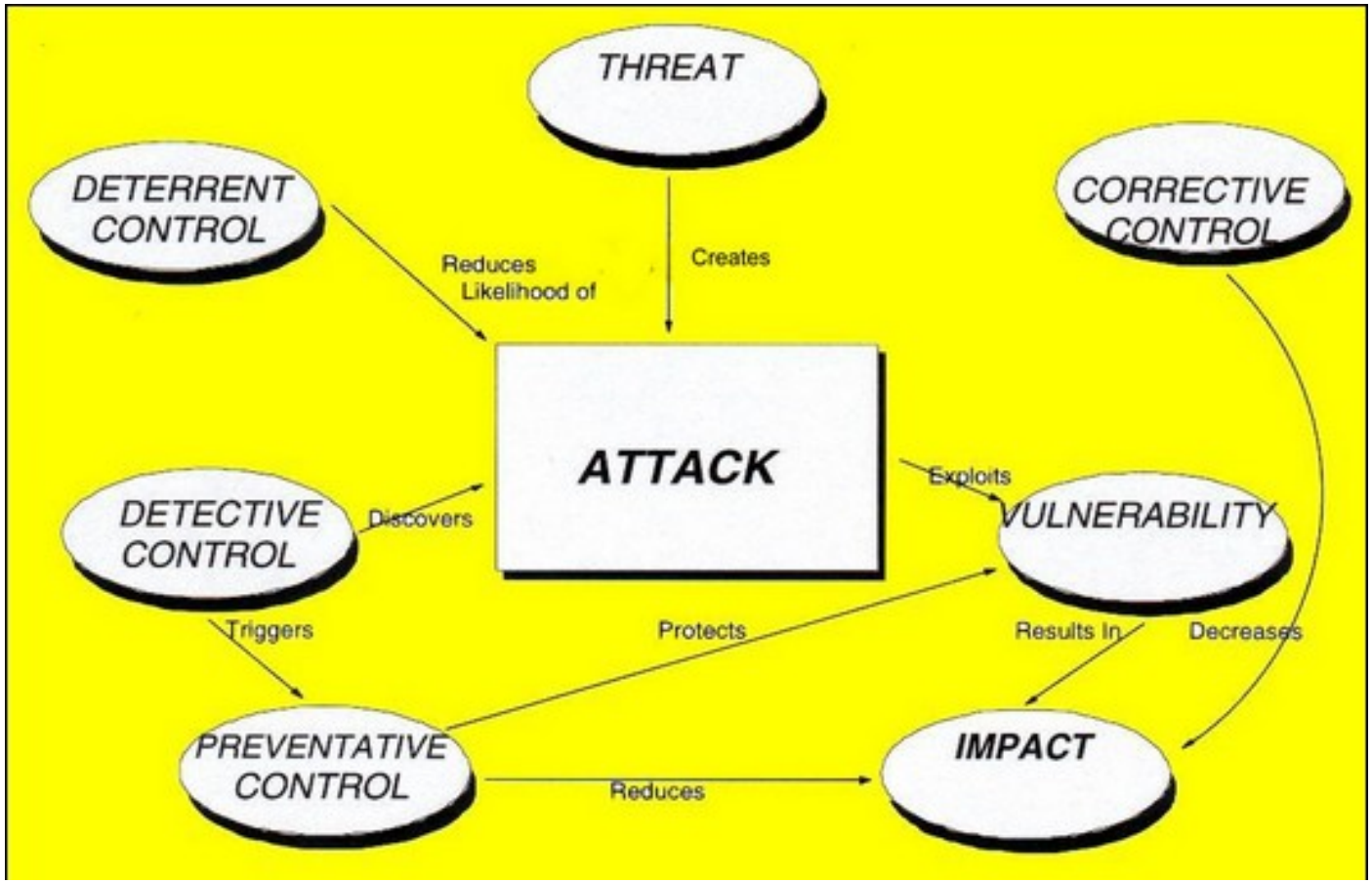
- VULNERABILITIESThese make a system more prone to attack by a threat or make an attack more likely to have some success or impact. For example, for fire a vulnerability would be the presence of inflammable materials (e.g. paper).

- CONTROLS

These are the countermeasures for vulnerabilities. There are four types:

Deterrent controls reduce the likelihood of a deliberate attackPreventative controls protect vulnerabilities and make an attack unsuccessful or reduce its impactCorrective controls reduce the effect of an attackDetective controls discover attacks and trigger preventative or corrective controls.

Controls


THREAT
DETERRENT CONTROL
CORRECTIVE CONTROL
Reduces Likelihood of
Creates
ATTACK
DETECTIVE CONTROL
Discovers
Exploits
VULNERABILITY
Triggers
Protects
Results In
Decreases
PREVENTATIVE CONTROL
Reduces
IMPACT