

Chapter 2 : Digital Generation

GENERATION Z

A generation that is surrounded by technology when growing up.

- *More ad-averse (dislike of ads)*
- *Spends more hours on mobile devices*
- *Thinking about retirement at young age*
- *Wants to be personally debt free*

Characteristics

- *Insightful & Savvy*
- *Knows world knowledge (due to the existence of internet)*
- *Responsible Self-Starters (hardworking, driven and responsible)*
- *Risk-Averse & Adaptable (understand that things can be changed any minute)*
- *Tech-Enabled (able to adapt with technology well)*

Stereotype Negative Traits

- *Have short attention span (cannot focus)*
- *Multitasker leading to high stress level*
- *Unable to handle f2f interactions*
- *High expectation on certain brands and companies they interact with*
- *Job-hop and ghost employers (not loyal towards an organisation)*

Millennials vs Gen Z

<i>Similarities</i>	<ul style="list-style-type: none">• <i>Shaped by technology.</i>• <i>Mostly lived in a mobile-first world.</i>
<i>Differences</i>	<ul style="list-style-type: none">• <i>Shopping habits.</i>• <i>POV about branding.</i>• <i>POV about money.</i>

DIGITAL NATIVE

The millennial generation and above, including Generation Z and Generation Alpha

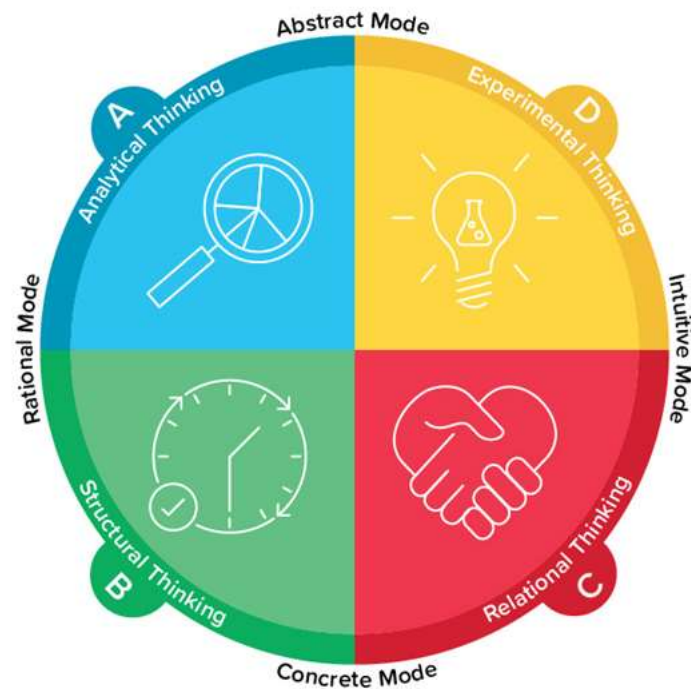
HYPERCONNECTIVITY

A maximum level of connection between humans and machines through devices and various platforms

Chapter 3 : Agile & Digital Thinking

AGILE THINKING

A way of thinking which enables the ability to respond to change or solve problems quickly and easily



Analytical Thinking - examine facts, numbers and problems (analyze)

Structural Thinking - coordinate projects, details and task (organize)

Relational Thinking - connect with people and emotions (personalize)

Experimental Thinking - formulate concepts and plans (strategies)

Characteristics

- Positive attitude
- Thirst for knowledge
- Goal of team success
- Pragmatism (common sense)
- Willingness to fail

DIGITAL THINKING

A fundamental paradigm shift from traditional ways of working and learning to be more agile and adaptive with the emerging digital technologies (having digital literacy)

DIGITAL LITERACY

The ability to use, understand, and engage with digital technologies effectively

Chapter 4 : Digital Culture & Society

CULTURE

A way / set of pattern of a group of people (behavior, belief, values, language etc)

DIGITAL CULTURE

A concept that describes how technology and the internet are shaping the way that we interact as humans

Impact on Digital Culture

- *Payment (e-wallets)*
- *Shopping (e-commerce)*
- *Service (website)*
- *Education (e-learning)*
- *Navigation (Waze / Google Maps)*
- *News*
- *Entertainment (YouTube / Netflix)*
- *Social Connection (social media)*

DIGITAL SOCIETY

An interdisciplinary research area and a kind of progressive society that has been formed as a result of adaptation as well as integration of advanced technologies into the society and culture

DIGITAL NATIVE

A person who has grown up in the digital age

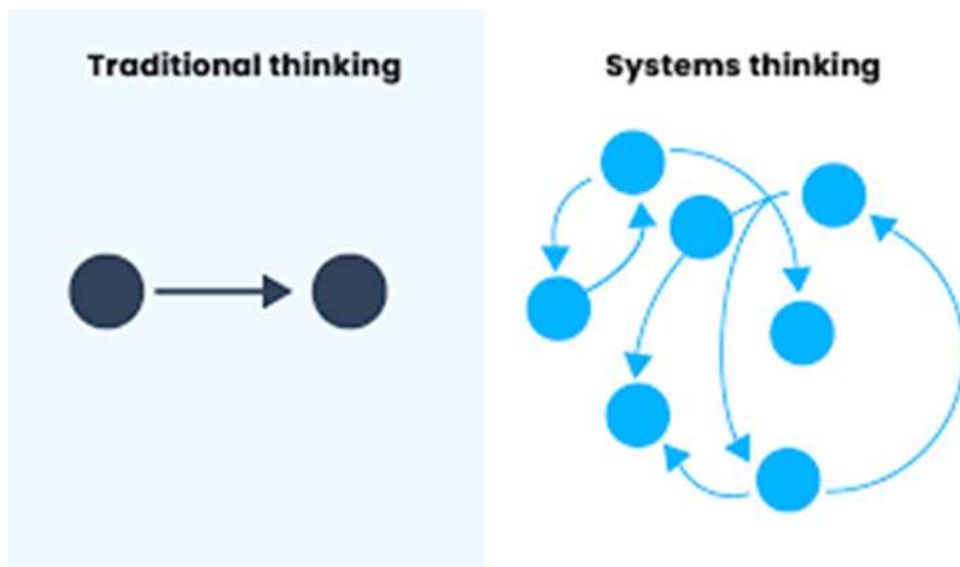
DIGITAL DEPENDENCY

The overuse of the internet or electronics to the point that one's daily life is affected

Chapter 5 : System Thinking & Organizational Innovation

SYSTEM THINKING

An approach to integration that is based on the belief that the component parts if a system will act differently when isolated from the system's environment or other parts of the system (looks at connected wholes rather than separate parts, e.g. house, food)



Summary :

A powerful approach to understand the nature of why situations are the way they are AND how to improve results

Characteristics of a System

1. Heap vs System

Heap	Comparison	System
X	If parts are being taken away / added, changes will happen. (e.g. car system - take away engine, whole car will not work)	/

2. Whole Greater than Sum?

- *The many interactions among the parts in a system give rise to qualities or properties that you just can't measure merely by adding those parts up*
- *E.g. Car parts - can measure the sum of weight of overall car but cannot measure other emergent properties such as comfort and speed*

3. Purpose

- *Most systems have a distinct 'point' or purpose in relationship to the larger system in which they are embedded / fixed (indirectly related)*

4. Causes & effects are a cycle

- *System thinkers notion of causality - feedback loops ($A > B > C > A$)*

5. Déjà Vu

- *A system archetype (Patterns of behavior of a system expressed by circles of causality have therefore similar structures)*
- *Behave in similar ways in very different kinds of settings*

Benefits of System Thinking

- *Understand and analyze the context within which one operates*
- *Bring together different stakeholders*
- *Can explore new business opportunities*
- *Create compelling vision of the future*
- *Understand the complex human factors associated with change*
- *Re-design broken systems*

Chapter 6 : Innovation in Digital Trends

BIG DATA

Data that contains greater variety, arriving in increasing volumes and with more velocity

(very big data that is fast and complex and cannot be processed using traditional methods)

CLOUD COMPUTING

An environment that provides resources and services accessed via the internet

- *Computer over the Internet*
- *Virtualized computing platform*
- *Scalable use of computing resources (can be measured)*
- *Pay-per-use concept*

SOFTWARE-DEFINED ANYTHING (SDE)

An approach where software is a lever to define and control the working of a hardware (one software control all hardware - e.g. smart home)

- *A growing trend towards disrupting traditional way of thinking*
- *E.g. Amazon - World largest bookseller, Netflix - Largest video service by number of subscribers*

OUTSOURCING vs CROWDSOURCING

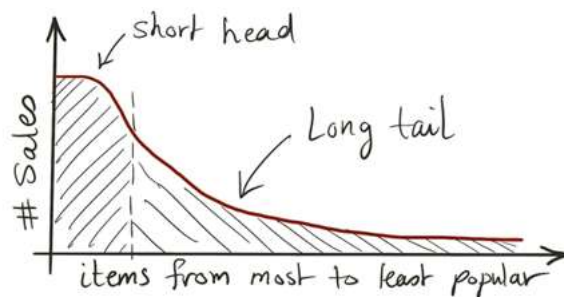
<i>Outsourcing</i>	<i>Comparison</i>	<i>Crowdsourcing</i>
<i>Focus on what you do best and let others do the rest</i>	<i>Definition</i>	<i>Encourage consumers and users to take charge and pursue their goals</i>
<i>Contract</i>	<i>Relationship Type</i>	<i>Partnership</i>
<i>Internet and beyond</i>	<i>Environment</i>	<i>Internet</i>
<i>Professional organizations or individuals</i>	<i>Choice of suppliers</i>	<i>Public network</i>
<i>Contractors only</i>	<i>Number of suppliers</i>	<i>Unlimited</i>
<i>Regular payment</i>	<i>Payment</i>	<i>Payment on satisfactory results</i>

PROSUMER ECONOMY

Consumer demand play a leading role reshaped into the demand chain (provider + consumer)

LONG TAIL

Refers to the large number of products that sell in small quantities, as contrasted with the small number of best-selling products



Head - High demand / best-selling products

Long tail - Large numbers of niche products that may not have high sales volume but contribute substantially to the market

ECONOMIES OF SCALE

Average costs decrease with the increase of production

DIGITAL FINANCE

Third-party payment companies integrate the gateway interfaces and build a bridge between numerous merchants and banks (e.g. TNG, PayPal, Alipay)

COLLABORATION

When a group of people come together and contribute their expertise for the benefit of a shared objective, project, or mission (e.g. Google Drive, Microsoft Teams, Skype)

Chapter 7 : Innovation through AI

ARTIFICIAL INTELLIGENCE

The concept of creating computer programs or machines capable of behavior we would regard as intelligent if exhibited by humans

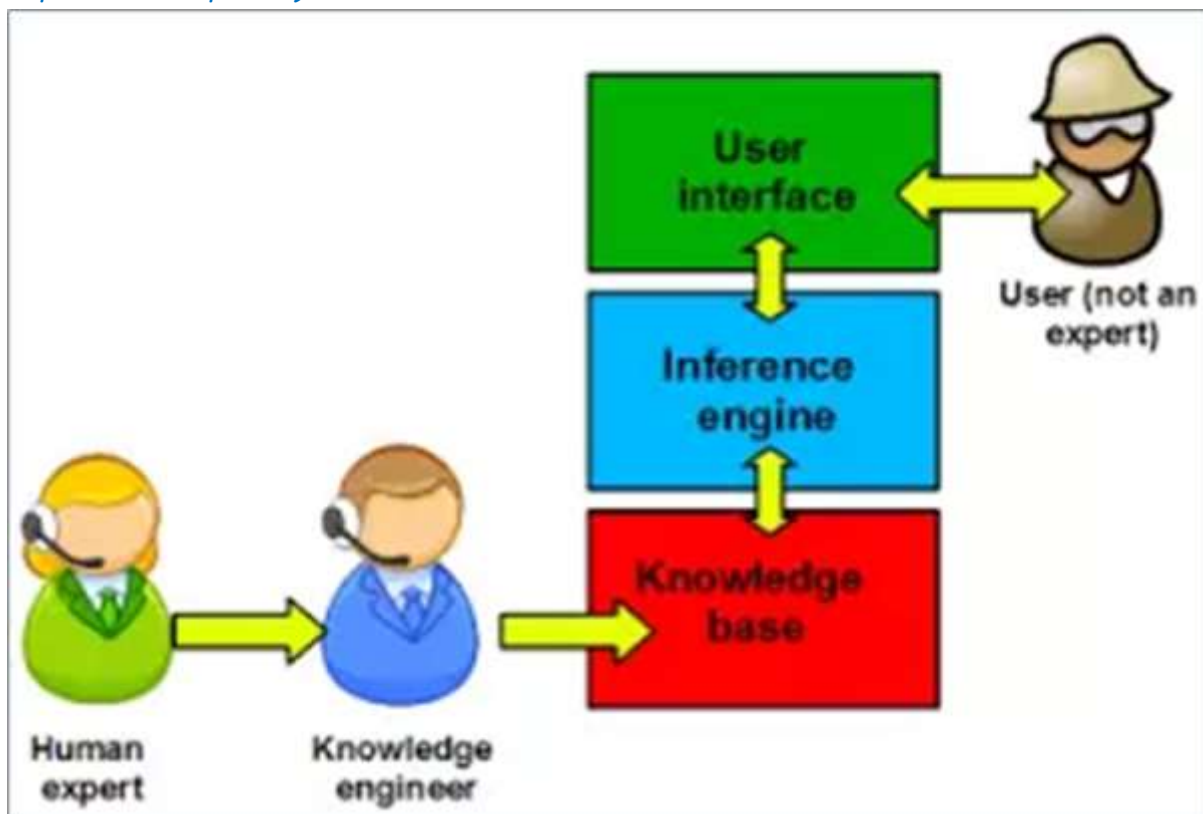
Impact of AI on Human Labor

1. Job opportunities
 - Some jobs may be affected, some jobs may be much needed, new job opportunities
2. Innovations
 - New things that AI can do

EXPERT SYSTEM

A system that employs human knowledge captured in a computer to solve problems that ordinarily requires human expertise (a system like ChatGPT, but can solve more expertise / professional / complex problems)

Experts > Transfer Expertise > Rules & Inferencing (IF ELSE THEREFORE) > Explanation Capability



Importance of Expert System

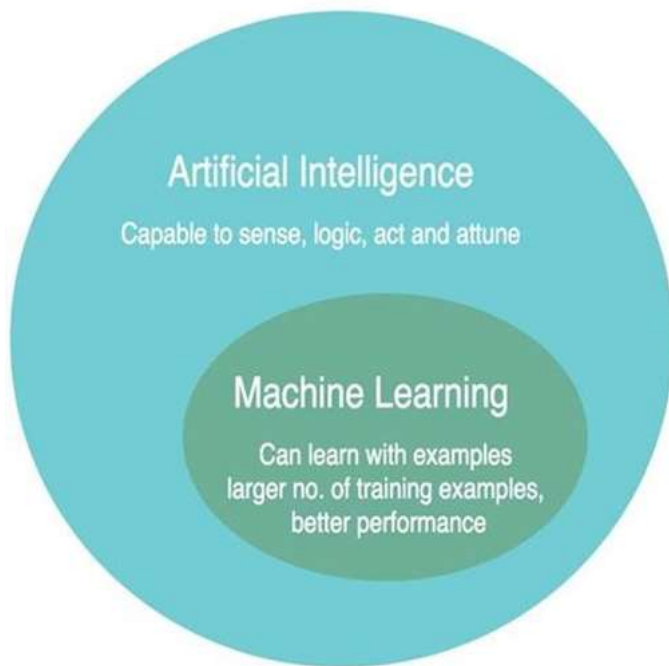
- *Preserve knowledge (kept in the system)*
- *To train new employees*
- *Improve worker productivity*

MACHINE LEARNING

A method of data analysis that automates analytical model building

Example :

- *Virtual Personal Assistants*
- *Online Customer Support*
- *Search Engine Result Refining*



ARTIFICIAL NEURAL NETWORKS *(subset of machine learning) (human brain structure)*

A computer program inspired by certain presumed organizational principles of a real neural network

ROBOTICS

Involves building machines that are capable of performing physical tasks

COMPUTER VISION

Focused on equipping computers with the ability to "see", in the sense of interpreting visual images

SPEECH RECOGNISATION

The process of converting speech signals into digital data (Siri / Google Assistant)

NATURAL LANGUAGE PROCESSING (NLP)

Deals with the interaction between computers and humans using the natural language

Example :

- *Predictive Text (will predict what word you will be writing next / give suggesting words for users to use)*
- *Google Search (Learn what we search and gives suggestions / something relevant suggestions)*

COMPUTER VISION

A field of artificial intelligence that enables computers to interpret and make decisions based on visual data from the world, often involving the analysis of images or video

Chapter 8 : Innovation through Analytics

DATA

Is raw, unorganized facts that need to be processed

INFORMATION

Data that is processed, organized, structured or presented in a given context to make it useful

DATA ANALYTICS

The science of analyzing raw data to make conclusions about that information and to enhance productivity and business gain (e.g. Google Analytics) [Can be structured or unstructured]

Factors of Data Analytics

- *Gather hidden insights (find out / conclude information that we might not know)*
- *Generate reports (the overall performance - according to data collected)*
- *Perform market analysis (gives understanding to the organization about the market better)*
- *Improve business requirements*

Tools of Data Analytics

Clean & Transform Messy Data – Data Preparation
OpenRefine (formerly Google Refine)
Descriptive Analytics
MS Excel
Descriptive Analytic, Diagnostic Analytics
Tableau Public, QlikView [in-memory data processing]
Descriptive Analytic, Diagnostic Analytics, Predictive Analytics, Prescriptive Analytics
<ul style="list-style-type: none">• R Programming – [Descriptive, Diagnostic, Predictive], Prescriptive – can be extended to perform prescriptive analytics to some extent, Free• Python - Free• RapidMiner – Free, Not Free• KNIME – Free, Not Free• SAS – Prescriptive Analytic – High, Not Free, Robust

- Apache Spark - Prescriptive Analytic – High, Free, Not Free [in-memory data processing], Robust

DATA ANALYST

A professional who can analyze data by applying various tool and techniques and gathering the required insights

BIG DATA

Data that is so large, fast or complex that it's difficult or impossible to process using traditional methods

Types of big data

Gartner Analytic Model Examples

Type of Analytics	Question Answered	General Business Example	Healthcare Example
Descriptive Analytics	What Happened?	How many cars did we sell last year?	How many patients were diagnosed with HBP last year?
Diagnostic Analytics	Why Did It Happen?	Why did we only sell x cars last year?	Why did these patients develop HBP?
Predictive Analytics	What Will Happen?	If I run x advertising programs, how many cars can we sell?	What are the chances Mr. Jones' HBP will result in a stroke?
Prescriptive Analytics	How Can We Make it Happen?	What do we need to do to sell x number of cars?	Mr. Jones should be put on x medication to prevent his HBP from resulting in a stroke.

BIG DATA ANALYTICS

A complex process of examining large and varied data sets, to uncover information that can help organizations make informed business decisions

- *Solve advertisers problem and offer marketing insights (understand users interest)*
- *Boost customer acquisition and retention (accurately aim customers and retaining them)*
- *Helps in risk management*
- *A driver of innovations and product development*
- *Supply chain management*

Chapter 9 : Innovation through Internet of Everything (IoE)

INTERNET OF THINGS (IoT)

The collective network of connected devices and the technology that facilitates communication between devices and the cloud, as well as between the devices themselves (Connect things to the internet and enable communication within the things)



- *Keeps systems functional by sensing and analysing data (automatic with no human intervention - using sensors, chips, actuators, radiofrequency identification (RFID))*
- *NOT to communicate among people*
- *NOT to access knowledgeable information*

CYBER-PHYSICAL SYSTEM (CPS)

A system that integrates physical and computational components to monitor and control the physical processes seamlessly (Domain of IoT, needs tight integration and control in closed-loop systems)

- *3D Printing*
- *Augmented reality*
- *Advanced robotics*
- *It enables responses within the schedule*

- *Decision-making role*

Benefits of IoT

- *Encourage Machine-to-Machine (M2M) communication*
- *Can automate by itself wirelessly without human intervention (collect data fast - efficiency)*
- *Can collect more information for better decision making*
- *Does not need 24 hour monitoring*
- *Reducing cost as optimum utilization of energy and resources are used (all under surveillance)*
- *Better quality of life*

Issues of IoT

- *Compatibility - different devices or protocols within an IoT ecosystem might not be able to work together*
- *Complexity - Need professional knowledge to manage and maintain devices and sensors*
- *Privacy - as IoT system involves data sharing and Third-Party access, personal information might be leaked out*
- *Security - Malicious attacks or unauthorized access towards smart devices (hackable system that can control overall smart devices)*
- *Safety - Involves physical harm, damage or hazards caused by the failure or misuse of IoT devices (hackable devices that can turn into smart weapon)*

INTERNET OF EVERYTHING (IoE)

Connection of smart devices, people, data and processes. Everything is linked up, working together to make things smarter and more efficient

- *May lead to privacy concerns as every of our moves are being recorded*

Chapter 10 : Digital Currency & Blockchain

DIGITAL CURRENCY

Money in electronic form, existing solely online without physical notes or coins (E.g. Cryptocurrency such as Bitcoin) (take note : not all digital currencies are cryptocurrency)

Problems : double-spend

Solutions : Blockchain technology

E-MONEY

A digital version of traditional currency stored electronically, regulated by authorities (E.g. digital e-Wallets)

Advantages of Digital Currency

- *Provides users with a more streamlined alternative (organized / efficient / simple)*
- *Peer-to-peer transactions*
- *Payments are both instantaneous (on the spot) and low-cost*
- *Introduce a higher level of record-keeping and transparency to the sector*

BLOCKCHAIN

A shared immutable ledger that facilitates the process of recording transactions and tracking assets in a business network

CENTRALISED LEDGER (Digital currency)

The main store of data and is responsible for managing it. There are no reconciliations as there is a central ledger

DISTRIBUTED / DE-CENTRALISED LEDGER (Cryptocurrency)

Each party has the same copy of data. They work together to store, distribute and validate data

Advantages of Cryptocurrency

- *Built-in scarcity may support value (inflation protection)*
- *Loosening of government currency monopolies*
- *Self-interested, self-policing communities within a blockchain system (miners earn rewards (aka cryptocurrency) by validating*

transactions, therefore they will try their best to keep system secure and accurate)

- **Robust privacy protection** (miners and public do not know who are the miners)
- **Harder for governments to exact financial retribution** (cannot be controlled by government)
- **Fewer barriers and costs to international transactions** (makes transactions easy and cheap, minimal (< 1%) or no fees needed - decentralized nature of cryptocurrency)
- **Generally cheaper than traditional electronic transactions** (no third-party payment processors, e.g. Visa)

Disadvantages of Cryptocurrency

- **Lack of regulation facilitates black market activity** (use them in black markets)
- **Potential for tax evasion in some jurisdictions** (they are not regulated by national government, therefore attracting tax evaders)
- **Potential for financial loss due to data loss** (because it is all "digital")
- **Potential for high price volatility and manipulation** (big amount of shares are held by small amount of people, making it easy to control its value, leading to drastic price swings and potential manipulation)
- **Often can't be exchanged for fiat currency** (difficult to exchange it to regular money / fiat currency - gold, silver)
- **Limited to no facility for chargebacks or refunds** (no one to turn to for dispute resolutions if being cheated / no refunds)
- **Adverse environmental impacts of cryptocurrency** (high energy consumptions)

Digital Currency vs Cryptocurrency

Digital Currency	Cryptocurrency
Centralized location for transaction	Decentralized location for transaction
Confidential transaction	Transparent transaction
Central Authority to deal with issues	Govern by the respective communities

BLOCKCHAIN

Master ledger that records and stores all prior transactions and activity, validating ownership of all units of the currency at any given point in time

- *Records the entire transaction history to date*
- *Transactions are usually irreversible*
- *Full nodes that keep complete copies of the blockchain secure and reliable (something like guardians of the blockchain) (take note: it is different with miners, nodes are the computers)*
- *No central authority managing data flow*
- *Produce cryptocurrencies as an incentive to maintain the integrity of the network (miners have benefits - avoid corruption)*

BITCOIN

- *The first immutable and unalterable digital currency / cryptocurrency*
- *A medium of exchange, unit of account / standard measure, store of value*
- *Little in amount, unduplicable, portable*

MINERS

Serve as record-keepers for cryptocurrency communities, and indirect arbiters of the currencies' value

The present and future of Digital Currency

Central Bank Digital Currency (CBDC)

- *Features a centralised distributed ledger technology (DLT)*
- *Allows central bankers to issue and control the monetary supply*

Chapter 11 : Digital Security

DIGITAL SECURITY RISK

An event that could cause loss of or damage to a computer or mobile device hardware, software, data, information or processing capability

COMPUTER CRIME

Any illegal act involving the use of a computer or related devices

CYBERCRIME

Online or Internet-based illegal act

MALICIOUS SOFTWARE (Malware)

Designed to harm or exploit computer systems, often causing damage, stealing information or disruption normal operation

1. VIRUS

Replicates and spreads by attaching itself to other programs, files or documents (need user interactions)

2. WORM

Copies itself repeatedly, using up resources and possibly shutting down computer or network (no user interaction required)

3. TROJAN HORSE

Hides within or looks like legitimate (legal) file or program until triggered

4. PLAYLOAD

The action or effect the malware is designed to deliver (damaging files, stealing information, disrupting computer functions)

5. SPYWARE

A program that secretly gathers and transmits user information without their knowledge

6. ROOTKIT

A program that hides in the device and allows someone from a remote location to take full control of the computer or devices

7. RANSOMWARE

Encrypts a user's file, demanding payments for their release (digital extortion - forcing users to pay)

8. ADWARE

A program that displays unwanted advertisements on a user's

computer (pop-up ads or banners, email messages, other internet services)

9. **BOTNET**

A group of compromised computers or mobile devices connected to a network (a botmaster will control all devices)

10. **ZOMBIE PC**

Compromised computer or device

11. **DENIAL OF SERVICE ATTACK (DoS)**

Disrupts computer access to an Internet service

12. **DISTRIBUTED DoS ATTACK (DDoS attack)**

Larger scale of a DoS (many compromised devices bringing overwhelming internet traffic into a server, causing server breakdown / slow / unavailable)

- The Computer Emergency Response Team Coordination Centre (CERT//CC) assist to prevent DDoS attacks

13. **BACKDOOR**

Program or set of instructions in a program that allows users to bypass security controls

MACRO VIRUS

Malicious code written in word programs

ANTIVIRUS

A software designed to detect, prevent and remove malicious software from a computer or device

VIRUS SIGNATURE / VIRUS DEFINITION

A unique code or pattern (binary pattern) used by antivirus software to identify and detect specific viruses or malware on a computer

SURGE PROTECTOR

Protects computers and equipment from electrical power disturbances (e.g. uninterruptible power supply (UPS))

How does Anti-virus work?

- a. Use information to detect if virus has tampered any files
- b. Records information about the files such as file size and creation
- c. Attempts to remove any detected virus
- d. Quarantines infected files that it cannot remove
- e. Keeps files in separate areas of hard disk

Steps to prevent Malware

- Do not open e-mails attachments unless from trusted source
- Install personal firewall programs
- Install antivirus programs
- Scan all removable devices

Prolonged malfunctions of computer

- Aging hardware, natural disasters or electrical power disturbances
- Might cause loss of hardware, software or data
- Noise - unwanted electrical signal
- Undervoltage - drop in electrical supply
- Overvoltage / power surge - significant increase in electrical power

DIGITAL SIGNATURE

Encrypted code that a software attaches to an electronic message to verify the identity of the message sender (something like a virtual seal on digital documents or messages)

DIGITAL CERTIFICATE

A kind of online ID card that verifies the authenticity of a website or entity on the internet (the padlock on the address bar)

SECURE SITE / SECURE SOCKET LAYER (SSL)

A website that uses encryption and other security measures to protect the information exchanged between the user and the site (e.g. https://)

CERTIFICATE AUTHORITY (CA)

A trusted organization that issues digital certificates, confirming the legitimacy of entities like website (e.g. GoDaddy, DigiCert, SSL.com)

BACKUP

To duplicate file, program or disk (e.g. full / selective backup)

DISASTER RECOVERY PLAN

Written plan for restoring computer operations in the event of disaster

1. **Emergency Plan** - steps taken immediately after disaster
2. **Backup Plan** - detailing how backup files and equipment will be utilized to resume information processing in case of data loss or system failure

3. *Recovery Plan* - actions to execute to fully restore information processing operations, hardware and software aspects
4. *Test Plan* - To stimulate various disaster scenarios to assess the organizations ability to recover (test and make continuous improvements)

Chapter 12 : Digital Ethics

ETHICS

Set of beliefs about right and wrong behavior within a society (community belief)

COMPUTER ETHICS

Moral guidelines that govern the use of computer and Information Systems

MORALITY

Shared social conventions about right and wrong that is the basis for an established consensus (personal beliefs)

VIRTUE

Habit that inclines people to do what is acceptable

VICE

Habit of unacceptable behavior

LAW

System of rules, enforced by a set of institutions

Concerns about ethical use of Information Technology (IT)

- *E-mail and Internet Access monitoring at work*
- *Software piracy, downloading in violation of copyright laws*
- *Unsolicited e-mail, spoofing (pretend to be someone else), spamming, phishing*
- *Hacker and cracker (stealing sensitive info) theft*
- *Plagiarism by students*
- *Malware, cookies and spyware to illegally track a user*

CODE OF ETHICS

A set of guidelines or principles that outline acceptable and expected behaviors for individuals or members of a profession, emphasizing moral and ethical standards (usually align with vision, mission, goals of organization)

ASSOCIATION FOR COMPUTING MACHINERY (ACM)

A professional organization for individuals in the computing and information technology fields

PROFESSION

Requires specialized knowledge and intensive academic preparation

INTEGRITY

Acting in accordance with a personal code of principles

Ethical Issues

1. **Software piracy**
 - *The act of illegally using, copying, modifying, distributing, sharing, or selling computer software protected by copyright laws*
2. **Trade secret**
 - *Intellectual property (IP) rights in confidential information which may be sold or licensed*
3. **Whistle-blowing**
 - *Employee reveals information about activity within a private or public organization that is deemed illegal, immoral, illicit, unsafe or fraudulent*
4. **Conflict of interest**
 - *Conflict between employee's self-interest and the interests of the client*
5. **Fraud**
 - *Obtaining goods, services, or property through deception or trickery*
6. **Misrepresentation**
 - *A false or misleading statement or a material omission which renders other statements misleading, with intent to deceive (trick or lie)*
7. **Breach of contract**
 - *When one party fails to meet the terms of a contract*

Bribes vs Gifts

Bribes	Gifts
Are made in secret, as they are neither legally nor morally acceptable	Are made openly and publicly, as a gesture of friendship or goodwill
Are often made indirectly through a third party	Are made directly from donor to recipient
Encourage an obligation for the recipient to act favorably toward the donor	Come with no expectation of a future favor for the donor

Source Line: Course Technology/Cengage Learning.