MANAGEMENT INFORMATION SYSTEM (MIS) and E-COMMERCE
UNIT-V

E-MARKETING CHARACTERSTICS

Addressability: the ability to apply transmission is the contribution of the Internet by providing assistance to agencies in order to determine their customers even before the implementation of the purchase. The role of digital technology is to provide multiple options for website users to determine their requirements.

Interactivity: Interactivity is the ability of customers to express their desires directly to enterprises, through their response and interaction with the marketing communications issued by these institutions.

Memory: It is the ability of electronic marketing to access databases that contain information about customers and their purchase dates.
Memory storage helps agencies that use electronic marketing to obtain customer information in a timely manner in order to provide marketing offers to them.

Control: This provides customers with the ability to control all the information provided through them; it provides customers only the information they want, and without forcing them to provide any confidential information.

Accessibility: This provides more detailed information to customers about the institutions' products and prices, while activating the ability to compare a group of products. Therefore, commercial institutions seek to develop their products based on the wishes of existing customers, and in an effort to reach new customers.

METHODS OF E-MARKETING

Search engine optimization (SEO): Search engines are relying on the use of a special type of website that contributes to providing information stored on all websites on the Internet and helps to achieve the desired goal of electronic marketing. Search engine optimization (SEO) is an important source of attracting customers and a method used to increase the number of visitors to the website that contains the products.

Search Engine Marketing (SEM): Search engine marketing is a type of digital marketing and it is one of the electronic marketing channels.
SEM seeks to increase and improve the appearance of the site to be marketed on the search engine results page.
As the owner of a product or service, the emergence of your site to top the first results in the search engines increases the number of visitors and thus increases profits.

Paid advertising: Paid advertising rectangles come first among the methods used in electronic marketing and are considered one of the most popular advertising methods across the Internet, as many website users see them.

Affiliate Marketing: Affiliate marketing is a performance-based marketing system in which a seller of a product pays a dependent commission when someone purchases his product.
The "product" can be physical (books, CDs, DVDs, clothing, jewelry, natural medicines, etc.) or digital

(e-books, e-reports, programs, online courses, etc.).
When your visitor clicks on your affiliate link (on your site), they are redirected to the seller's website, where the seller will close the sale; much easier after you've prepared for them!
When a visitor to your site purchases a seller's product, you get a commission.

Social Media Marketing (SMM): Advertising and promotion of products via social media on the Internet. This branch of electronic marketing can be considered Word-Of-Mouth Marketing (WOM Marketing) across the World Wide Web.
There are specific tools designed to help marketers know how effective social media marketing is, and what improvements you might want to do to increase this effectiveness.

Email marketing: Email marketing is a highly active, cost-effective way to get your marketing message across to existing and potential customers. E-mails are very important in e-marketing. Many marketing officials are interested in designing e-mail forms that contain many different and interactive designs of products in order to reach consumers.
Email marketing mainly depends on having a valuable email list, so if you haven't had a chance to build it before, then it's time for that.

E-MARKETING VALUE CHAIN

The e-marketing value chain is a framework that outlines the various stages involved in the process of creating and delivering value to customers through online marketing activities. Here are the key stages involved in the e-marketing value chain:

1. **Market research and analysis:** This involves identifying and understanding customer needs and preferences, as well as market trends and competitive landscape.
2. **Strategy development:** Based on the insights gained from market research, e-marketing strategy is developed, which outlines the goals, target audience, messaging, and tactics to be used.
3. **Website and content development:** The website is designed and developed to attract and engage customers. Content is created to inform, educate, and entertain customers.
4. **Search engine optimization (SEO):** SEO techniques are used to improve the visibility of the website in search engine results pages (SERPs) and attract organic traffic.
5. **Online advertising:** Advertising is used to attract targeted traffic to the website. This may include paid search, display ads, social media ads, and other types of online ads.
6. **Email marketing:** Email marketing is used to engage customers and build relationships. It may include newsletters, promotional emails, and automated email campaigns.
7. **Social media marketing:** Social media platforms are used to connect with customers, build brand awareness, and drive traffic to the website.
8. **Analytics and measurement:** Data is collected and analyzed to measure the effectiveness of e-marketing activities and identify areas for improvement.
9. **Continuous improvement:** Based on the insights gained from analytics, e-marketing activities are continually optimized to improve performance and achieve business goals.

BROWSING BEHAVIOUR MODEL

A browsing behavior model is a framework used to understand how people interact with websites and other online platforms. The model helps to identify the key factors that influence user behavior during their browsing session.
There are various models used to explain browsing behavior, but the most common one is the Information Processing Model. This model consists of four stages:

1. **Exposure:** The user is exposed to a website or platform, either through a search engine, social media, or direct URL entry.
2. **Attention:** The user decides whether to pay attention to the website or not. This decision is based on the website's design, relevance, and value proposition.
3. **Comprehension:** The user tries to understand the information presented on the website. This stage involves reading, scanning, and interpreting the content.
4. **Retention:** The user stores the information in memory for future use. This stage depends on how well the website or platform is designed to facilitate retention, such as through the use of visuals, interactive features, and easy navigation.

Other models, such as the Theory of Reasoned Action and the Technology Acceptance Model, focus on the psychological and social factors that influence browsing behavior. These models emphasize the importance of attitudes, beliefs, and social norms in shaping user behavior.

Overall, a browsing behavior model can help businesses and website designers understand their target audience and create a more user-friendly and effective online experience.

E-ADVERTISING

In the era of Internet, people can get a lot of information online, which increases their awareness about lifestyles, products, and services. For them, the Internet serves as a channel for not only communication but also for transaction and distribution. People can visit the website and can pay online for what they purchase.

You can increase the business profit in multifold by online advertises of your products and services.

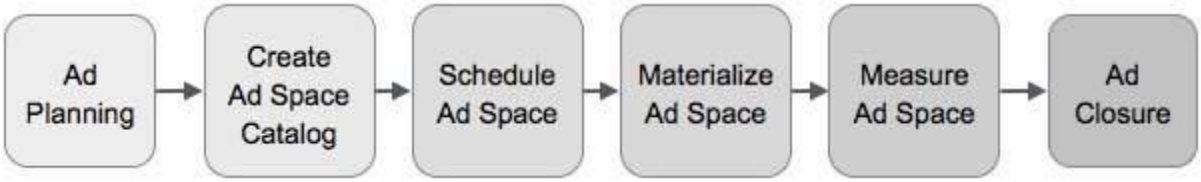
What is Online Advertising?

Online advertising is a type of business promotion which uses Internet to deliver marketing messages to attract customers.

With the rapid growth of Internet users and Internet technology, a number of businesses started to advertise their products and services online.

Publishing an Online Advertise

Publishing an online Ad is a sequential process. The following diagram shows the basic steps an Ad publisher takes to create and post the Ad online −



Ad Planning

The marketing team conducts analysis of various domains.

- Marketing analysis
- Product targeting analysis
- Audience analysis
- Customer targeting analysis

Based on the analysis results, the advertiser decides on −

- Selecting a publisher
- Ad presentation approach
- Approach of posting the Ad
- Ad posting schedules

Creating Ad Space Catalog

Ad space list is created to record Ad space availability status, space profile, location, presentation, scheduling method, frequency, etc.

Trading Ad Space

Advertisers and Publishers interact to determine online Ad space. There are three types of Ad space trading −

- **Buy and Sell** − Publishers sell the Ad space schedule to Advertisers on first-come-first-serve basis.
- **Space Auction** − Ad space bidding is conducted to settle the trade.
- **Space Exchange** − Multiple publishers interact with each other to sell the space schedules available with them, which have not been sold.

Scheduling the Ad Space

The online publishers create and maintain advertising schedules for the online Ad space. They help the advertisers for booking, purchasing, and confirming various schedules for online advertisements.

Materializing the Ad Space

The online publishers collect advertisement from the advertiser and materialize the specified ad spaces by displaying the advertisement as per the specified schedules.

Measuring an Ad Space

All active Ad spaces in the publishing websites are monitored and measured. After the Ad is actually visible and accessible online, it is evaluated regularly for performance. The analyzers collect data and evaluate the effectiveness on the viewers, its popularity, Ad space management, etc.

Ad Closure

The advertisers pay the publishers by pre-decided terms of payment for the published online Ad.

Online Advertising Performance Measurement

The performance of an online Ad is measured to enable the marketing team to analyze the readings of measurement.

What Does the Performance Measures Tell?

The performance measurement can uncover the following facts −

- Effectiveness of the Ad on views.
- Problems related to the Ad such as inappropriate content, incorrect targeting of people, Ad place, and timing for publishing.
- Estimation and prediction of sales in short and long terms.

Online Advertising - What to Measure?

The performance metrics of Online Ad are as follows −

Clicks − It is the number of times viewer clicks the Ad. It can be taken as viewer's acknowledgement to your Ad. It suggests that the viewer has seen the Ad and wants further information.

Impressions − It is the number of times your Ad is displayed on the web page.

Click Through Rate (CTR) − It is the ratio of Ad clicks to Ad impressions. The higher the CTR, the more relevant your Ad is.

Cost Per Click (CPC) − It is the amount advertiser pays for each click on the Ad. The number of clicks determines the amount of payment. The lower CPC is better.

Cost Per Thousand Impressions or Cost Per Mille (CPM) − It is the amount the advertiser pays for thousand clicks.

Return On Investment (ROI) − It is (Return – Investment) X 100. The higher ROI is better.

Advantages of Online Advertising

Online advertising is beneficial over conventional advertising in many ways.

- Internet access is easy and affordable. Today, the number of global internet users is almost 3 billion. No other conventional advertising medium can bring such huge audience for your products or services.

- Internet is capable of serving multimedia substance such as audio and video content apart from text and graphics. Multimedia advertisements are highly persuasive.
- Internet by nature is interactive. It can provide a reliable platform for smooth shopping experience for people. The conversion rate is high for compelling advertises.
- No time or demographic constraints on delivering the online advertise.
- Online advertising is promotional as well as informational.
- It brings speedy outcomes.
- It provides effective performance tracking.

E-BRANDING

E-branding is everything that appeals to the brand's reputation on the internet. It is therefore the policy of a brand to promote it to online consumers.

The approach includes the name of the brand,

- Its hosting,
- Its promotion,
- Its referencing,
- Its strategy and all web marketing aspects

allowing to improve the quality side of the brand with Internet users.

Branding brings together all the aspects involved in the brand image of a company:

- Description of the quality of its products.
- Its graphic charter, its visual identity.
- Its values.
- The logo.

Goals: E-Branding

Lesson Contents

- Goals: E-branding
- Know the brand's values
- The challenges of brand creation
- HOW TO AVOID THIS MARKETING ERROR?
- The importance of E-branding
- In conclusion,

The objective of E-branding is to make a brand known and to unite around a brand community, an audience who will have the role of ambassador.

Since it is essentially a question of refining its brand image, more than the quantity, it is the quality that interests the Webmarketing teams in an E-branding campaign.

E-branding does not seek immediate performance, but rather to build a community around specific values.
Different techniques will be used and in particular interventions on social networks in SMO.
The video is particularly appreciated within the framework of E-branding since it has an extreme virality on social networks or in blogs.

Know The Brand's Values

Before defining an E-branding campaign, it is essential to know the brand's values and clearly define the target audience.
These two elements are the keystone for setting up an E-branding action since they will make it possible to constitute the messages and target the media on which the brand will disseminate these messages.
RELATED POST: How to adapt your marketing strategy to deal with the coronavirus?
Focusing on a target audience is more effective than trying to reach a larger audience.
It is only when the brand is well developed and already enjoys a certain reputation that we will be able to try to expand our community by attracting new consumer profiles.

The Challenges Of Brand Creation

The challenges of brand creation are numerous. However, its competitive dimension is particularly important.
Indeed, the first mission of your brand will be to differentiate you (better, if possible) from your competitors in the eyes of consumers.

However, if you win by watching what others are doing, you will always lose by seeking to reproduce their practices.

HOW TO AVOID THIS MARKETING ERROR?

By conducting regular competitive intelligence to constantly ensure the originality of your brand.
Know your enemies: this adage also applies to marketing, and especially to the art of branding.

The Importance Of E-Branding

It is important to take your time and build a good brand image.
Branding helps build trust with our target audience and create a strong emotional bond by showing them what the company is as a brand (brand identity).
For any business, online branding is central not only to the success of the business but to its continuity and relevance in today's business world. It is difficult to overstate the importance of online branding for a business, and here are the top 10 reasons why online branding is important for your business.

- **Recognition:** In order for people to learn about your business and what you have to offer, online branding is essential. Without this, your business will remain unknown and customers will be hard to come by.

- **Preference:** For people to gain trust in your brand and prefer you over other businesses of your kind, you will first need appropriate online branding. This is the only way for people to be aware of your business and continue to work with you.

RELATED POST: How to put in place a good digital strategy?

- **Brand Loyalty:** Brand loyalty is one of the most important consumer aspects of any business. When people can see your brand and know what you can do, they will remain loyal to your brand and pick you over others in the market.

- **Differentiation:** The market is full of people offering similar goods and services. This can make it difficult for the consumer to be able to differentiate one business from the other. Online branding alleviates this problem and clearly marks you as different from other players in the market.

- **Recommendation:** Recommendation is a big part of the business. Recommendations give you access to a whole new client base and maximize your profitability. It is however very difficult for people to recommend your business to others if they are not sure what your brand is. Online branding will help people recognize and get familiar with your business.

- **Reduced Advertising Expenses:** Online branding gets your name out there in the beginning, and as people become more aware and familiar with your brand, you will find yourself spending less time and money on branding. In the long run, online branding will reduce the amount of money you spend on advertising and overall operation costs.

- **Better Business Equity:** Online branding will get people to stick to your brand. Once you have a loyal consumer base, you will be free to charge what you feel your products are worth. This is great for increasing profitability and brand loyalty.

- **Recognition:** online branding gets your name out to the consumer and potential clients, and makes your business familiar to them. This is a great way to get noticed and recognized as a leader in your niche market.

RELATED POST: Building Domain Authority for Your Site in 7 Easy Steps

- **Memory:** Consumers will only be able to remember brands that have made an impact on them. A good brand design should be easy to remember, and easily recognizable among other similar brands. Online branding ensures that your clients and potential clients commit your brand to memory, and can be able to recognize it easily.

- **Emotional Attachment:** Studies have shown that consumers are emotionally attached, to some level, to their favorite brand. A good brand should be able to tap into the emotional part of the consumer, and ultimately lead to the creation of a fiercely loyal customer base.

In Conclusion,

Branding is not to be taken lightly. E-branding requires a real work of analysis and reflection, because customer loyalty requires having a well-developed brand image, making an impression. It is often essential to use the services of professionals to support you throughout the process.

E-MARKETING STRATEGIES

1: Search Engine Optimization (SEO)

SEO or search engine optimization is the process of adjusting your website to improve its organic, free, or “natural” placement in search results. SEO consists of on-page factors (content, structure, and user-friendliness) and off-page factors (links from other sites, social shares, authority). SEO

strategies involve adjusting certain elements on your website so it meets Google's requirements while making sure your website presents the best overall experience for visitors.

2: Search Engine Marketing (SEM)

Search engine marketing or SEM is the process of using paid search (Pay Per Click ads) to gain website traffic. In the past, SEM was used as an umbrella term that encompassed SEO and paid search. Over time, as the digital marketing industry evolved, the term SEM stopped being used for both types of internet marketing strategies, and has come to typically refer exclusively to paid search activities (according to Search Engine Land).

3: Pay Per Click or Pay Per Call (PPC)

PPC marketing can be broken down into two main categories: paid search (see above) and paid social marketing. Ads are published on search engines or social platforms, and companies are charged every time their ad is clicked.

Google AdWords is the most popular paid search platform, followed by Bing Ads, which also serves search ads on Yahoo. Search marketing encompasses display, mobile, retargeting/remarketing, and paid social advertising.

Facebook, Twitter, Instagram, and other social platforms have expanded their ad offerings and made it more difficult to achieve organic views of marketing posts. As a result, paid social is accounting for a higher percentage of most companies' PPC ad spend budgets. PPC strategies can create a dramatic, short-term boost in visibility and sales.

4: Content Marketing

Moz defines content marketing as the creation and distribution of relevant, valuable content to communicate with customers and achieve your marketing goals. Content marketing strategies focus on communicating with customers, rather than selling, providing content that educates, amuses, or otherwise provides value to customers on a consistent basis in order to attract and retain a specific desired audience.

Content encompasses virtually any information format disseminated online such as blogs, videos, podcasts, infograms, social media posts, and more. High quality content plays a role in all the main types of online marketing strategies, including SEO, PPC, social media marketing, email marketing, etc.

5: Social media marketing

Social media marketing is the use of social media platforms and websites to promote your business and connect with customers. Social media marketing does not necessarily drive sales. Instead, it is often used to increase engagement, build links and bring content to the attention of customers, and create a distinctive "brand".

6: Email marketing

Email marketing is one of the most cost-effective types of digital marketing strategies. Email is often cited as the "more effective replacement" for direct mail marketing, as you can directly reach a wide network of customers in an instant with newsletters, ads, or reminders through email. Email marketing can be very specifically targeted using demographics and other information to segment lists and achieve the best result.

7: Influencer marketing

Influencer marketing is one of the newest types of internet marketing strategies but it is expected to become increasingly popular in 2018. Influencers (individuals with a strong social following) are paid to promote your company's products or services. When you find influencers who are in line with your company's values and resonate with your customers, this marketing strategy can be highly effective for some companies.

8: Affiliate Marketing

Affiliate marketing is the process of earning a commission by promoting or advertising other companies' products or services. Affiliate marketing often consists of promoting a product through a blog or video, or featuring ads on your website. You receive a payment for every sale made through your links.

9: Reputation marketing

Reputation marketing consists of using press releases, social media, and customer review platforms to develop a positive perception of a company. Online referrals and reviews have become increasingly important in certain industries such as the travel industry. Reputation marketing involves developing a distinctive brand, encouraging customers to post reviews, and responding quickly to resolve customer concerns or complaints on social media and review platforms.

SECURITY RISKS

1. Financial fraud

Financial fraud takes several forms. It involves hackers gaining access to your customer's personal information or payment information, then selling that information on the black market. It also involves fraudsters using stolen credit card information to make illegitimate purchases from your e-commerce store.

2. Phishing

Your customers are the target in a phishing scam, where a fraudster sends messages or emails pretending to be you with the goal of obtaining their private information. These messages may contain logos, URLs, and other information that appears to be legitimate, but it won't be you sending it. They'll ask customers to verify their account by logging in and then use the information to steal personal data.

3. Spamming

In an attempt to obtain personal information—or to affect your website's performance—spammers may leave infected links in their comments or messages on your website, such as on blog posts or contact forms. If you click on the links, they can take you to a spam website that exposes you to malware.

4. Malware

Malware refers to malicious programs such as spyware, viruses, trojan horses, and ransomware. Hackers install it on your computer system and spread it to your customers and administrators, where it might swipe sensitive data on their systems and from your website.

5. Bad bots

People are generally aware that bots are all over the Internet, obtaining information about our habits and behaviours. Your competition, however, could use bots to gather information about your inventory and prices. They then use that information to change their prices. Or hackers can send malicious bots to e-commerce checkout pages to buy large amounts of a product and scalp it for up to 10 times the list price.

6. Distributed denial of service (DDoS) attacks

Distributed denial of service attacks happens when your servers receive an overwhelming amount of requests from various IP addresses—usually untraceable—that cause your server to crash. That means your e-commerce store isn't available to visitors, which disrupts your sales.

7. Fake return and refund fraud

Fraudsters can obtain money from you by committing fake returns and refund fraud in many ways. Some use a stolen credit card to purchase merchandise, then claim that the card is closed and

request a refund to another card. Others use counterfeit receipts to request refunds for items they haven't purchased.

RISK MANAGEMENT ISSUES

1. Systematic Risk

Systematic risk is the risk a company faces from the entire market or market segment in which it operates. A classic example of systematic risk in the e-business market is the dotcom crash of 2000 and 2001. Several e-businesses started and went public, then were purchased by other e-businesses. Most of the e-businesses had little cash flow and were unable to make profits; these companies valued growth over financial stability, creating an unsustainable economic bubble that burst, destroying many dotcom companies. While this type of systematic risk may not occur again, most market segments may tend to operate in business cycles, growing, reaching a plateau and contracting. Owners and entrepreneurs of e-businesses must be able to assess their market segment and plan for each stage in the business cycle.

2. Security Risk

E-Businesses face many different types of risks related to the security of their business information and customer information. Computer viruses and hackers are constantly trying to tap into online companies and steal customer identities and financial information. These security risks force e-businesses to use software and encryption codes that limit an outsider's ability to hack into their secure systems. Online security risks can also lead to legal issues for e-businesses as they are obligated to protect consumer information by federal and state law. Breaches in an e-business system will also increase the company's insurance risk, as insurers require higher premiums for companies with legal issues, if they decide to take on the e-business as a client.

3. Business Risk

Business risk relates to the risk companies face from conducting business operations every day. These risk include inventory, labor, overhead or supply chain problems. Because most e-businesses do not have large physical locations or warehouses, they must rely on a supply chain for getting goods to consumers. Anytime a business must rely on individuals or other businesses to help distribute goods, risk may increase. Business risk also occurs if the e-business is unable to purchase inventory and move it through the supply chain quickly and efficiently.

4. Hidden Costs

One of the biggest selling points of e-business is the low start-up costs. Domain names and web hosting incur comparatively low costs when considered against renting or buying a physical space. While some business owners choose to build a website in house, many hire a third party to build the site. The costs of a custom site can run into the thousand of dollars. Maintaining and updating the website also requires time, which can mean either hiring someone to do that work or using your own time to do so.

5. Data Security

Every business faces the problem of data security and e-business maximizes these challenges. Customer enter a considerable amount of sensitive information, ranging from phone numbers to credit card numbers, on your site. As the site owner, you take responsibility for protecting that information with appropriate security measures, such as Secure sockets layer encryption or contracting with third parties to provide secure transaction processing. Failures in data security can lead both to fines and loss of faith on the part of your customers.

LEGAL AND ETHICAL ISSUES

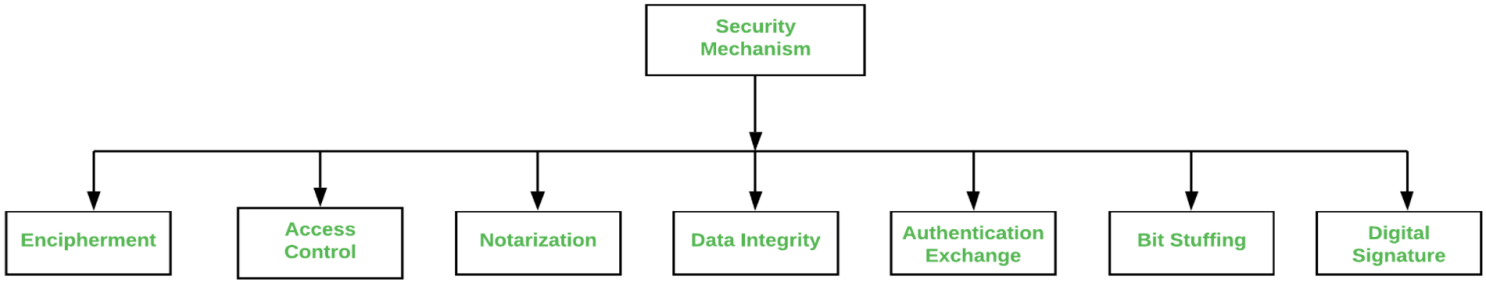
E-security, also known as cybersecurity or information security, is a critical concern for individuals, organizations, and governments. It involves protecting digital information and systems from unauthorized access, use, disclosure, disruption, modification, or destruction. There are several legal and ethical issues associated with e-security, including:

1. **Privacy:** Individuals have a right to privacy, and organizations must protect their personal information from unauthorized access or use. Laws such as the General Data Protection Regulation (GDPR) and the California Consumer Privacy Act (CCPA) set standards for how organizations handle personal data.
2. **Intellectual Property:** The internet makes it easy to access and distribute copyrighted materials without permission. Organizations must take measures to prevent copyright infringement and protect their intellectual property.
3. **Cybercrime:** Cybercrime refers to criminal activities committed using digital technology. These crimes include hacking, identity theft, phishing, and malware distribution. Organizations must take measures to prevent these activities and report any incidents to law enforcement.
4. **Ethical Hacking:** Ethical hacking, also known as penetration testing, involves testing a system's security by attempting to exploit vulnerabilities. While this is a valuable tool for organizations to improve their security, it must be done in an ethical manner and with proper authorization.
5. **Liability:** Organizations can be held liable for damages resulting from e-security breaches. They must take measures to prevent breaches and have a plan in place to respond to incidents.
6. **Surveillance:** The use of surveillance technology such as cameras and tracking software raises ethical concerns about privacy and personal liberty. Organizations must ensure that their use of surveillance technology complies with applicable laws and regulations.
7. **International laws:** E-security is a global issue, and organizations must comply with laws and regulations in multiple jurisdictions. This can be challenging, as laws can differ significantly between countries.

In conclusion, e-security is a complex issue with legal and ethical implications. Organizations must take measures to protect their digital assets and comply with applicable laws and regulations. They must also consider the ethical implications of their actions and ensure that they respect individuals' privacy and rights.

TYPES OF SECURITY MECHANISM

Network Security is field in computer technology that deals with ensuring security of computer network infrastructure. As the network is very necessary for sharing of information whether it is at hardware level such as printer, scanner, or at software level. Therefore security mechanism can also be termed as is set of processes that deal with recovery from security attack. Various mechanisms are designed to recover from these specific attacks at various protocol layers.



Types of Security Mechanism are :

1. **Encipherment :**
   This security mechanism deals with hiding and covering of data which helps data to become confidential. It is achieved by applying mathematical calculations or algorithms which reconstruct information into not readable form. It is achieved by two famous techniques named Cryptography and Encipherment. Level of data encryption is dependent on the algorithm used for encipherment.
2. **Access Control :**
   This mechanism is used to stop unattended access to data which you are sending. It can be achieved by various techniques such as applying passwords, using firewall, or just by adding PIN to data.
3. **Notarization :**
   This security mechanism involves use of trusted third party in communication. It acts as mediator between sender and receiver so that if any chance of conflict is reduced. This mediator keeps record of requests made by sender to receiver for later denied.
4. **Data Integrity :**
   This security mechanism is used by appending value to data to which is created by data itself. It is similar to sending packet of information known to both sending and receiving parties and checked before and after data is received. When this packet or data which is appended is checked and is the same while sending and receiving data integrity is maintained.
5. **Authentication exchange :**
   This security mechanism deals with identity to be known in communication. This is achieved at the TCP/IP layer where two-way handshaking mechanism is used to ensure data is sent or not
6. **Bit stuffing :**
   This security mechanism is used to add some extra bits into data which is being transmitted. It helps data to be checked at the receiving end and is achieved by Even parity or Odd Parity.
7. **Digital Signature :**
   This security mechanism is achieved by adding digital data that is not visible to eyes. It is form of electronic signature which is added by sender which is checked by receiver electronically. This mechanism is used to preserve data which is not more confidential but sender's identity is to be notified.

DIGITAL SIGNATURE

A digital signature is a mathematical technique used to validate the authenticity and integrity of a message, software, or digital document.

1. **Key Generation Algorithms**: Digital signature is electronic signatures, which assure that the message was sent by a particular sender. While performing digital transactions authenticity and integrity should be assured, otherwise, the data can be altered or someone can also act as if he was the sender and expect a reply.
2. **Signing Algorithms**: To create a digital signature, signing algorithms like email programs create a one-way hash of the electronic data which is to be signed. The signing algorithm then encrypts the hash value using the private key (signature key). This encrypted hash along with other information like the hashing algorithm is the digital signature. This digital signature is appended with the data and sent to the verifier. The reason for encrypting the hash instead of the entire message or document is that a hash function converts any arbitrary input into a much shorter fixed-length value. This saves time as now instead of signing a long message a shorter hash value has to be signed and moreover hashing is much faster than signing.
3. **Signature Verification Algorithms** : Verifier receives Digital Signature along with the data. It then uses Verification algorithm to process on the digital signature and the public key

(verification key) and generates some value. It also applies the same hash function on the received data and generates a hash value. Then the hash value and the output of the verification algorithm are compared. If they both are equal, then the digital signature is valid else it is invalid.

The steps followed in creating digital signature are :

1. Message digest is computed by applying hash function on the message and then message digest is encrypted using private key of sender to form the digital signature. (digital signature = encryption (private key of sender, message digest) and message digest = message digest algorithm(message)).
2. Digital signature is then transmitted with the message.(message + digital signature is transmitted)
3. Receiver decrypts the digital signature using the public key of sender.(This assures authenticity, as only sender has his private key so only sender can encrypt using his private key which can thus be decrypted by sender's public key).
4. The receiver now has the message digest.
5. The receiver can compute the message digest from the message (actual message is sent with the digital signature).
6. The message digest computed by receiver and the message digest (got by decryption on digital signature) need to be same for ensuring integrity.
   Message digest is computed using one-way hash function, i.e. a hash function in which computation of hash value of a message is easy but computation of the message from hash value of the message is very difficult.

Benefits of Digital Signatures

- **Legal documents and contracts:** Digital signatures are legally binding. This makes them ideal for any legal document that requires a signature authenticated by one or more parties and guarantees that the record has not been altered.
- **Sales contracts:** Digital signing of contracts and sales contracts authenticates the identity of the seller and the buyer, and both parties can be sure that the signatures are legally binding and that the terms of the agreement have not been changed.
- **Financial Documents:** Finance departments digitally sign invoices so customers can trust that the payment request is from the right seller, not from a bad actor trying to trick the buyer into sending payments to a fraudulent account.
- **Health Data:** In the healthcare industry, privacy is paramount for both patient records and research data. Digital signatures ensure that this confidential information was not modified when it was transmitted between the consenting parties.
- Federal, state, and local government agencies have stricter policies and regulations than many private sector companies. From approving permits to stamping them on a timesheet, digital signatures can optimize productivity by ensuring the right person is involved with the proper approvals.
- **Shipping Documents:** Helps manufacturers avoid costly shipping errors by ensuring cargo manifests or bills of lading are always correct. However, physical papers are cumbersome, not always easily accessible during transport, and can be lost. By digitally signing shipping documents, the sender and recipient can quickly access a file, check that the signature is up to date, and ensure that no tampering has occurred.

DIGITAL CERTIFICATES

Digital certificate is issued by a trusted third party which proves sender's identity to the receiver and receiver's identity to the sender.

A digital certificate is a certificate issued by a Certificate Authority (CA) to verify the identity of the certificate holder. The CA issues an encrypted digital certificate containing the applicant's public key and a variety of other identification information. Digital certificate is used to attach public key with a particular individual or an entity.

Digital certificate contains:- The authenticity

1. Name of certificate holder.
2. Serial number which is used to uniquely identify a certificate, the individual or the entity identified by the certificate
3. Expiration dates.
4. Copy of certificate holder's public key.(used for decrypting messages and digital signatures)
5. Digital Signature of the certificate issuing authority.

Digital certificate is also sent with the digital signature and the message.

Digital certificate vs digital signature :

Digital signature is used to verify authenticity, integrity, non-repudiation ,i.e. it is assuring that the message is sent by the known user and not modified, while digital certificate is used to verify the identity of the user, maybe sender or receiver. Thus, digital signature and certificate are different kind of things but both are used for security. Most websites use digital certificate to enhance trust of their users

Feature	**Digital Signature**	**Digital Certificate**
Basics / Definition	Digital signature is like a fingerprint or an attachment to a digital document that ensures its authenticity and integrity.	Digital certificate is a file that ensures holder's identity and provides security.
Process / Steps	Hashed value of original message is encrypted with sender's secret key to generate the digital signature.	It is generated by CA (Certifying Authority) that involves four steps: Key Generation, Registration, Verification, Creation.
Security Services	Authenticity of Sender, integrity of the document and non-repudiation.	It provides security and authenticity of certificate holder.
Standard	It follows Digital Signature Standard (DSS).	It follows X.509 Standard Format