Online Communication in the Digital Age

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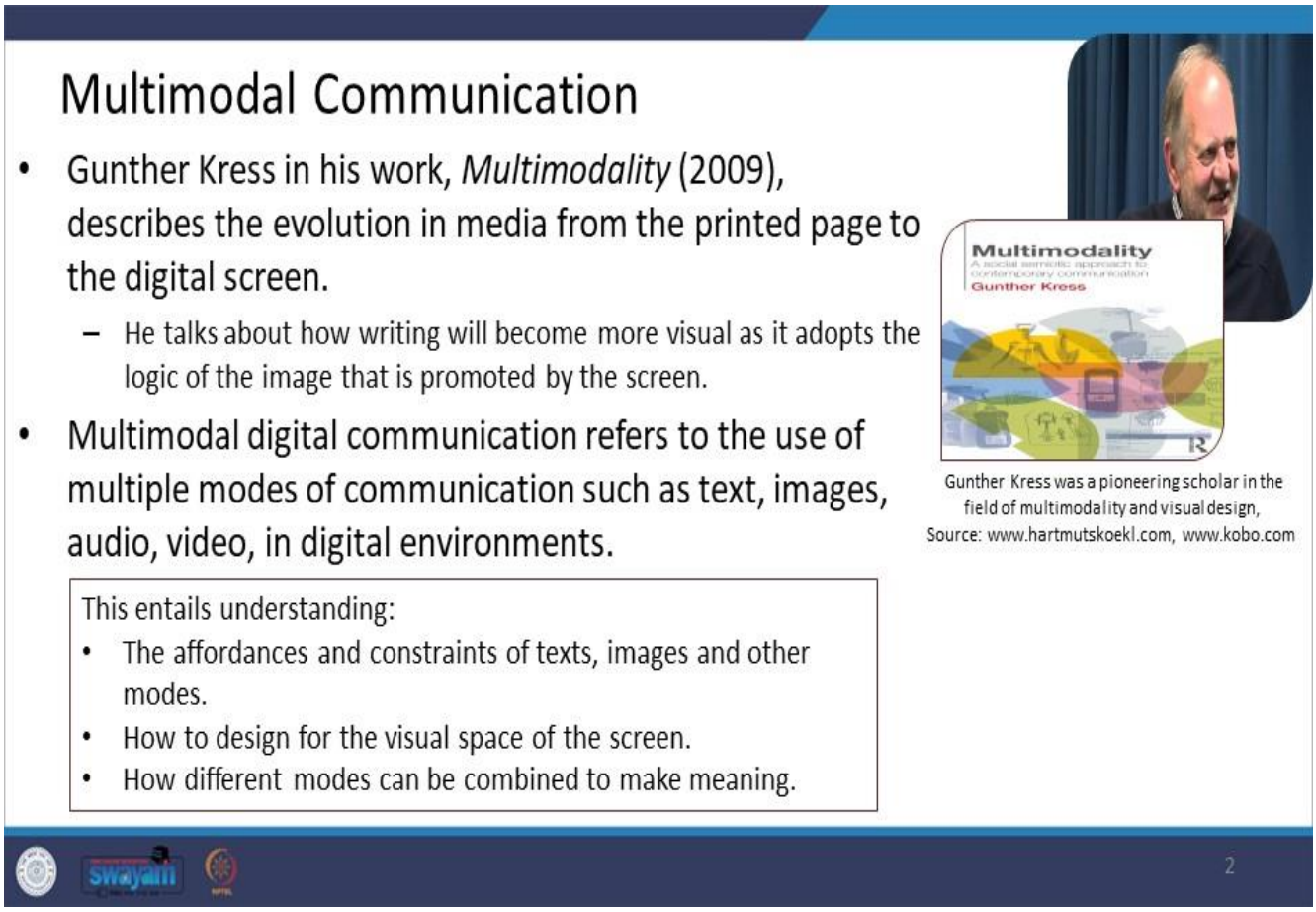
Lecture – 28

New Literacies in Multimodality and Multimedia

Good morning dear participants and welcome to this module. In the previous module, we had looked at professional communication in the digital age and its frameworks, locating the significance of language and effective communication in digital platforms through the concepts of digital rhetoric and digital literacy. We had also looked at certain examples and case studies. In today's module, we will be extending the concept of digital literacy further to multimodality, hypertext and linking visual communication and new visualization techniques in the context of digital technologies. Further, we will be focusing on multimedia in hypermedia practices. As we see, the escalating focus on literacies and digital technologies has increased the scope and research potential of multimodality for digital communication.

Multimodal communication supports a convergence of channels or modes like text, audio, video and images for user to user communication. What is interesting about multimodal representations is that they unsettle and remake genres and often also reshape practices and interactions. Let us now look at the shift towards multimodal content, tracing its history and key concepts and understand the range of new literacies to cope with the proliferation of images, graphics, video, animation and sound in digital texts.

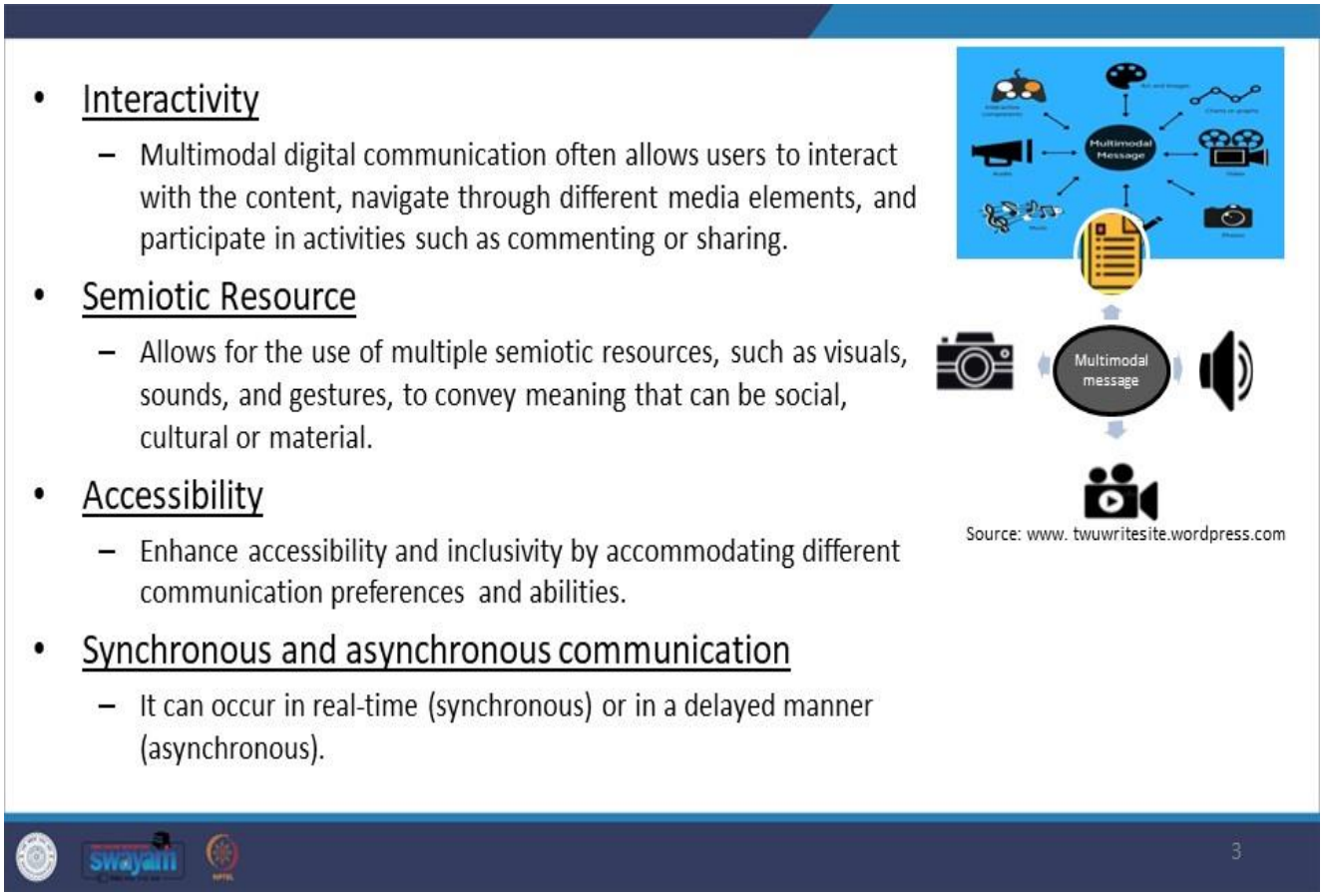


In this reference, I would refer to the book Multimodality which came out in 2009 authored by Gunther Kress which has described the evolution in media from the printed page to the digital screen.

Kress talks about how writing would become more visual as it adopts the logic of the image that is promoted by the screen. Multimodal digital communication refers to the use of multiple modes of communication such as text, images, audio and video etc. simultaneously in digital environments. This entails understanding the affordance and constraints of text, images and other modes also. Also, it discusses how to design for the visual space on the screen and how different modes can be combined to make a meaning slightly different or to create a new meaning altogether.

Multimodal digital communication combines various forms of media elements within a single communication context. But we have to know that the mode that we are using makes a difference to the kinds of meanings that different audiences can make. For example, meanings in images represent continuous phenomena in comparison to the meanings given in text. Different modes have different underlying assumptions even

though they do share some common features. And now, let us look at some of those.

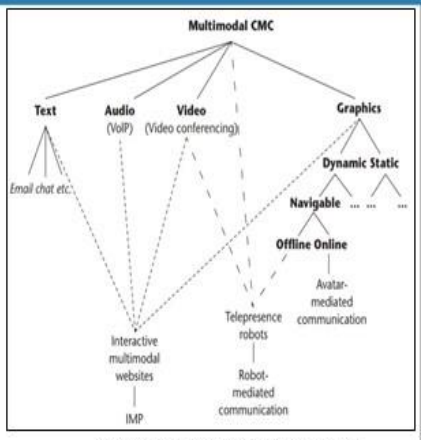


The common features which we would be taking up in this slide are interactivity, semiotic resources, accessibility, synchronous and asynchronous communication. Interactivity allows us in the context of multimodal digital communication to interact with the content, navigate through different media channels and elements and participate in activities such as commenting or sharing. Semiotic resources allow for the use of multiple semiotic resources such as visuals, sounds and gestures to convey a meaning that can be social, cultural or material. Multimodal communication also enhances accessibility and inclusivity by accommodating different communication preferences and abilities. We can also look at synchronous and asynchronous communication.

Synchronous communication is one which occurs in real time and asynchronous communication is one which occurs in a delayed manner. Multimodal digital communication offers flexibility in terms of content creation and consumption. It can also be accessed and delivered across different devices and platforms allowing the users

to adapt their communication preferences based on their needs and technological capabilities and also the accessibility to a particular type of technology.

- Susan C. Herring, in her article "New Frontiers in Interactive Multimodal Communication" describes two emergent phenomena related to multimodality.
  - **Interactive Multimodal Platforms (IMP)**
  - **Robot-Mediated Communication**
- IMPs incorporate user-generated content and social interaction that allow users to comment via multiple channels on a single website.
  - Text (e-mail chat), Audio (Voice over Internet Protocol), Video (video conferencing), Graphics
- Robot-mediated communication makes use of telepresence robotics that facilitate geographically distributed communication. It makes use of cameras, sensors, microphones, speakers, and other tools.



Source: The Routledge Handbook of Language and Digital Communication

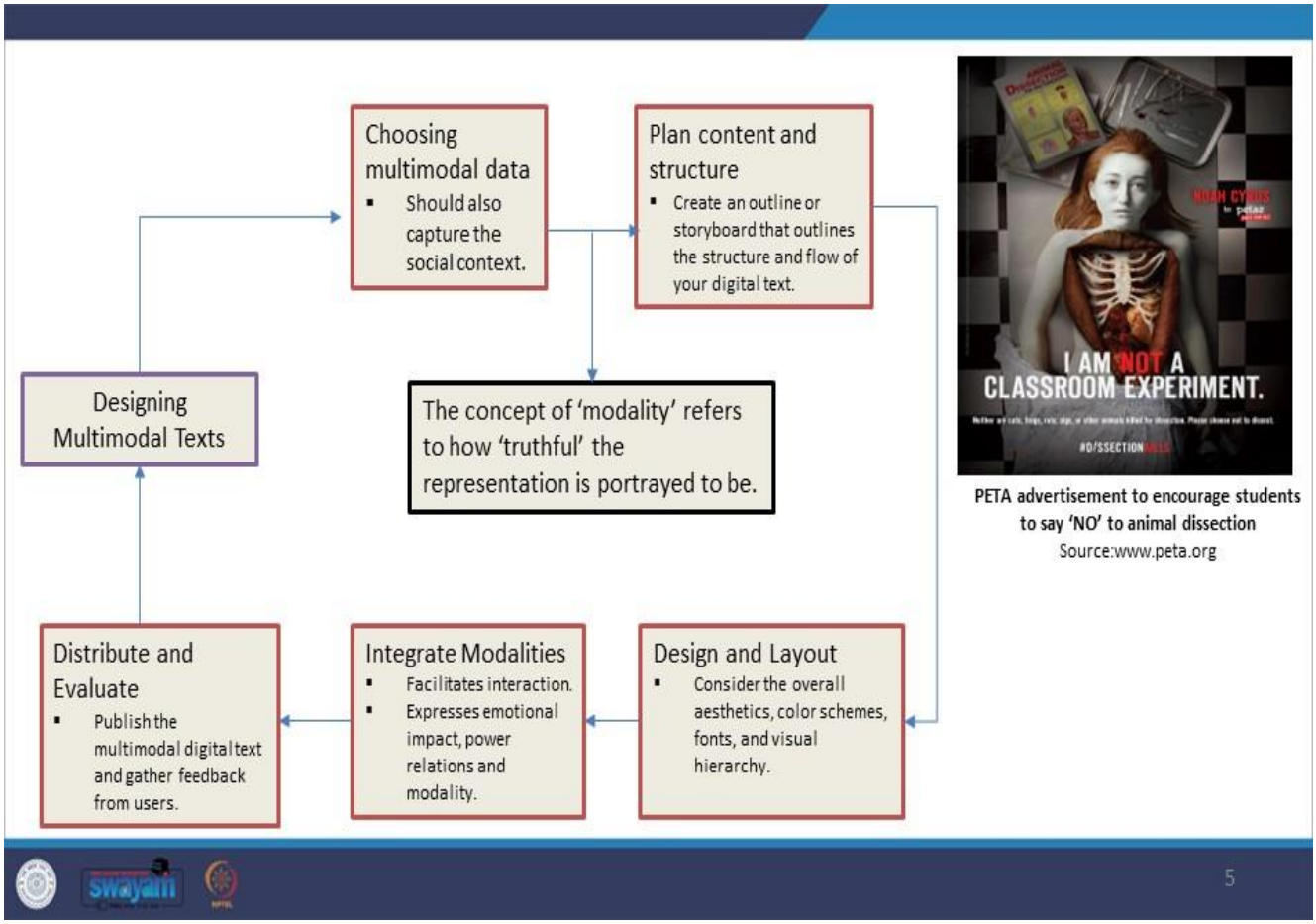
Now, let's look briefly at the two emergent phenomena related to multimodality in digital communication. They are interactive multimodal platforms or IMP in brief and robot mediated communication.

IMPs or Interactive Multimodal Platforms incorporate user generated content and social interaction that allow users to comment via multiple channels on a single website. It can be in the form of text as in email chat, audio that is Voice over Internet Protocol, video as in video conferencing and graphics etc. In comparison to IMP, robot mediated communication makes use of telepresence robotics that facilitate geographically distributed communication. It makes use of cameras, sensors, microphones, speakers and other tools also. The concept of IMP and robot mediated communication was mentioned initially by Susan Herring in her article New Frontiers in Interactive Multimodal Communication.

WhatsApp is arguably an example of the IMP on a mobile device. In addition to text

messaging, it enables smartphone users to exchange image, video and audio messages in a single conversation. We will discuss more about robot mediated communication in the coming modules. To communicate with multimodal resources, we need to know also how to design them. And now, let us consider the steps to ensure an effective communication experience in digital mode.

If we look at the slide, we look at an advertisement by PETA, which wants to encourage students to say no to animal dissection. But it is a very apt illustration in the context of multimodal digital communication.



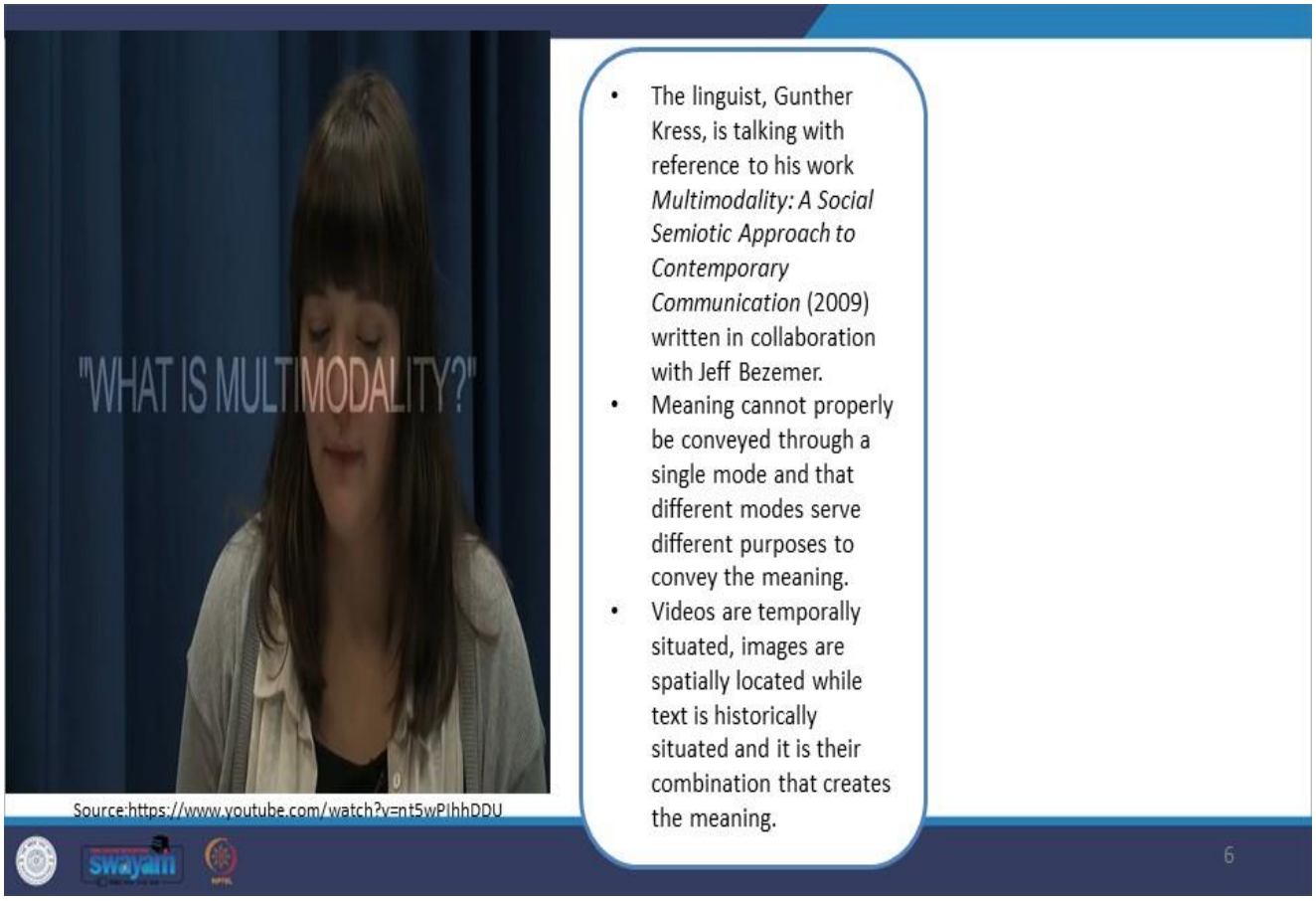
PETA advertisement to encourage students to say 'NO' to animal dissection
Source:www.peta.org

In the diagram also, we can look at different aspects related with multimodality. For example, in order to design multimodal texts, we have to choose the multimodal data. We should also be able to capture the social context.

We should also be able to plan content and structure in order to create an outline or a storyboard. We should also be able to distribute and evaluate that is how to publish the multimodal digital text and how to gather feedback from different users. How do we

integrate the issues related with design and layout to consider the overall aesthetics, color schemes, etc. And how do we integrate these modalities so that it facilitates interaction and also expresses emotional impact, power and relationships also. The concept of modality refers to how truthful the representation is portrayed to be.

The multimodal text on the right hand side has incorporated visual modes of text and images. So, this PETA advertisement has also shown a popular American singer, Noah Cyrus. It is an interesting example of text image interaction and also of a visual argument that can simultaneously appeal to our emotions. In the following video, we shall look at an interview of the famous linguist, Gunther Kress. We have also referred to Gunther Kress in the previous module in the context of multiliteracies.



In this interview, he is talking about multimodality and social semiotics. He suggests that meaning cannot be properly conveyed through a single mode and that different modes serve different purposes to convey the meaning. Let us now have a look at the video. Gunther Kress is shown in conversation with one of the scholars, Berit Henriksen at the University of London in 2012. This interview was an extension of his work,

Multimodality: A Social Semiotic Approach to Contemporary Communication.

He suggests that videos are situated temporally, where images are spatially located, while text is historically situated and it is this combination which creates the meaning in its totality.

So, what happens when we put modes together? Well, behind it all is of course the notion of communication. I want to communicate something to you. I want to have a meaning which I want you to get in some way. I have the sense that one mode alone won't do it.

So I put modes together because I have a sense that this mode will allow me to do this kind of thing best and this mode will allow me to do this other thing best. So for instance, on this website that we have here, I can click on a particular thing and what I have is something which is in time. There's a mode of moving image or little video which is moving image and it's speech. Together these things are in time. But at the same time, I have things which are not in time, bits of writing.

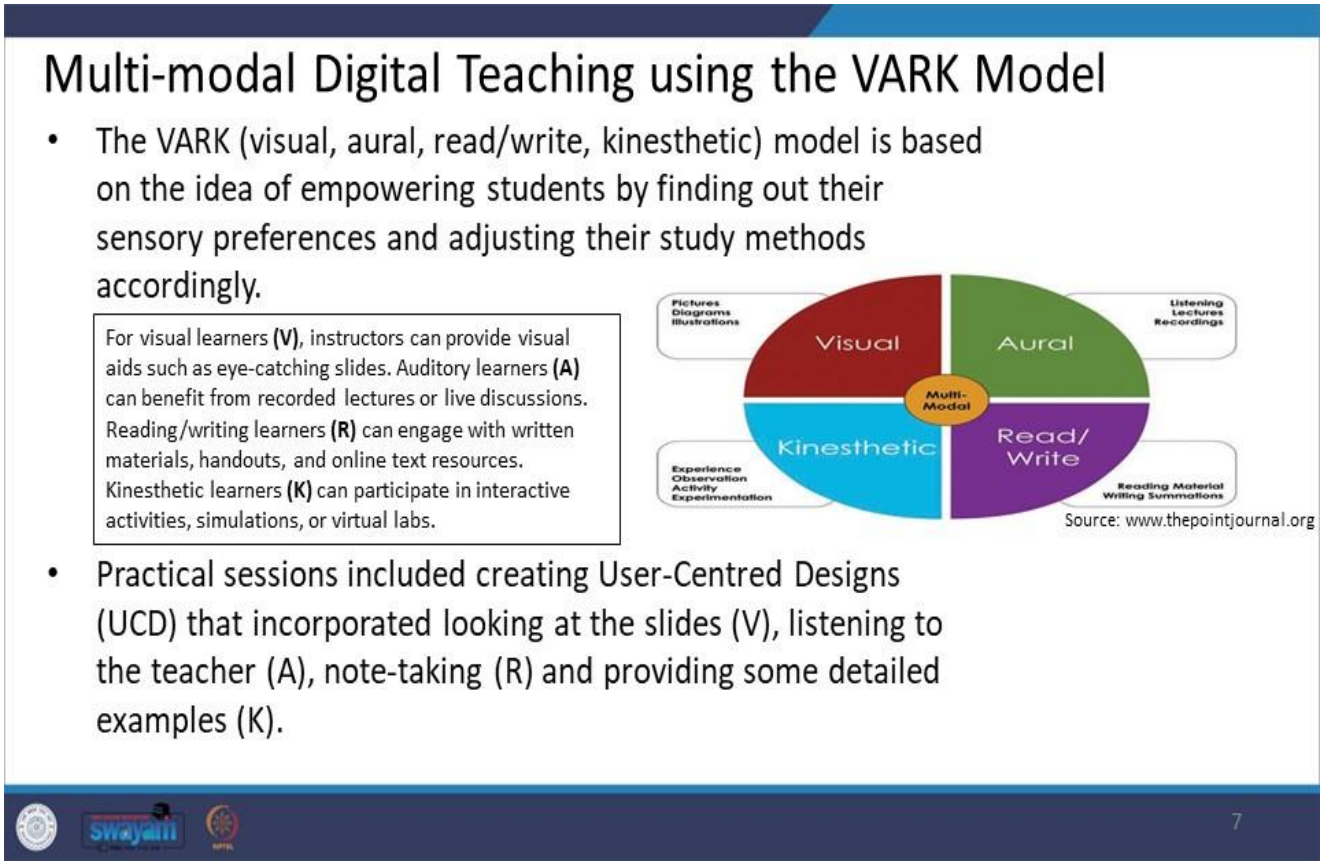
So I have things which are not in time and things which are temporally insatiated. I have an image, a still image, which is spatial. So because I want to say things which are about things which are in time, they move, things which are not in time, they're stationary, things which are spatially kind of displayed like images, I want to put all these together because of the meaning that I want to make. So I have a sense of what these things do. I have a sense of what I want to mean and so I have a kind of an interest to make a composition in which certain kinds of things come together in a particular way that best exemplifies or communicates what I want to mean.

So these modes are kind of arranged according to the interest I have as the person communicates but also my sense of who you are and what might be most interesting, most readily memorable, yeah, most pleasurable, most informative for you. So these things are sort of set in a communicational frame. So you seem to suggest that different modes can do different kinds of things. Yes and I suggested in part that it's me who makes the decision about which mode to use. There is also of course around me a sort of conventional notion.

I said for instance if I'm kind of communicating something very formally then writing might seem to be, because my society tells me, the best means for doing that. It seems that we have in our society not just these modes available to use but also conventions that indicate to us not as strict rules, nobody's going to get shot, but as rules, conventions to use them in particular ways. And so we might say that writing over many hundreds of years in literate societies has become specialized to be the carrier of certain kinds of

information. There's a functional specialization of writing. And also of course then what happens is that writing in that past which is now changing very rapidly carried most of the informational load.

So we can ask in a particular on this website which mode is carrying most informational load. Kress elucidates the point that these modes can be arranged and rearranged depending on a person's interests and the type of communication one wants to convey. Let us also take a case study of multimode digital teaching using the VARK model during the COVID-19 pandemic.

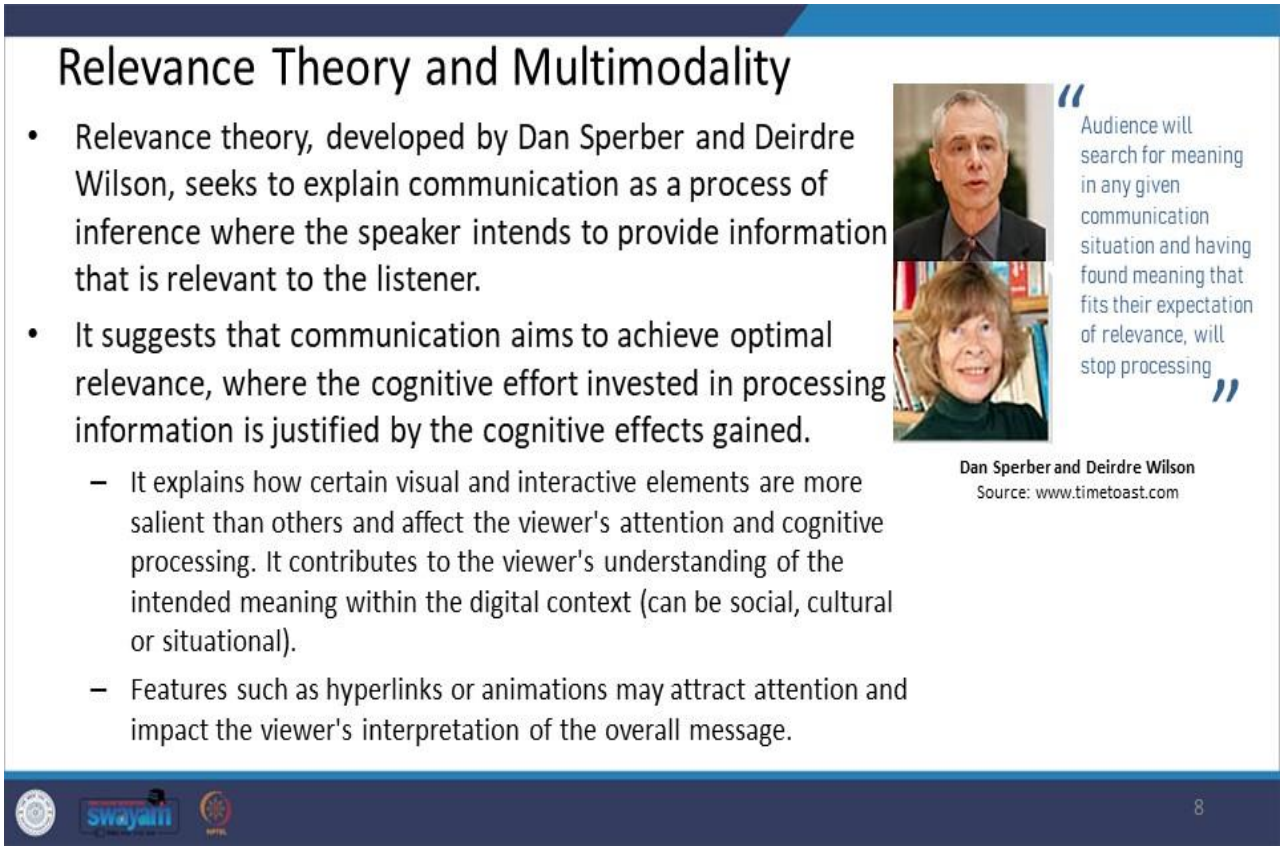


VARK stands for visual, aural, read or write and kinesthetic. The VARK model is based on the idea of empowering students by finding out their sensory preferences and adjusting their study methods accordingly.

As the diagram on the right hand side of the slide suggests, practical sessions included creating user centered designs or UCD that incorporated the visual aspects that is they had to look at the slides. Listening to the teacher constituted the auditory component, note taking and providing some detailed examples were taken as the writing skills, the

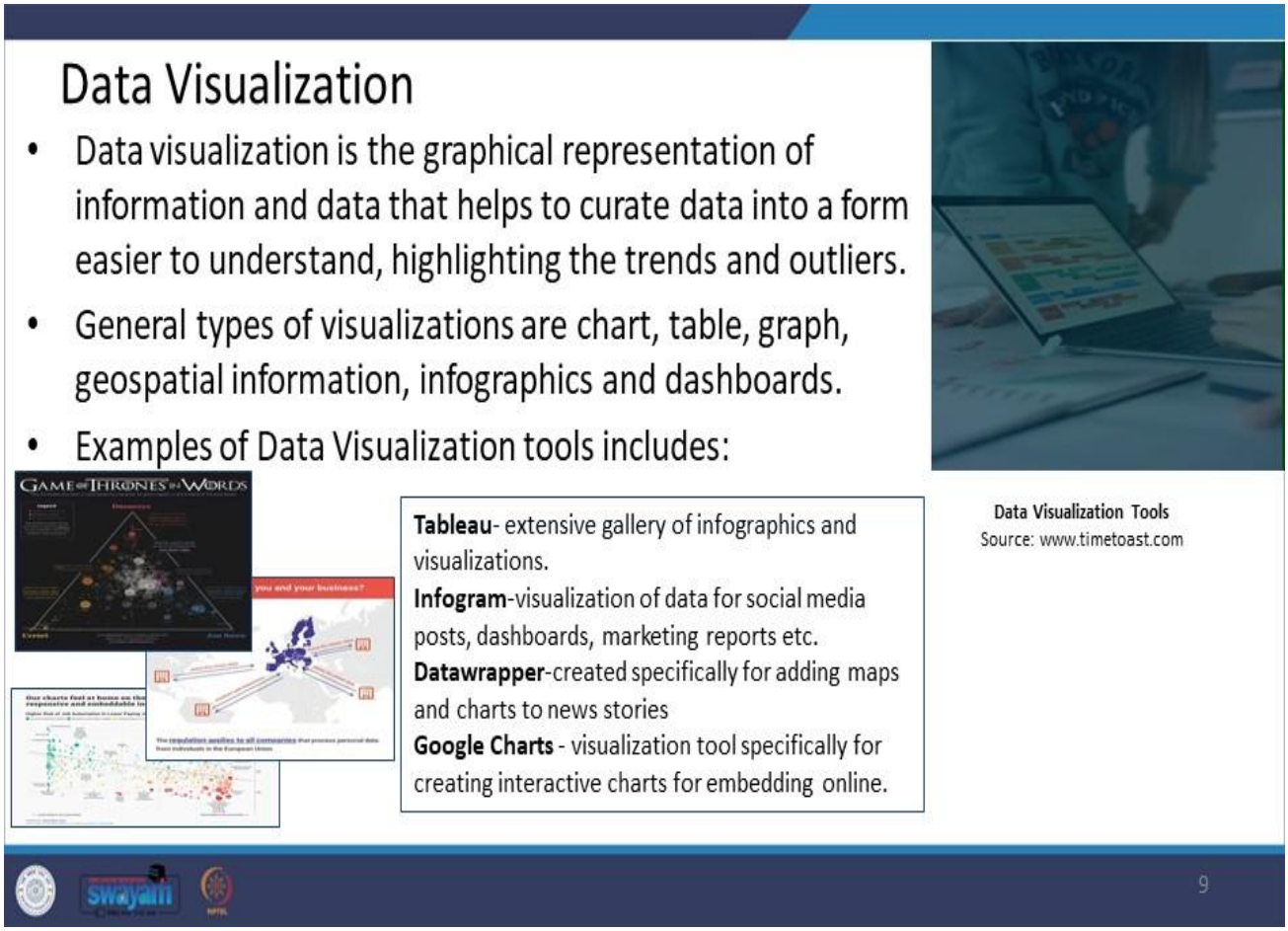
reading skills as well as the kinesthetic skills. Video conference softwares such as Teams and Discord were also recommended for teachers during the COVID era to explain the activities. What we have to understand is that communication is a process of inference where the speaker intends to provide information that is relevant to the listener. In multimodal communication also different modes are used to match the goals and expectations of the users who consume the data.

Let us understand this by applying the relevance theory to digital multimodal texts and visual rhetoric. So, what exactly is relevance theory in the context of communication?



Relevance theory has been developed by Dan Sperber and Deirdre Wilson who seek to explain communication as a process of inference where the speaker intends to provide information that is relevant to the listener. It suggests that communication aims to achieve optimal relevance where the cognitive effort invested in processing information is justified by the cognitive effects gained. Sperber and Wilson also explained how certain visual and interactive elements are more salient than others and affect the viewer's attention and cognitive processing. It contributes to the viewer's understanding of the intended meaning within the digital context whether it is social, cultural or situational.

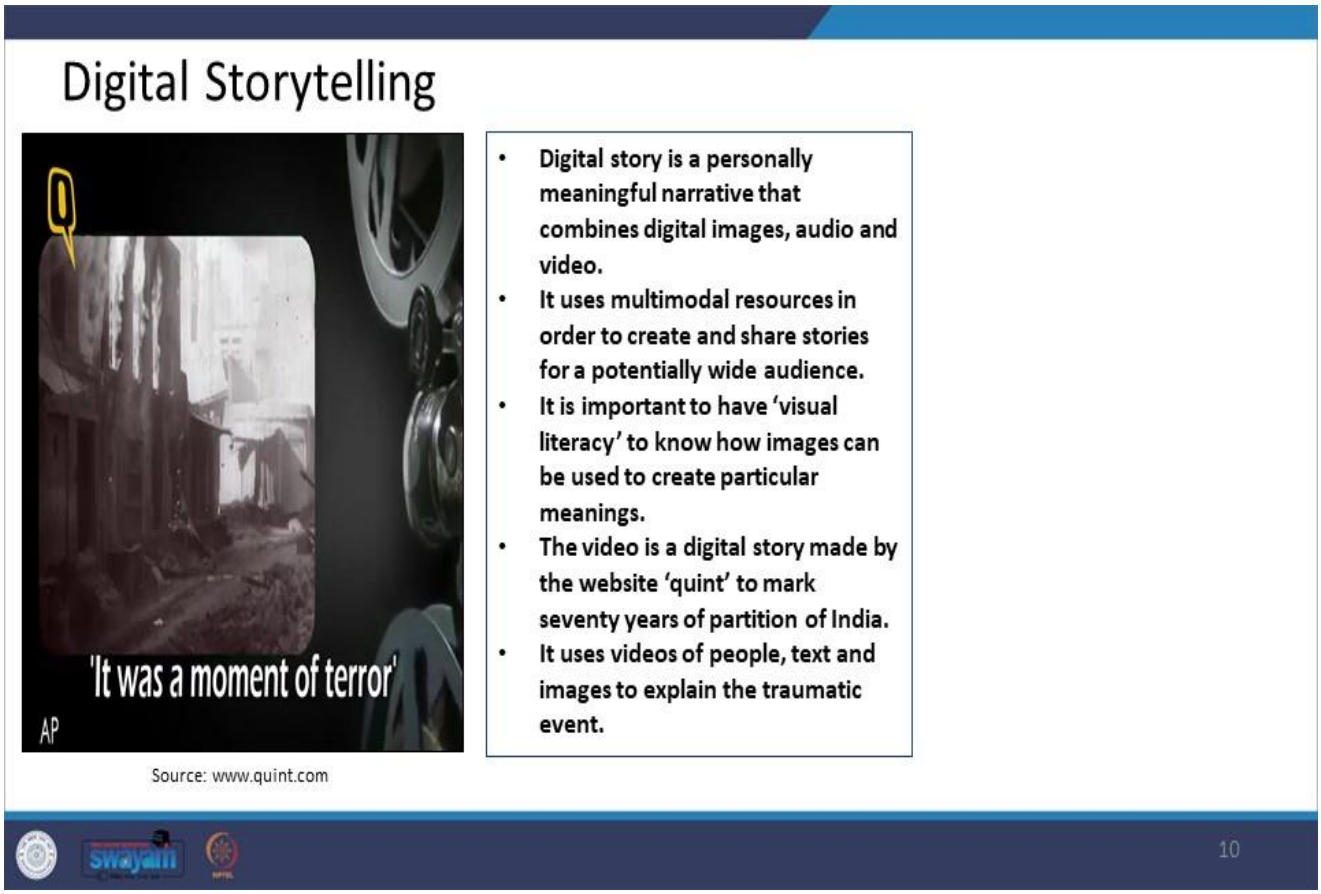
Features such as hyperlinks and animations also attract attention and impact our interpretation of the overall message when we view it on the screen. In multimodal digital texts viewers need to navigate through various elements and interactive features. Relevance theory here can help us in understanding how viewers assess the relevance of these elements and allocate their cognitive resources effectively to understand the intended message or achieve their goals within the digital environment. Many people find themselves engaged in new multimodal literary practices as producers of digital texts. The representation of data and information now has increasingly become digital due to the advent of new data visualization techniques.



So, what do we exactly mean by data visualization? It is the graphical representation of information and data that helps to curate data into a form which is easier to understand highlighting the trends and outliers. General types of visualizations are chart, table graph, geospatial, infographics and dashboards. And certain examples of data visualization may include Tableau, Infogram, Datawrapper or Google charts. Tableau is

an extensive gallery of infographics and visualizations. Infogram is visualization of data for social media posts, dashboards, marketing reports, etc.

Data wrapper is created specifically for adding maps and charts to news stories and Google charts indicate a visualization tool specifically for creating interactive charts for embedding online. Data visualization is an important part of visual literacy and multimodality. The tools mentioned help people see, interact with and better understand data. Right visualization can bring everyone on the same page regardless of their expertise. To further broaden our study on multimodality, let us look at digital storytelling.



Digital story is a personally meaningful narrative that combines digital images, audio as well as video using multimodal resources in order to create and share stories for a potentially wide audience. It is important to have visual literacy to know how images can be used to create particular meanings. The video which we are going to play here is a digital story made by the website Quint to mark 70 years of partition of India which

unfortunately had occurred for the countrymen in 1947. It uses videos of people, text and images to explain the traumatic event.

Life in that village was very good and you start to miss all that.

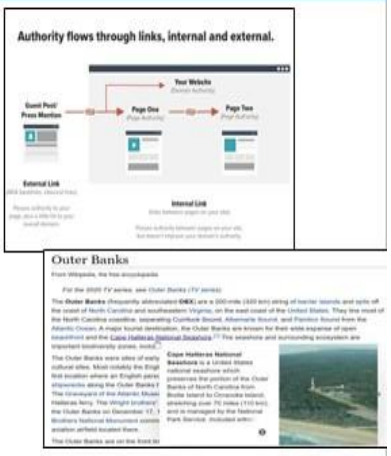
You start to think about what was it like over there. We start to dream about it. I still dream about it and when I'm talking to you the picture of my village is moving in my head. So, that trauma with time has increased.

Data visualization and digital storytelling are two impactful examples of digital multimodality.

However, in digital media there can be certain limitations in the context of design. One of the ways in which these constraints can be overcome is through hypertext and linking that cannot be available in only the print based media. And this has a profound effect on the way the writers can structure and organize information and the ways in which readers can navigate their way through it.

Hypertext and Linking

- The term 'hypertext' was coined by American sociologist Theodor H.Nelson which was later developed in his book *Literary Machines* (1983).
- Hypertext is electronic text which is 'hyperlinked' to another electronic text on the internet.
- It allows readers and writers to make use of hypertext links to organize electronic texts in a non-sequential way depending to a large extent on the reader's choice.
- Hypertext links provide order and structure to texts in two ways:
  - 'Internally linking' different parts of the same text in a logical way.
  - 'Externally linking' the texts to other texts on the internet.



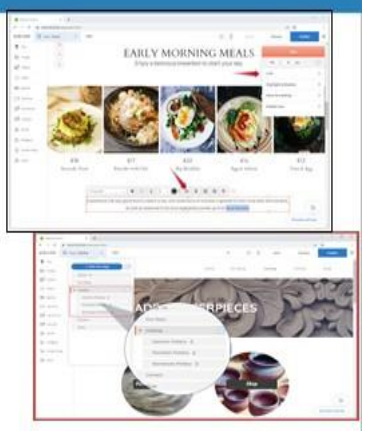
Homepages of websites have hyperlinks offering readers different paths to choose from.
Source: edu.gcfglobal.org

The term hypertext was coined by American sociologist Theodor Nelson in his book, Literary Machines. Hypertext is an electronic text which is hyperlinked to another electronic text on the internet.

It allows readers and writers to make use of the hypertext links to organize electronic texts in a non-sequential way depending to a large extent on the choice made by the reader while going through that particular web page. Hypertext links provide order and structure to texts in two different ways. Either they can be internally linking or they can be externally linking. Internally linking means different parts of the same text are linked in a logical way and the external linking suggest that the texts are externally linked to other texts on the internet. In this way, electronic texts can reference and include prior texts through hyperlinks that make them accessible with minimal effort on the part of the reader.

Let us also analyze at this point the ways in which people use hyperlinks to internally organize online texts. It can be hierarchical, linear or hypertextual.

- Hypertexts organized in a **hierarchical structure** have hyperlinks arranged like a menu or a tree-like outline.
  - It allows readers to see the entire organization of the document at a glance and easily navigate to the part that is most relevant to their needs.
- In **linear structure**, parts of the text are organized in a specific sequence which readers have to follow.
  - It is common in online learning sites or filling out surveys or forms.
- In **hypertextual structure**, parts of the document are linked to other parts of the document or other documents on the internet based on relationships of association.
  - For example, some key terms are highlighted and linked to related pages, definitions or elaborations of terms or concepts.

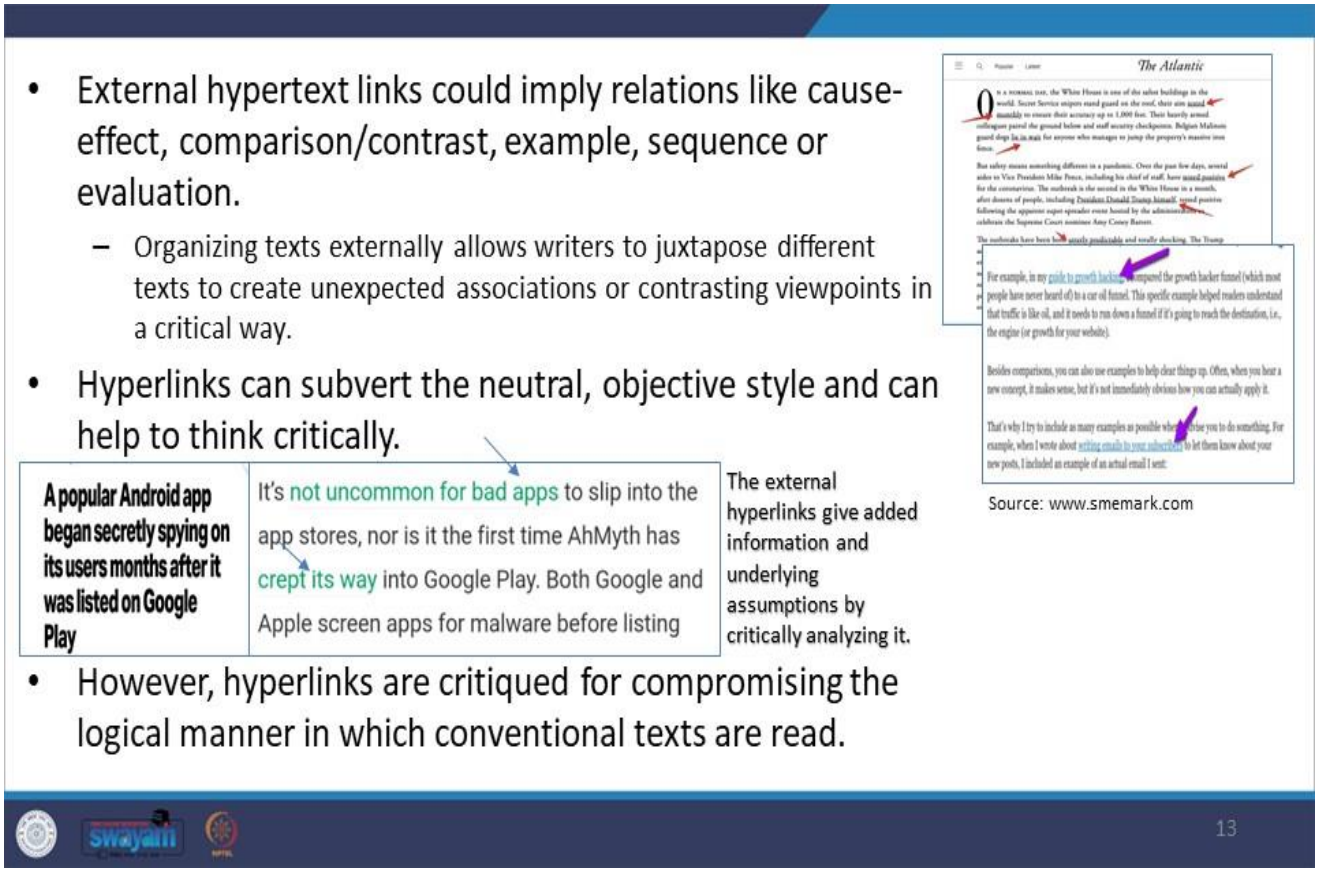


Online Shopping sites make use of combination organizational patterns.
Sources:help.one.com

Hypertext which are organized in a hierarchical structure have hyperlinks arranged like a menu or a tree-like outline. This arrangement allows readers to see the entire organization of the document at a glance and easily navigate to the part which they feel is the most relevant for their needs. In linear structure, part of the text are organized in a specific sequence which readers have to follow and it is a very common practice to use this structure in online learning sites or also while we have to fill out surveys or different types of forms.

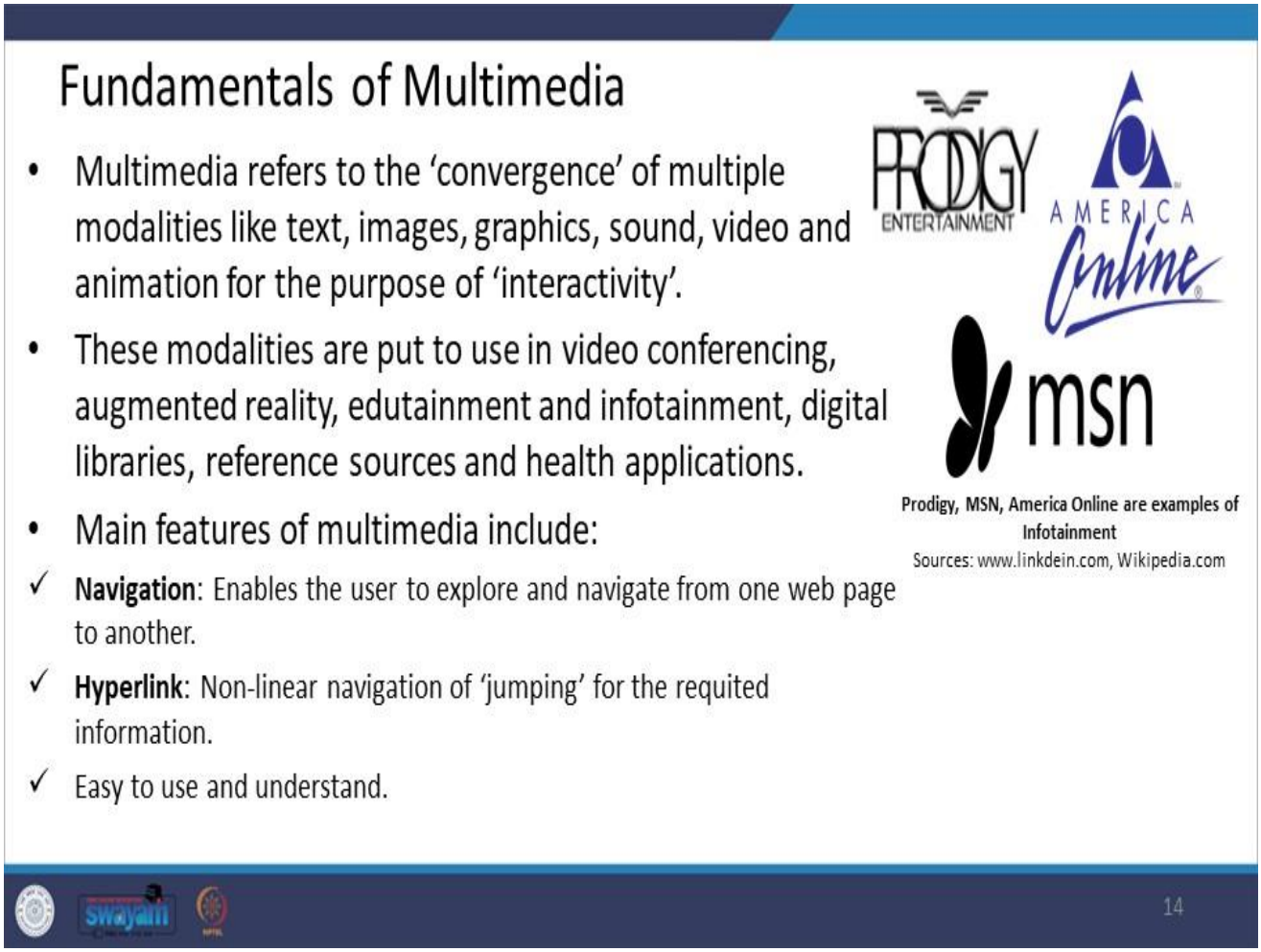
In hypertextual structure, parts of the document are linked to other parts of the document or other documents on the internet based on relationships of association. For example, some key terms are highlighted and linked to related pages, definitions or elaborations of terms or concepts. The online shopping texts as the visuals on the right hand side of the slide illustrate make use of combination organizational patterns. Most digital texts use a combination of hierarchical, linear and hypertextual organizational patterns to make them more attractive. Hypertext links can also serve to organize an online document externally by associating the text with other texts on the net.

It could also imply a set of relations.



So, what are the relations which can be implied through the use of external hypertext links? It can be cause and effect, comparison or contrast. It can be an example, sequence or evaluation. Organizing text externally allows writer to juxtapose different texts to create unexpected associations or contrasting viewpoints in a critical way. Hyperlinks can subvert the neutral objective style and can also help the reader to think critically as different examples given in the pictures on this slide suggest. However, hyperlinks are also critiqued for compromising the logical manner in which conventional texts are read.

Hypertext and all other modalities that we have discussed earlier converge together to form multimedia. Access to multimedia information has become the principal motivation behind communication networks today. Interactivity is the keynote behind multimedia. Graphics, visualization, data compression and networking all have important contributions to make in multimedia. Now, let us look at the fundamentals of multimedia and its basic components.



As we have suggested earlier, multimedia refers to the convergence of multiple modalities for the purpose of interactivity. These modalities are put to use in video conferencing, augmented reality, entertainment and infotainment, digital libraries, reference sources and health applications. Main features of multimedia include navigation which enables the user to explore and navigate from one page to another. Hyperlinks suggest a non-linear navigation of jumping for the requited information to make it easy to use and understand. Most of the websites display all these features in the form of advertisements.

They employ multimedia features to market merchandise or to offer services online. Creating effective multimedia presentations includes planning the content, visual designs, creative integration of modes, layouts and effective use of software compatibility, as well as of course accessibility. Let us look at the types of multimedia, its applications and how it can be personalized for synchronous or asynchronous communication.

- **Text** is one of the most effective components of multimedia for presenting information.

Use of text and typography in film posters
Source: www.linkedin.com

- Texts in multimedia are used in messaging, advertisements, subtitles in films etc.
- Font editors and design tools are used to specifically create or modify font files. It includes ResEdit, Fontographer, Font Monger etc
- Hyperlinked text connects non-linear information.

- **Digital audio** enhances multimedia applications by supplementing images, animations, video and presentations.

- The method used for digitizing sound is called sampling.
- Audio file formats include MIDI (Musical Instrument Digital Interface), Apple's AIFF (Audio Interchange File Format), compressed formats like MPEG (Motion Picture Experts Group Formats) etc.

MIDI is used by musicians to hook together musical instruments and computer equipment.
Source: support.apple.com

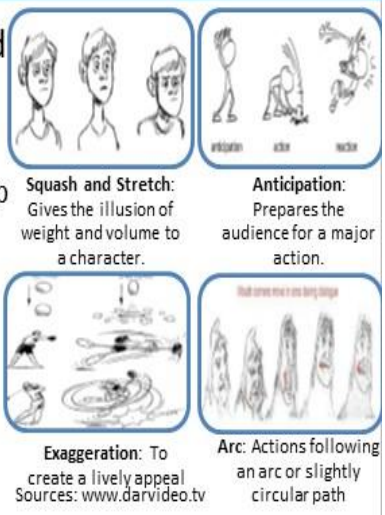
One of the most effective components of multimedia for presenting information is of course the text. Text and multimedia are used in messaging, advertisement, subtitles in films, etc.

Font editors and design tools are used to specifically create or modify font files. It includes ResEdit, Fontographer, Font Monger, etc. Hyperlink text connects non-linear information. Digital audio enhances multimedia applications by supplementing images, animations, video and presentations.

The method used for digitizing sound is called sampling. Audio file formats include MIDI that is Musical Instrument Digital Interface, Apple's AIFF that is Audio Interchange File Format, compressed formats like MPEG, etc. Sounds can be mono or stereo. Mono sounds are flat and unrealistic whereas stereo sounds are much more dynamic and lifelike which can be further enhanced using sound editors. At this point, I think we should look at images and the fundamentals of animation that have now become vital to multimedia applications.

Their importance cannot be overstated.

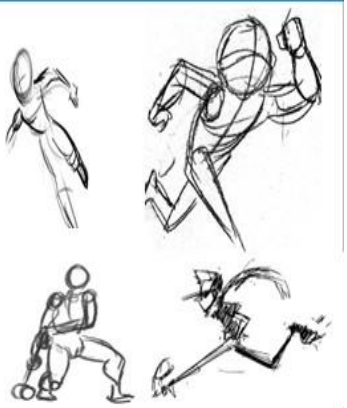
- **Graphics** refers to any type of visual representation displayed on digital systems and screens.
  - Image file formats include Graphics Interchange Format (GIF), Portable Network Graphics (PNG), Joint Photographic Experts Group (JPEG) etc.
- **Categories of digital graphics** include:
  - Bitmaps: Maps of binary color information which is stored in a grid of points or pixels.
  - Vectors: They are computer generated drawings used to create graphics such as detailed drawings of plans and maps.
  - Animated graphics
- Computer animation or CGI animation is the process used for generating animated images by using computer graphics. Some **principles of animation** include anticipation, squash and stretch, arc, staging, slow-out and slow-in, exaggeration.



Graphics refer to any type of visual representation displayed on digital systems and screens. Image file formats include GIF that is Graphics Interchange Format, PNG that is Portable Network Graphics or JPEG that is Joint Photographic Experts Group. So, the categories of digital graphics includes bitmaps, vectors and animated graphics. Bitmaps are maps of binary color information which is stored in a grid of points or pixels. Vectors are computer generated drawings used to create graphics such as detailed drawings of plans and maps.

Computer animation or CGI animation is the process used for generating animated images by using computer graphics. Some principles of animation include anticipation, squash and stretch, arc, staging, slow-out and slow-in, and exaggeration, etc. In the visuals given on this slide, we can look at the definitions of these principles of animation. Animation is a broad field that encompasses various techniques and styles and one has to choose the animation tool best suited for the purpose and then build and tweak the discussed sequences.

- Cel animation was widely used before the advent of computer animation. The primary difference is that the latter relies on animation software programs along with the frame of animation provided by the animator.
  - Keyframes: They are the most important poses or positions within the animation.
  - Tweening: It involves drawing the frames that come between the keyframes to create the illusion of smooth movement.
- Kinematics and Inverse kinematics are techniques used in animation to position a specific part of a system in a desired location and to study the movement and motion of structures that have joints, such as a walking man.
- Morphing, refers to the process of smoothly transforming one image or shape into another.



The Use of Tweening and Kinematics in Animation
Sources: www.deviantart.com

Before the advent of computer animation, cell animation was widely used.

The primary difference is that the latter relies on animation software programs along with the frame of animation provided by the animator. So, there are normally two terms which are basically used, keyframes and tweening. Keyframes are the most important poses or positions within the animation and tweening involves drawing the frames that come between the keyframes to create the illusion of smooth movement. Kinematics and inverse kinematics are techniques used in animation to position a specific part of a system in a desired location and to study the movement and motion of structures that have joined such as a walking individual. Morphing refers to the process of smoothly transforming one image or shape into another.

Morphing applications can perform transitions not only between still images, but often between moving images as well. Besides text, images and digital audio-video is one of the most engaging modalities of multimedia venues. Unlike analog video which is played using physical media or signals, digital video is stored, transmitted and manipulated electronically. Let us look at this idea somewhat in detail.

- **Video** places the highest performance demand on any computer system. Digital video is stored and transmitted in the digital format, that is, in binary codes (0s and 1s).
  - It is used in television broadcasting, filmmaking, video streaming, video sharing platforms, and video conferencing.
- Video recording in a multimedia project involves choosing a shooting platform, storyboarding that visually outlines the project, lighting, composition and editing.
- Video editing is the process of manipulating and rearranging video shots to create a new work.
  - Non-linear editing (NLE) makes use of computers with video editing software such as Avid, Final Cut and Adobe Premiere.
- Video can be compressed using standards like MPEG-4 (Moving Picture Experts Group) and HEVC (High Efficiency Video Coding).

Video Recording and Editing
Sources:www.pcmag.com

Video places the highest performance demand on any computer system. Digital video as we have discussed is stored and transmitted in the digital format that is primarily the binary codes. It is used in television broadcasting, filmmaking, video streaming, video sharing platforms and video conferencing. Video recording in a multimedia project involves choosing a shooting platform, storyboarding that visually outlines the project, lighting, composition and editing. Video editing is the process of manipulating and rearranging video shots to create a new work. Non-linear editing that is NLE makes use of computers with video editing software such as Avid, Final Cut and Adobe Premiere.

Videos can be compressed using standards like MPEG-4 and HEVC. The video that you are viewing now that is the module itself is also recorded, edited, compressed and digitally streamed. We will discuss more about digital video platforms and the use of visual rhetoric in the next module. Now let us take an example of multimedia elements in digital comics that have created a new reading experience by providing new avenues for storytelling, engagement and creativity.

Digital Comics and Multimedia

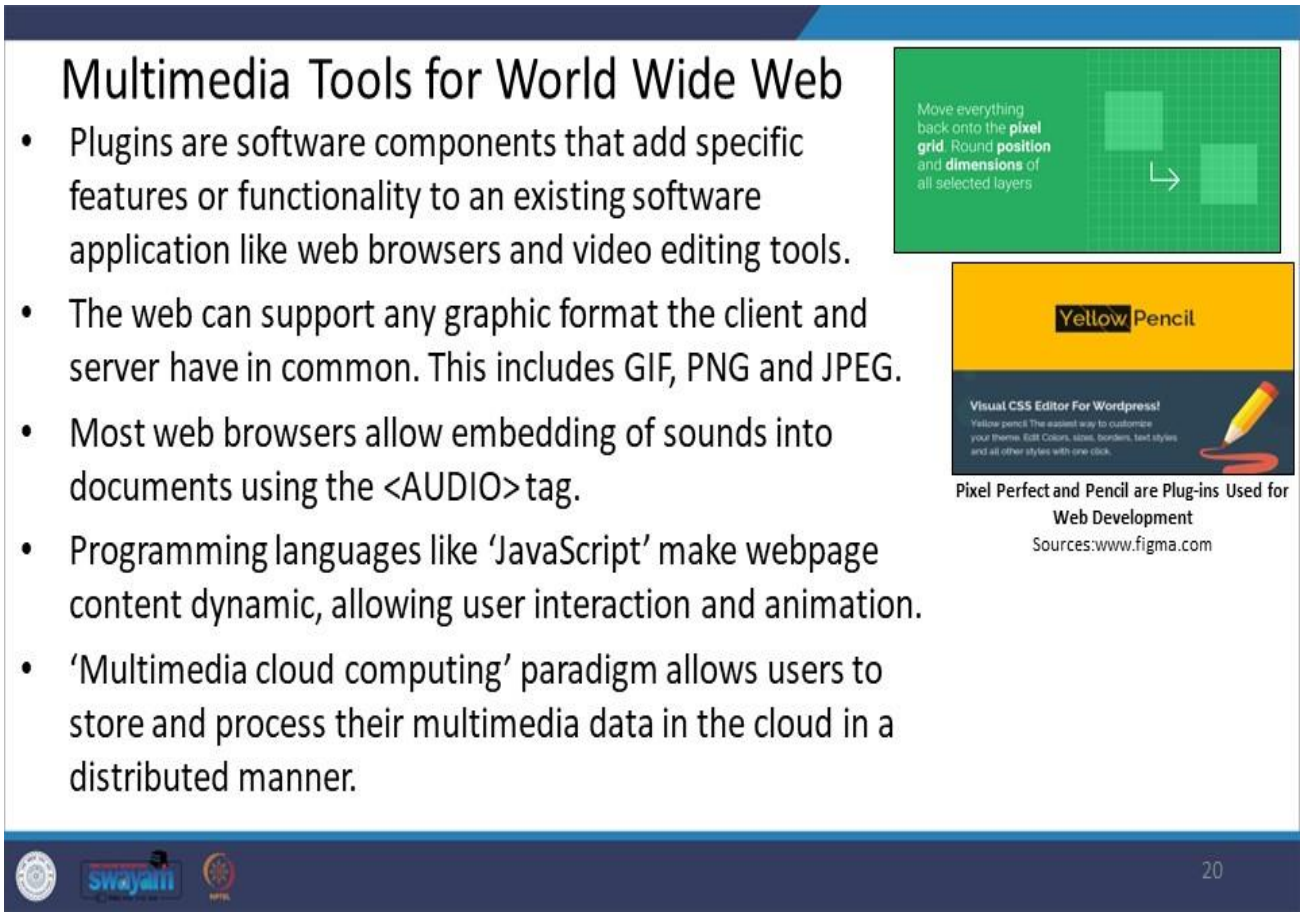
- Digital comics are created and distributed in digital format. They incorporate multimedia elements to create a more dynamic and immersive reading experience.
- Panels can transition smoothly, characters can move, and objects can be animated, bringing the static images to life.
- They often include sound effects accompanied by audio effects. This feature adds an auditory layer to the visual narrative, making it more engaging.
  - For example, explosions, footsteps, or dialogue bubbles popping up.
  - It also contains voice-over narrations and background score to add emotional depth to the narrative.
- It can also view 3D models of characters or objects using VR technologies.

Adobe Photoshop is used as a good tool for graphic design and illustration.
Source:www.youtube.com

Digital comics incorporate multimedia elements. Panels can transition smoothly, characters can move and objects can also be animated, bringing the static things to life.

They often include sound effects accompanied by audio effects. This feature adds an auditory layer to the visual narrative, making it more engaging. For example, explosions, footsteps or dialogue bubbles which are popping up, etc. It also contains voiceover narrations and background score to add emotional depth to the narrative. It can also view 3D models of characters or objects using VR technologies. Digital comics can also take advantage of hyperlinks to provide additional context or reference to related content.

With the advent of the internet and the World Wide Web, it has become easier to access and share multimedia documents and it has led to collaborative developments like joint editing and multi-user presentations such as conferencing, training, tele-learning, etc. Let us see how multimedia contributes to the World Wide Web.



Pixel Perfect and Pencil are Plug-ins Used for Web Development
Sources:www.figma.com

The first tool we refer to is plugins which are software components that add specific features or functionality to an existing software application like web browsers and video

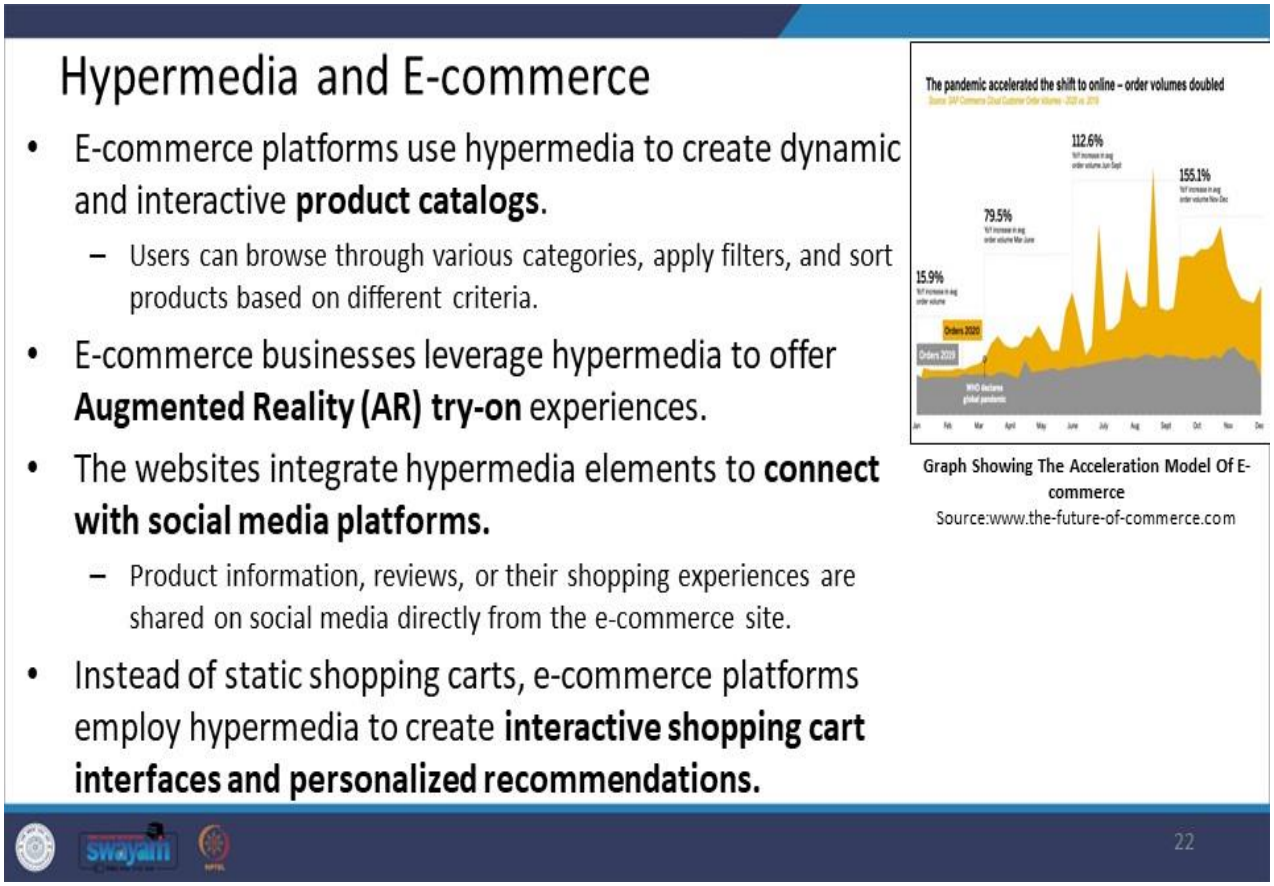
editing tools. The web can support any graphic format that client and server have in common including GIF, PNG and JPEG.

Most web browsers allow embedding of sounds into documents using the audio tag. Programming languages like JavaScript make web page content dynamic, allowing user interaction and animation. Multimedia cloud computing paradigm allows users to store and process their multimedia data in the cloud in a distributed manner. We will learn more about cloud computing and communication when we talk about artificial intelligence in the coming modules. What we have to understand is that the World Wide Web is a well-known example of a hypermedia system. We have already talked about hypertext and links and now let us see how these hyperlinks form an important part of multimedia in the form of hypermedia and its applications.

Hypermedia extends the concept of hypertext to describe the form of multimedia content that incorporates links or hyperlinks to other related resources. It includes text, images, audio, video or any other type of digital media content. It is often associated with

the concept of the Hypermedia As The Engine Of Application State principle in web development which suggests that a hypermedia driven application should provide information about available actions or resources through hyperlinks embedded within the response, allowing the clients to dynamically navigate and interact with the application's resources. Some of the examples include the World Wide Web itself, e-commerce applications, Google maps, as well as different types of interactive tutorials.

Let us take a real world application of hypermedia on e-commerce platforms. Hypermedia applications can greatly enhance the e-commerce experience by providing interactive and interconnected content, offering a more dynamic and engaging shopping environment for users. Let us see how this is brought into utility.

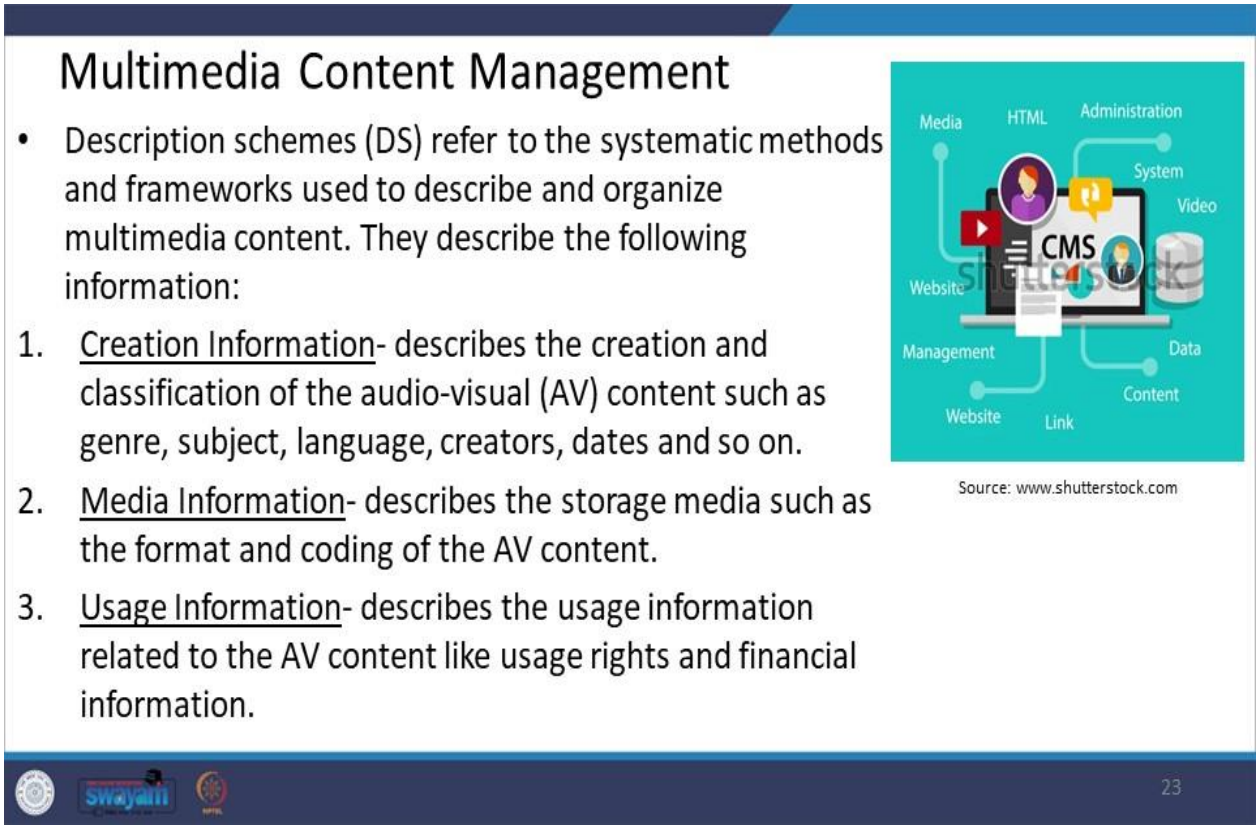


Graph Showing The Acceleration Model Of E-commerce
Source:www.the-future-of-commerce.com

E-commerce platforms use hypermedia to create dynamic and interactive product catalogs and the e-commerce businesses leverage hypermedia to offer augmented reality try-on experiences. The websites integrate hypermedia elements to connect with social media platforms and instead of static shopping carts, e-commerce platforms employ hypermedia to create interactive shopping cart interfaces and personalized recommendations. The graph which we are showing on the right hand side of the slide

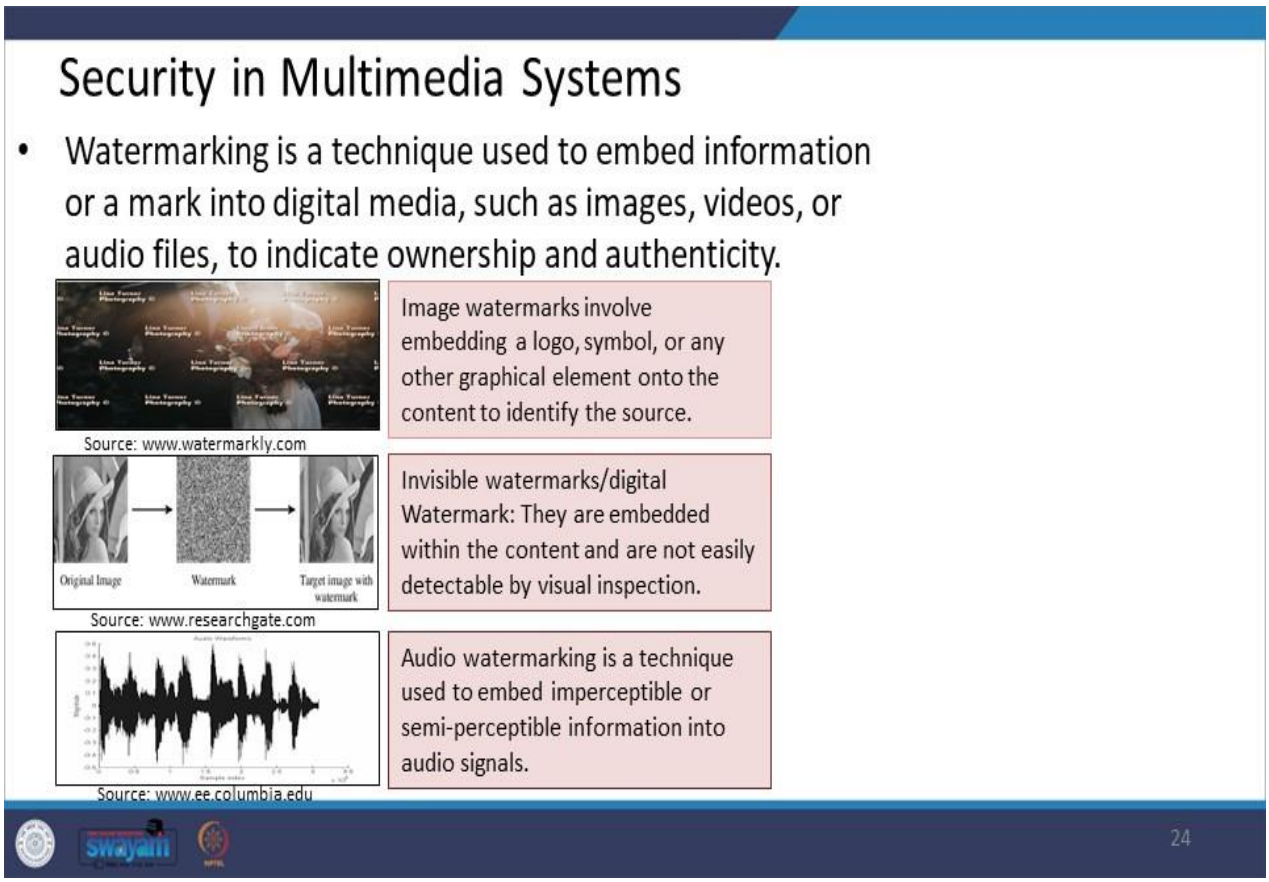
shows the acceleration model of e-commerce.

This shows how the global pandemic caused online holiday shopping to skyrocket in ways no one could have predicted before the lockdowns had started. Since then, there was no turning back and hypermedia has become key for retail e-commerce growth. This resulted in a sharp rise in ad revenue as well as privacy concerns for the user. This brings us to the final topic in the module that is content management and security of multimedia systems. Multimedia content management provides a structured approach to manage and categorize various types of multimedia data like audios and visuals and this is done through what is known as DS or the description schemes.



DS or description schemes refer to the systematic methods and frameworks which are used to describe and organize multimedia content. The types of information which they describe are presented below as creation information, media information and usage information. Creation information describes the creation and classification of the audio visual content such as genre, subject, language, creators, etc. Media information describes the storage media such as the format and coding of the AV content. Usage information describes the usage information related to the AV content like usage rights and financial information.

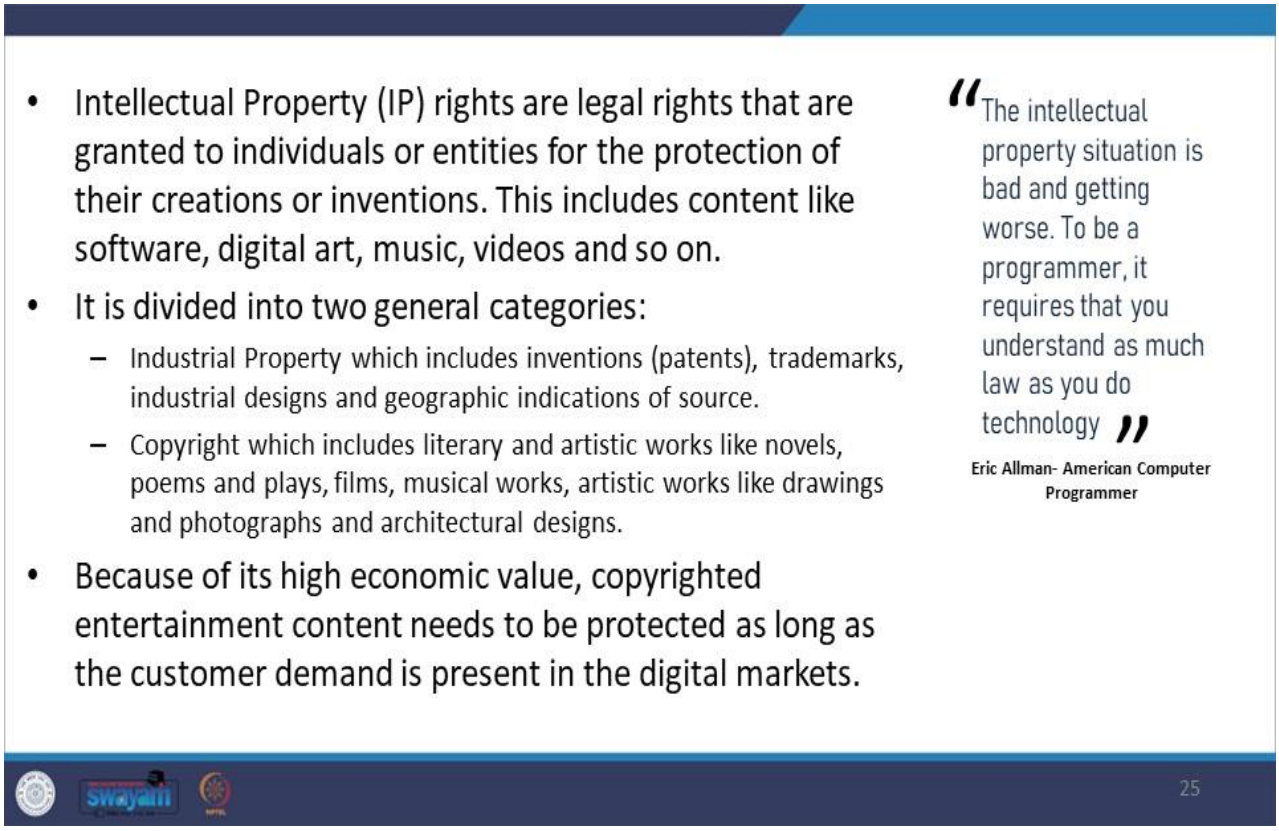
The categorization of description schemes is to enable efficient indexing, searching and browsing of multimedia content within a collection of database. However, the fundamental problem of communication is reproducing the multimedia content either exactly or approximately. This poses the question of how the security of multimedia content can be secured. Piracy is a growing potential threat and some of the ways in which it can be reduced is through watermarks and copyright protection.



Watermarking is a technique which is used to embed information or a mark into digital media. Image watermarks involve embedding a logo, symbol or any other graphical element onto the content to identify the source. Invisible watermarks or digital watermarks are embedded within the content and are not easily detectable by ordinary visual inspection. Audio watermarking is a technique which is used to embed imperceptible or semi-perceptible information into audio signals. Watermarks, especially the invisible ones, can be used to verify the authenticity and integrity of digital media.

They provide a means to detect tampering or unauthorized modifications. Watermarking

serves several purposes in which copyright protection is the most prominent one. Let us look at IP rights, that is intellectual property rights and copyright more closely.



IP rights are legal rights that are granted to individuals or entities for the protection of their creations or inventions. This includes content like software, digital art, music and video, etc.

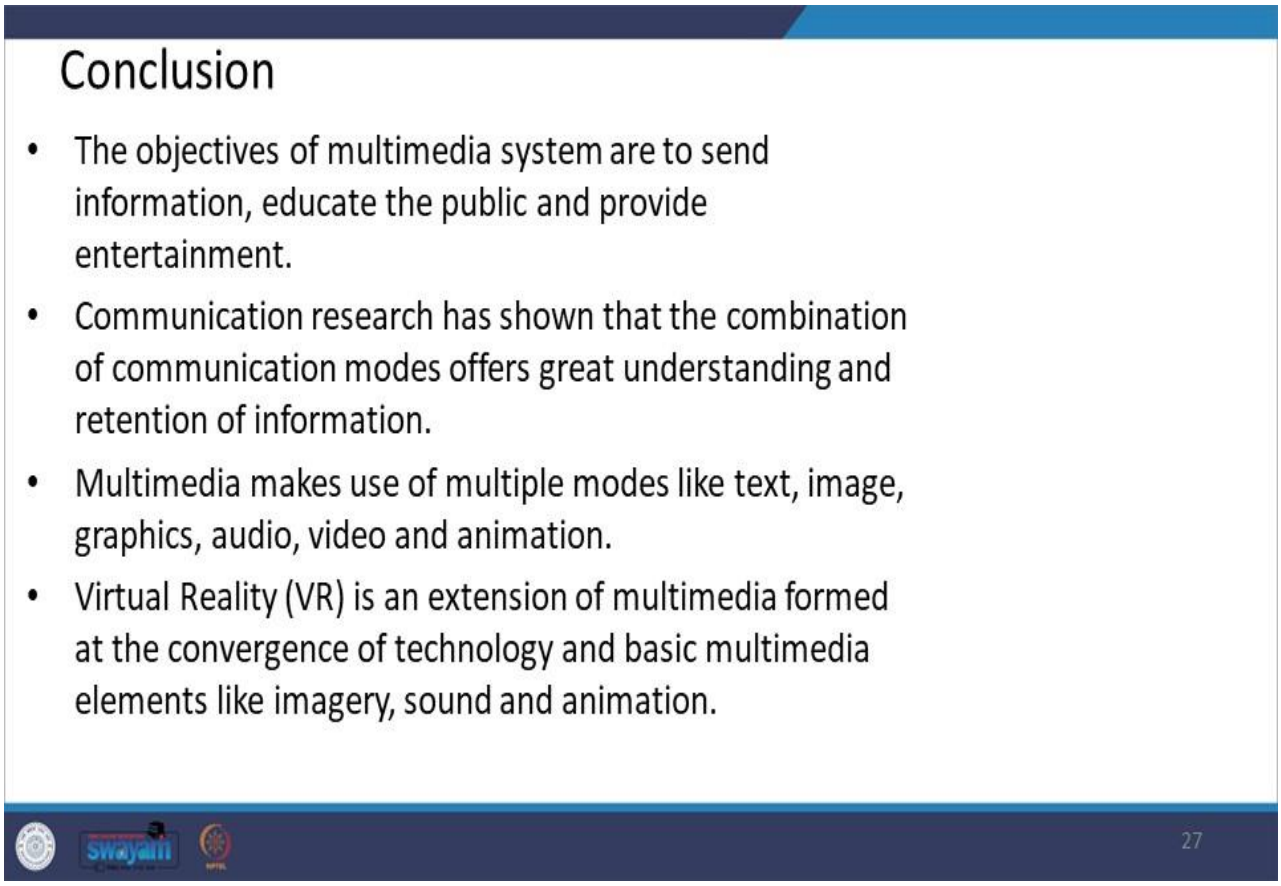
It can be divided broadly into two general categories. The industrial property includes inventions, patents, trademarks, industrial designs, geographic indications of sources, etc. Copyright includes literary and artistic works like novels, poems and plays, films, musical works, artistic works like drawing and photographs and architectural designs. Because of its high economic value, copyrighted entertainment content needs to be protected as long as the customer demand is present in the digital markets. End-to-end security is the most critical requirement for the creation of a new digital market where copyrighted entertainment is a major product. Digital media including text, images, videos and music are automatically protected by copyright when they are created, but it is advisable for creators to register their works for additional legal protection.

- Digital Rights Management (DRM) technologies are used to control the access, use, and distribution of digital media.
- Copyright protection is automatically granted to digital content creators as soon as their work is fixed in a tangible form and they have exclusive rights over their digital works.
- Copy difference mechanism is adopted to discourage unauthorized duplication and distribution.
  - It traces unauthorized copies to the original owner of the work or track the owner of the infringement.
- Digital media faces challenges from unauthorized copying, distribution, and sharing, commonly known as piracy.

Copyright Infringement Cases
Source: www.99designs.com

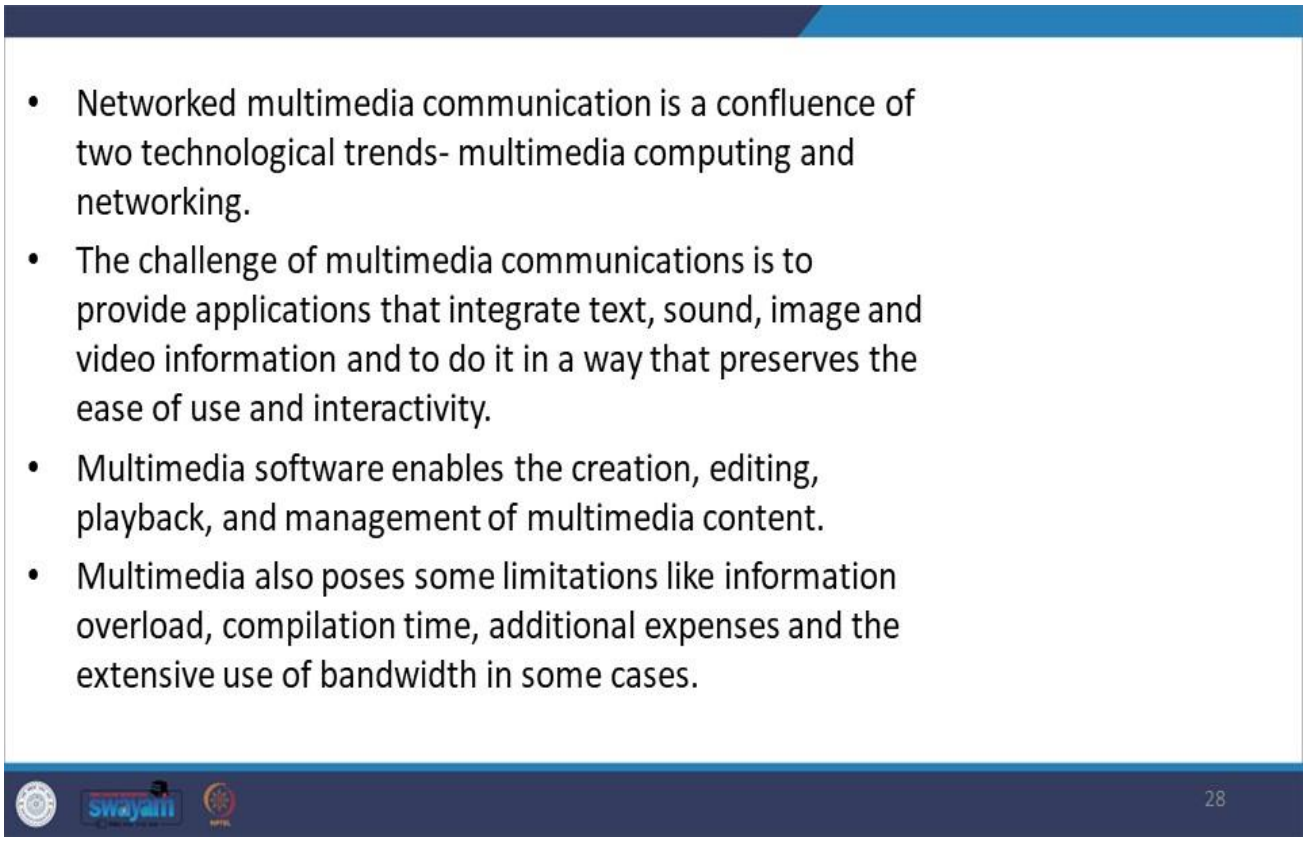
Digital rights management or DRM technologies are used to control the access, use and distribution of digital media. Copy difference mechanism is adopted to discourage unauthorized duplication and distribution, tracing unauthorized copies to the original owner of the work or track the owner of the infringement. Digital media faces challenges from unauthorized copying, distribution and sharing which is commonly known as piracy. This can lead to financial losses for content creators and distributors.

Antipiracy measures such as DRM technologies and legal actions are employed to combat piracy. Multimedia and its multimodal communication have impacted and been incorporated into the lives of people on a daily basis. With the emergence of high speed and high quality networks, multimedia communication has become an extension of the existing mono media systems.



The objectives of multimedia system are to send and share information and educate the public and also to provide entertainment. Communication research has shown that the combination of communication modes offers great understanding and retention of information.

And multimedia makes use of multiple modes as we have discussed earlier. Virtual reality or VR is an extension of multimedia format at the convergence of technology and basic multimedia elements like imagery, sound and animation. As progress continues to be made in this field, it is necessary to amplify consumer interest in this particular form of communication. Multimedia has become a major theme in today's information technology by merging the practices of communications, computing and information processing into an interdisciplinary field.



Networked multimedia communication is a confluence of two technological trends, multimedia computing and networking. The challenge of multimedia communications is to provide applications that integrate text, sound, image and video information and to do it in such a way that preserves the ease of use and interactivity.

Multimedia software enables the creation, editing, playback and management of multimedia content effectively. It also poses some limitations and challenges like information overload, compilation time, additional expenses and the extensive use of bandwidth in some cases. In the next module, we will discuss about the technological developments that have led to the socialization of the web. We will look at Web 2.0 that is the social web that we know and experience today in the context of typical channels of communication like blogs, wikis, podcasting. We will also be discussing the new generation of web called the semantic web. Thank you.