The hypermedia methodology of e-learning combines the Web technologies and multimedia formats to provide a learner-led framework of learning.

Hypermedia computer files are hypertext documents which include not only text but pictorial and aural information.

A hypermedia program for e-learning consists of a database of information with multiple methods of navigation and features to facilitate learning.

Two components are necessary for a hypermedia program to be successful:
- It must have a clear and well-reasoned purpose.
- It must be designed in accordance with that purpose.
Structure for Hypermedia

- Hypermedia programs consist of many “pages” each of which contains multimedia objects (text, images, sound, videos, animations) that are linked to other objects or pages.
  - A particular element (object) can be linked to several other elements.
    - For example, pointing to a word might display its definition, whereas clicking on it might transport you to a page with greatly expanded information on the topic.

- Hypermedia programs do not have the traditional organization of sequential pages. This is in contrary to approaches such as tutorials, drills, and simulations.
  - The pages can be traversed in many different sequences which is difficult to estimate in advance.

Hypermedia formats

- There are several hypermedia formats that can be used in e-learning (depending on the purpose of learning). The most common of them are:
  - Encyclopedic reference
  - Specific subject matter reference
  - Analysis of a domain
  - Case study
  - Construction set
  - Edutainment
  - Museum
  - Archive

- In the following we describe shortly each one of the above formats.

Encyclopedic reference

- Encyclopedic references include encyclopedias, dictionaries, thesauruses, etc.
  - They contain large amounts of text, pictures, audio, and movies with links between interrelated information and several methods of searching and retrieving the information.

- Examples:
  - World Book Multimedia Encyclopedia
  - Microsoft Encarta

- Purpose:
  - They are not intended to be studied like textbooks. Rather, they are general reference materials for doing research on some topic.
  - They are not intended to be used like a tutorial, but as resources to assist in some other learning activity.

Specific subject matter reference

- They are specific reference works that catalog the knowledge of particular subject areas.
  - They cover the subject area in depth.

- Examples:
  - Art and life in Africa
  - How Your Body Works
  - Cyberwalker, http://www.cyberwalker.net/

- Purpose:
  - They are not intended to be studied like textbooks due to their non-sequential form. Rather, they are reference materials for doing research in depth for a specific topic.
  - They can be used instead of tutorials to perform learner-led guided research.
Analysis for a domain

- Analysis of a domain is similar to specific subject matter reference but emphasizes on the analysis rather than presenting information. Therefore, it includes different viewpoints and arguments, it discuss the complexities of the subject and analyzes its issues.
- It analyzes somehow controversial issues

Examples:
- Set on Freedom, (analyzes the U.S. civil rights movement)
- Who built America? (address the question of who was responsible for the growth of the U.S.)

Purpose:
- They are ideal to perform learner-led guided analysis.

Case Study

- Case studies is the most easily hypermedia format for e-learning. It is similar to the analysis for a domain but analyzes a more defined topic, such as a person, a historical event, or a work of art or literature.

Examples:
- Macbeth, (Shakespeare play)
- Ninth Symphony (Beethoven)
- Leonardo the Inventor

Purpose:
- They are ideal to perform learner-led case studies and guided analysis.

Construction Set

- Construction set are hypermedia programs which in addition to the material (references) provide learners with tools to construct their own hypermedia compositions.

Examples:
- Visual Almanac
- HyperStudio

Purpose:
- They are ideal to perform hands-on activities related with web development, hypermedia programs construction, multimedia authoring etc.

Edutainment

- Edutainment refers to hypermedia programs that are both educational and entertaining. They are generally specific matter references or case studies embedded in a scenario that is engaging for young children
- Typically are game like activities. The hyperlinks included are embedded mainly to objects rather than to words.

Examples:
- Kidsculture: The Great Explorers (learn about explorers in 3D environment and with a movie like presentation)
- The Magic School Bus Explores the Solar System (traveling with the school bus -which is translated to spacecraft- to explore the solar system)

Purpose:
- They are ideal for children training.
**Museum**

- They virtual museums representing real ones and their exhibits. They typically include virtual reality capabilities to represent reality as better as possible.

**Examples:**
- Vatican's Sistine Chapel
- The Louvre
- Art Institute of Chicago

**Purpose:**
- They are ideal for studying art, the history of art etc.
- They are used in guided research, guided analysis, case studies etc.

**Archives**

- They are collections of movies, news, photographs, newspaper articles, journal articles etc. which either exist in digital form or they have been digitized.

**Examples:**
- ERT archive, CyBC archive
- National Geographic Archive
- Art Institute of Chicago

**Purpose:**
- They are ideal for role playing, guided research, and guided analysis.

**Factors in Hypermedia design**

- When designing hypermedia programs the designer should:
  - Select one of the hypermedia formats that best accomplish the purpose of learning.
  - Create the characteristics (factors) of the program in accordance with the selected format and the purpose.

- There are three categories of characteristics which affect hypermedia design:
  - The hypermedia database
  - Navigation and orientation
  - Features supporting learning and learning strategies (involvement of learning theories).

**The Hypermedia database**

- A central component of a hypermedia program is a database of information. Without a database hypermedia programs are just a collection of web-pages.

- The following factors are related with the hypermedia database:
  - Media types
  - Size of database
  - Organization of the database
  - Resolution
  - Modifiability
  - Platform independence
  - Language independence
The Hypermedia database (II)

Media types: proper choice and integration of appropriate media
- Text => Good for high ability learners, easy to search, formatted in many different ways, easy to display, good for encoding conceptually complex information
- Still Pictorial Images => Attract attention, good for describing real objects, more memorable than text, they are relatively language independent, convey spatial information well
- Motion images => Attract attention and improve motivation, convey both spatial and temporal information, good for teaching sequences and procedures. They combine well with aural information
- Aural information => It is combined with motion images or still images to describe procedural or spatial information, good for narrative information, conveys emotional information

The Hypermedia database (III)

Size of the Database: to take advantage of hypermedia programs a large database is an essential characteristic which should be supported (at the cost of the increased mass storage space that is required)
- Small amounts of information are delivered better using other instructional methodologies (tutorials, drills, open ended environments, etc).
- The larger the database the more (and efficient) navigation tools required

Organization of the Database: A database may be organized in several ways, alphabetically, temporally, hierarchically, etc. This is easily achieved by sorting applied to different fields
- Hypermedia databases must be organized in many different ways to support different purposes or different learners.

The Hypermedia database (IV)

Resolution (granularity): It refers to how finely information is divided into separable usable pieces (text “pieces” for example can be words, sentences, paragraphs, chapters etc.)
- More finely divided =>
  - Learners focus on more specific content goals
  - Flexible use of information
- Less finely divided =>
  - Learners tend toward more broad and general learning
  - Ease of creation

Modifiability: It refers to the ability of learners to modify the content of the database. Modifiability is rarely supported in commercial hypermedia programs
- Modifiability is an important characteristic for hypermedia programs used for learning.

Navigation and orientation

Navigation => Getting where you want to go
Orientation => Knowing where you are and where the information you want is

Hypermedia disorientation and poor navigation are the most important problems in learning from hypermedia

Navigation methods in hypermedia:
- Hyperlinks, Menus, Indexes, Tables of Contents, Searching, Bookmarks and Histories

Orientation devices
- Maps, timelines, menus, text cues
Factors affecting hyperlinks

Although several methods of navigation are provided in hypermedia programs the primary type is hyperlinks. A number of factors are relevant to hyperlinks:
- Types of links (text, labels, pictures, parts of picture, icons, movies, parts of movies, etc)
- Purpose of links (encyclopedias => definitions, analysis of a domain => multiple perspectives, etc)
- Density of links (readability, disorientation)
- Visibility
- Screen location
- Confirmation
- Semantic cueing
- Distance (local vs distant web sites)
- Modifiability

Conclusion

When designing hypermedia programs for e-learning one should:
- Take into account the context of learning, learning content and learner characteristics
- Be clear about the purpose of the program so as to identify the appropriate hypermedia format to accomplish that purpose
- Remember the three essential features that define a hypermedia program
  - Knowledge database
  - Multiple methods of navigation
  - Multiple media
- Navigation methods must be easy to use and appropriate to the hypermedia format
- The database must be of appropriate size, resolution and organization for the purpose and format