

# Information Systems

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Applied Multimedia

[HIGHER]



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# INTRODUCTION

This unit is designed to develop knowledge and understanding of the principles of multimedia applications and practical skills as they relate to the use of contemporary hardware and software. This knowledge and understanding, and these practical skills, may then be applied by the candidate to solve practical problems related to multimedia applications.

## Target audience

While entry is at the discretion of the centre, candidates will normally be expected to have attained one of the following qualifications (or equivalent experience):

- the corresponding unit at Intermediate 2
- Intermediate 2 Information Systems
- Standard Grade in Computing Studies at Credit Level.

This unit has two outcomes:

1. Demonstrate knowledge and understanding of the principles, features and purposes of multimedia applications.
2. Demonstrate practical skills in the context of multimedia applications using contemporary hardware and software.

Outcome 1 is assessed by a multiple-choice test. Outcome 2 is assessed by a practical skills checklist, based on work done during the unit.

## Learning and teaching approaches

It is recommended that the assessment and delivery of this unit are combined in order to maximise the amount of time that students spend developing multimedia. These study materials should be made freely available to the students during assessment, as should any tutorials, documentation or other material relevant to the hardware, software or design processes that they are engaged in.

A mixture of student-centred, resource-based learning and teacher/lecturer class teaching is recommended. Students will require access to appropriate computer hardware and software throughout this unit.

A range of suitable questions is provided at various points throughout the notes. The teacher/lecturer should direct the student to these questions as they see fit. The questions should be used to break up the learning process and should provide a means of diagnostic assessment as part of the learning and teaching of the unit.

### **Hardware and software requirements**

This unit requires that the student has regular access to a computer system which can be used throughout the production of the multimedia product. At the time of going to print, such a system would have:

- a 600 MHz G4-based Apple Power Mac or a Pentium III 800 MHz Processor-based PC
- sufficient RAM, e.g. 128 Mb RAM for Macs and PCs
- sufficient backing store, e.g. 10 to 30 GB hard disk
- authoring software, such as Macromedia Director, Macromedia Authorware, Macromedia Flash, HyperStudio, etc.
- graphics software, such as Adobe PhotoShop, Adobe Illustrator, Macromedia Fireworks, Macromedia Freehand, etc.

### **How to tackle this unit**

A standard learning pattern is suggested for your use throughout this unit:

- a clear outline of the main learning points
- questions to check understanding of these points
- practical tasks to illustrate the learning.

Wherever possible, tutors should provide opportunities for candidates to do practical work related to the learning in each section.

## **What is in the pack?**

### **Section 1: Contemporary uses and means of delivery**

Description of multimedia, application areas, basic hardware, delivery media. Questions and tasks

### **Section 2: Description of analysis stage**

Project brief, contractual requirements, requirements specification. Questions and tasks

### **Section 3: Design of navigational structures and HCI**

Navigational structures, user interfaces design, use of metaphors. Questions and tasks

### **Section 4: Design of screens and media elements**

Screen design, storyboards, text features, graphics, audio, video. Questions and tasks

### **Section 5: Implementation (general)**

Description of application software, personnel skills. Questions and tasks

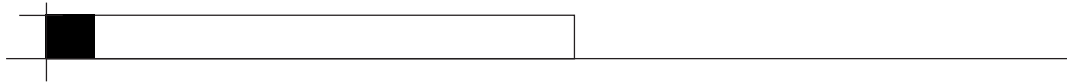
### **Section 6: Implementation (media elements)**

Graphic file types, audio file types, video characteristics, URL structure. Questions and tasks

### **Section 7: Testing and documentation**

Analysis of different types of testing, documentation types, copyright, evaluation. Questions and tasks

### **Section 8: PowerPoint slides outlining main topics**



**SECTION 1****A definition of multimedia**

Multimedia is the combination of different types of media, the integration of text, audio, video and graphics in a computer-based environment. A multimedia PC or personal computer is a computer system that can play back multimedia applications such as educational CD-ROMs, video and Internet applications. Multimedia applications use the concept of interactivity, which passes the control of media content to the user. The main features of multimedia are interactivity, hyper-linking and computer-based delivery.

Multimedia is used extensively in the areas of business, educational training and home pursuits; each of these areas will be looked at in detail.

**Multimedia applications: Business*****E-commerce***

Electronic commerce or e-commerce is concerned with the buying and/or selling of something electronically, often through online transactions. These may be business to business (B2B), business to consumer (B2C), or consumer to consumer (C2C). An electronic transaction is the purchase or sale of services or goods directed and conducted over computer networks.



Multimedia applications in e-commerce can be used in many ways, for example:

- booking hotel reservations
- online banking
- buying a book, CD, etc. (for example, [www.amazon.com](http://www.amazon.com)).

The use of e-commerce requires three components:

- a merchant account: this enables the user/seller to take credit card information from a prospective customer
- online shopping cart: customers can order 24/7
- transaction software: how the money is actually delivered.

### ***Presentations***

Multimedia presentations tend to include a variety of text, graphics, video and audio components, used to present information on a wide range of subjects, for example:

- an educational lecture
- a new marketing strategy
- an annual meeting for employees.

For a successful presentation the designer must collate all relevant information, then integrate all different media into a software package (MS PowerPoint). Each element can be embedded in the file and edited.

### ***Teleconferencing***

Teleconferencing is a form of interactive communication between people who are at two or more locations. Teleconferencing includes:

- video conferencing
- audio conferencing.

Video conferencing is a collection of different technologies that integrate audio with video and display the result in real time over a distance. The purpose is to communicate with people over a large distance. This can be cost effective for a business because it will save the company travel expenses. At one site there will be a video camera that will transmit data to the second site, and vice versa.

Audio conferencing uses the same principles but uses microphones to exchange information. Microsoft Net Meeting software is a popular choice at the present time.

### ***Collaborative working***

This is work that is undertaken by a group. In a multimedia application it could be the integration of work by different designers who have the necessary skills for certain media areas. Web-based software is available that is designed to support the work of virtual teams who are working separately on different problems. Project management software and applications are also available which can run on networks. These allow several people to work on complex problems at the same time, either separately or together. Popular software at the present time is EyeComm, which allows you to communicate online with several members of staff at the same time. Each member is displayed on-screen in a small video window.



## Multimedia applications: Training

### *CBT (Computer Based Training)*

Computer Based Training uses multimedia such as applications and animation to educate and interest the learner. This media is used to implement instruction in an effective manner. CBT packages (including both CD-based and online packages) are very popular. Topics and advantages include:

- learning office software applications
- learning internet application software
- access available 24/7
- allows independent training (go at your own pace)
- interactive learning is possible
- can reach large audiences at various locations
- saves cost of a trainer.

CBT CD-ROMs come with most software packages and new computers. These allow the user to attempt tutorials and gain an understanding of the product prior to using it.

### *Multimedia simulations*

For training and education applications, multimedia simulations can be used. These are simulations in which graphics, photographs, sound and video are deployed to create realistic micro-worlds where users can attempt to understand and explore certain areas of training and education. Examples include:

- medical applications where students can train on a virtual human body
- flight simulators where trainee pilots can learn to fly a virtual jet
- driving simulations for train drivers
- industrial control simulations.

Simulations enhance the learning process in different ways to lectures, textbooks, etc. One advantage is that these simulations replace costly and hazardous demonstrations in areas such as chemistry, biology, medicine and aviation.

## Multimedia applications: Home

### *Home entertainment*

With the development of broadband and high-speed processors, home entertainment is now a rapidly expanding multimedia area. Home users can now enjoy online games, video and audio on demand, as well as video telephony streamed through a television set or home computer system. Other services include:



- high-speed Internet surfing over TV
- messaging (SMS) over TV and e-mail.

By expanding computer peripherals to include television, audio and video, the growth of consumer services in the home will continue to expand.

### *Edutainment*

Edutainment is defined as an experience that is both entertaining and educational. Based on the concept that 'a picture is worth a thousand words', this type of application can make the learning experience richer and more coherent. Some examples include:

- virtual space walks
- exploring prehistoric geology using 3D graphical images.

### *Home shopping*

There are now numerous Internet sites that offer home shopping. Consumers can now shop in online supermarkets, and you can buy just about anything online if you have a credit card and a computer with Internet access. Some popular sites are:



- [www.amazon.com](http://www.amazon.com) (books and CDs, etc.)
- [www.tesco.com](http://www.tesco.com) (consumer goods)
- [www.macys.com](http://www.macys.com) (jewellery, perfume, etc.)
- [www.ebay.com](http://www.ebay.com) (online auctions)

**Questions**

1. What is e-commerce?
2. Give three examples of e-commerce.
3. What is required for e-commerce?
4. What are the main components of a multimedia presentation?
5. What is the purpose of video conferencing?
6. What are the advantages of collaborative working?
7. What are the main applications of CBT?
8. What is edutainment?

**Task**

Search the Internet (or relevant books) to find examples of the use of multimedia applications for:

- e-commerce
- training
- simulations
- edutainment.

**Multimedia delivery media**

This section considers the various different delivery modes for multimedia applications.

***CD-ROM (Compact Disk, Read Only Memory)***

This optical storage medium is available in different formats (ROM, Audio). Data on a CD-ROM is divided up into sectors and arranged in files. A CD-ROM provides approximately 700 MB (megabytes) of read-only data storage, which is equivalent to approximately 500 floppy disks.



In order to read data from a CD-ROM, you require a peripheral called a CD-ROM drive.

CD-ROMs can be used for computer-based training, storing and running programs, installing software drivers, playing back video, etc.

***DVD-ROM (Digital Versatile Disk, Read Only Memory)***

This high-capacity storage medium exists in numerous formats, the most popular being the read-only type of DVD-ROM, which provides seven times the storage capacity of a CD-ROM. Development began in 1991 as a next-generation replacement for Laser Disk. A DVD can have four layers (two on each side), and these characteristics enable more data storage. Latest models can hold up to 4.7 Gigabytes of data (single layer), 8.4 Gb (dual layer). These disks can contain full-length films and are compatible with audio players.



Some DVD-ROM applications:

- multi-disk CD-ROM games can now be stored on one DVD-ROM
- encyclopaedias with high-quality MPEG-2 video
- interactive high-quality wide-screen films.

***Kiosk***

A Kiosk is usually found at public information points. These are essentially computers designed for stand-alone public use, and are commonly found in museums, ticket outlets in cinemas, train stations and banks.

Emphasis is on hard-wearing robust units because security is an issue. Also the system must user friendly and in some cases bi-lingual. Access can be controlled by chip card or magnetic



band. Some have touch-screen facilities which enable users to input information on geographical locations or finance information. Some applications for Kiosk systems:

- information areas in public buildings
- tradeshow exhibits
- phone directories in phone boxes.

### **WWW (World Wide Web)**

World Wide Web is a service provided on the Internet. It is a global network of computers that can share files, documents and other resources. The technology that is used is HTML (hypertext mark-up language), HTTP (hypertext transfer protocol), web servers and web browsers (Internet explorer). The WWW is a cross-platform environment, and has applications in almost every area of technology, entertainment, education, etc.



HTML (web) pages can display text, graphics, sound and video.

### **Mobile communications**

Early mobile phones could only be used for voice and text messages, but WAP (wireless application protocol) enabled mobile phones to send and receive multimedia data. 3G (third-generation) mobile phones can provide video calling and WAP at broadband speed



### **Hybrids**

By integrating two or more delivery media it is possible to create a hybrid system. For example, CD-ROMs are particularly useful for large amounts of static data, while WWW is excellent at producing smaller amounts of regularly updated information. By creating hyper-links from the CD-ROM to the WWW, it is possible to run the CD and open up websites throughout the application/presentation.

Therefore some of the information could be delivered by CD and another part could be delivered across the WWW. This is already integrated into most software help packages and browsers' update facilities.

Some examples:

- multiplayer Internet gaming
- software updates and upgrades
- online help for applications.

### ***Virtual reality***

Can also be known as ‘artificial reality’, this is a visual form of cyberspace and consists of 3D graphics, with user interaction via a ‘data glove’. This application uses advanced technological computers and multimedia peripherals to produce a simulated virtual environment. The user wears a head-set and glove to interact. Users can perceive real objects and events in cyberspace.

Some applications are:

- visualisation and representation of molecules
- weather simulation
- flight simulation.

### **Advantages and disadvantages of different multimedia delivery media**

#### ***CD-ROM***

- Data capacity: approximately 700 Mb
- Data transfer rate: 40x gives maximum 6 Mb per second
- Window size: depends on the computer monitor
- Ease of update: cannot update (read-only memory).

*Advantages:* small and portable; cheap.

*Disadvantages:* cannot update information as disk is read only.

#### ***DVD-ROM***

- Data capacity: can be 17.1 Gb
- Data transfer rate: can be 11.8 Mb per second
- Window size: depends on the computer monitor
- Ease of update: cannot update (read-only memory).

*Advantages:* large storage capacity; small and portable; cheap.

*Disadvantages:* Cannot update information as disk is read only. Requires user to have DVD drive.

#### ***Kiosk***

- Data capacity: can be very large as hard disk drives are used
- Data transfer rate: very fast
- Window size: large, size of normal computer screen or larger
- Ease of update: can be updated.

*Advantages:* user-friendly, excellent for on-the-spot information.

*Disadvantages:* prone to vandalism.

#### **WWW**

- Data capacity: effectively infinite
- Data transfer rate: limited by user's connection
- Window size: large, browser window
- Ease of update: can be updated easily on server.

*Advantages:* access from anywhere, anytime.

*Disadvantages:* vulnerable to network traffic and bandwidth constraints.

#### **Hybrids (CD/Web)**

- Data capacity: unlimited because linked to Internet
- Data transfer rate: depends on user's connection
- Window size: large
- Ease of update: can be updated easily.

*Advantages:* Can deliver large files (CD / Web Hybrid).

*Disadvantages:* Prone to network and bandwidth constraints.

#### **Mobile communications**

- Data capacity: small
- Data transfer rate: slow
- Window size: very small

**Questions**

Match the following descriptions to delivery media:

1. A device that can contain up to 700 Mb of data in read-only format
2. High-capacity device that can store 17 Gb of information
3. A device that can be used in a mobile situation
4. A device that allows you to 'enter' cyberspace
5. A combination of CD and Internet
6. Advice found in public information points

**Task**

Using the Internet, find information on a Kiosk system. Write a summary covering:

- Kiosk location
- application objective
- primary users
- multimedia components used.

(try [www.thekioskfactory.com](http://www.thekioskfactory.com))

**SECTION 2****Analysis****The project brief**

Working in the field of multimedia development will certainly involve building and designing different multimedia applications. Usually, a client or customer will contact a multimedia designer (or business) and give an outline of the application they require, in the form of a project brief. This document will list all the requirements for the type of multimedia application that is to be designed. Some project briefs will contain more information than others. Usually there will not be enough details for any implementation to be attempted.



Consider the following project briefs:

'Design and develop a website that will promote and sell my products.'

As you can see, this project brief contains no information on what is to be built, only mentioning that it will be a website. There is no information on the client's product or type of business, so no application cannot be designed from this project brief.

'Design and develop a CD-ROM that will be used in further education to teach adults numeracy. The application should have help screens and be embedded with relevant audio and video applications.'

This brief contains a lot more information, but it would still be difficult to build an application from the brief given above. For example:

- What level of numeracy is required?
- What computers are available in further education?

It may be necessary for the application to be run from a mouse and not from keyboard commands, but this was not mentioned in the project brief. Relevant audio and video was mentioned, but these need to be expanded.

You need to describe all aspects in detail before attempting an implementation; otherwise you may have major faults in the design stage. So the project brief gives you only a rough outline of the content of the desired application. Much more specific information is required, from an early stage. The stage of gathering and refining the project details is called the *analysis stage*, and leads to the production of the *requirements specification*.

### Requirements specification

The requirements specification is a formal document that provides the basis of a contract between the client and the developer. It must provide a clear understanding (for both parties) of exactly what is required from the multimedia application. The requirements specification must contain *all* the necessary details.

When specification has been completed, the developer and client must agree on the contractual requirements specification. This will be the definitive project guide throughout development. All requirements must be met. Failure would be breach of contract. If the client requires further changes after this stage, an extension would be required as well as additional financial compensation for any extra work.

The requirements specification should cover all the following aspects:

- purpose
- user/audience
- content
- delivery media
- hardware and software requirements
- budget
- timescale.

### Purpose

The client is the organisation or person who has originally requested the multimedia application or solution to a particular problem. It is the developer's job to translate these wishes into a working project. S/he has to ensure that the client:

- has clearly defined the project's aims and objectives
- knows what s/he wants the application to say
- is clear about the content.

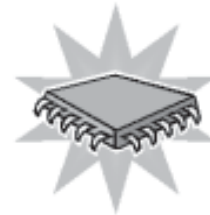
### Example

- Aim: To promote and boost awareness of client business

- Objective: To increase financial stability of business
- Must reflect client's identity by using original logos
- User will have full control over application through concise navigation menus
- Corporate video footage will be supplied by client.

### Hardware and software requirements (delivery platform)

An essential part of the analysis is to determine the delivery platform of the intended users, as whatever you develop will have to be compatible with the user's own system. Most target audiences have a spectrum of different systems, so it is useful to determine the lowest and the highest and work within those ranges.



- What kind of computers will end user have? (PC, Apple Mac?)
- RAM capacity?
- CD-ROM / DVD-ROM?
- Is Audio playback available?
- What is CPU speed?
- What version of operating system?
- Resolution settings?
- Video card available?

### User/audience

A successful product will be one that is relatively easy to understand. It is therefore essential to understand the needs and level of expertise of the people who are going to use the finished system. The description of the user requirements is a statement of the user's characteristics and aims. Here are a few pointers:



- What is the intended age group?
- Geographical location of intended audience/user?
- Level of education?
- Accessibility?
- Expertise in computer use?

### Content

You will need to retain the user's attention. This can be done by including specific information that will describe the product in an exciting manner. This should interest the user and encourage the target

audience to become accustomed to the application. This is essential if the application is to be successful. Some points to note:

- User interface should be user-friendly.
- Application must be easy to navigate.

### Delivery media

Is the application to be one of the following:

- Website?
- Presentation?
- Educational tool?
- CD-ROM?
- DVD-ROM?
- Hybrid application?

### Budget

- How much is to be paid?
- When is it to be paid?
- Is payment conditional? (For example, on work being completed by a specific date?)



### Timescale

- Is there a clear end-date for application to be operational?



### Questions

1. What is a project brief?
2. What is the difference between a project brief and a requirement specification?
3. Write a requirements specification for a simple arithmetic program for children aged 7–12.
4. What should be included in a requirements specification?
5. Explain why hardware and software standards are necessary.
6. Why is a budget important?
7. Who and what is the client?

## SECTION 3

### Navigational structures

In any multimedia applications screens will have to be linked in a logical manner, so that the user can manipulate the application. If you can easily find your way around an application, whether it be a website or CD-ROM, it means that the navigation is well designed and easy to follow. We will study four different structures:

- linear
- hierarchical
- web
- composite/hybrid.

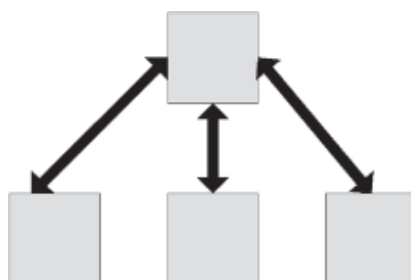
#### Linear structure

Linear structure usually consists of a number of different slides or modules, which all follow each other. A linear structure is common in business presentations where you need information expressed in a 'regular flow' or progressive order. The user will be required to understand one piece of information before the next is presented.



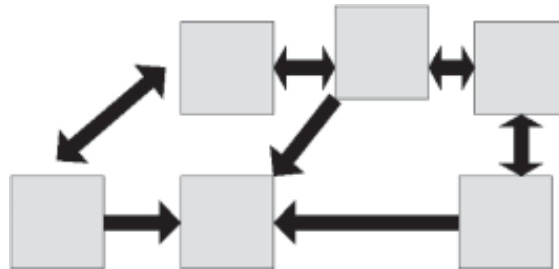
#### Hierarchical structure

This structure groups each part into topics, with sub-topics and headings. It is also based on content designed according to categories and sub-categories. This structure is far less limiting than the linear structure. The user can link to any main area within the structure from the home page. It is a useful structure for information-based websites, where the user can easily move directly to any topic of interest.



### Web structure

The web structure allows users to follow their own information flow in a heuristic pattern, which is unique to each user who will use the application. This structure is used widely on the WWW, but it can also be applied to other types of delivery.



### Composite/hybrid (mixed) structure

This structure can be part linear and part hierarchical, which is a useful concept when you have a lot of topics and sub-topics. Users may navigate in a free manner (non-linear), but are linked in a hierarchical or linear fashion for parts of the presentation / website. This structure has following features:

- It integrates various aspects of other structures.
- It has the least limiting structure.

### Complexity of navigation structures (lost in hyperspace)

When browsing it is easy to get confused with where you are relative to where you started. This is called being 'lost in hyperspace'. Designers must provide navigational aids to prevent users from getting lost, no matter how complex the application structure.

The following navigational aids can be used to prevent users getting lost.

#### ***Backtracking***

This is implemented by using a back button on menu or on toolbar, which will link to the last node visited. Without this facility it is possible to get permanently stuck in a node with no outgoing links. This is a useful tool for re-orientation, as you can go forward as well as backward. The software keeps a list of which screens the user has visited.

***Highlighting (nodes/links)***

This can be achieved by including a 'sense' of location by graphically indicating where the current page is. This is equivalent to a 'you are here' mark. Also, greying out or highlighting a current section can help users understand where they are. Hyperlinks are usually shown in blue and underlined; they change colour once they have been selected.

***History***

This is a complete list of all nodes or links that have been visited. Each previous screen is represented once in the history file. The user can return by simply clicking on the relevant highlighted link. The history file will only contain recently visited links and will not contain older links. The number of links stored can be set by the user as required. This is easier to understand than simple backtracking, and is used in many learning applications.

***Bookmarks***

This is a list of pages that have been selected by the user, as s/he may want to visit particular links again. Bookmarks can be personal or collaborative, and can be annotated and changed by the user. This is useful as the user can arrange all the links into personalised folders.

***Breadcrumbs***

This is essentially a 'trail' which has been left and can lead the user back to wherever they have originated. Some systems may provide a visual clue that a link has been previously visited. They can be placed as small text near the top of a website to indicate where you are in the site.

**Use of search facilities**

The Internet and other multimedia applications (e.g. encyclopaedias) contain huge amounts of information. In order to retrieve information it is necessary to use search facilities and specific criteria. These search criteria work according to the principles of Boolean logic (named after a mathematician called George Boole). Boolean logic is the conventional method for searching computerised systems.

The primary operators are:

- AND
- OR
- NOT

Words and phrases may be linked using AND, OR and NOT to achieve the desired aim of focussing your search as specifically as possible.

### **AND**

e.g. Computer AND Printer

Using 'and' will narrow a search by only returning pages which match *all* the words linked by AND. The more words connected by 'and', the fewer documents you will retrieve. So if you searched for 'weather forecast' AND 'pollen count' AND 'Portugal' your search will be much narrowed down. All three terms must be somewhere in every document that is retrieved.

### **OR**

e.g. Computer OR Printer

This operator requires at least one of the terms to appear in the document, in any order. So using 'or' will broaden the search, as a lot more documents will meet the criteria of the search. The more words entered and connected by 'or' the more search results will be returned. This operator can be used to join equivalent or similar terms together. So if you search for 'Spain' OR 'Brazil' OR 'Orchid', at least one of the above terms must be in any retrieved document.

### **NOT**

This operator can be used to eliminate certain terms in your search, and filter out unimportant sub-categories, e.g. Computer NOT Printer.

This will return results only for 'computer' and will omit any documents that contain 'printer'.

All the above can be joined together in a specific search, e.g.

'Spain' OR 'Portugal' AND 'holidays' NOT 'beach'

This will return documents about holidays in Spain or Portugal but not if they mention a beach.

#### **Task**

Look up the advanced search facilities on a web search engine. Try using various combinations of AND, OR and NOT and compare the results you get.

## User interfaces

The way in which a human and a computer exchange information and instructions is through the user interface. The job of the user interface is to make the program easy to use and understand.

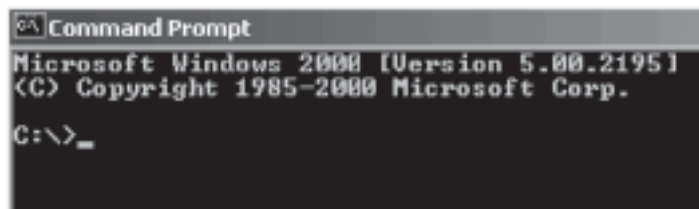


There are four different types of user interface to look at:

- CLI (command line interface)
- Menu-driven interface
- Form fill-in interface
- GUI (graphical user interface).

### CLI (command line interface)

This type of interface requires the user to enter commands by typing on the keyboard. These commands are processed by the computer. The user may enter a command such as 'mkdir'; the computer will then process the command and (in this case) make a new directory and display results. The set of commands a user uses to interact with the computer is called the 'command language'. MS DOS uses a command line environment, as do Linux, BBC Micro and some database applications.



### *Advantages of CLI*

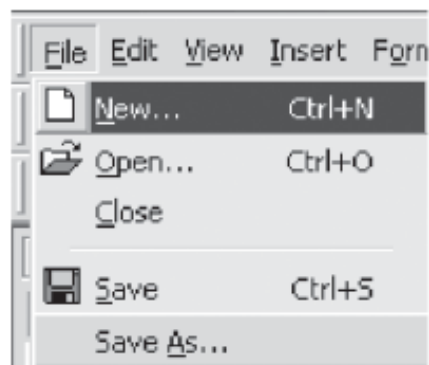
- Good for experienced user, can enter commands quickly
- Takes up small amount of memory
- Does not require fast processor
- Can group commands in a batch file (automates repetitive tasks).

***Disadvantages of CLI***

- Command language difficult to learn
- Error messages can be ambiguous
- Needs experienced user.

**Menu-driven interface**

This interface requires the user to interact with the computer by selecting various options from a menu. Programs may have many menus, designed carefully for maximum ease of use. They are popular on consumer goods such as mobile phones, cash machines, etc.



There are many different types:

- Scrolling Menus
- Pull-Down Menus
- Pop-Up Menus
- Hierarchical Menus
- User-Defined Menus.

***Advantages of menu-driven interface***

- Does not need to memorise lots of commands
- Commands are all listed
- Menus can be nested together
- Easy-to-use program for beginners/minimal training.

***Disadvantages***

- Certain operations/options cannot be 'visual'
- Options are limited
- Can be time consuming
- Tends to 'clutter' user interface (consumes screen space).

### Form fill-in user interface

The user will see a display of related fields and will enter data and information in the relevant areas (text boxes). This interface is very common on the Internet, particularly on shopping sites and educational sites. It can be used for personal details processing. There may be optional, default and required values (fields) within the form.

#### *Advantages of form fill-in interface*

- Simple data entry (easy to learn)
- No need to remember syntax or commands
- Requires minimum training
- Assistance is given (pop-up screens, error messages).

#### *Disadvantages*

- Consumes a lot of screen space
- Can be overwhelming (size of form)
- Needs efficient validation (for typing errors).

### GUI (graphical user interface)

Sometimes called direct manipulation, with a GUI the user can interact with the computer by using a mouse (pointing device), which enables manipulation of windows, icons and menus. This gives the user the feeling of physically manipulating objects on the screen. The most popular form is WIMP (windows, icon, menu, pointer). This has been one of the most important inventions in information technology, and is a development that has expanded the use of computers due to its 'user-friendly' manner.



#### *Advantages of GUI*

- Fast interaction
- No commands or memorisation required
- Allows easy retention and learning
- Will encourage user exploration
- Uses familiar designs.

#### *Disadvantages*

- Difficult to program (therefore costs more)
- Graphical representation not suitable for all tasks
- Takes up lots of memory
- Needs a fast processor
- Can be hard to implement (depending on application).

### The use of metaphors in interface design

Metaphors can be used in interface design to give a visual expression of a function. For word processing you can use the metaphor of a book, by designing the screen to look like a sheet of paper; and for navigating by clicking a page-turn icon at the foot of the page. Some other metaphors include:

- filing cabinets, files, folders
- desktop and waste basket
- books, arrows for navigation.

If you are designing a video-editing suite it would be sensible to include buttons that evoke a real environment. This could result in a virtual desktop that mimics a real editing suite complete with faders, etc. A well designed user interface will allow real-world experiences, such as push buttons that will 'push', sliding scales that will 'slide'. These real-world metaphors should be used to enhance your interface.

### User interface design

The study of this aspect of computing is called 'human computer interaction' (HCI). There are many key principles that have arisen from this study, some of which are listed below.

- consistency and standards
- aesthetic and minimalist design
- help and documentation
- differing ability levels
- providing feedback
- easy correction of errors
- avoiding information overload.

Five of these principles are considered in more detail below:

#### *Consistency*

Consistency is an important factor in applications. The user can transfer familiar skills if a consistent interface is used, and use skills learned from one application in another. Consistency can be built up using:

- similar components
- consistency of colour throughout.

All pull-down menus, press buttons and pop-up windows should follow a similar method of operation. Users should not have to worry whether

terms used with one application mean the same thing on another application: they should be able to assume consistency.

It is always useful to follow 'real world conventions', and make information appear in a natural and logical order. The most important consistency is consistency with user expectations. You may have to formulate some kind of 'user test' to establish that these expectations have been met.

### ***Differing user ability levels***

Once the purpose of the application has been defined, the ability levels of all users will need to be considered. Some important considerations:

- kind of environment
- levels of user experience
- disabled environment
- ergonomical considerations (similarities and differences between individuals).

### ***Providing useful feedback***

For every user action, there should be some kind of feedback. Here are some methods for giving users feedback:

- changes of colour when a button is clicked
- sounds
- visual feedback
- confirmation dialogue boxes.

### ***Easy correction of errors***

Good design should help users avoid making mistakes by giving clear instructions. However, users may choose the wrong option or enter incorrect data. The software should always make it possible easily to correct these errors.

### ***Avoiding information overload***

A good user interface should avoid presenting the user with too much information at once, or the user may become confused, or miss some important information. Some important objectives:

- avoid multiple windows
- simplicity is always the goal
- minimise 'clutter'.

**Questions**

1. What is a navigational structure?
2. Which is the least limiting structure?
3. List three methods that prevent users getting 'lost in hyper-space'.
4. Why is it necessary to use Boolean operands in search criteria?
5. What is a user interface?
6. What type of interface is MS-DOS?
7. What type of interface is MS Windows?
8. What is a metaphor? Give some examples.
9. Give two examples of user interface consistency.
10. Why is feedback important?
11. What is information overload?

**Task**

Sketch the design for a user interface for the example application on page 22 (Question 3: arithmetic application for children aged 7 to 12); you will need to examine all interface design principles in terms of:

- consistency
- ability levels, etc.

**SECTION 4****Critical evaluation of screen design**

You have already learned about the use of storyboards as a design tool for multimedia applications. A storyboard consists of sketches of each screen. It will show:

- each media element on the screen
- any buttons or menus with which the user can interact
- information about colours and font sizes
- any animations on the screen
- any transitions used
- all the links between screens.

You have also studied what makes for good interface design.

Using this background, you should now be able to evaluate existing examples.

**Task**

Choose **four** contrasting multimedia resources – for example, a ‘fun’ website, an ‘e-commerce’ website, a CD-ROM based encyclopaedia, and an educational program.

For each one, choose **two** screens – the initial title page, and another page from within the application.

For each of these **eight** screens, complete an evaluation form like the one on page 34. Use the blank right-hand column for your evaluation.

Application:	
Sketch/storyboard:	
Comments on layout of elements:	
Comment on user interface:	
Comment on use of transitions:	
Comment on navigation:	
Overall summary:	
Suggested improvements:	

## Storyboards outline/detailed

Storyboards can help the developer (and client) understand the big picture for the application project, and they give writers a 'road map' to refer back to as they design each draft.

### *Outline storyboard*

A storyboard can be as simple or as elaborate as it has to be. To begin with it is easier to have a few quick sketches of the desired design; and by using a pencil it is easy to modify and change details as the project evolves. Do not get sidetracked on too much detailed analysis at this stage as things will inevitably change! The outline storyboard will show the overall structure of the application, but no fine detail.

### *Detailed storyboard*

The detailed storyboard will contain *all* the elements that the finished prototype should cover, e.g.

- user interactivity (buttons, menus, dialogue boxes)
- audio
- text (with details of fonts, styles and size)
- video/animation/graphics
- links and navigation
- colours (backgrounds).

All these should be laid out on a design template, and the client should be aware of the design in case of any further changes. These can be merged into an electronic storyboard (MS PowerPoint, HTML, Macromedia Director), which will give an accurate impression of the finished product.

### *Additional text features*

The most flexible and widely used way of presenting information on screen is to use text. It is used in multimedia applications to communicate key concepts and is integrated into other media. Apart from the normal design features (font, alignment, colour, size), there are a few additional features of fonts that designers should be aware of.

### *Kerning*

To improve the visual appearance of grouped characters, sometimes it is necessary to reduce or increase the gap between adjacent letters. This is called 'kerning'.

- Larger type sizes require kerning (because gaps between letters are prominent)

- Can be automatic if font has kernel data embedded
- Goal of kerning is to improve overall spacing between letters, e.g.
  - Without kerning: WAV
  - With kerning: WAV

### ***Anti-aliasing***

Aliasing is a term used to explain and describe the undesirable effects exhibited when information and graphics are displayed at a lower resolution. Anti-aliasing will make all objects appear as if they are of higher resolution. This technique can 'smooth' the edges and trick the user into believing that the piece of information has straight edges and smooth curves. Display software can insert grey pixels around edges or lines, and this can soften out hard edges and lines to give the illusion of a smoother object.

### **Complications of using non-standard fonts**

Sometimes a designer may wish to use a font that is not widely installed on users' computers. The user may substitute an alternative font, spoiling the designer's intended look and feel. This can be avoided by use of embedded fonts or graphical text.

### ***Embedded fonts***

Font embedding allows fonts that were originally used in the creation of the document to be embedded in the file / document, guaranteeing the end user the complete original document (without alterations). Before font embedding was available, web designers had to rely on the compatibility of the browser that was being used, and the user's various applications. Great care must be taken when designing an application with non-standard fonts, since if you do not embed the fonts in your application, the user's software may have to replace it with its own default font, which could change the appearance of the application!

The disadvantage of embedding fonts is that larger files are created, and this can slow down page loading.

### ***Graphical text***

For small sections of text (e.g. titles or logos), it may be appropriate to use 'graphical text'. This allows the designer to transform dull text into eye-catching or colourful designs. These should be displayed on the user's screen exactly as the designer intends.

***Advantages***

- Can be aesthetic and eye-catching
- Looks good on menu/tool bars.

***Disadvantages***

- Accessibility problems (difficult to read, can be problem in browsers)
- Takes up valuable storage space
- Longer download times.

**Colour and graphics (implications)**

When creating graphics for a multimedia application, a designer needs to remember that the user's display technology may not display the graphic exactly as intended.

***Colour***

If colours are displayed on an eight-bit (256 bit) display, different web browsers (Netscape, Internet Explorer) will display and remap colours according to their own characteristic palette. This may be a problem because it can change the original colour scheme.

***Web palettes***

At present there are only 216 colours that appear identically on the majority of browsers and operating systems. This 'browser-safe web palette' limits the designer's choices to 216 different colours out of a possible 256. The remaining 40 colours vary on Apple Macs and PCs.

***Dithering***

Palettes are a requirement as many display devices are limited to 256 colours. In order to manage this you need software that will map the image of more than 256 colours to a palette of 256 colours. If a particular system has a lower colour depth than the graphic then the browser will compensate by mixing pixels of two different colours from its default palette in order to give an 'impression' of the desired colour. The process for doing this is called 'dithering'.

An example might be if you required orange on a graphic, and this was not available on your system palette; the browser could then give a mix of red and yellow pixels to compensate.

***Gamma correction***

To display an image correctly on a computer screen requires overall control of the brightness of the image, since some images or graphics can look 'bleached out' or 'too dark'. For this problem to be eradicated the input signal (voltage) to the monitor (vdu) must be 'gamma

corrected'. This dilemma is caused by cathode ray tubes (CRT) that do not generate light intensity that is proportional to the input voltage. The actual intensity created by the CRT is proportional to the input voltage raised to the power of 'gamma'.

$$\gamma = \text{Gamma} = 2.5$$

Input voltage = Range between 0 and 1 (for example = 0.6)

$$\text{Intensity created} = 0.6^\gamma = 0.6^{2.5} = 0.278$$

The value of gamma is usually approximately 2.5. For an application to be 'fit for purpose', it must be operational on all platforms and operating systems. The Apple Mac has embedded gamma correction, the PC does not. This is resolved by installing a graphics card that has gamma correction built-in.

### Progressive scan (displays)

#### *Interlacing*

Graphic files can take a while to download on a web page. With a slow connection, you can see graphics gradually appearing. A better alternative is to use 'progressive display'. In this method, every second line of pixels is downloaded first, so the user quickly sees a rough version of the whole picture; then the other lines are downloaded, completing the picture. In reality, there may be several passes rather than just two, so a very rough version appears very quickly, gradually improving with each pass. This is known as 'progressive display' for jpeg images, or 'interlacing' for GIF and PNG images.

### Downloading audio

Two methods for utilising audio will now be looked at, downloading and streaming.

The downloading method is quite slow as you must wait for the entire file to be downloaded. Once it has been saved to your hard drive, you can open it in a suitable player.



#### *Advantages*

- Complete file is saved on hard drive
- Can play file as often as required
- Can fast forward and rewind.

***Disadvantages***

- Takes a long time to download
- Cannot listen until fully downloaded.

**Streaming audio**

The audio is played as it arrives over the Internet in real time. The file is not preserved on the computer so a network connection must be sustained. This allows radio stations to transmit audio live, and news channels to stream interviews live. It is useful for research and e-commerce as you can listen to audio before you buy online. This is becoming more popular as the cost of bandwidth is falling, so it is more economic to stream albums at high quality.

***Advantages***

- Listen to the file immediately
- Play as it downloads
- Free plug-ins available.

***Disadvantages***

- Requires fast network connection
- Some ISPs will disconnect after prescribed amount of time
- Cannot fast forward or rewind
- Some firewalls will disallow connection
- High compression can reduce quality of file.

**Implications of using video**

When video is embedded into a multimedia application, a designer must ensure the user can control the video playback. VCR-type controls must be provided (forward, fast forward, rewind, stop, pause, alter volume, alter size).



Video to be incorporated into a multimedia application can be:

- created by the designer
- commissioned from a scriptwriter
- copied from CD-ROM
- downloaded from the Internet.

Just as audio can be downloaded or streamed, so too can video.

### Downloading video

After downloading a video from a website, you can save it on to hard disk and play back when convenient. Many websites make downloading easy, as you just click on the relevant icon.

#### *Advantages*

- Complete file saved on hard drive
- Can play file as often as required
- Can edit the file if required
- Can fast forward and rewind.

#### *Disadvantages*

- Takes a long time to download
- Cannot listen until fully downloaded
- May need software plug-in.

### Streaming video

This method requires connecting to a streaming server. A special player is required to view and play these video files. Streaming video can be played and downloaded at the same time (similar to streaming audio).

When a user selects a streaming clip, the streaming player contacts the server and establishes bandwidth and delay information. A small amount of the clip is then downloaded into buffer storage, the clip is played and more content is downloaded. If the network is clogged the clip will use up content in the buffer.

#### *Advantages*

- Play and listen to file immediately
- Play as it downloads
- Less time required to view file
- More use of bandwidth.

#### *Disadvantages*

- Firewalls can prevent streaming
- High compression can reduce quality of file
- Requires good network connection.

### Health issues (video playback)

There are health issues to be considered, as flashing sequences in a video or presentation can cause epilepsy (known as photosensitive epilepsy). This type of epilepsy is triggered by flashing or flickering at a certain frequency. The safe frequency for flashing sequences is on or below five hertz.



Warnings should be given on applications to alert any person to the danger of flashing sequences. You should:

- construct a risk assessment of the application
- make sure display has control to adjust brightness, etc.
- minimise reflections.

**Questions**

1. What is a storyboard?
2. Using the example 'arithmetic application' on page 22 (Question 3), design outline storyboards for the first six screens.
3. What is the difference between an outline and a detailed storyboard?
4. What can be done to improve the visual appearance of text characters?
5. What is an embedded font?
6. What is a web palette?
7. What is the term used when a browser compensates by merging colours?
8. What is the usual value for gamma?
9. What platform has embedded gamma correction?
10. What is the benefit of interlaced (progressive display) graphics?
11. Give two benefits of each: downloading audio or streaming audio.
12. What happens when you select a streaming video clip?
13. Is high bandwidth necessary?
14. What is the recommended safe frequency for flashing sequences?

**Task**

Using the Internet:

- download three audio files
- access some streaming audio
- repeat above for video.

## Software for creating and delivering multimedia applications

### 1. Presentation software

Presentation software can be used to edit and create linear multimedia presentations. It is possible to combine text and graphics, and incorporate audio and video files. Transitions between slides, and animations within slides, can be used. Hyperlinks can be incorporated, but the product is essentially linear.

A wide range of packages are available including:

- Microsoft PowerPoint
- Slim Show
- Hyperstudio.

#### **Task**

Explore the features and functions of any presentation software package. Make a list of advanced features available.

### 2. Authoring software (icon-based)

Authoring software combines text, graphics, audio, images and video by using either an icon-based or script-based system. Authoring packages create a user interface where the user can control a cast of multimedia objects and define how they will react.

In an icon-based authoring package, the developer can build a flow chart of different events by dragging icons from a pre-defined 'icon palette' as the structure is built; text, graphics, animation, audio and video can be added. Icons can represent audio, video, etc., as well as conditional statements such as decisions and selections. Certain icons will have properties that describe flow control and user interaction.

Example of icon-based software:

- Authorware (professional)
- Hyperstudio (simple).

***Advantages***

- Easy-to-follow structure
- Easy to edit and update information.

***Disadvantages***

- Can be difficult to learn.

**Task**

Explore the features and functions of any icon-based authoring package. Make a list of basic and advanced features.

**3. Authoring software (scripting-based)**

Macromedia Director is the recognised software. More advanced authoring software provides a scripting facility. This uses a time-based tool and a score as the primary authoring metaphor, and elements are presented in horizontal tracks with vertical columns (timelines). By scripting the behaviour of each of the cast members you can build a powerful presentation.

Director has a self-contained scripting language 'Lingo'. This code can allow authoring through English words and phrases. The developers can use pre-written scripts, or write new ones, and can simply drag and drop these elements onto the timeline. This allows the developer to add more powerful commands. Director is suitable for presentations with a lot of animation, and large media- or video-driven applications.

Authoring software such as Macromedia Director is a huge package. It can take a while to master and previous knowledge of programming can be an advantage. The package is also very expensive.

**4. Web-page applications**

Dynamic and modern presentations can also be built using a web-page editor. These can be viewed over the internet thereby increasing the audience. Web-page editors range from basic HTML editors that allow you to create pages individually, to website managers that will design and handle all aspects of web management. Here are some examples:

- Microsoft Front Page (basic)
- Macromedia Dreamweaver (professional)
- CoffeeCup HTML Editor (basic).

**Task**

Explore the features and functions of a web page editor. Make a list of functions available.

Once a multimedia application has been created – using a presentation package, authoring package or web-page editor – it can either be turned into a stand-alone application that requires no specialised software to view it, or saved in a format that requires a software player.

The first option is more difficult for the multimedia developer, and raises compatibility issues. For example, a stand-alone application designed to run on a Windows-based PC may not run on a MacOS machine. On the other hand, once created, no other software is required, so it can be sold as a ‘complete’ package.

The alternative depends on the user having a ‘player’ installed on their system. For example, a developer might create an animation using Macromedia Flash. To view the animation, the user requires the Flash player to be installed. Fortunately most players (or plug-ins) can be freely downloaded from the Internet.

Of course, if a user buys the full application (e.g. Flash), he/she will be able to edit the file as well as play it.

**Skills required by personnel*****Project manager***

The project manager is accountable for ensuring that the development meets the client’s requirements, is created to a high standard, all within the agreed budget and stipulated deadline. The project manager is involved in the scope and design of the application and works closely with the client. S/he also assembles all the team members and make sure they are the ‘correct’ people for the post. The manager will require high managerial and communication skills and will be able to ensure good teamwork throughout the process.



***Multimedia designer***

The multimedia designer will specialise in the overall design and in the combination of different media, and will be responsible for: content, structure, navigation, screen layout, interactivity.



S/he will work closely with all technical staff, and will implement designs by utilising relevant members of the team.

***Subject expert***

This individual would have an in-depth knowledge of the particular subject, and will provide content for the application.

The subject expert will play an important role in testing.

***Media specialists***

These can be video engineers, audio engineers, specific animators, or graphic designers. Each is an expert at creating media elements within their own area of expertise.

***Multimedia programmer***

The multimedia programmer is responsible for creating the overall application to the design provided by the multimedia designers, and incorporating media elements provided by the media specialists. S/he will be an expert in the chosen software or authoring tool.

***Webmaster***

This individual should administer the website. If the application is designed for web use, s/he would be in charge of: web server hardware, web server software, website design and update, monitoring any feedback and traffic.

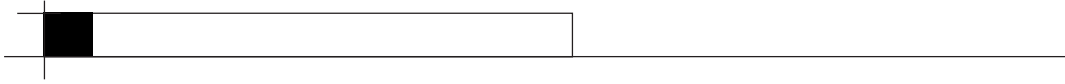
**Questions**

1. What kinds of software can you use to edit and create a multimedia application?
2. What two methods can be used to view a multimedia application?
3. What is authoring?
4. What scripting language does Macromedia Director use?
5. What is HTML?
6. List the personnel in a multimedia development team.
7. What is the project manager responsible for?
8. Why do you need a subject expert?
9. What tasks will the programmer perform?
10. Who should administer the website?

**Task**

Using a suitable presentation package, develop a presentation explaining the roles of the various members of a multimedia development team.

Create a title page, and a main menu page listing the team members, with hyperlinks to a page for each team member. Use some advanced features. (Start by drawing a storyboard!)



## SECTION 6

You need to know some facts about graphic, audio and video files, so that you can make best use of them.

### Graphic file types

Three different graphic file types (TIFF, jpeg, GIF) will be discussed in terms of:

1. Colour depth = Number of different colours for each pixel
2. Resolution = Number of pixels per unit area
3. File size = Numbers of bytes to store graphic
4. Degree of compression: Can determine image quality (lossy and non-lossy)
5. Appropriate uses

#### *TIFF (Tagged Image File Format)*

This format was developed for the purpose of scanned images, and is one of the most widely supported file formats. It is recognised across many hardware and software applications, and uses lossless compression.

- Colour depth: Can be any colour depth
- Resolution: Can be any resolution
- File size: Larger than jpeg or GIF
- Degree of compression: Can employ various lossless compression methods
- Appropriate use: Scanned images, desktop publishing.

#### *jpeg (Joint Photographic Experts Group)*

Mainly used on the web, principally to reduce size of image and lessen download time, compression is built into the jpeg format. It is not suitable for images with sharp borders and uses lossy compression (loss of some of original data), and supports full colour.

- Colour depth: High
- Resolution: Various

- File size: Small, can reduce file size to 5%
- Degree of compression: Lossy
- Appropriate use: Photographic images for web display, low resolution print.

### ***GIF (Graphics Interchange Format)***

Mainly used on web for images with sharp content such as logos and screenshots. It utilises non-lossy compression which is built into the format.

- Colour depth: Small (8 bit)
- Resolution: Output to any
- File size: Small
- Degree of compression: Lossless
- Interlacing possible
- Animation possible
- Appropriate use: Best for graphics with large area of uniform colour, clip-art.

### **Audio file types**

#### ***MP3 (Motion Picture Experts Group, Layer 3)***

This is a digital audio compression format, and it can reduce an original sound file to ten to fifteen times smaller than the parent file, by eliminating waveforms that the human ear cannot process. The small file that is produced is easy and quick to download and is perfect for web use. It is used extensively on music websites. You will need an MP3 player to listen to the files.

- File size: Small
- Degree of compression: Compression can be 6:1
- Appropriate use: Music download from web.

#### ***MIDI (Musical Instrument Digital Interface)***

This is essentially a communication standard between electronic musical instruments and computers. It does not store sampled sound, it stores binary signals (instructions). MIDI files download fast and take up little space in memory. They are much smaller than digital audio files as they store instructions on how to recreate sounds. The sound card takes these instructions and plays the notes from a bank of pre-recorded sounds. The advantage of a MIDI sequencer is that it allows the user to record and edit a musical performance without using an audio-based input source.

- File size: Small
- Degree of compression: None
- Appropriate use: Can be embedded in web pages, easy to manipulate/download.

### **Video file size and quality**

Video file size and quality of playback are affected by:

- frame rate
- window size
- compression.

#### ***Frame rate***

One frame is one complete picture within the reel of a film. Moving pictures need many frames to be shown in one second in order to produce the effect of motion. The unit of measurement used is the 'frame rate', which is in frames per second. Film has twenty-four frames per second but must be adjusted to match the display rate of the video system. The higher the frame rate, the smoother the film will appear to be, but this will also require higher bandwidth for playback and increased storage (file size). For multimedia and web production the typical frame rate is 15–30 frames per second, with a key frame included so that the audio and video can be synchronised every 15 frames to prevent overlap problems. Some formats are shown below:

- NTSC: 30 frames per second (USA)
- PAL: 25 frames per second (Europe)
- Quick Time for Windows: 15 frames per second (.mov)
- Video for Windows: 15 frames per second (.avi)
- MPEG: 30 frames per second (international standard).

#### ***Window size***

Digital video has to store lots of information about each frame. The smaller the window size, the less time is needed to draw all the pixels. However, if the window size is large, there may not be sufficient time to display a complete image in a single frame before the next frame appears. So you will need to choose an appropriate window size that results in a smooth display. By reducing the window size you will also reduce the amount of data and therefore reduce the file size.

So choose an appropriate window size for efficient display.

### ***Compression***

For video to be delivered over the web it is imperative that the file be compressed. Compression will reduce the video and audio file size to a more realistic delivery size. Large bandwidth and connection speeds also play a significant role.

As well as reducing window size to compress the file, encoding is used, involving a codec (compressor/decompressor). Codecs work by removing data from the file and replacing this data when it is decompressed at the user's end.

During compression you will select a quality setting, generally on a scale value of 1–5. A lower setting will give greater compression and small file size but weaker overall quality. Tables of file sizes and quality for various codecs can be obtained from digital video websites and magazines.

### **MPEG (Moving Picture Expert Group) video**

MPEG was developed as an international standard for use in CD-ROMs and video games. The files are large (30 frames per second), and they output high-quality playback. MPEG requires special hardware to digitise video and specific hardware to playback video. A major disadvantage is that it is not compatible with the Apple Mac platform whereas Quick Time is, and different computer manufacturers (Compaq, IBM) have different playback hardware.

### **Structure of a URL (Uniform Resource Locator)**

A multimedia application may include hyperlinks to websites. These are identified by a URL – or uniform resource locator. A URL uniquely specifies the address of a file on the web. The actual URL is a set of four numbers (209.222.546.888), but these are difficult to use and remember, so each address is represented in alphanumeric form.

#### *URL format:*

Protocol://host name/path/filename

#### *For example:*

<http://www.ltscotland.org.uk/edresources/edu.doc>

So the structure of the URL is:

- *Protocol* = Hypertext Transfer Protocol = http
- *Host name* = www.ltscotland.org.uk
  - Host computer* = World Wide Web = www
  - Domain name* = ltscotland
  - Domain type* = organisation in united kingdom = .org.uk
- *Path name* = edresources
- *File* = edu.doc

### **Protocols**

Web pages are constructed in HTML (Hypertext Mark-up Language). They are served from an http server. Other protocols used on the web include ftp: file transfer protocol, used for downloading files.

### **Host name**

The host name includes the host computer, domain name and domain type. There are many domain types.

- .com: indicates a commercial entity
- .org: indicates an organisation (often a charity or non-profit organisation)
- .ac: indicates an academic institution (college, university)
- .ac.nl: indicates an academic institution in Holland
- .org.fr: indicates an organisation in France.

### **Path name**

This specifies the location of the file on the computer system.

### **Absolute URL**

A URL that has a fully qualified domain name is an 'absolute URL', which would include the host name, and the full path name of the file. The example we looked at previously is an absolute URL:

<http://www.ltscotland.org.uk/edresources/edu.doc>

This URL has specified the *http* service on the system *www*, which is located at the *ltscotland.org.uk* domain, and is asking for file *edu.doc* which is in the *edresources* directory.

***Relative URL***

A relative URL is the location of a file relative to the location of the file being currently used. The directions refer to where you are starting from, so the relative URL does not need to specify the protocol or machine name:

`/edresources/edu.doc`

This points to the folder *edresources*; in this folder is the file *edu.doc*; the relative URL for this example only needs the folder name and the file name. The browser assumes the current server is the requested computer system, and this can be embedded in the web page:

`<A HREF= "edresources/edu.doc">`

**Questions**

1. Name three graphic file types.
2. Why is compression necessary?
3. Which graphic file types are mainly used on web?
4. What is an MP3 file?
5. What is the advantage of a MIDI sequencer?
6. What is video frame rate?
7. What is the frame rate for NTSC?
8. How can window size affect overall quality of a video?
9. What is a codec?
10. Explain the parts of this URL: <http://www.sqa.org.uk/resources/computer/higher/pdf>.
11. What is a relative URL?

**Task**

Write a short report (300 words) detailing the importance and relevance of compression relating to video, audio and graphics.

**Project**

Now it is time to put what you have been learning into practice. You are going to design and implement a working multimedia application.

1. Choose topic that you are interested in.
2. Write a project brief, describing what your application will do.
3. Use storyboarding to design your application. It should be non-linear in structure, and involve several screens with navigation links. It doesn't need to be complicated.

Remember to apply good design principles.

4. Decide what software you are going to use to create the application.
5. Create or collect the various media elements you will include: text, graphics, and at least one sound and/or video clip.
6. Assemble these elements with a complete application.

## Testing

Testing a multimedia application involves examining each function to check that it meets a specified performance or quality level. Testing is also used to ensure that all components and functions work individually and as an ensemble according to the original design.



Four different types of testing will be looked at:

- screen testing
- integration testing
- acceptance testing
- usability testing.

### Screen testing

Each separate screen must be tested in the application, to ensure it matches the design and functions correctly. It is a good idea to make up a checklist as you observe each component. Some standard screen tests are listed:

- Does the layout match the design?
- Do all the buttons and navigational functions work?
- Do all the texts, fonts, colours and sizes match the original design specification?
- Do all the scroll functions, video and audio clips run without any problems?
- Do the non-functioning controls grey out when not needed?
- Is there a visible continuity between screens?
- If there are any applets (small java program, embedded in HTML), do they operate correctly?
- Has the text been spell-checked?

### Integration testing

After testing every screen independently, the purpose of integration testing is to ensure that they all work together.

### Acceptance testing

This will be performed by the client, who will test the finished application to ensure that it does what the original contract specifies. Satisfying the acceptance test regime will result in the client 'signing off' the project, or formally agreeing that the contract has been successfully completed.

### Usability testing

This evaluates the application's 'usability'. A selected group of users will work on typical tasks that are relevant to the application. They will evaluate how easily the application allows users to recover from mistakes, and whether the interface is 'user friendly' or aesthetically pleasing. A checklist can be given to each participant and the results evaluated. In the testing of the application's usability, attention must be given to the needs of users with a disability.

#### Questions

1. Why is testing so important?
2. List some criteria for screen testing.
3. What is the purpose of integration testing?
4. Which type of testing evaluates the application's 'ease of use'?

#### Task

Carry out screen, integration and usability testing on the application you created for your project.

## **Project development documentation**

During the development process, various types of documentation should be produced. This falls into two main groups: project development documentation (for use by the present and future developers), and user documentation (for use by users of the application).

Project development documentation includes the requirements specification, navigation maps, storyboards and a record of testing.

### ***Requirements specification***

This is the formal document agreed between the client and the developer. This specification can be used as a checklist to ensure all criteria have been met. The requirements specification was described in detail in Section 2 (page 20).

### ***Navigational maps***

A navigational map shows the links between screens and should define the structure and flow of the presentation or application. As mentioned earlier the structure could be:

- linear
- hierarchical
- web style
- composite/hybrid.

### ***Storyboards***

Storyboards are created during the design stage, and show:

- what the GUI will look like
- any animation included, with duration
- video stills, with duration
- text design
- a layout of all screens.

### ***Record of testing***

A test strategy document should be created at the design stage:

A careful record should be made of all tests carried out, detailing expected and actual results. If there are any discrepancies these should also be explained.

User Documentation will include hardware and software system requirements, and use instructions/guide.

### ***Hardware and software system requirements***

The hardware and software system requirements describe to the user the minimum requirements to run the application, and may include:



- Clock speed of CPU
- PC or Apple Mac
- Memory capacity
- Hard disk capacity
- CD-ROM or DVD drive
- Sound-card configuration
- Video-card configuration
- Monitor resolution
- Operating system type.

### ***User guide/instructions***

Instructions for running the application will have to be included in the finished documentation. This should include a detailed set of instructions for running the software, and highlighting frequently asked questions (FAQs). For example:

- Switch system on
- Insert CD-ROM / Disk / Navigate to website
- Click on start button
- Navigate to tutorial section.

### **Questions**

1. What are the project aims?
2. Design a suitable test strategy document, using tables or a spreadsheet.
3. Design a suitable test specification document, using tables or a spreadsheet.
4. Using your own system, list all the hardware specifications.
5. Develop a simple user guide, for example for the arithmetic program. (See page 32.)

## Evaluation of multimedia application

Every multimedia application should be evaluated in terms of fitness for purpose, accessibility and clarity of presentation.

### *Fitness for purpose*

- Does the application do what it is intended to do?
- Has the designer designed the best solution for the problem?
- Does the application work in an efficient manner?
- Is the application robust?
- Is the application easily maintained?
- Has a technical and user guide been provided?

### *Accessibility*

Some users may have disabilities, and applications should be designed to reflect the best agreed practice in this area. These include:

- *Text*: Use of clear/resizable fonts
- *Audio*: Include captions, avoid conveying information with sound only
- *Audio*: Include volume controls
- *Images*: Offer best possible resolution
- *Images*: Provide a zoom feature
- Provide full descriptions for graphs and diagrams
- Avoid flickering on screen
- Choose good colour combinations.

### *Clarity of presentation*

- Navigational elements should be always visible
- Screen should be arranged in a symmetrical manner
- Each transition should flow coherently
- Colours should be appropriate to the topic.

Evaluation is an iterative process, and may lead to improvements and development of the application in future versions.

#### **Task**

Using the Internet (or books), find out the latest requirements for accessibility relating to multimedia applications. Summarise this information.

## Copyright

Any multimedia application must comply with copyright legislation.



Rigorous attention should be paid to copyright and intellectual property issues. You should be aware of the laws relating to the use of copyright material in any commercial product.

At the time of writing, the Copyright, Design and Patents Act is the most relevant UK legislation. Wherever possible public domain material (or material where the copyright holder has granted a waiver) should be used. Failing this, copyright holders should be contacted and permission sought to use their material.

### The essence of copyright

Copyright is intended to provide access to works whilst protecting the rights of their original authors.

### Types of work

Much of the copyright law was developed to cover works that are essentially linear. There is now an increasing body of work that is dynamic and non-linear, such as multimedia applications. This non-linear work raises questions as to how it should be copyrighted and how licences to reproduce media within a non-linear work should be framed. Additionally, many works are now produced directly in electronic form, which poses many difficulties for copyright regulation.

### Duplication of works

In the past the duplication of a work involved as much economic cost as creating the original work. With the increased availability of printing technology, the development of the photocopier and the use of electronic media, the relative cost of duplication has fallen dramatically. In addition to this, the time taken to produce a copy is much reduced, while the technical expertise and the quality of copies has improved. Equipment which can be used for duplication is widely available and has a legitimate use.

### Transmission of works

In tandem with the increasing ease of duplication has come increasing ease of transmission. With electronic media in particular, transmission of

works is both fast and cheap. It is also becoming increasingly easy to convert works to electronic form.

### **Manipulation of works**

Works in electronic form can be adapted and distorted in ways which make it difficult to detect an infringement of copyright.

### **Monitoring of infringements**

As well as being fast and cheap, electronic transmission is largely free of monitoring. The sheer volume of electronic traffic and the way in which it is transmitted makes it impractical to inspect what is being sent. In many cases transmission will be between countries, raising issues of international copyright agreement and enforcement.

### **Availability of works**

In modern society people not only have greater access to the means of copying, they also have greater access to works protected by copyright. Whilst this will typically not be to the original, it will usually be to a copy of sufficient quality for duplication. They are also more likely to come across illegal copies, and this tends to erode the validity of copyright in the eyes of the public.

### **Types of work covered**

There are several general categories of work covered by copyright, all of which are subject to broad interpretation.

#### *Literary works*

Including novels, non-fiction prose, newspaper articles, software, manuals, catalogues, directories and compilations such as databases.

#### *Musical works*

Including songs, jingles and lyrics.

#### *Dramatic works*

Including plays, operas and accompanying music.

#### *Pantomimes and choreographic works*

Including ballets, dances and mimes.

*Pictorial, graphic and sculptural works*

Including posters, photographs, paintings, drawings, maps and plans.

*Motion pictures and other audio-visual works*

Including movies, documentaries and TV programmes.

*Sound recordings*

Including music, sounds and words.

*Architectural works*

**Where does multimedia fit?**

Technically it doesn't matter, as a work does not need to fit explicitly into a particular category, but multimedia is generally considered to be audio-visual work, though this is somewhat contrived and may suggest a need to revise categories in the light of technological developments.

**Types of work not covered**

A number of works are not covered by copyright, including

- Works that are not fixed in a tangible form, for example choreographic works that have not been recorded, or improvised speeches or performances that have not been written or recorded.
- Titles, names, short phrases and slogans, familiar symbols or designs, mere variations of typographic ornamentation, lettering or colouring, mere listings of ingredients or contents (but Trademark law may apply).
- Ideas, procedures and methods, systems, processes, concepts, principles, discoveries or devices as distinguished from a description, explanation or illustration (but Patent and Trade Secret laws may apply).
- Work consisting entirely of information that is common property and containing no original authorship, e.g. standard calendars, height and weight charts, tape measures and rulers and lists, or tables taken from public documents or common sources.

Copyright protects only an author's original expression in a work, not ideas or factual information or previously available material that is incorporated into the work.

### Asserting copyright

Copyright is secured automatically upon creation (in a legal sense) of an original work; no registration, publication or other process is necessary. A work is only required to be original in that it is not a copy of another work. It does not need to be novel or unique and requires only an exceedingly low element of creativity. For instance, any number of people taking similar photographs of Edinburgh Castle or the Wallace Monument could claim copyright of their own photograph despite the fact that the level of originality and creativity may be minimal.

Creation occurs when a work is first fixed in a tangible medium that is sufficiently permanent or stable to permit it to be perceived, reproduced or otherwise communicated for a period of more than transitory duration. As soon as a work is fixed it is copyright protected. For example, if a jazz band performs an improvised piece of music it is not copyrighted as it is not fixed. However, if someone makes a recording of the piece, even without the band's permission, then it is fixed and the musicians own the copyright.

As the author of a work generally owns the copyright in the work, it is important to identify who the author is. For a book it is easy, even with joint authors who then assert a joint copyright. The author of a sound recording or film is the person who brings about the arrangements necessary for the making of the recording or film to be undertaken. In the case of a broadcast, the author is the person making that broadcast and the author of a cable programme is the person providing the cable programme service. In the case of a typographical arrangement of a published edition, authorship may be asserted by the publisher. In the case of a literary, dramatic, musical or artistic work which is computer generated, the author is the person who undertakes the arrangements necessary for the creation of the work. The authorship of computer-generated works is somewhat ambiguous.

If the author creates the work under contract, or in some cases under more general terms of employment, the employer owns the copyright. When a self-employed contractor creates a work for a company the copyright resides with the contractor unless it is explicitly transferred to the company.

Publication is the distribution of copies or phonorecords or work to the public by sale, other transfer of ownership, or by rental, lease or lending. The offering to distribute copies or phonorecords to a group of persons for further distribution, public performance or public display also constitutes publication.

A public performance of a work does not of itself constitute publication. Publication is no longer necessary as an assertion of copyright, but it can still be useful for proving and defending copyright.

The copyright notice has not been formally needed since 1 March 1989, at least in the UK and certain other countries; however its use is still recommended. The correct form consists of three elements:

1. The copyright symbol, 'c' in a circle, or ©. Sometimes c in brackets, (c) is used – but this has no legal force. The word 'Copyright' or the abbreviation 'Copr' may be used in place of the symbol. The copyright symbol for a phonorecord is a 'p' in a circle.
2. The year of first publication of the work (may be omitted on certain cases, e.g. pictorial work on greetings cards and postcards).
3. The name of the copyright holder, or a recognisable abbreviation, or other generally known alternative designation of the owner.

The notification of copyright removes the right of an infringer to claim innocent infringement; this may affect damages awarded by a court.

There are other ways of securing proof of copyright ownership:

- Send yourself the work by registered post, asking the Post Office to stamp across the seal and add your signature. This should then be kept unopened until proof is necessary.
- Use an independent copyright registry; these tend to charge.
- Have a responsible person sign and date a copy of the work. The person must be prepared to testify in court.
- In some countries there are official copyright registration offices.

### **Duration of copyright**

The duration of a copyright is complicated by a variety of factors, including the copyright law that existed at the time a work was created, copyright extensions available under previous copyright laws, the type of work, and so on.

Generally copyright lasts for the term of author's life, plus 50 or 75 years after their death. For certain types of work, the duration of a copyright is for a period of time from the date a work is published or broadcast.

### **Restricted acts**

The copyright owner may exercise the following exclusive rights and may authorise another person(s) to exercise any of these rights and prevent third parties from exercising them:

- To modify a work to create a new work, i.e. to create a derivative work.
- To recite, play, dance or show work at a public place or to transmit it to the public.
- To show copy of the work directly or by means of film, slide or TV image or to transmit it to the public.
- Some works of visual art also have ‘moral rights’ designed to protect an author’s reputation or honour.

### ***Attribution***

This is the right of an author to claim authorship of work and to prevent their name being used as the author of work created by someone else.

### ***Integrity***

This covers the right of an author to prevent their name being attributed to a distorted version of their work, and to prevent distortion of the work; it also allows for destruction of the distorted version of the work.

These moral rights are not part of copyright law. They last as long as a copyright, except for false attribution which lasts for 20 years after an author’s death. These rights are designed to protect the creator of work even when they no longer hold the copyright to the work.

Licences to exercise any or all of these rights can be agreed under a wide variety of terms and conditions. The transfer of ownership of a copyright is also possible. Copyright and moral rights can be passed by will or intestacy on an author or copyright owner’s death.

Ownership of a copy does not entitle you to any ownership of copyright: for instance, if you purchase a copy of a film on video you do not have the right to rent that video to other people.

## Public domain

Works that are in the public domain have no copyright protection. Such works can be used by anyone, for any purpose, without cost and without the need to obtain any licence. Works enter the public domain by a variety of routes:

### *Copyright expires*

Copyright in a work is for a fixed period. Once this period expires the work is in the public domain.

### *Copyright relinquished*

The copyright owner can place a work in the public domain by issuing an unambiguous statement along the lines of 'I grant this work to the public domain'. Relinquishment has to be total, since statements such as 'This work is in the public domain for non-commercial purposes only' are legally ambiguous as the copyright owner wishes to retain copyright control in commercial contexts.

### *Copyright inapplicable*

Some works, such as US Government publications, cannot be copyrighted and are automatically in the public domain.

Once a work has been placed in the public domain the copyright cannot be regained.

A common misconception is that certain types of electronic publication, such as e-mail or postings to bulletin boards and newsgroups are automatically in the public domain – this is not true, and the author retains copyright on their work. Public domain works tend to be the exception rather than the rule. So if you are unsure, it is wisest to assume that a work is copyrighted.

### *Fair dealing*

Copyright is intended to promote science and the useful arts, in addition to protecting the rights of copyright holders. So it also allows for the copyrighted work to be used in certain circumstances by other people, providing that use is judged to be fair.

The definition of 'fair dealing' is complicated and vague, and is determined by the courts on a case-by-case basis. This consideration takes into account four main factors:

*The purpose and character of the copy*

Courts will generally favour non-commercial and beneficial copying over commercially motivated copying for profit.

*Nature of the copyrighted work*

Courts will generally favour the copying of a factual work rather than a creative one as copyright does not apply to facts. They will also generally favour the copying of a published work over the copying of an unpublished one; and the first publication of a work is seen as more important to the author than subsequent publishing.

*Amount and substantiality of the portion copied*

Courts will generally favour the copying of small portions of a work, or portions which do not contain 'significant content'.

*The effect on potential market or value of the copyrighted work*

Courts will generally favour copies that are not produced as direct competitors with the original work; these should not affect potential future markets for the original work. For example, posting a digitised picture taken from a magazine to the Internet will affect the *potential* market for online editions of the magazine even if the magazine has no plans to release such editions.

Examples of fair dealing may include:

- quotation of excerpts for review, criticism, illustration or comment
- quotation of short passages in a scholarly or technical work for illustration or clarification of the author's observations
- use in a parody of some of the work
- summary of an address or article with brief quotations in a news report
- reproduction by a library of a portion of a work to replace part of a damaged copy
- reproduction by a teacher or student of small parts of a work to illustrate a lesson
- reproduction of a work in legislative or judicial proceedings or reports
- incidental or fortuitous reproduction in a newsreel or broadcast about a work located at an event being reported.

What constitutes fair dealing is also viewed dynamically, evolving with different technologies and different social perspectives. For instance, recording a television broadcast on a VCR for viewing at a later date may be legal, but watching the copy multiple times may not be.

## Infringements

Anyone who exercises any of the rights of the copyright holder without the permission of the copyright holder is violating copyright. No regard is paid to any intent to break copyright; 'innocent' infringement is still infringement. The consequences of infringement may include:

- the payment of damages
- the seizure of the pirate product containing the copyright work
- the seizure of equipment used in the infringement.

Acknowledging the author of a work does not protect you from infringing their copyright. It is still an infringement even if you don't charge for a copy.

If a copyright has been previously infringed without prosecution, the author continues to retain his/her copyright.

Copying and modifying a work is a breach of both the copying and modification rights, e.g. scanning and sampling. The *similarity* between a copy and the original work need not be exact or literal; substantial similarity may be found even if none of the words, brush strokes or musical notes are identical. For instance, a common sequence of events in two plays may be sufficient violation; again, these decisions are up to the courts.

The case of publication of copyrighted material on a bulletin board is complex and depends on the court's view of whether or not the people running the board exercise an editorial policy and whether they solicit or encourage the publication of copyrighted material, and whether the operators are viewed as a republishers or merely distributors. International transmission, where receiver and transmitter are in different countries, further complicates the case if different laws apply in each country.

Copyright is part of civil law, so the prosecution needs only prove infringement on the balance of probability (unlike criminal law in which proof must be beyond reasonable doubt). Certain types of infringement come under criminal law, particularly to catch those who trade in and make profit from copyright violation.

## Digital infringements

What constitutes a copy of a digital work?

- When a work is placed onto a computer, whether on a storage medium, ROM or in RAM, for more than a very brief period, a copy is made.
- When a printed work is converted into digital form by an optical character reader, a copy is made.
- When other works are digitised using a scanner, video grabber, sound recording, etc., a copy is made.
- When a file is transferred from a computer to a bulletin board or vice versa, a copy is made.
- When a file is transferred from one networked computer to another, a copy is made.
- When you view a file on some other server, a copy of the viewed portion is made. (Consider the implications this has for copyright on the WWW.)
- When you transmit a document by fax, a copy is made.

## Multimedia copyright

Multimedia work is often a combination of content from different sources, all of which may be independently copyrighted. In addition to this, multimedia applications may require complex licence agreements due to their non-linear, interactive nature; for instance a synchronisation licence is required to play a piece of music in synchronisation with an image. Typically these licences are defined in terms of the number of seconds of synchronised material. In an interactive multimedia system it may not be possible to quantify usage in this way.

A complete multimedia work can be copyrighted just like any other work. However, if a multimedia work contains subworks copyrighted by other authors with their permission, the copyright holder for the multimedia work does not hold the copyright for the subworks. Similarly, purchasing the copyright to a composite work does not necessarily give the purchaser copyright over all the elements of the work.

The complexity of gaining copyright licences may be holding back multimedia developments. As an example of this complexity of licensing, consider trying to obtain permission to use a piece of music, which may require a mechanical licence for the right to make and distribute

material objects in which a recording of a composition is embodied; it may also require a synchronisation licence to synchronise the composition with visual images, a public performance licence, and a master recording licence to use a particular performance by a specific artist.

There is a trend for multimedia developers to use only original in-house material in their applications. There are however several options available to the developer. For instance, consider the use of images:

***In-house or contract sources***

- Advantages – get desired images, can own copyright, control quality of digitisation, can manipulate image.
- Disadvantages – limited by available talent, expensive to do complex subjects, cannot create historic images.

***Public domain sources, libraries, government agencies***

- Advantages – images free (or cheap), large variety of images, many historical images.
- Disadvantages – cannot purchase copyright, no exclusivity of use, few modern images, often disorganised collections, long lead time to receive image, cannot control quality of digitisation.

***Commercial stock photo houses***

- Advantages – speed of service, large well-organised collections, can purchase copyright.
- Disadvantages – costs more for each additional use, may be limits on length of time image can be used, may be limits on changes that can be made, cannot control quality of digitisation.

***CD-ROMs of images***

- Advantages – large, organised collections, ease of use.
- Disadvantages – many disks do not allow reselling, quality of images variable, impossible to obtain exclusive rights.

Multimedia developers need also to be aware that people may violate the copyright on their multimedia product.

**Obtaining a licence**

Having located the copyright holder or appropriate agent, you are usually required to provide the following information:

- the title and description of the new work, its extent and aims

- a description of the target audience
- a description of the method of distribution and the geographical area in which the new work may be marketed
- the name of the commercial publisher/distributor of the new work
- a precise description of the work you wish to use
- an understanding of the rights you wish to acquire, including whether you wish to sell the material, whether you wish to modify it, and so on.

### Clauses for licences

All agreements regarding copyright should be made in writing. The following clauses should be included in any licence agreement:

1. *preamble* – states who are the licensor and licensee, and the subject matter of the licence
2. *materials* – describes materials clearly
3. *rights* – describes the extent of use being permitted
4. *period* – the period for which the rights are granted
5. *cost* – the fee to be paid to the licensor and when payment is due
6. *return* – whether materials are to be returned, destroyed, etc., after the period expires
7. *updating* – if the material is likely to be revised, will the licensee be provided with an updated version
8. *adaptation and copying* – the terms under which copies and alterations may be made
9. *moral rights* – if moral rights have been asserted over the material, these must be passed on as an obligation to the licensee
10. *warranty and indemnity* – licensor warrants it has a legal right to enter into the licence and indemnifies the licensee against claims as a result of this being false. The licensee indemnifies the licensor against any action resulting from a failure to observe the limitations of a licence
11. *general* – that the licence cannot be amended or terminated except in writing
12. *interpretation* – The legal system under which the licence is drawn (Scotland, England, etc.).

### The future

There is a continuing need to balance access to copyrighted material with the protection of an author's rights. Networked electronic information systems are likely to require new approaches to copyright in the future. Future scenarios might include:

- A single-stop copyright shop that files details of copyrights held and predetermined licence agreements for common applications might be created.
- Networked countries may have to agree on international copyright standards.
- New copyrights, such as transmission rights, will need careful definition of transmission, redefinition of publication and distribution for copyright purposes in an electronic medium. In some cases certain devices, such as devices to circumvent copy-protection systems and encryption systems are already banned.
- An electronic information server might be used to provide automatic billing for providing copies of a work, but this would not prevent creation of subsequent copies.
- Special systems that prevent copying could be embedded within the media or within the hardware.
- Digital signatures can be embedded in media to prove copyright, but they do not prevent copying as such.
- Whilst encryption can provide protection against copying, it complicates access to the work.

Possibly the greatest single threat to copyright is web culture, which tends towards the free and unregulated transfer of information. Indeed, there is a common misconception that works placed on the Internet are not subject to copyright protection.

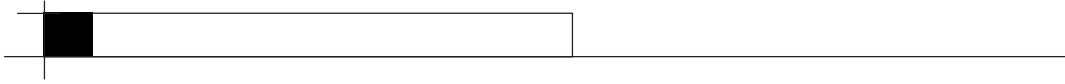
In addition to these concerns, there are wider issues to consider such as whether networks threaten the production of new works, whether the lack of adequate protections will threaten the growth of networked information services, and whether those who do not have access to electronic media will lose access to future works.

**What you should know now about multimedia testing and documentation!**

- Which hardware and software to use for creating and running your multimedia product.
- How to construct a realistic project plan that can be used in the construction of the product.
- The ways to capture, create and manipulate media elements to be incorporated in your multimedia product.
- How copyright applies to multimedia and what steps are involved in copyright clearance.

**Questions**

1. Why is copyright necessary?
2. What is the essence of copyright?
3. Name some categories of work covered by copyright.
4. What works are not covered by copyright? Name six.
5. What three elements constitute the copyright notice?
6. What is the duration of copyright?
7. When is copyright applicable?
8. What information do you need to obtain a licence?



**SECTION 8**

The following PowerPoint presentation may be downloaded from the Information Systems subject pages in the e-library at [www.LTScotland.org.uk/nq](http://www.LTScotland.org.uk/nq)

**INFORMATION  
SYSTEMS**

APPLIED MULTIMEDIA  
HIGHER

**CONTEMPORARY USES  
AND MEANS OF DELIVERY**  
*MULTIMEDIA APPLICATIONS*

Three main areas:

- Business (e-commerce, presentations)
- Training ( CBT, simulations)
- Home ( edutainment, shopping)

**DELIVERY MEDIA**

- CD-ROM
- DVD-ROM
- Kiosk
- WWW
- Mobile communications
- Hybirds
- Virtual reality

**ADVANTAGES /  
DISADVANTAGES OF DELIVERY  
MEDIA RELATING TO:**

- Data capacity
- Data transfer rate / bandwidth
- Window size
- Ease of update

**STAGES OF  
DEVELOPMENT:**  
*Analysis*

- Description of project brief
- Description / contents of requirements specification
- Requirements specification goals

**STAGES OF  
DEVELOPMENT:**  
*Design of Navigational  
Structures and HCI*

Description of:

- Linear structure
- Hierarchical structure
- Web structure
- Hybrid structure

### **'LOST IN HYPERSPACE'**

Description of:

- Backtracking
- Highlighting
- History
- Bookmarks
- Breadcrumbs

### **DIFFERENT USER INTERFACES**

- Command Line Interface
- Menu Driven
- Form Fill-In
- Graphical User Interface
  
- Use of Metaphors

### **GOOD USER INTERFACE DESIGN METHODOLOGY**

- Consistency
- Providing feedback
- Avoid information overload
- Human-computer interaction

### **STAGES OF DEVELOPMENT: Design of Screens and Media Elements**

- Layout of screen elements
- Transitions between screens
- Navigational issues  
(evaluation of each design)

### **STORYBOARDS**

- Outline storyboard
- Detailed storyboard

### **TEXT FEATURES**

- Kerning
- Anti-aliasing
- Embedded fonts
- Graphical text

### **COLOUR AND GRAPHICS**

- Using different platforms
- Gamma correction
- Dithering
- Web palettes
- Progressive displays

### **STREAMING AUDIO**

- Description
- Advantages / disadvantages

### **STREAMING VIDEO**

- Description
- Advantages / disadvantages

### **VIDEO IMPLICATIONS**

- Health issues (epilepsy)
- User-controlled
- Streaming video vs downloading video

### STAGES OF DEVELOPMENT: General Implementation

Software for creating and delivering multimedia applications:

- Creation (authoring, web page)
- Delivery (stand-alone, players)
- Advantages / disadvantages

### PERSONNEL SKILLS

- Project manager
- Multimedia designer
- Media specialists
- Programmers
- Webmaster

### GRAPHIC FILE TYPES

- TIFF, jpeg, GIF
- Colour depth
- Resolution
- File size
- Compression
- Appropriate uses

### AUDIO FILE TYPES

- MP3, MIDI
- File size
- Compression
- Appropriate uses

### VIDEO QUALITY

- Frame rate
- Window size
- Compression
- File size
- MPEG

### STRUCTURE OF A URL

- Absolute pathnames
- Relative pathnames

### STAGES OF DEVELOPMENT: TESTING

Analysis of different types:

- Screen testing
- Integration testing
- Acceptance testing
- Usability testing

### STAGES OF DEVELOPMENT: DOCUMENTATION

- Project development documentation: Navigational maps, storyboards, etc.
- User documentation: hardware and software requirements, etc.

**COPYRIGHT ISSUES**

- Description of Copyright Design & Patent Act
- Fair use policy
- Protection of personal materials

**STAGES OF DEVELOPMENT:  
EVALUATION**

- Fitness for purpose
- Accessibility issues
- Clarity of presentation

**LEARNING OUTCOMES**

**Outcome 1:**

- Demonstrate knowledge and understanding of the principles, features and purposes of multimedia applications

**Outcome 2:**

- Demonstrate practical skills in the context of multimedia applications using contemporary hardware and software