

Understanding IT

Notes on Computing to support the INGOTs ITQ Examination

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These notes should be viewed as explanations of concepts and not a complete or exhaustive guide. Used in conjunction with example test questions and other textbooks, they should give the user an idea of the breadth and scope of the theory.

Why use IT?

We use IT to work more productively, such as using shared files and resources, collaborate online and perform tasks that could not be performed by hand in a reasonable time.

IT is not there to make the IT companies money, add unnecessary tasks or make our work lives boring. If using IT does not improve the way a task can be performed, choose another method.

When using IT it is also important to choose the right tool for the job. If you just need a table, use a word processor. If you need to analyse data in a table, use a spreadsheet. If you want to gather data, use a form or a database. Using the wrong tool will produce poor results and may slow you down.

Audience and Accessibility

People who have disabilities may have special needs that require the designer of IT products to think about how their product will enable access for all. We call these “Assistive Technologies”, “Accessibility Options” or “Universal Access”.

For example, users with colour blindness may not be able to access your work or appreciate the colours that you have chosen. For more explanation, look at:

<http://www.colourblindawareness.org/colour-blindness/>

People with dyslexia can benefit from the use of simple to read type-faces, such as Verdana, as well as using less harsh contrast or light text on a dark background, for example.

People with full or partial blindness may use a screen-reader to ‘speak’ the website or resource to them. Images must have ‘alt-text’ applied to them, so that the screen-reader can interpret the image for the user. Without this text, the end user misses out on your site.

On a Mac, VoiceOver will read any website to you by pressing cmd-F5. On Windows the free “Thunder” software performs a similar function. On Linux, the MetalMouth project is popular.

When making a video, or any product with audio, subtitles (commonly known as closed captions) are an important addition. These can be added in programs like iMovie or sometimes with the use of special software, such as Movie Captioner.

If the end user has difficulties with the language you are writing in, translation software or utilities can be useful to assist. Once an expensive and unreliable option, free services such as Google Translate can instantly give alternate versions.

For example, consider the BBC News website:

British English: <http://www.bbc.co.uk/news/>

Spanish: <https://translate.google.co.uk/translate?hl=en&sl=en&tl=es&u=http%3A%2F%2Fwww.bbc.co.uk%2Fnews%2F&sandbox=1>

Collaborative Working

Global audiences can use communications technologies to offer improvements in productivity. Key characteristics of writing formally as opposed to writing informally in IT environments and why. .

ePortfolios can not only allow collaboration between people carrying out group tasks, such as scientific experiments, gathering lists of weblinks or resources for others to use, working on group tasks across different countries or creating a shared website.

These are sometimes known as Wikis (or WikiWebs) where they become publicly editable sites. These do have disadvantages, as the quality of information can be variable depending on who is contributing. The advantage is that shared gathering of knowledge can create a deeper understanding overall and encourage collaboration.

One disadvantage of all of this sharing online is that potential employers can discover these contributions and, as they encourage informal language, a false impression could be given unless the creator of the articles is careful. An advantage is that the potential employer can find out about the person's skills through one simple URL.

Collaborative sites can also be used for creating shared notes about a subject that can be accessible to themselves and their peers from any location and can be linked to references and supporting resources. Services such as Wordpress and other on-line publishing services can be useful for more formally written texts.

Informal Working

SMS (texts), chat, instant messaging of friends, video chat and other informal services can encourage short cuts and slang to communicate meaning however users of these services must show an awareness that many people using English discussion groups and mailing lists are not native English speakers and therefore care needs to be used when communicating using them.

Be careful with text-speak. Remember, LOL is Laugh Out Loud in the UK but Lots of Love in some countries. Not everyone knows what you mean if you will BRB after you ROFL!

eMail can also be used to communicate in both formal and informal ways but here there are issues. It is vital to check the email headers before replying to ensure that only the people that need to receive the reply get it.

When using email, it is important not to send unsolicited messages (spam) or open yourself to being the victim of spam by placing your email address in a public area, such as websites. This can be avoided by using an image containing the address or using a form such as a(dot)name(at)domain(dot)com to disguise it.

Finally, it is seen as poor manners to overuse automated replies, such as "I'm out of the office" (so called vacation responses) as people emailing you from lists will get a message back every time and you may even alert people that you will not be at home!

The Purpose and Advantage of IT Applications

Applications and File Extensions

Each type of application will have its own file extension (the . followed by letters, usually 3 or 4, after the file name) that tells the computer the application that created the file but do you know what each one is?

Word Processing

Allow effective drafting and redrafting of work with the advantage of improving presentation of written work. More advanced features such as word counts, tables of contents, foot notes and others can create work that would be hard to do using just a pen and paper.

Examples include Microsoft Word (.doc and .docx), Apple's Pages (.pages) and Open Office Write (.odt), Rich Text Files (.rtf) and Plain Text Files(.txt).

Spreadsheets

These allow the manipulation of large amounts of data, the creation of formulae to make complex calculations repeatedly and the ability to present data in graphs and charts. Patterns can be identified and scenarios tested using what-if data to see what could happen to a business if data changed in a particular way.

Examples include Microsoft Excel (.xls and .xlsx), Apple's Numbers (.numbers) and Open Office Calc (.ods), Comma Separated Value Files (.csv)

Multimedia Presentations

These allow the user to present text, images, animations, audio and video as a set of slides that can either happen manually by the presenter, by the end user clicking on buttons (interactive multimedia) or automatically. Best used for key facts, rather than large amounts of information, they can help share a message more effectively than the items on their own.

Examples include Microsoft PowerPoint (.ppt and .pptx), Apple's KeyNote (.keynote) and Open Office Impress (.odp).

Audio Editing

Audio recordings can be edited either in quite simple software, where a single clip is cropped or adjusted for volume, etc. or more complex software that allow layers of sounds to be built up and 'mixed' together to create recordings with greater depth, such as songs. The advantage is that the adjustments to clips can be non-destructive (the original can be recovered) and poor recordings can often be improved by reducing noise or adjusting tone and volume. As the format is digital, the quality of the recording stays the same, unlike analogue recordings where the quality can reduce with each edit.

Project File examples include Audacity (.aup), Apple's Garageband (.band), Adobe Audition (SESX), Avid Pro (.OMF) and many others.

Mixed-down File examples include Windows Wave Format (.wav), Audio Interchange File Format (.aiff), MPEG-1 Layer 3 (.mp3), Advanced Audio Codec (.aac) and Ogg Vorbis (.ogg)

Video Editing

Video recordings allow audio and video files to be combined to produce rich, multimedia experiences from stop frame animation all the way to full movies. As with audio editing, clips can be gathered and mixed/remixed until the product meets the needs of the audience. Subtitles can also be added to enhance accessibility. Sound either takes the form of diegetic (sound whose source is visible on the screen) or non-diegetic (where the source is off-screen) and both can be included in the video product.

Project File Formats can include Apple's Quicktime (.mov), Apple's iMovie (.imovieproj), Apple's Final Cut (.fcp and .fcpx), Adobe Premiere (.prproj), Lightworks (.ed5), Windows Movie Maker (.mswmm) and many others.

Mixed-down File Formats include Quicktime (.mov), Windows Media Video (.wmv), Audio Video interleave (.avi), Ogg Video (.ogv), MPEG 1 and 2 (.mpg), MPEG 4 (.m4v), Matroska WebM (.webm).

Bitmap Graphics Editors

Bitmap Editors allow the user to take a digital image and edit individual pixels of the image. Most editors have a range of tools that are similar to real art - paint brush, pencil, ruled line, eraser, as well as those that only exist in software - bucket fill, gradient fill, magic wand, etc. Many bitmap editors also allow the user to build up layers that can be moved independently, before mixing down to create the single image file. Images are measured in both pixels (height and width) and pixels per inch (resolution - also known as dots per inch or dpi).

Editor formats include Adobe Photoshop (.psd), Pixelmator (.pxm) and GIMP (.xcf).

Common bitmap graphics formats include Joint Photographic Experts Group (.jpg), Tagged Image File Format (.tiff), Graphics Interchange Format (.gif), Windows Bitmap (.bmp), and Portable Network Graphics (.png).

GIF is an example of a LOSSLESS format and JPEG a LOSSY format.

Vector Graphics Editors

Vector graphics are often a better format for page layout, typography, logos, sharp-edged artistic illustrations, such as cartoons, clip art and complex geometric patterns, technical illustrations, diagrams and flowcharts. Files sizes are usually smaller than bitmap graphics and can be scaled more easily.

Common editors and their file formats include Adobe Illustrator (.ai), CorelDraw (.cdr), Scalable Vector Graphics (.svg), Open Document Graphics (.odg) and Inkscape (.svg).

Other Document Formats

Adobe's Portable Document Format (.pdf) is a combination of vector and bitmap resources that create a useful, non-editable way of transferring documents between devices. The PDF format has now become an Open Standard. Encapsulated Postscript files (.eps) are a graphic file format that originally came from the same work that created PDFs. They are less transferrable between devices.

Web Browsers and Web Applications

World Wide Web pages and applications require a web browser to be viewed. They usually allow plugins to view embedded content, such as video, audio, animations, etc. and rely on a URL (Uniform Resource Locator) or an IP (Internet Protocol) Address to connect to a web page. Pages themselves may include links to other pages (hyperlinks). Web pages should appear the same no matter what device they are viewed on and allow the global sharing of information. If they adapt themselves to the device, for example when viewed on a mobile device, we call them “Responsive Websites”.

Common web browsers include Microsoft’s Internet Explorer, Apple’s Safari, Mozilla’s Firefox and Google’s Chrome, as well as Opera, Silk and many others that are used by smaller numbers of users.

Web pages generally use the .htm or .html formats and should use open standards. If a site will only work for one browser, they are probably using proprietary technologies that could lock you in to one type of computer.

eMail Software

eMail messages allow rapid, asynchronous communications that can include plain or formatted text along with multimedia files and documents as attachments. eMails include an address for the recipient in the form username@domainname, a subject for the message and the body of the message with a “signature” containing contact and business information.

It is important to avoid sending unwanted or unrequested emails to lists of people as this may be regarded as “Spam”.

File Names and Types

You have seen the basic list of file names and structures associated with each type of application.

Transferring files between different manufacturer's applications are rarely perfect and so thought has to be given to what the audience of your file may have on their computer. However, file conversion has improved over the years and most applications have a "File>Export" menu item allowing a range of file formats to be produced.

With Audio and Video file formats, file sizes are an issue and are associated with the file size and format.

Video: 1 hour of video usually equates to:

Audio: 1 hour of audio usually equates to:

Other file types show similar size issues with compressed or unformatted files being much smaller than the original file formats. For example, a Word (.doc) file will always be much bigger than the Plain Text file (.txt) of the same text.

MPEG1 (VCD) MPEG2 (SVCD) MPEG2 (DVD) MPEG4 (HDTV)

600MB 1200MB 2400MB 9000MB

DIVX 600MB WMV 600MB MOV 1200MB DV-AVI 12000MB

WAV 620MB MP3 85MB AAC 85MB

Note that a wav file is less compressed than an MP3 and therefore will be of higher quality. This may be noticeable on a good sound system.

Cloud Working

One move away from traditional software applications installed locally on a computer is to “cloud computing” where the software runs in web pages on remote computers, such as Google Apps, Office365 and Apple’s iCloud apps. One advantage is that the files and software are available on any computer, anywhere however a web connection is required and large files, such as video, do not work particularly well in online applications.

Zipped Files

Some files have space in the data that can make a file bigger than it needs to be. Word processed documents are good examples of files that can be effectively compressed. Note that files such as audio, video and images may have already been compressed so there is little benefit in compressing them further.

.zip, .rar, iso and .dmg are common compressed formats. The latter two are disk image formats.

Malware

Not something that you would want on your computer but Malware is the term given to any software that can cause harm to a computer system. Viruses, Trojans, unwanted web plugins or extensions, spyware, key loggers and others are types of malware.

Viruses are programs that can copy themselves (replicate), transmit themselves to a new device and carry a ‘payload’, that is an action that they run without human interaction. A Trojan is a piece of malware hidden inside an apparently harmless and useful application. This tricks the user into installing it onto a system.

Security and safety when working online.

We secure our use of computing devices and services using passwords. What people forget is that the quality of the password is important.

A good password should be between 8 and 15 characters, memorable without writing down but not containing names or words that someone might guess about you. For example dogs, children and other family members, home town, favourite band, etc. In a survey, the top ten passwords were:

Others, such as princess, sECURE, letmein, etc. were equally insecure. So... What makes a good password?

G1r4ff3S (giraffes) is 8 characters, memorable and has upper case, lower case and numbers. 101.D4lm4ti0n5 (101.Dalmations) would be even more complex.

Never leave your computer logged in unattended, never share them with anybody or write them down in a place that others could discover.

Never set up a website without setting the security for the viewer, otherwise you may find that your site has been 'edited' by someone who wishes to use it for illegal purposes.

Never trust anyone online without good and independent verification of their identity. Anyone can make online profiles that appear to be real.

Simple internet searches can reveal a lot about you and other people, so be careful about what you place online and never use any commonly found information about you in security questions.

A lot of information is given away by people who fall for email and internet scams, commonly called 'phishing'. www.hoax-slayer.com is an excellent place to look for advice if you are suspicious. One common tactic is "updates" to Flash!, Java and other video viewing utilities that actually install spyware on your device. Often these links come from well-meaning friends

sharing “must-see” funny videos. The latest hoaxes are listed at <http://www.hoax-slayer.com/latest-information.html> .

We also have to think about the operating system that we are using. Older, less supported systems can be more vulnerable. For example Windows XP is particularly targeted by virus writers and is no longer supported by Microsoft, whereas MacOS X, iOS, Linux and Windows 7 or Windows 8 are less vulnerable.

When backing up large amounts of data, sometimes it is only possible to back up changes regularly, as it would take too much time to always take a full copy of the data. Then, when users are off the system, for example in the night, a full backup is possible.

123456 password 12345678 qwerty abc123

123456789 111111 1234567 iloveyou adobe123

Strengths and weaknesses of the presentation of information

When we share information with others, we have to think about the audience and the purpose of the task. Sometimes the first idea may not be effective.

To quote the INGOTs teacher guide, *“A lot of information gets presented inefficiently because most people associate presentation with desktop presentation software and many have little experience or skills to use other methods.”* (https://theingots.org/community/files/uploads/common/Handbooks/IT_User/Handbook2017_3_1.pdf)

For example, take a leaflet on how to use QR codes. This could be better as a blog on a website with other training resources, so people had one place to go for help in a business or other organisation.

A website version of a presentation would also allow the material to be updated, rather than people having out of date information. This can therefore be a more productive way of working, as the potential audience for the material is larger. If the audience is small and fixed, a presentation created by desktop software may be better.

A disadvantage of web-based presentations may be that they could have less “effects” than standard multimedia presentations and large video or audio files may need to be uploaded to a suitable website, such as YouTube, if the website that you are using cannot display the content. Another is that, without a login to access the material, the resource could not easily be sold to potential customers, whereas a multimedia presentation could be sent only when payment has been received.

Again, from the ITQ site, *“The problem with e-mailing files as attachments or even downloading a file is that there is then a big task managing all those files and no means of updating them centrally.”*

Mostly routine presentations are simple slides and so there is no great advantage compared to using linked web pages or a simple web based presentation system. Giving the audience the URL (web address) of the information means all they have to do is book mark it.

If anchors are set in the information and published the users can integrate precise bits of information into their own information systems with simple links. With the shift from desktop to the web these issues are becoming increasingly important in improving productivity.

There is still reluctance to acknowledge benefits when people have all their personal learning locked into older less efficient methods. This is why education for technological change is important rather than just teaching current established practice.”

Handling and interpreting information in IT contexts

When we share information, the ability of the person receiving it to be able to access it is important. If they need to purchase software to do this, it places an obstacle in the way of the sharing of information with all people.

Free and Open Source Software (FOSS) are programs that are written and maintained by communities of individuals, sometimes assisted by corporations who will benefit from the community effort (such as the Webkit browser core). The benefit is that the software is free, however users accept that support will either be up to the community, usually through forums, or payment to a company, sometimes a business associated with the software.

Systems that can work well with each other, transferring information back and forth, are referred to as having good interoperability. Commercial software can sometimes deliberately prevent this from happening so that you buy all of your systems from their company. The FOSS movement openly encourages interoperability and so can save a business money.

The other advantage in free and open standards formats is that they should last longer and therefore our digital record is less likely to be lost as software changes. A disadvantage, for businesses, is that they might not have as much control of the format and therefore the consumer has more power. This is perhaps why the .ogg open audio format has not become as popular as the closed .mp3 and .aac formats.

With commercial and proprietary information, software and standards, there are always business interests that may influence how the information is shared. For example, it would not be in the interest of a company to tell you any bad points about their product.

One example of this could be news papers which will want to present information to suit a particular viewpoint or sell more news (and advertising) over open Wiki news sites where

information is published regardless of any personal or corporate agenda.

So, because of these “conflicts of interest”, choices made on the basis of information given, for example when purchasing services for a school or making decisions that affect productivity, **MUST** be made on the basis of evidence that has been gathered from other sources, not just glossy brochures.

Understanding developments in technology and standards will help people and organisations make better choices and, in the end, improve productivity.

Copyright licensing and patent issues

File formats can be either open or licensed.

An open file format can be used by a product without having to pay a licence fee to an organisation whereas closed or proprietary licences may have a fee, or conditions on their use. Open standards can help preserve digital information as it is not 'locked away' in a form difficult for future users to access.

The process of tying people to one particular manufacturer's system, using closed systems, is known as "Vendor Lock-in".

SVG, JPEG and PNG are open standards for graphics, for example, whereas Adobe's Photoshop format (.PSD) is proprietary.

HTML5 is an open standard for playback of video content on a website, whereas Flash! from Adobe is proprietary and licenced.

Just because something may be free to use, does not mean that it is free of copyright or licence conditions.

Traditionally, business' approach is to prevent copying without paying, however, licences for sharing can encourage competition, interoerability and the proliferation of a standard. The INGOTs handbook lists *"the IBM PC hardware design, worldwide web, Wikipedia, web browsers, Android Smart-phones"* as examples of the impact of opening up a standard, licences for free, to others.

An important note is that a licence for free use does NOT affect the copyright, trademark or other property of the organisation. Referencing work, respecting trademarks, avoiding illegal use of copyright material, contrary to the licence conditions, and other areas of legislation are important for an individual or organisation to take account of.

Creative Commons licences allow business to still set restrictions on how a product can be used but encourage the sharing of resources. A good example could be a manual or user

guide that they are happy to freely share but want to restrict how it could be copied.

The Flow of Information

Information flows through systems in a number of steps.

Information and Data Gathering
Input of information into a system
Processing of Information
Analysis of Information

Output of Results

For example, if you conduct a survey, you can input that information onto a spreadsheet, identify common responses, sort and search the data and summarise with charts, graphs and tables, finally producing a report for people to read.

Gathering data using sensors, importing into a spreadsheet, applying a formula to calculate a result, and creating a conclusion based on the data.

From the INGOTs

“Providing information in an e-portfolio system, linking it to assessment criteria and providing self- assessment and passing it to an assessor, assessor returning it with feedback.

Listing the information sources needed for a homework assignment, explaining how they will be organised and how the final outcomes will be presented.

Gathering data from the internet about two different software applications and processing and presenting the results to highlight comparative data.

Collecting survey data using web forms, processing it and presenting the results.”

The efficiency of the process relies on the choices made into what systems and software are used. For example gathering data in word processing documents is not as efficient as spreadsheet software as data analysis cannot be easily conducted, however this often happens due to lack of user understanding or IT skills.

We can improve productivity by the use of macros, scripts and programs to perform repetitive tasks, for example using Python scripts in Google Accounts Manager to automate the creation of thousands of new email users. Macros are generally series of commands in a program to automate actions in a document, for example to swap between sheets in a spreadsheet, update a sale discount number in formulae, carry out a mail-merge, etc. All of these can improve the number of tasks that we can achieve in a given time.

Costs of IT Solutions

IT systems do not have to be expensive. For example, placing information on web pages can be performed on computers running free operating systems (such as Linux) and using free software. They can then also be viewed on similar computers.

Placing information in Microsoft Publisher (.pub) then requires the end-user to have Microsoft Publisher and Microsoft Windows, which cost money for both the person making the resource and the end-user.

Using a program like Inkscape (a free vector graphics editor) and saving a drawing in svg format means it can be used (viewed or edited) using free software and displayed on the web whereas, if it had been done using Adobe Illustrator (.AI) or Corel Draw (.CDR), software would need to be purchased.

When a school or other organisation is replacing systems, therefore, it is important that all options are considered, as many thousands of pounds could be saved, as well as making the materials more accessible for customers.

Sometimes, services are best moved off-site. Website fees normally include the purchase, maintenance and technical support of the server, disk space, backup, software licence fees, antivirus software (where needed) and other services. If the resources are placed on a computer within the organisation, all of these costs fall to the organisation. There will also be training costs for the local support staff.

Project Management and Target Setting

The use of SMART targets has become a recognised standard. When carrying out a project, targets (or success criteria) are ways of measuring whether the project has been a success.

SMART stands for:

S specific

M measurable A agreed upon R realistic

T time-based

They are targets that can be used to identify resources needed to complete a project to successful conclusion and when they are needed.

Examples:

These are NOT smart targets:

I will produce a nice website.

I will get an A* in my French GCSE I will write a story

These ARE smart targets:

By 1st June I will have created ten web pages, each with text and images.

My website will be successful if it gets 300 views per week.

I will produce a website which gets an average satisfaction rating of 8/10 by visitors.

When conducting a project using SMART targets, we follow a system used across many areas of IT:

Identify Analyse Design Implement Test Evaluate

Sometimes this is written as

Research (Identify) Plan (Analyse, Design) Do (Implement, Test) Evaluate (Evaluate)

Choosing the Right Tool for the Job

When choosing software to perform a task, there are important considerations.

- (1) Cost**
- (2) Availability across different devices**
- (3) Usability**
- (4) Features**
- (5) Reliability**
- (6) Support**
- (7) How they will improve productivity and efficiency**
- (8) Short, Medium and Long Term effects of their use**
- (9) Do they support macros to automate common processes and tasks.**

For example:

Inkscape is available on Windows, MacOS and Linux and is free. It allows the creation of a wide range of vector graphics formats, including the open .SVG format.

Microsoft Word or Apple Pages are appropriate word processors to use on the Macs in school as they are installed on all of the computers and can output in .DOC and .PDF formats.

Google Docs Spreadsheets are useful as they can gather data from online forms, are free for schools to use and can allow collaborative working.

Portable Apps can be run from a USB key without having to install anything on the computer. This means that students can have a memory stick with all of the software that they need when they get home, thus making IT more accessible.

Systems such as Wordpress or Drupal (Content Management Systems) allow groups of people to edit web pages together and share resources to a wide audience quickly.

Purposes and outcomes in ICT projects

When using IT resources, a user should be able to describe how they carried out the task. For example:

How a website was constructed to make an ePortfolio

How a science report was constructed and shared over the Internet

How video-conferencing was used to conduct an interview with a business-person

A user should be able to document how their work progressed and any issues with productivity. A number of case studies from personal experience would be good.

Communicating Effectively

We are all used to speaking face to face or via a telephone, where both parties can speak at the same time. Voice Over Internet Protocol (VOIP) or video chatting, such as FaceTime, Skype and others allow the same Synchronous communication.

When we sent letters, we would have to write and post it, then wait for a reply, then send a response. This old type of Asynchronous communication has been joined by the more modern methods of eMail, messaging and SMS texting.

Each type has an advantage and you should be able to think about when would have an advantage over the other.

Acceptable Use Policies

When we use a computer system, we are usually governed by an Acceptable Internet Use Policy.

These are there to ensure safe and appropriate behaviour and the safe use of resources. They usually cover the following categories however it is important to read your acceptable use policy and be able to explain specific examples from it.

Security:

We have already looked at passwords. The AUP would remind users about not sharing passwords, making them sufficiently complex, changing them at agreed intervals, not leaving computers logged in unattended (especially for users with confidential information), etc.

Appropriateness:

Searching for, viewing and sharing inappropriate images and other content using the accounts and equipment belonging to or brought into the organisation. Producing inappropriate material. Undertaking bullying or harassment of other users.

Time-wasting (productivity):

Using social media, working on non-business materials, etc. during working hours.

Legal:

Not using the organisation's resources to contravene any laws, for example related to copyright, computer misuse (including hacking), privacy, Harassment, Illegal content.

Good-practice:

Not installing unapproved software on organisation-owned equipment, using devices in a way such as to not risk damage or loss, backing up work according to organisation policies, etc.

Data Protection:

When we use computers, we inevitably leave a trail of data on our hard drives, in emails and other places. There are important principles enshrined in the Data Protection Act but the following are examples of what users should do:

- Data should be backed regularly with a proper plan for how the data will be retained.
- Hardware or software firewalls should be used to protect connections to and from the Internet.
- Hard drives from redundant servers and workstations should be retained to protect data or wiped using an approved data scrambling utility. If disposed of, it must be through a certified company.
- Data should be backed up when it is changed and full backups performed at least once per week or, for servers, daily.

Uploading Information

Web connections are measured in Megabits per second. (Mbps). We usually measure file sizes in Megabytes (MB) with eight bits per byte. This means an 8Mbps internet UPLOAD connection is actually 1MBps.

If we needed to upload an 800MB video, for example, that would take 800 seconds at 8Mbps (1MBps) or just over 13 minutes.

We therefore have to consider people's upload and download speeds when placing resources online and use the most appropriate file format and quality.

Bits, Bytes and Nibbles

Computers are essentially collections of vast quantities of switches, each having an on or off position. We record off as 0 and on as 1. The mathematics of this sort of a system is called Binary Mathematics.

You grew up knowing the Denary or Decimal system with Units, Tens, Hundreds, etc. In Binary, we have Units, Twos, Fours, etc.

Each piece of data (a zero or 1) is called a BIT. Four BITS make a NIBBLE and Eight BITS make a BYTE.

Because the number columns go up in powers of 2, a KILOBYTE is 1024 BYTES and a KILOBIT is 1024 BITS. A MEGABYTE is 1024 KILOBYTES and a MEGABIT is 1024 KILOBITS.

Lets say we buy a VGA webcam. The resolution is 640 pixels x 480 pixels. As this is a rectangle, the 'area' is 307200 pixels in total, or about 0.3 MEGAPIXELS.

If each pixel had to record the amount of red, green and blue, and this took up 8 bits of information per pixel, the picture would be (307200×8) bits in total = 2457600 BITS. This is a big number so we divide by 1024 to get KILOBITS = 2400kb. Dividing by 1024 again gives us MEGABITS = 2.34375Mb. Finally, we can divide by 8 to turn MEGABITS into MEGABYTES = 0.29296875MB.