

## **A2 Module 5**

### ***Information: Policy, Strategy and Systems***

#### **14.1 Policy and Strategy Issues**

##### **factors that need to be addressed in forming a suitable backup strategy for a company that has several information systems/hard drives with files on them**

- What media **(1)**; media must have enough capacity to hold the backup **(1)**
- What frequency **(1)**; backup should occur often enough to ensure minimal loss of data/not so frequent that it impinges on the business function **(1)**
- What content **(1)**; a decision needs to be made as to which files need to be backed up all the time, and which files are more likely to be backed up on a more ad hoc basis **(1)**
- Where stored **(1)**; the backup should not be vulnerable to the same threats as the data **(1)**
- Who's responsible **(1)**; someone/ a set of people should be allocated the task of carrying out/ ensuring the backup takes place **(1)**
- How is it logged **(1)**; a record needs to be held, so that it is known who carried out the latest backup and when **(1)**
- Recovery testing **(1)**; there has to be some way of knowing that the backup has been successful **(1)**
- Time of backup **(1)**; at what time of day should the backup be completed **(1)**

##### **methods a manager can use to monitor and control the usage of network printers**

- Use of network activity monitoring/ auditing **(1)**
- To show who is doing what, when **(1)**
- Abusers can be pinpointed/contacted **(1)**
- Use of network accounting software **(1)**
- Each user can have output restricted/quota imposed **(1)**
- If they exceed their limit, they can't print **(1)**

##### **factors that should be considered when devising a backup strategy for a chain of high street clothes shops**

- Suitable storage media **(1)** has sufficient capacity for making the backup onto **(1)** each shop backs up to DAT cassettes **(1)**
- frequency **(1)** how often the data on the system changes will affect how often the backup needs to be made **(1)** shops back up daily **(1)**
- timing **(1)** how critical system is **(1)** can system be taken off-line overnight in order to back up **(1)**
- storage / location **(1)** the backup needs to be stored away from the main system **(1)** DAT cassettes dispatched from shops by courier **(1)**
- volume **(1)** the backup needs to take into account how much data there is **(1)** procedure at shop closing / overnight **(1)**

- personnel (1) who is going to conduct the backup (1) assigned job description (1)
- logging (1) will there be a record indicating when the backup has taken place? (1) audit trail / manual log maintained (1)
- testing (1) integrity of the backup needs to be ensured (1) so that if it needs to be recovered it can be relied on (1)

## **reasons why a manager would not be advised to use different hardware systems (eg macs instead of PCs) to the rest of the organisation.**

- Main points:
  - Portability of data
  - Training
  - Organisational support
  - Cost
  - Morale
- Also
  - Transfer of documents may be a problem to/ from this department (1) as there may be no common data format for transfer (1)
  - Maintenance contracts may be compromised (1) separately purchased hardware may cause problems not covered under contract (1)
  - Software licensing may be compromised (1) e.g. as the organisation may have agreements with particular software providers (1)
  - Support within the organisation may be an issue (1) as support teams may not have the expertise with these new systems/ the cost of providing the specific support may be beyond the organisation's resources (1)
  - Staff morale within/ outside this department may be compromised (1) + relevant reason (1)

## **Reasons why an Information Technology Management Policy is needed**

- To have procedures for compliance with legislation (1)
- To ensure that systems are introduced that are of benefit to the organisation (1)
- To identify backup procedures (1)
- To identify the type/ content of data that is stored in a particular fashion (1)
- To identify what information should be passed to whom (1)
- To ensure correct training provision (1)
- To ensure consistency of hardware and software (1)
- Maintenance and support (1) **Max 2 marks 2**

## **problems that upgrading software that a department may have if it upgrades its software while the rest of the company does not.**

- file compatibility problems between versions/upward or downward compatibility between versions (1)
- compatibility with existing hardware (1)
- compatibility with existing software (1)

- staff training issues to learn new version (1)
- company IT training policy may not support upgrade in unstructured way (1)
- user support issues- can organisation cope with increased support required (1)
- site licences issues (1)
- purchase/leasing contracts may exist on existing hardware (1)
- maintenance contract issues for new hardware may exclude this option (1)
- unstructured upgrading may demotivate other staff/his staff (1)
- additional strains on department budgets (1) - not just costs

**A hospital information system holds program files, which are rarely changed, and large database files, which are changing constantly. At present the backup strategy uses a tape storage device, and has the following characteristics: Each evening the information system is taken off-line and a full backup is made of the entire system. Three sets of tapes in use and are referred to as sets A, B and C. Set A is used one evening, Set B is used the next evening, Set C is used the following evening. This sequence is then repeated, starting the next evening, with Set A again.**

**Here are the ways this strategy could be improved, and why.**

<b>Changes might include:</b>	<b>Reasons</b>
Systems files only need backup prior to systems upgrades (1)	reduce backup time /hospital system must never be down (1)
Separate Procedures/systems/media/ devices for backing up systems/program files and database files(1)	reduce demands on storage capacity (1)
Periodic dump of database to disc while on-line (1)	Dump can be backed up to tape without going off-line (1)
Need for weekly backup tape (1)	Data errors will overwrite good data in three days if not discovered (1)
Use of raid array to facilitate on-line backup (1)	to eradicate down time (1)
Use incremental backup if not doing already (1)	Reduce time system unavailable/ hospital system must never be down (1)
Keep off-site master / keep in fireproof safe(1)	Added security (1)
Medium term full backup to CD/dump to CD	More reliable than tape (1) or If a data error is not detected within three days it will be impossible to restore from backup (1)
Set up a live mirror server to act as backup on the network (1)	Improve recovery time after data loss (1)
Employ software solution to enable on-line backup. If off-line time is a problem – find	Faster recovery from disaster (1)

a software solution to enable on-line backups to take place	
Planned testing of tapes by restoring them (1)	To ensure media /strategy is OK (1)
Maintain a backup log (1)	To keep records of failures in backup process (1)
Use compression (1)	To reduce backup time or storage media space (1)

## reasons why the company may wish to upgrade their computer

- to cope with the resource demands of software development (1)
- to decrease processing time (1)
- organisation ethos/future proofing (1)
- task driven change e.g. data volume capacity (1)
- other software change (1)
- hardware may be obsolete- spares unavailable (1)

## Explanation of the terms 'compatible' and 'software emulation'

### **compatible:**

- different hardware manufactures produce machines which all support the same software/data files (1),
  - applications are dependent on particular hardware configurations (1),
  - e.g. processor type, memory configuration, VDU configuration (1),
- compatible hardware refers to those systems which conform to a particular minimum hardware specification (1)
  - similar architecture/ instruction set (1)
  - peripheral devices can be used on compatible systems (1)

### **software emulation:**

- A piece of systems software that (1)
- acts an interface between the hardware of a system and any applications running on that system (1)
- in order that the applications software can run on a hardware platform other than that for which it was designed (1)
- enable a computer to give the appearance of being a different platform (1)

## **advantages and limitations of 'software emulation'**

### **advantages:**

- access to greater range of applications on multiple platforms (1)
- enables data transfer between platforms (1) etc.

### **limitations:**

- software emulation may not provide full functionality of hardware solution (1),
- software support more complex - difficult to ascertain whether a problem lies with the application software or with emulation software (1),

- emulation software may make excessive demand on systems resources (1)

## **Advantages of upgrading to take advantage of a company's network environment.**

- Additional dialogue to deal with log-in, id and password (1)
- Network drives become visible in desktop applications. (1)
- Networked resources such as printers become available in desktop applications (1)
- Icon/menu option for email appear (1)
- Icon/menu option for newsgroups appear (1)
- Icon/menu option for browser tools appear (1)
- Other 'computers' visible in peer-peer networks (1)
- Icon/menu option for networked software/applications (1)

## ***Benefits/advantages for computer users of a standard user interface, so that all the users have the same set of menus, icons and colour schemes.***

- ease of learning - training material can be written to match workstation HCI, [2,1,0]
- easier transfer of skills to new packages if interface is maintained, [2,1,0]
- consistency of interface maintained when users move between workstations, [2,1,0]
- better self support between users, [2,1,0]
- standard settings for defaults' e.g. Word starting each sentence with a capital letter. [2,1,0]
- Easier distribution/use of standardised items such as templates/logos etc

## ***drawbacks/disadvantages for computer users of a standard user interface, so that all the users have the same set of menus, icons and colour schemes.***

- Level of skills for different users - standard may suit less able but not highly skilled, [2,1,0]
- Have to wait for changes in software configuration rather than do it themselves, [2,1,0]
- May not be able to use favourite specialised software unless is included in standard [2,1,0]
- Standard colour sets may not be appropriate for colour blind or other disabilities [2,1,0]
- User no longer has control over their own desktop environment plus expansion [2,1,0]
- Either need for additional training/support OR user may be confused plus expansion [2,1,0]

## **resource implications for planning a standardised interface so that all the users have the same set of menus, icons and colour schemes**

- Need to upgrade some workstations if they cannot support standard (1)
- Upgrades may include hard-drive, screen (1)
- May involve moving software from local workstations to a server (1)
- May involve increased network traffic (1)
- Need to upgrade server storage capacity to accommodate move of apps from workstations to a server (1)
- Need to upgrade networking infrastructure from ring to star (1)
- Time consideration for restructuring (1)
- Use of staff for restructure (1)

- Time lost during changeover (1)
- Network management software enables this change to occur (1)

## **issues that would be included in policy and strategy documents relating to the use of IT systems at work and an example of its effect on employees.**

- Compliance with Data protection legislation eg. Non disclosure of personal data/privacy (1)
  - Staff may not leave logged-in machine unattended (1)
- Compliance with Software license conditions (1)
  - staff may not carry out unauthorised install or copying (1)
- Hacking/Computer misuse/theft (1)
  - no browsing or alteration of others data or files (1)
- Internet policy (1),
  - covering permissible sites and times (1)
- Security (1)
  - no use of other peoples passwords- no disclosure of passwords
- Defamation (1)
  - no publication of such material by e-mail (1)
- Health and safety (1)
  - eg employees must take rest periods (1)
- Back up strategy (1)
  - eg sensible frequency (1)
- Training policy (1)
  - for induction of new staff (1)
- Computer Misuse Act (1)
  - plus reference to legality (1)

## **reasons why a company would need an information policy**

- To define who has access to information (1) at what level (1)
- To define mechanisms for distribution (1) e.g. Paper, e-mail, web based, etc. (1)
- To define those responsible for providing information (1)
- To define timeframes for information requirements (1)
- To assist in maintaining the running of the company (1)
- To inform employees of legal responsibility (1)

## **reason why managers from all departments of a company are consulted before any standardisation of ICT systems takes place**

- in order to make sure that departmental requirements are met (1);
- managers will know what their own departmental needs are and can communicate these/ good example(1)
- so that they feel included in the decision (1); if they have ownership of this decision, they are more likely to support and implement it correctly (1)

**A company's strategy says that : (1) no computer hardware will be used for more than a fixed number of years; (2) all departments will have a standard set of applications software; (3) the software must support a certain set of file formats. Why would they do this – what are the benefits?**

- control over spending (1); replacement cost of hardware can be anticipated (1)
- new technology can be implemented over a reasonable period (1) without having to change every piece of equipment (1)
- core functionality will be maintained (1) all departments will be sure that they can share documents and guarantee that they can be understood (1)
- training issues (1) e.g. training can be standardised across all departments for the relevant applications (1) 2 × (2,1,0) marks

## 14.2 Software

### **Why evaluation criteria is established/decided upon before comparing some software packages**

- So that developer and end-user understand the requirements of the system if the proposed system will be successful (1)

### **Advantages of employing an external development team to provide a bespoke software solution**

- No need to employ permanent team for this one-off project (1) 1
- Solution should exactly fit with end-user requirements (1)
- Documentation provided should be exact and of high quality (1)

### **Disadvantages of employing an external development team to provide a bespoke software solution**

- Expensive option compared with others (1) 1
- Time from inception to solution can be long (1)
- Availability of support is restricted (1)
- Possibility of sharing sensitive data with outside workers (1)

### **Purpose/Advantages of using a team to develop a software solution rather than just one individual?**

- Able to split the task and give each part to those with the skills to tackle those parts (1);
- can use a modular approach to reduce the time to completion of the project (1);
- changes to any part of the system do not affect other parts (1);
- Allow a good expansion of one point for a second mark

### **Reasons why a consultant who is employed to purchase a new system for maintaining stock data would first hold a meeting with the departmental managers concerned**

- To establish client needs (1)
- Both parties have a clear understanding of the problem at hand (1)
- To find out what is essential and desirable (1)
- So suitable software can be sought out (1)
- To ensure the departments have ownership/involvement (1)
- to establish clear criteria for software choice (1)

### **Accidentally deleted the question – gotta find out what it was!**

- The college informs the supplier of their needs (1)

- The supplier needs to demonstrate that they have a clear understanding of the college's needs (1)
- Both parties need to establish clear criteria for software choice (1) 3

### **Why 'cost-benefit' is a good evaluation criteria**

- The company needs to see a good return on investment that is measurable (1)
  - e.g. through more efficiency or through added functionality that reduces costs (1)

### **Why 'compatibility' is a good evaluation criteria**

- The company will have systems in place (hardware and/or software) (1)
- ...and the new package will have to function effectively with these (1) 2

### **Sections that are likely to form part of a report into different MIS that could be used**

- methodology (1) how the report has been derived (1)
- results (1) the actual comparison of software packages based on the agreed evaluation criteria (1)
- recommendation/conclusion (1) the judgement reached based on the results (1)
- justification (1) how the results have informed the recommendation (1) 4 × (2,1,0) marks

### **Topics that the ICT manager above should include in her evaluation report**

- methodology / how report developed (1)
- results / actual software comparison (1)
- recommendations / conclusions / decision (1)
- justification / reasons for decision (1)

### **reasons why the ICT manager of a chain of high stores might want to upgrade or replace the company's software.**

- perfective maintenance (1) customer service goals may enforce change, e.g. provide new glasses in less time (1)
- corrective maintenance (1) rectify underperformance of operational tasks (1)
- adaptive maintenance / legal / standards changes (1) new DP provisions may require increased network security (1)
- Cost benefit (1) cost of upgrade / replacement against projected increase in market share (1)
- Compatibility with hardware (1) new optometric device may require new interface with system (1)
- Compatibility with software (1) standardisation (1)
- Software development (1) new version of software may offer new functions / better performance (1)
- Organisation ethos (1) achieve mission statement (1)

### **Why the ICT manager in the above question needs to use evaluation criteria when deciding on the new software/upgrade**

- to provide a framework to enable comparison (1) against specified requirements (1)

**possible criteria, that could be used by the consultant above, with reasons why each is appropriate in this situation (similar to previous question)**

Criterion	Reason
Robustness	The company will be dealing with vast quantities of data (1) and the software will have to cope without crashing (1).
Performance	The company will require results to be produced in a reasonable time (1) so the software package must be more efficient than current methods (1).
Support	The company will require access to support initially as training (1), but also in future if things go wrong (1).
Portability	The company may use other software to create reports (1), and so this package must have an export function (1).
Transferability	Any existing data the company holds with regard to inventory needs to be available (1) without the need for reentering data (1).

**Evaluation criteria that could be used when comparing some software packages, with reasons why, in the context of a car insurance company**

- Robustness
  - The company will be dealing with vast quantities of data (1) and the software will have to deal without crashing (1).
- Performance
  - The company will require results to be produced in a reasonable time (1) so the software package must be more efficient than current methods (1).
- Support
  - The company will require access to support initially as training (1), but also in future if things go wrong (1).
- Portability
  - The company may use other software to print the final quotations (1), and so this package must have an export function (1).
- Transferability
  - Any existing data the company holds with regard to insurance groups, customer details etc. need to be available (1) without the need for re-entering data (1).

**General criteria that might be used in evaluation various pieces of software.**

- functionality (1) user requirements match user needs (1)
- performance (1) use of benchmarks/processing/printing speeds (1)

- usability (1) HCI issues/training (1)
- compatibility *with* existing software base (1) backwards compatible with legacy components(1)
- transferability of data (1) to legacy components/standards(1)
- robustness (1) in use with competitors/testing issues(1)
- user support (1) documentation/fault handling/training (1)
- resource requirements (1) hardware/software/human(1)
- upgradeability (1) version release strategy(1)
- financial issues (1) development cost/development opportunities. (1)
- portability of software (1) across platforms(1)
- compatibility *with* hardware (1) can old hardware be retained?(1)

## **criteria that a company might use to evaluate alternative accounting packages for a college**

Refer to p29/30 of the specification for the list of acceptable criteria.

- Functionality
  - The software will have to provide all the functions of the old systems (1)
  - ... so that the college can produce the relevant information for all parties (1).
- Robustness
  - The college will be dealing with vast quantities of data (1)
    - ...and the software will have to deal without crashing (1).
- Performance
  - The college will require results to be produced in a reasonable time (1)
    - ...so the software package must be more efficient than current methods (1).
- Support
  - The college will require access to support initially such as training (1),
  - ...but also in future if things go wrong (1).
- Transferability
  - Any existing data the college holds that is should be available to the new software package (1)
  - ...without the need for re-entering data (1).
- Appropriateness/Suitability
  - Can't guarantee ICT literacy level to end user of end user (1)
  - ...college wants old and new
- Futureproofing/Upgradability
  - The software will have to be of use for a significant length of time (1)
  - ...so the college will not have to have further investment in the same area in the future (1)

## Evaluation criteria for A large market research company

Criterion	Reason
Functionality	The software will have to provide statistical functions <b>(1)</b> so that the research company can produce the relevant analysis <b>(1)</b>
Robustness	The company will be dealing with vast quantities of data <b>(1)</b> and the software will have to deal without crashing <b>(1)</b>
Performance	The company will require results to be produced in a reasonable time <b>(1)</b> so the software package must be more efficient than current methods <b>(1)</b>
Support	The company will require access to support initially as training <b>(1)</b> , but also in future if things go wrong <b>(1)</b>
Portability	The company may use other software to present the results of their analysis <b>(1)</b> , and so this package must have an export function <b>(1)</b>
Transferability	Any existing data the company holds that is useful for analysis should be available to the new software package <b>(1)</b> without the need for re-entering data <b>(1)</b>
Appropriateness/Suitability to end user <b>(NB NOT EASE OF USE)</b>	Can't guarantee ICT literacy level of end user <b>(1)</b> company wants old and new employees alike to use the package quickly <b>(1)</b>
Futureproofing/Upgradability	The software will have to be of use for a significant length of time <b>(1)</b> and the new package will have to function effectively with these <b>(1)</b>
Compatability	The company will have systems in place (hardware and/or software) <b>(1)</b> and the new package will have to function effectively with these <b>(1)</b>
Cost Benefit	The company may be prepared to pay extra <b>(1)</b> in order to gain extra functionality <b>(1)</b>

### Advantages of emulation

- access to more file types **(1)** that might be specific to particular software that is not available on her system **(1)**
- allows her to use her own existing hardware **(1)** meaning she does not have to invest in further hardware that may be of limited use **(1)**
- cheaper in the short term **(1)** she can decide if she wants to invest in a new system at a later date **(1)**
- possible access to other hardware **(1)** which may only be developed for the 'other' platform **(1)**
- access to both platforms **(1)** user has advantages of both sets of operating systems available at once/accessible through a simple mouse click **(1)**
- able to provide a service to a wider client base **(1)** as she does not have to insist on files being provided in a restricted number of types **(1)**

### Limitations/disadvantages of emulation:

- lack of functionality **(1)** there may be functions missing she needs in order to be productive (e.g. lack of printer support) **(1)**

- speed issues (1) the emulator may run too slowly to be of practical use (1)
- resource issues (1) the software takes up space on the hard disk of her existing system that may reduce the speed of her own system/ will have to buy software licences for applications to run under the emulator (1)
- she may still need to convert the files (1) if suitable software is not available under the emulator (1)

## **reasons for producing an evaluation report when considering alternative software solutions to a particular problem.**

- To present the overall findings of the evaluation to the person(s) requiring the evaluation to be carried out (1)
- To show the end user which packages were being considered as possible solutions (1)
- To detail the required functionality that was being checked for in this evaluation (1)
- To describe how the evaluation has been carried out/ methodology (1)
- To show the results of the evaluation for each package being considered (1)
- To give the end user a recommendation based on the evaluation carried out (1)
- To give the end user justification for the recommendation made (1) 4 x 1

## **Definition of the term “compatible” in the context of hardware or software.**

- different hardware manufactures produce machines which all support the same software/data files (1)
  - applications are not dependent on particular hardware configurations (1)
  - e.g. processor type, memory configuration, VDU configuration (1)
- Compatible hardware refers to those systems which conform to a particular minimum hardware specification (1)
  - similar architecture/ instruction set (1)
  - peripheral devices can be used on compatible systems (1)

## **compatible software refers to ...something missing...**

### **ways in which a company might obtain software, with benefits of each way**

- bespoke solution in-house (1)
- external consultancy/ development/ IT solutions (1) no need to employ specialist staff (1)
- purchasing pre-written/ off-the-shelf software (1) cheaper than bespoke/ timescale advantage / economies of scale (1)
- leasing pre-written/off-the-shelf software (1) lease cheaper than purchase / upgrade advantages (1)

### **ways by which an organisation may obtain a software solution**

- **‘off-the-shelf’ packages:**
  - immediately available (1) as produced for mass market(1)
- **leasing licences:**

- cheaper than purchasing software **(1)** so may be able to have more copies available for use **(1)**
- **in-house bespoke solutions:**
  - support readily available **(1)** as development team are already part of company **(1)**
- **external software house bespoke solutions:**
  - contract is in place **(1)** so there can be clauses to do with late delivery **(1)**

## 14.3 Database Management Concepts

### Definition of normalisation

- Process of breaking down complex data structures into simpler forms. (1) + expansion/example (1)

### Definition of data independence

- Changes in the structure of the data only affects those programs/functions that are reliant on that part of the structured) +expansion/ example (1)
- Data structure is separate from the programs that access it (1) + expansion/ example (1)

### Definition of data consistency

- Data is only stored once, and this is the sole source of that data. (1) + expansion/ example (1)
- Data is stored as one value, and not stored again as another (1) Data consistency automatically occurs when there is no redundancy (1)

### Definition of data integrity

- Correctness/ how trustworthy the data is
- Data integrity is there to make sure that data is free from corruption / validated (1)
- expansion/example (1)

### Why Validation is needed

- To check that entered data is sensible (1) + relevant example of validation in context (2,1,0),
- Must give a field that can be validated and the validation check that can be carried out on it
- e.g. Date of Birth field (1) using a range check (1) Max 3

### Reasons for consultation on the design of a database structure/system

- to ensure that the data they require is recorded on the system (1)
- to find out what training/ documentation may be needed by other members in order to make use of the system (1)
- to ensure that the system can create the relevant outputs that different members require (1)
- or any other sensible reasons (1 per reason up to a maximum of three) 3 x 1

### Definition of relational database management system.

A collection of programs/ layer of software (1)

... that is between the user and the data structure (1),

...which allows manipulation of data through use of query functions (1),

...allows definition of a data dictionary (1)

...where the data is stored in separate tables that are related through linked fields (1) ...and can dynamically generate new tables from old (1) 3 x 1

### What to write about to get marks asking for a description of the normalization process

- naming First Normal Form, Second Normal Form, Third Normal Form (1)

- (1NF) Removal of repeating fields/ attributes/ ensure that values are atomic (1)
- (2NF) Removal of partial key dependencies/ ensure that non-key fields are functionally dependent on the primary key (1)
- (3NF) Removal of non-key dependencies (1)
- Normalisation is the process for making the structure of a relational database more efficient (1)
  - by defining tables, fields, and relationships/ appropriate terminology (1)
- it is the process of breaking the structure into simpler forms (1)

## **facilities that are provided by a Relational Database Management System.**

- mechanism for constructing/ maintaining the database (1) + expansion (1)
- provides the interface between user and data (1) + expansion (1)
- provides querying facilities (1) + expansion (1)
- provides reports/ output formatting (1) + expansion (1)
- provides security (1) + expansion (1)
- provides method of data definition (1) + expansion (1)
- provides facilities to aid data definition (1) + expansion (1)
- Open Database Connectivity/ ODBC (1) allowing program-data independence(1) 3 × (2,1,0) marks

## **Describing a many to many relationship between actor and film**

- A many-to-many relationship (1)
- One actor appears in many films (1)
- One film has many actors (1)

## **Reasons why Entity Relationship (ER) diagrams are used when designing databases**

- provides a diagrammatic representation of the structure of the data (1)
- shows the types of relationships within the database (1)
- one to one, one to many, many to many relationships shown (1)
- shows the logical structure of the database (1) 3 × 1 marks

## **Reasons why Normalisation is done when designing databases**

- Strong points
  - in order to reduce/eliminate redundancy (1)
  - in order to avoid data duplication (1)
  - in order to increase consistency (1)
- weaker points:
  - to ensure that data in tables in independent (1)

- to allow more complex queries / reports (1)
- to break down complex data / structures... (1)
- to avoid non key dependencies (1)
- to ensure data integrity (1)
- to improve access speed (1)

## Explanation of the term entity

Person / place / thing about which data / fact stored (1) e.g. patient (1)

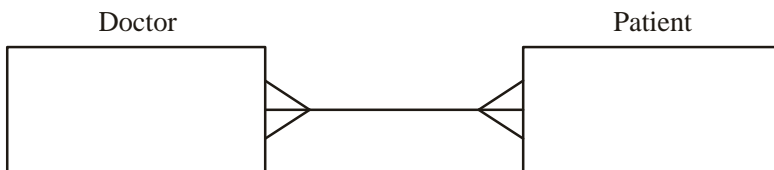
## Explanation of the term attribute

Property inherent in entity/associated with entity (1) e.g. patient's blood group (1)

## Explanation of the term relationship

Connection / link between entities (1) e.g. patient can have multiple diagnoses, diagnosis concerns only one patient (1)

## Diagram and description of a many to many relationship



The relationship means:

- a doctor can treat more than one patient (1)
- ... and a patient can be treated by more than one doctor (1)

## problems that could be experienced when constructing a relational database using a many to many relationship

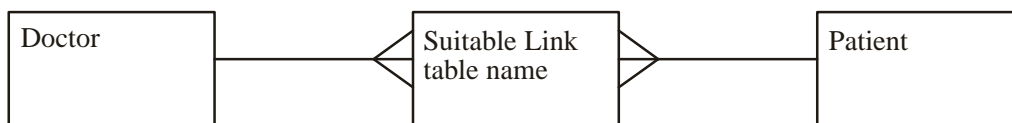
- The relationship cannot be implemented / exist at physical level in RDB
- The relationship is not in 1NF – it will have repeating groups and redundant data

## Fixing a many to many relationship

You need to add an appropriate linking / joining entity (1)

There must be a one-to-many relationship **from** doctor **to** link table (1)

There must be a One-to-many relationship **from** patient **to** link table (1)



## 14.4 Communication and Information Systems

### Difference between analogue and digital transmission

- analogue
  - data transmitted as a wave form or continuously variable signal (1)
- digital
  - data transmitted as a series of discrete/separate pulses or signals (1)

### Benefits of transmitting data in a digital instead of analogue form through a telephone line

- Can Use phone lines to connect computers to internet wide area networks (1)
  - Improved functionality (1)
- Use of phone lines to control intelligent appliances in the home (1)
  - long distance transmission (1)

### Benefits of Networking an office, instead of leaving it with stand-alone computers

- shared printer 'available' on each desktop, even though only one printer exists [2,1,0]
- distribution or sharing of documents/work files, without need to physically exchange floppy disks [2,1,0]
- possibility of shared access to interact, 1 modem and on line connection but access for all [2,1,0]
- e-mail could be set up improving inter-office communications [2,1,0]
- centralised backup eg to keep all data secure [2,1,0]
- sharing software to standardise on all machines [2,1,0]
- control of network resources eg printers [2,1,0]       $3 \times [2,1,0] = 6$

### Why a peer-to-peer network might be appropriate in an office

- No need for central server -thus reduced cost (1)
- Scale of network does not justify complexity of server (1)
- Management overheads low- c/w need for systems administrator in server based network (1)
- Low volume of data transfer does not justify server based network (1)       $2 \times 1 = 2$

[8]

### Changes that an end-user might notice when they change over from using a stand-alone computer to a networked environment

- login screen (1)
  - user now has one more stage to complete before they are able to use their system (1)
- more disk drives on screen (1)
  - user now has access to drives that are logical rather than physical (1)
- less control over data (1)
  - user may now find that they have changed/no right to access files they could previously (1).
- physical appearance of workstation/environment (1)
  - for example extra ports on machine/extra cable connected to machine/ability to print to other machines/extra hardware in the form of hubs etc (1)
- access to remote/ shared resources (1) + expansion (1)
- less control over the interface (1)

- e.g. inability to customise (1)
- increased communication using/ via the machine (1) + example (1)

## **Facilities that an intranet provides which improve productivity**

- video-conferencing (1)
  - managers will be able to see each other without the need for travel costs/long arrangement times (1)
- Group working on projects using productivity (1)
  - work can be completed in a shorter time scale (1)
- Distributed databases (1)
  - meaning that all users have access to the same information all the time/changes are reflected everywhere as soon as they are made
- Electronic sharing of documents (1)
  - means that there is less reliance on physical media (1)
- Ability to share hardware resources (1)
  - means that funds can be devoted to other areas of the business/less hardware needs to be purchased/excess hardware can be sold off (1)
- e-mail (1)
  - which means you have more control over spam/ viruses/ etc. (1)
  - OR internal e-mail (2)

## **Possible problems that arise if you use an intranet**

- risk of unauthorised access (1)
  - meaning potentially sensitive/confidential information may be accessible (1)
- risk of viruses (1)
  - all nodes need to have up to date anti-virus software (1)
- reliance on external agencies (1)
  - e.g. the telecommunications network that the company has little/no control over (1)
- more vulnerable to spurious data (1)
  - if incorrect data is entered into the system, the mistake may not be picked up for a long time (1)
- more difficult to back up (1)
  - as there will be no one centralised control (1)
- increased management overhead (1)
  - means that more time/money/manpower will need to be dedicated to the computer systems (1)

## **measures a company can take to solve problems caused by having an intranet**

- Provide user login and password (1)
  - to make it more difficult to enter system if not authorised (1)
- set up required procedures (1)
  - so that users know the tasks that need to be carried out to maintain system security/integrity (1)
- invest in redundant systems for mission critical applications (1)
  - so that if disaster hits, essential business functions can still be carried out (1)
- ensure validation/verification checks are made on data (1)
- encryption of data (1)
  - so that intercepted data/ packets cannot be understood (1)
- use up to date anti-virus software (1) + expansion/ example (1)
- use a firewall (1)

- e.g. to provide a filter on traffic coming in/ going out (1)

## **Procedures that a company could adopt to discourage breaches of security**

- Procedures for employing/ vetting staff (3,2, 1,0)
- Procedures for restricting/ controlling system access (3,2, 1,0)
- Procedures for use of information gained from network accounting/ auditing systems (3,2, 1,0)
- Procedures for the use of removable media (3,2, 1,0)
- Marks are allocated for: What is the procedure (1), expansion (1) why is it an appropriate procedure for the company (1)

## **Reasons for using accounting software on a network**

- Charge users for use of scarce/expensive resources e.g. colour printing (1)
- See where network has high traffic in terms of time or location so that it can be dealt with/ charges adjusted accordingly (1)
- To ensure that resources are being utilised efficiently (1)
- Encourage efficient use of resources (1)
- Able to vary charges with respect to requirement and/ or utilisation (1)      2 x 1

## **Ways in which an international company can use its computer network to support the exchange of data and information.**

*One mark is for what the company can use, one mark is for how (the way) this supports data/ information exchange.*

- Distributed databases (1) so that all areas of the organisation have access to the same data at the same time (1)
- Centralised database (1) so that data can be added from across the organisation (1)
- Intranet (1) so that communication can be delivered to the desktop/ workstation/ everybody gets the information at the same time (1)
- E-mail (1) so that communication can be delivered to all staff within the organisation (1)
- Tele/Video-conferencing (1) so that meetings can be arranged without the need for travel (1)
- Collaborative software (1) Ability to work on the same document/ project (1) so that workers in different areas of the company can collaborate (1)
- Hot desking (1) Ability to work in any part of the company/ still be able to access your own work areas (1)

## **Advantages of using a distributed database when a database has to be accessed from two separate sites**

- processing is local (1); there is no need for a powerful central server/ there is no reliance on a single machine (1)
- data is stored locally (1); this is the data that is used the most, so response time will be quicker/ means less network traffic between sites (1)
- queries can be localised (1) so if a certain search is only performed on one site, the query is held there (1)

## **Disadvantages of using a distributed database when a database has to be accessed from two separate sites**

- reliance on communication links (1); if there is a problem with the communication lines, data cannot be shared (1)
- loss of central control/ increased management overhead (1); someone at each site is responsible for the management of data on that site (1)
- increased security risk (1); more access points = more likelihood of unauthorised access (1)
- increased complexity of database itself (1) structure at both sites needs to be aware of the other (1)
- need for each site to perform their own backup (1) meaning that a complete database backup cannot be assured (1)

### **Advantages of using a client/server database when a database has to be accessed from two separate sites**

- centralised resource (1) management of the system happens in one place (1)
- decreased network traffic (1) only queries and results are sent/ received, not entire tables (1)
- consistent views of the database (1) everyone sees the same\ database (1)
- increased security (1) access control/ backup occurs at the server (1)
- less powerful client machine required (1) all the work is done at the server (1)

### **Limitations of using a client/server database when a database has to be accessed from two separate sites**

- requires an expensive resource (1) a powerful server is required (1)
- reliance on one machine (1); if there is a problem with the server, no one can work (1)

### **Methods that can be used to ensure security and privacy when two sites are connected using a public communications network**

- make use of a firewall/ proxy server/ 'tunnelling'/Virtual Private Networks (1) data is filtered so that data for the 'private' network does not reach the 'public' network (1)
- use encryption technologies (1) so that anyone getting hold of the data is not able to make sense of it (1)
- passwords/ logins (1) to deter casual access to the system (1)

### **Definition of the term *client*, in a computer networks**

- local workstation/computer/software (1)
- makes requests for applications/data to a server (1)
- may not have a lot of local processing power (1)     2 × 1 mark

### **Definition of the term *server*, in a computer network**

- remote/powerful computer (1)
- provides resources/data to clients (1)
- point at which processing is carried out (1)     2 × 1 mark

### **Advantages of a client/server database over a non-client/server**

- expensive resource is made available to a large user base (1) ; this is more cost effective (1)
- consistency of the data is maintained (1); only one copy of the data is held on the server, rather than copies held on workstations (1)
- processing is done at the server (1); the client does not need to be so powerful (1)
- communication between client and server is minimal (1); only requests and results are communicated, rather than entire databases (1)

- Department specific report formats or queries can be held on workstations (1) meaning that less room is taken up on the server/these are less likely to be accessed by the 'wrong' people (1)

## The role of a router

- Let traffic flow between networks/ allow access to other networks/use as a gateway (1)
- Best path determination/ decides next portion of journey (1)
- Switching function/ takes packet from one network/interface and moves it to another (1)
- Allow build up a knowledge of the network(s) (1)
- Allow packet filtering/use as a firewall (1) 2 × 1 mark

[10]

## Responsibilities that would be included in the job specification for a database administrator

- Structure of the database (1) e.g. changes to structure in order to alleviate problems (1)
- Keep users informed of changes made to database (1) for example change in field name or field size/introduction or deletion of queries or reports (1)
- Maintenance of the data dictionary (1) including such factors as setting conventions for naming of tables, fields etc (1)
- Controlling/implementing access rights to the database (1) e.g. so that inexperienced users who need to see data cannot inadvertently delete/change it (1)
- Allocating passwords to users (1) so that one person has overall responsibility for who has any access to the database and can track this (1)
- Provide training and support to users (1) so that new staff are aware of how to use systems, and all staff able to make efficient use of the system (1)
- Backup/ restore (1) + expansion (1)

Max 3 x (2,1,0)

[10]

## benefits to a company of delivering training and assessment for their entire organization, over the internet

- Training is consistent across the company (1) irrespective of physical location (1)
- Able to move staff around (1) without need for retraining/ they can continue current training (1)
- Able to change content at one time (1) so that latest training is available to employees (1)
- Quality Assurance (1) easy to track online assessment and see if there are areas to work on (1)
- Cost benefit (1) e.g. no need to employ an instructor to deliver the courses/ no need to send staff on courses (1)
- Time factor (1) employees can train during quiet periods for the company (1)

## benefits to an employee of delivering training and assessment for an entire organisation over the internet

3 x (2,1,0)

- Access to curriculum all the time (1) so missed sessions can be caught up with (1)
- Instant feedback on assessment (1) so that weak areas can be addressed immediately (1)
- Ability to work at own pace (1) so misunderstood parts can be repeated over and over until they are understood (1)
- Stimulating learning environment (1) some people do not learn well in a classroom situation/ very hands on approach (1)

- Ability to work for different sites (1) so training can be carried out when convenient to the student not the trainer (1) 3 x (2,1,0)

## **Factors that should be considered, when planning an online training system, which involves employee-computer interaction**

- User friendliness
- ICT literacy of the student
- Use of shortcuts
- Familiar/ meaningful icons
- Consistent layout
- Informative response from system/ error messages
- Forgiveness (system has to cope with 'odd' responses)
- Feeling of control - employee controls system not the other way around 4 x 1

## **Why it would be a problem for a supermarket if its website cannot be viewed correctly using certain browsers**

- Users of this browser cannot access the supermarket's website (1) so they will go somewhere else/ custom/ money will be lost (1)

## **Measures that can be taken to ensure that a supermarket website facility is secure**

- Use encryption/ secure protocols like https (1) so that if communication is intercepted, it is not understandable (1)
- Ensure that access rights on the server are set correctly (1) so that only authorised users have access to sensitive data i.e. credit card numbers (1)
- Keep a record of transaction details e.g. originators IP address (1) so that if transactions are fraudulent, these should be traceable to the originating system (1)
- Keep a record of customer payment details (1) to avoid unnecessary transmission of sensitive data (1)
- Use access restrictions to the system by users, e.g. require login to the server/ registration to the service (1) to deter casual access to the site (1)
- Use of third party service providers (1) plus expansion (1)  
Credit any sensible answer (1) plus expansion (1)

## **Items that are necessary for a customer to be able to connect to a retailer's website**

- Physical connection to the network – telephone line/ DSL line/ Broadband cable (1)
- Service provision/ ISP (1)
- Browser software (1)

## **How protocols and addressing mechanisms are used to support the World Wide Web**

- Protocols are the rules that define how network devices communicate (1) 3
- A unique addressing mechanism is required so that source and destination devices can be identified (1) so that communication is sent to the required recipient(s) (1)

- URLs are used as an easy to understand mechanism for remembering addresses on the World Wide Web (1)
- Allow one mark for naming more than one protocol used on the World Wide Web e.g. IP, TCP, HTTP (1)

## **Legitimate activities for which Organisations use the Internet**

- e-mail (1)
- selling products/services (1)
- ordering / purchasing (1)
- marketing/advertising products/services (1)
- training / support (1)
- recruitment (1)
- banking (1)
- information publication (1)
- VLE (1)
- information acquisition (1)
- video conferencing (1)
- voice over IP (1)
- remote backup (1)      3

## **The role of a router**

- acts as a gateway / connects networks (1)
- that maintains a table of available routes (1)
- that reads the destination address (1)
- that determines where to forward packets/data (1)      2

## **The role of a web server**

- serves files/ services http requests (1)
- to a web user/browser (1)
- that builds web pages (1)
- hosts web sites (1)
- content filtering (1)
- restricts access (1)

## 14.5 Networks

### Ways in which a company can use its computer network to support the exchange of data and information.

- Distributed databases (1)  
so that all areas of the organisation have access to the same data at the same time (1)
- Centralised database (1)  
so that data can be added from across the organisation (1)
- Intranet (1)  
so that communication can be delivered to the desktop/ workstation/ everybody gets the information at the same time (1)
- E-mail (1)  
so that communication can be delivered to all staff within the organisation (1)
- Tele/Video-conferencing (1)  
so that meetings can be arranged without the need for travel (1)
- Collaborative software (1)  
Ability to work on the same document/ project (1) so that workers in different areas of the company can collaborate (1)
- Hot desking (1)  
Ability to work in any part of the company/ still be able to access your own work areas (1)

### Definition for protocol

- A standard set of rules that define how communication will take place between computers

### Advantages of using protocols

- Users are not restricted to one manufacturer's equipment/ allows for the existence of open systems (1)
- meaning several disparate pieces of equipment can be connected together and can be expected to communicate effectively (1)

### things to consider when setting up a network, and why these things are important.

- Previously installed network devices/ software need to be considered (1)  
to avoid address conflicts (1) OR  
device addresses need to be unique (1)  
so that each device is uniquely identified on the network (1)
- Network Operating System has to be considered (1)  
so that correct protocols are set up (1)
- How devices are connected to the network (1)  
it may cause a bottleneck and so there may be congestion (1)
- If the devices are set up to access the Internet (1)  
they will have to use TCP/IP to communicate (1)
- Applications will need to use the correct protocols (1)  
e.g. different e-mail servers use different settings (or other relevant example) (1)
- Size of network (1) + expansion (1)
- Security issues (1)  
data on the network may need to be protected/ have restricted access (1)
- Network usage (1) + expansion (1)

## **Changes an end-user may notice when they change over from using a stand-alone computer to a networked environment.**

- Login screen (1)  
user now has one more stage to complete before they are able to use their system (1)
- More disk drives on screen (1)  
user now has access to drives that are logical rather than physical (1)
- Less control over data (1)  
user may now find that they have changed/no right to access files they could previously (1).
- Physical appearance of workstation/environment (1)  
for example extra ports on machine/extra cable connected to machine/ability to print to other machines/extra hardware in the form of hubs etc (1)
- Access to remote/ shared resources (1) + expansion (1)
- Less control over the interface (1) e.g. inability to customize (1)
- Increased communication using/ via the machine (1) + example (1)

## **Facilities provided by an intranet, and how those facilities improve productivity**

- Video-conferencing (1)  
managers will be able to see each other without the need for travel costs/long arrangement times (1)
- Group working on projects using productivity (1)  
work can be completed in a shorter time scale (1)
- Distributed databases (1)  
meaning that all users have access to the same information all the time/changes are reflected everywhere as soon as they are made
- Electronic sharing of documents (1)  
means that there is less reliance on physical media (1)
- Ability to share hardware resources (1)  
means that funds can be devoted to other areas of the business/less hardware needs to be purchased/excess hardware can be sold off (1)
- E-mail (1)  
which means you have more control over spam/ viruses/ etc. (1) OR internal e-mail

## **Problems that may arise as a result of using an intranet**

- Risk of unauthorised access (1)  
meaning potentially sensitive/confidential information may be accessible (1)
- Risk of viruses (1)  
all nodes need to have up to date anti-virus software (1)
- Reliance on external agencies (1)  
e.g. the telecommunications network that the company has little/no control over (1)
- More vulnerable to spurious data (1)  
if incorrect data is entered into the system, the mistake may not be picked up for a long time (1)
- More difficult to back up (1)  
as there will be no one centralised control (1)
- Increased management overhead (1)  
means that more time/money/manpower will need to be dedicated to the computer systems (1)

## **Measures that a company can take to combat problems caused by the use of intranet**

- Provide user login and password (1)  
to make it more difficult to enter system if not authorised (1)
- Set up required procedures (1)  
so that users know the tasks that need to be carried out to maintain system security/integrity (1)
- Invest in redundant systems for mission critical applications (1)  
so that if disaster hits, essential business functions can still be carried out (1)
- Ensure validation/verification checks are made on data (1)
- Encryption of data (1)  
so that intercepted data/ packets cannot be understood (1)
- Use up to date anti-virus software (1) + expansion/ example (1)
- Use a firewall (1) e.g. to provide a filter on traffic coming in/ going out (1)

## **Effects/changes that a network environment causes to the user interface in terms of the security of the system**

- Need to login to the system (1)  
puts more dialogue in place before accessing the system proper (1)
- Password management (1)  
e.g. minimum password length message (1)

## **Effects/changes that a network environment causes to the user interface in terms of the control of software used**

- Access to software restricted (1)  
As only the licensed number of concurrent copies can run at any one time (1)
- Users are only allowed to use certain software at certain times/ e.g. only allow students access to games at non-lesson times (1)

## **Effects/changes that a network environment causes to the user interface in terms of the control of files used**

- Status message relating to the file appears (1)
- Users are aware of others accessing the files (1)
- Access to the file is read only (1)

## **Effects/changes that a network environment causes to the user interface in terms of the access rights to resources**

- Users can 'see' certain printers (1)  
That users in different areas see different printers/different user logging on to the same machine see different printers (1)
- Users can only see network drives relevant to their needs (1)
- Administrators see most/all resources whilst users see a restricted set (1)

## **Definition for the term *client*, in a computer network**

- A Local workstation(1)
- ...which makes requests for applications and data to a server (1)
- ... and may not have a lot of local processing power (1)

## **Definition for the term server, in a computer network**

- A Remote, powerful computer (1)
- ...that provides resources and data to clients (1)
- ...and is the point at which processing is carried out (1)

## **Advantages of a client/server database over a non-client/server database.**

- Expensive resource is made available to a large user base (1)  
this is more cost effective (1)
- Consistency of the data is maintained (1)  
only one copy of the data is held on the server, rather than copies held on workstations (1)
- Processing is done at the server (1)  
the client does not need to be so powerful (1)
- Communication between client and server is minimal (1)  
only requests and results are communicated, rather than entire databases (1)
- Department specific report formats or queries can be held on workstations (1)  
meaning that less room is taken up on the server/these are less likely to be accessed by the 'wrong' people (1)

## **The role of routers in computer networks.**

- Let traffic flow between networks/ allows access to other networks/ is used as a gateway (1)
- Best path determination/ decides next portion of journey (1)
- Switching function/ takes packet from one network/interface and moves it to another (1)
- Allow build up a knowledge of the network(s) (1)
- Allow packet filtering/use as a firewall (1)

## **different applications/used for networks, along with benefits that a company gains from them**

- Use of networked systems (1) benefit to company (1)
- Internal e-mail (1)  
instant communication with all staff (1)
- Distributed databases (1)  
sharing data across company (1)
- Collaborative software (1)  
sharing software across company (1)
- Sharing printers (1)  
few printers between many workstations (1)
- Backup (1)  
backup centrally coordinated (1)
- Video conferencing (1)  
saving travel time and cost (1)

## **Legal/legitimate uses of the Internet**

- E-mail (1)
- Selling products/services (1)
- Ordering / purchasing (1)
- Marketing/advertising products/services (1)
- Training / support (1)

- Recruitment (1)
- Banking (1)
- Information publication (1)
- VLE (1)
- Information acquisition (1)
- Video conferencing (1)
- Voice over IP (1)
- Remote backup (1)

## **Description of the role of a web server.**

- Serves files/ services http requests (1)
- To a web user/browser (1)
- That builds web pages (1)
- Hosts web sites (1)
- Content filtering (1)
- Restricts access (1)

## **Reasons why PDF is selected as the format in which to provide files**

- Standard for document sharing on the web (1)
- A company cannot guarantee the system type that viewers will have (1) so it will use a common used one
- Software to read the document is freely available (1)
- The Formatting is retained... (1)  
...e.g. logos/forms/fonts (1)
- Content can be copied and pasted into other applications (1)
- Content of this document format is easily accessible but harder to change (1)

## **The role of IP addresses in the functioning of the Internet**

- Uniquely identifies single machine (1)
- If more than one machine has same address, data cannot be routed towards it (1)
- Provides a consistent way to refer to a specific machine (1)
- Formal standard for addressing (1)
- Hierarchical addressing scheme (1)

## **Benefits of using a URL instead of an IP address**

- staff find it more readable/ understandable than IP address (1) well-chosen name easier to recognize than numbers (1)
- staff more likely to remember (1) don't have to remember IP addresses (1)
- staff able to view selected information (1) points to a specific web page / website (1)
- staff don't have to be aware of changing IP addresses (1) can be redirected (1)

## **Methods a manager can use to monitor and control the usage of the printers on the network.**

- Use of network activity monitoring/ auditing (1)
- To show who is doing what, when (1)
- Abusers can be pinpointed/contacted (1)
- Use of network accounting software (1)
- Each user can have output restricted/quota imposed (1)

- If they exceed their limit, they can't print (1)

## Items of data that an accounting log might include.

- A record of facilities used by each person including processor time (1),
- No of pages printed (1)
- Disk space used (1).
- Details of systems failures/ crashes/error messages (1)
- Details files stored/ updated/deleted (1)
- Details of e-mail usage/storage (1)
- IDs of logged-on users/who (1)
- Network address/hardware id of logged on users/details of workstations (1)
- Time & duration of log in/log out/ when logged in (1)
- Details of applications used/count of users per application/ no. of licenses used (1)
- Details of network traffic (1)
- Details of failed login attempts (1)

## Reasons why an accounting log is useful.

- provide systems administration with information about network load (1)
- monitoring software licenses (1)
- enable administrators to deal with network performance problems (1)
- facilitate sensible distribution of resources to users (1) e.g. memory/ time/ printers/ etc.
- to limit use of scarce resources (1),
- inform decisions about any upgrade or systems enhancement (1)
- help in tracking abuse of network (1)
- enable administrator to identify and support novice users (1)

## Resources that could be charged for by using network accounting software.

- Duration of login / processor time (1)
- Storage (not RAM) (1)
- Printers/ ink/ toner/ paper (1)
- Other peripherals (1)
- APPLICATIONS software / example (1)
- Application software licenses (1)
- What files accessed (1)
- Data throughput (1)
- What web pages accessed (1)
- E-mail (1)

## Access Permissions that would be provided to people in a college

- Students
  - Read access only to attendance data (1)
  - Restricted to their own records (1)
  - May be able to give their own reasons for absence (1)
- **teaching staff:**
  - read access only for a traditional method/central database (1)
  - may have write access for on-line method prior to upload to a central server (1)
  - search or query particular student records (1)
  - reporting at individual student level or class level or at department level or all records depending on the College (1)

- office staff
  - input/edit and update capability (1)
  - restricted access to a departmental data set (1)
  - reporting at individual student level or class level (1)
- **senior managers**
  - read only access (1) (Ignore read/write access here.)
  - access to full data set (1)
  - summary reporting rather than detail of each student or class (1)

## **Differences between a peer-to-peer and client-server network**

- Central or main computer exists on server based network but not on peer-to-peer (1)
- Shared data/programs/applications stored on server c/w on any local hard drive (1)
- Maintenance benefit of installing applications once on server c/w installing copy on each local hard-drive in peer-peer (1)
- Systems manager overheads for a server based network (1) E.g. setting up user accounts and access rights. (1)
- shared resources such as printers, hard drives, etc in peer-peer only available when workstation is on c/w available when network is up for server based (1)
- Server based net can simplify job of central administrator, at some cost in performance (1)
- Server introduces single point of failure (1)
- Server implies one 'more capable' machine suited to serving many clients. (1)
- server based network tend to be much larger scale than peer-peer (1)
- software upgrades more easily managed on server based network (1)
- security issues harder to control on peer-peer (1)
- server based nets likely to need additional hardware: routers, bridges, repeaters, switches, etc (1)
- centrally managed backup on server based net. (1)
- speed of access varies with number of users/load on server based net. (1).

## **Steps that have to be taken, either by the user or the network manager, to maintain security on a network that would not apply to stand-alone computer systems.**

- Create a login ID OR password to identify user (1)
- Force change of passwords on a timed basis (1)
- Create hierarchy of password giving different access rights (1)
- Set an accounting log to track misuse/inappropriate transactions (1)
- Allocate a level of hierarchy/access (1)
- Allocation of network address to workstation (1)
- Firewall (1)
- Controlled access to peripherals (1)

## **Items of data that you would expect to be held in a log that is used to monitor use of the network's resources.**

- The following answers are examples only.
- A record of facilities used by each person including processor time(1),
- Number of pages printed (1)

- Amount of disk space used (1).
- Details of systems failures/ crashes/error messages (1)
- Details of files stored/ updated/deleted (1)
- Details of e-mail usage/storage (1)
- IDs of logged-on users (1)
- Network address/hardware id of logged on users/details of workstations (1)
- Time & duration of log in/log out/ when logged in (1)
- Details of applications used/count of users per application/ number of licenses used (1)
- Details of network traffic (1)
- Number of failed log on attempts for a user (1)
- Number of attempts to access blocked websites (1)

## **Tasks for which a log that is used to monitor use of the network's resources can be used.**

- Observe usage patterns of users (1)  
so that peak times can be anticipated and planned for (1)
- Observe where there are issues of congestion (1)  
so that strategies for upgrading/ replacement can be formulated (1)
- Monitor usage of scarce resources e.g. colour laser printers (1)  
So that users can be charged correctly (1)

## **Ways in which a company can make use of networked system**

- Distributed databases (1)  
so that all areas of the company have access to the same data at the same time (1)
- Centralised database (1)  
so that data can be added from across the company (1)
- Intranet (1)  
so that communication can be delivered to the desktop/ workstation/ everybody gets the information at the same time (1)
- E-mail (1)  
so that communication can be delivered to all staff within the company (1)
- Tele/Video-conferencing (1)  
so that meetings can be arranged without the need for travel (1)
- Collaborative software (1)  
ability to work on the same document/ project/so that workers in different areas of the company can work together (1)
- Hot desking (1)  
ability to work in any part of the company/ still be able to access your own work areas (1)
- Internet access (1)  
so that data sources external to the company can be accessed (1)
- Share resources (1)  
e.g. a few printers between many workstations (1)
- Network audit function (1)  
e.g. tracking printer usage (1)

## **procedures that the company could adopt to discourage breaches of security**

- Procedures for employing/ vetting staff (3,2, 1,0)
- Procedures for restricting/ controlling system access (3,2, 1,0)
- Procedures for use of information gained from network accounting/ auditing systems (3,2, 1,0)
- Procedures for the use of removable media (3,2, 1,0)
- Credit any point that relates to company issues and that can justifiably form part of a code of practice.
- Marks can be allocated for: What is the procedure (1), expansion (1) why is it an appropriate procedure for the company (1)

## **Reasons why accounting software may be used**

- Charge users for use of scarce/expensive resources e.g. colour printing (1)
- See where network has high traffic in terms of time or location so that it can be dealt with/ charges adjusted accordingly (1)
- To ensure that resources are being utilised efficiently (1)
- Encourage efficient use of resources (1)
- Able to vary charges with respect to requirement and/ or utilisation (1)

**Answers must refer to weak points which must result in the need for disaster recovery, not simply additional security measures.**

Physical issues (1) plus reason (1)

Document issues (1) plus reason (1)

Hardware issues (1) plus reason (1)

Communications issues (1) plus reason (1)

Software issues (1) plus reason (1)

Data transfer (1) plus reason (1)

**Do not accept the same reason for vulnerability more than once, e.g. only credit 'sensitive data is stored' as a reason for one area.**

**Max 3 × (2,1,0) marks      6**

## **Issues that should be considered when reviewing a backup strategy**

- Where should backup media be stored/ RAID be situated in relation to the live system (1)  
backup is no use if it is as vulnerable as the live system to attack/ disaster (1)
- Log to be kept of backup activity (1)  
e.g. so if the system breaks down, the point at which it broke down can be established/ time of last backup can be established (1)
- Planned testing of recovery (1)  
so that if recovery is necessary the organisation can be sure that it can be carried out
- Assignment of responsibility for procedure (1)  
so organisation can be sure that the procedure is being carried out (1)

## **Measures that can be taken to ensure that a websites financial transactions are secure**

- Use encryption/ secure protocols like https (1)  
so that if communication is intercepted, it is not understandable (1)
- Ensure that access rights on the server are set correctly (1)  
so that only authorised users have access to sensitive data i.e. credit card numbers (1)

- Keep a record of transaction details e.g. originators IP address (1)  
so that if transactions are fraudulent, these should be traceable to the originating system (1)
- Keep a record of customer payment details (1)  
to avoid unnecessary transmission of sensitive data (1)
- Use access restrictions to the system by users, e.g. require login to the server/ registration to the service (1)  
to deter casual access to the site (1)
- Use of third party service providers (1) plus expansion (1)

## **Items needed to connect to a website**

- Physical connection to the network – telephone line/ DSL line/Broadband cable (1)
- Service provision/ ISP (1)
- Browser software (1)

## **Explanation of how protocols and addressing mechanisms are used to support the world wide web**

- Protocols are the rules that define how network devices communicate (1)
- A unique addressing mechanism is required so that source and destination devices can be identified (1)  
so that communication is sent to the required recipient(s) (1)
- URLs are used as an easy to understand mechanism for remembering addresses on the World Wide Web (1)
- Examples: IP, TCP, HTTP (1)

## 14.6 Human/Computer Interaction

### Features of a 'user friendly' software package

- intuitive to use (1)
- command, menus etc in familiar places on screen -similar menu structure to other packages (1)
- ability to customise tool bars/menus (1)
- help readily available on-line (1)
- context sensitive help (1)
- short cuts available for expert users (1)
- effective use of colour/sound to assist users (1)
- effective diagnostic messages on screen (1)
- use of wizards to assist with complex tasks (1)
- Well suited to task- not unnecessarily complicated (1)

### Physical factors that influence how people interact with computer systems

- position of screen/ lighting (1)
  - always visible/not facing window/avoiding glare or reflections (1)
- arrangement of seating (1)
  - adjustable level of chair (1)
- work patterns (1)
  - ability to take frequent breaks (1)
- ergonomics of hardware (1)
  - problems such as RSI, mention of keyboard design or wrist rests, etc. (1)
- Choice of colour schemes (1)
  - the effect of colour blindness to certain colours (1)
- Sound effects associated with tasks (1)
  - problem in a noisy environment or for people with hearing difficulties (1)

### Psychological factors that influence how people interact with computer systems

- A different set of peer pressures (1)
  - may exist in this store- e.g. manager at this store is anti the new system (1)
- Different background or experience (1) –
  - These users may have used a different previous system to those in the other store (1)
- Different satisfaction level/degree of familiarity with previous system (1) –

- may have been using old system much longer (1)
- Strong IT phobia (1)
  - willingness to accept an IT solution in this store is weak (1)
- Different social context in this store (1) –
  - maybe this store is in the US/Europe/etc. (1)
- Low user self confidence (1)
  - if many staff feel unable to cope this may build to create group dissatisfaction (1)
- Sound effects associated with tasks (1)
  - initially helpful could become irritating (1), etc.
- Choice of colour schemes (1)
  - the effect of colour combinations can affect mood or attitude towards the system (1)
- HCI complexity (1)
  - may lead to frustrating expert users (1) because of help given to novice users (1)

## **Factors that need to be considered when designing for human/computer interaction.**

- User friendliness
  - Making the system accessible to the widest audience
  - Have easily navigable screen layouts
  - Provides a consistent look and feel so that skills are transferable between packages
  - So that the system is intuitive so that the user feels comfortable and the system is easy to learn how to use
- Help mechanisms
  - Using context sensitive help means that the user has a consistent method of getting aid.
  - Use of wizards can help users to complete most parts of a complex task by guiding them through the required stages
  - Use of tips/assistants can point out alternative methods of completing a task that may benefit the user
  - Built in demonstrations can show users how to complete complex/unfamiliar tasks
  - Error messages provided by the system should not only be of assistance to programmers, but also to end-users so that they can see what has gone wrong and why.
- Shortcuts
  - Once a user is familiar with a process/piece of software they want to complete tasks efficiently
  - In order to support productivity, users should have the facility to customised toolbars/menus so that commonly used tasks are easily accessible
  - The ability to use alternative input methods for commands such as ctrl-P for print can aid efficiency
- Long term memory
  - Use standard menu items/key strokes will help the end-user by reducing the amount of time needed to

learn how to use a package.

## **Resource implications / how hardware is affected of providing an effective interface**

- Capacity of Backing Store/Hard Disk Drive
  - Operating system (OS) will consist of large graphics files that require storing.
  - Comprehensive help systems will have a large number of files to be stored
  - Programs that operate in an environment such as a GUI will tend to be complex in terms of how they have been programmed, and so tend to be large.
  - Document created by users may contain lots of e.g. format information/graphics that may not conveniently be stored on removable media.
- Capacity of Immediate Access Store/Main Store/RAM
  - Complex graphics will take up a lot of space in IAS when they are being used, due to the bitmapped nature of graphics
  - When help facilities are being accessed (such as wizards/demos/help files), these need to be stored alongside OS, application and data in IAS in order to be of use
  - In order for multi-tasking to take place, as when a task is not being accessed it has to be stored when it can be accessed immediately
- Speed of processor/clock speed
  - If the processor is slow, graphics will not be produced smoothly
  - Users may get frustrated waiting for systems to complete tasks
  - Multi-tasking involves the processor working at a high rate
- 

## **Consequences/problems that support staff may have in providing technical assistance if users are allowed to customise their interface**

- More time will be taken up in support **(1)**
  - as staff will have to identify which icons perform which task/ the position of icons to perform tasks
- Changes made by the users may have other consequences **(1)**
  - and this may be difficult/ impossible for the support staff to assess without access to the user's system **(1)**
- Workers that share desks don't recognise the environment **(1)**
  - and support staff are not aware of what has been changed **(1)**

## **Methods of providing help to users of ICT systems**

- Online help/ help menu within application/ context-sensitive help/ screen tips **(1)**
- Written documentation/ manuals **(1)**
- Telephone support **(1)**

- Wizards/ Demonstrations/ tutorials (1)
- User groups (1)
- Training (1)

## **Factors that need to be addressed when considering Human/Computer Interaction**

- Appropriate input (1)
  - To user/to task/device(1) Example(1)
- Appropriate output (1)
  - To user/to task/format/device (1) Example (1)
- Interface issues (1)
  - Menus/layout/colour and text/icons/pictures (1) Example (1)
- ‘User friendly’ (1)
  - Help systems/error messages/instructions/wizards (1) Example (1)
- Easier access to tasks (1)
  - Shortcuts/macros/automation of common tasks (1) Example (1)
- The user themselves (1)
  - Memory/skill/age/disabilities (1) Example (1)

## **Psychological factors that need to be considered when designing human/computer interaction**

- User-friendly or example
- Give help to novices or example
- Provide shortcuts for experts or example
- Make use of human long-term memory or example      4 × 1 mark

## 14.7 Human/Computer Interface

**The system's resources that would be affected by a complex CAD (computer aided design) package, along with an explanation of how**

- **Backing storage (1)**
  - requires sufficient capacity to cope with large graphics files large help-files/ size of application code (1)
- **IAS (1)**
  - requires sufficient capacity to cope with multiple graphical user windows (1)
- **Processor (1)**
  - needs sufficient clock speed to cope with additional processing involved in smooth presentation of Graphics display (1) etc.

### **'sophisticated' features in a human-computer interface**

- on-line help (1)
  - with context sensitive searching of different topics (1)
- effective use of colour (1)
  - to highlight on screen message e.g. warning messages in red, suggestions in a different colour (1)
- well designed command/menu structures taking into account skills of CAD designer (1)
  - with short cut keys for experienced users (1)
- use of a range of input/ output devices appropriate to CAD design work (1)
  - e.g. graphics tablet, plotter, etc. (1) - 2 examples gets 2 marks
- user friendliness (1)
  - takes account of design skills and terminology used by designers (1)
- GUI (1)
  - presents complex information in graphical/icon format (1)
    - features must be appropriate to CAD e.g. not voice recognition.

### **Benefits to users of having a standardised user interface – with the same set of menus, icons and colour schemes**

- ease of learning - training material can be written to match workstation HCI,
- easier transfer of skills to new packages if interface is maintained, [2,1,0]
- consistency of interface maintained when users move between workstations, [2,1,0]
- better self support between users, [2,1,0]
- 'standard settings for defaults' e.g. Word starting each sentence with a capital letter.
- [2,1,0]
- Easier distribution/use of standardised items such as templates/logos etc

## **Disadvantages to users of having a standardised user interface – with the same set of menus, icons and colour schemes**

- Level of skills for different users - standard may suit less able but not highly skilled, [2,1,0]
- Have to wait for changes in software configuration rather than do it themselves, [2,1,0]
- May not be able to use favourite specialised software unless is included in standard [2,1,0]
- Standard colour sets may not be appropriate for colour blind or other disabilities [2,1,0]
- User no longer has control over their own desktop environment plus expansion [2,1,0]
- Either need for additional training/support OR user may be confused plus expansion [2,1,0]

## **The resource implications for planning a standardised interface**

- Need to upgrade some workstations if they cannot support standard (1)
- Upgrades may include hard-drive, screen (1)
- May involve moving software from local workstations to a server (1)
- May involve increased network traffic (1)
- Need to upgrade server storage capacity to accommodate move of apps from workstations to a server (1)
- Need to upgrade networking infrastructure from ring to star (1)
- Time consideration for restructuring (1)
- Use of staff for restructure (1)
- Time lost during changeover (1)
- Network management software enables this change to occur (1)       $4 \times 1 = 4[12]$

Drafting a number of policy and strategy documents relating to the use of IT systems at work.

## **Issues that should be included in the policy and strategy documents of an IT and its affect on employees. (state 4 issues)**

- Compliance with Data protection legislation eg. Non disclosure of personal data/privacy (1)
- Staff may not leave logged-in machine unattended (1)
- Compliance with Software license conditions (1)  
staff may not carry out unauthorised install or copying (1)
- Hacking/Computer misuse/theft (1)
- no browsing or alteration of others data or files (1)
- Internet policy (1), covering permissible sites and times (1)
- Security (1) no use of other peoples passwords- no disclosure of passwords
- Defamation (1) no publication of such material by e-mail (1)
- Health and safety (1) eg employees must take rest periods (1)
- Back up strategy (1) eg sensible frequency (1)
- Training policy (1) for induction of new staff (1)

- Computer Misuse Act (1) plus reference to legality (1)

## Reasons why a company needs an information policy

- To define who has access to information (1) at what level (1)
- To define mechanisms for distribution (1) e.g. Paper, e-mail, web based, etc. (1)
- To define those responsible for providing information (1)
- To define timeframes for information requirements (1)
- To assist in maintaining the running of the company (1)
- To inform employees of legal responsibility (1)

## Factors that need to be considered when designing for human/computer interaction

Factor	Reason
User friendly	Making the system accessible to the widest audience
	Use icons in a meaningful way, so that users are not frustrated
	Have easily navigable screen layouts
	Provides a consistent look and feel so that skills are transferable between packages
	So that the system is intuitive so that the user feels comfortable and the system is easy to learn how to use.
Help mechanisms	Using context sensitive help means that the user has a consistent method of getting aid.
	Use of wizards can help users to complete most parts of a complex task by guiding them through the required stages.
	Use of tips/assistants can point out alternative methods of completing a task that may benefit the user.
	Built in demonstrations can show users how to complete complex/unfamiliar tasks.
	Error messages provided by the system should not only be of assistance to programmers, but also to end-users so that they can see what has gone wrong and why.
Short cuts	Once a user is familiar with a process/piece of software they want to complete tasks efficiently.
	In order to support productivity, users should have the facility to customised toolbars/menus so that commonly used tasks are easily accessible.
	The ability to use alternative input methods for commands such as ctrl-P for print can aid efficiency.
Long-term memory	Use standard menu items/key strokes will help the end-user by reducing the amount of time needed to learn how to use a package.

## resource implications of providing an effective HCI interface.

Resource	Reason
Capacity of Backing Store/Hard Disk Drive	Operating system (OS) will consist of large graphics files that require storing.
	Comprehensive help systems will have a large number of files to be stored.
	Programs that operate in an environment such as a GUI will tend to be complex in terms of how they have been programmed, and so tend to be large.

	Document created by users may contain lots of e.g. format information/graphics that may not conveniently be stored on removable media.
Capacity of Immediate Access Store/Main Store/RAM	Complex graphics will take up a lot of space in IAS when they are being used, due to the bitmapped nature of graphics.
	When help facilities are being accessed (such as wizards/demos/help files), these need to be stored alongside OS, application and data in IAS in order to be of use.
	In order for multi-tasking to take place, as when a task is not being accessed it has to be stored when it can be accessed immediately
Speed of processor/clock speed	If the processor is slow, graphics will not be produced smoothly.
	Users may get frustrated waiting for systems to complete tasks.
	Multi-tasking involves the processor working at a high rate.

### **These are the consequences for support staff who provide technical assistance if computer users were allowed to customise their interface**

- More time will be taken up in support **(1)** as staff will have to identify which icons perform which task/ the position of icons to perform tasks **(1)**
- Changes made by the users may have other consequences **(1)** and this may be difficult/ impossible for the support staff to assess without access to the user's system **(1)**
- Workers that share desks don't recognise the environment **(1)** and support staff are not aware of what has been changed **(1)**

An important feature of a mail order system is the interface for the staff who use it.

### **Features to expect the human/computer interface for a company to have, along with the reasons for each one (state 3 features)**

- Cater for different levels of user expertise **(1)**
  - workers may not be very ICT literate **(1)**
- Cater for different end user's physical abilities **(1)**
  - e.g. for partially sighted **(1)**
- Consistent at both sites **(1)**
  - so staff do not have to learn two systems **(1)**
- Sensible use of colour **(1)**
  - as the system will be used fairly intensively **(1)**
- Help features accessible **(1)**
  - so that users are able to assist themselves when they need to **(1)**
- Menu based system **(1)**
  - so that input choices are restricted to items sold **(1)**
- Graphical user interface **(1)**
  - to build on users previous experience/ to avoid language issues/ etc **(1)**
- Consistency with other systems **(1)**

- so that users are less likely to make errors (1)
- Automated data entry (1)
  - to reduce errors (1)

## **appropriate devices for capturing data (ie data capture devices) for a retail outlet, and the advantages for the company of using this device**

- Bar Code Scanner (1)
  - simple method (1) needs minimal training so staff can be working quickly (1)
  - stock is already provided with bar code from supplier (1) so little extra work required in preparation (1)
  - Speed of data capture c/w other methods (1) so that store increases productivity (1)
- Key Board (1)
  - cheap method c/w bar code scanner (1)
  - simple method (1) needs minimal training so staff can be working quickly (1)

## **factors a school should consider whilst designing an interface for a computer-based learning environment, to be used by 6-10 year olds**

- Use of colour (1) plus reason (1)
- Navigation around the system needs to be simple (1)
  - so pupils can get to the necessary areas without getting confused/ bored (1)
- Amount/ size/ type of text (1) plus reason (1)
- Use of appropriate language (1)
  - as it needs to be understood by the pupils (1)
- Help/ error messages/ error handling (1) + reason (1)
- Use of graphics/ buttons/ icons/ pictures/ moving images/ sounds (1) + reason (1)

## **suitable input devices that could be used by pupils aged 6-10**

- Trackball (1)
  - as young children may not have the motor skills to use another device (1)

## **Output devices that could be used by pupils aged 6-10**

- Colour inkjet printer (1)
  - so that pupils can take away exact hard copy of their work (1)

## **features of a command line interface**

- Text only input (1);
  - user has to know exactly what the command is they want to execute (1);
- Faster execution (1)
  - as the CPU has less to do to support the interface (1);

- Minimal requirement in terms of input and output devices **(1)**;
  - so able to function on simple hardware **(1)**
- ‘Small’ when compared with other interface types/ take up less room on host storage devices **(1)**
  - so more storage/ memory available for tasks **(1)**.

## **Reasons, and applications where a command line would be appropriate**

- Initial setup of a system **(1)**;
  - e.g. availability of sophisticated hardware cannot be guaranteed;
- Configuration of hardware/ machinery control **(1)**;
  - e.g. command structures are text by nature **(1)**

## **Features of a menu driven interface**

- Limited options **(1)**
  - so user is less likely to make errors **(1)**; 2
- Hierarchical nature **(1)**;
  - have to navigate through the different levels of menus until required option is reached **(1)**;
- Only requires a simple input device**(1)**;
  - e.g. a set of buttons **(1)**;
- Guides/ controls user through the system **(1)**;
  - so user IT literacy not an issue **(1)**.

## **Reasons, and applications where this interface (menu driven) would be appropriate**

- ATMs/ mobile telephone/ printers **(1)**;
  - e.g. displays a restricted set of relevant options **(1)**.
- Credit any reasonable application suggestion **(1)** and reason **(1)**.

## **Features of a graphical user interface**

- Use of icons/ pointers/ drag and drop **(1)**
  - makes operations simpler to perform **(1)**;
- Not based on language use**(1)**,
  - so suited to different native tongues/ can use the same interface in different countries **(1)**;
- Ability to provide shortcuts to often used applications/ functions **(1)**;
  - so tasks are carried out more efficiently **(1)**;
- Heavy use of machine resources **(1)**,
  - e.g. hard disk space, memory space **(1)**;
- Ability to make use of several different input devices **(1)**;

- so special needs of particular users can be met **(1)**.

## **Reasons, and applications where a graphical user would be appropriate**

- Interface with personal computers **(1)**;
  - e.g. easily understood interface that gives access to many varied tasks **(1)**

Graphical User Interfaces make high use of system resources.

## **System resources needed to run for Graphical User interfaces**

- Hard Disk Drive/ Backing Store **(1)**;
  - a GUI holds many lines of code which needs to be stored/ the images used in the interface will need to be stored **(1)**
- Memory/ Immediate Access Store **(1)**;
  - large amounts of code need to be held in memory for execution/ by its nature, the interface contains a large proportion of graphics which need to be held in memory **(1)**
- Certain input devices are required **(1)**;
  - the interface will probably rely on some kind of ‘point and click’ in order to function **(1)**
- CPU **(1)**;
  - the complexity of the interface will mean that some form of processing time will have to be dedicated it **(1)**

## **Situations where menus are used as the main feature of an HCI.**

- Mobile phones
- Portable Audio devices (eg iPOD)

## **Reasons why menus are appropriate in some situations**

- Speed **(1)**
- Unknown user IT literacy **(1)**
  - end users skills cannot be predicted **(1)** so a simple interface has to be provided that guides the user
- Restricted choice **(1)**
  - menus may be edited to allow for shortcuts **(1)** so that often used functions are easily available **(1)**
- Avoidance of errors **(1)**
- Easy to learn/use **(1)**
  - menus are structured in a logical fashion **(1)**
  - so that users can make ‘intelligent guesses’ to find particular functions **(1)**
- Less hardware resource required **(1)**
  - menus take up less resource on the device**(1)** so that these resources can be devoted to other things that add functionality/ device can be made more efficiently **(1)**

## **A suitable type of interface for an ATM**

- Menu Driven Interface (1)
  - as there are a restricted number of tasks that can be performed via an ATM (1)
- Allow answers that relate ATM to Graphical User Interface (1)
  - with reasonable explanation (1)

## **Characteristics/benefits of a menu driven interface**

- restricted choice (1); easy to show what to do for inexperienced users nature of the device is to offer restricted services/ any reasonable expansion (1).
- hierarchical nature (1); structure is logical e.g. withdrawal amounts are together/ any reasonable expansion (1)
- ease of use (1); skill level of end user is not known (1)
- speed of use (1); this is important to users (1)

## **Characteristics of the input and output devices of an ATM**

- robust input device(s) (1) ATMs are often installed open to the elements (wind, rain etc) (1)
- screen resolution can be low (1)
  - only has to support text and basic graphics (1)
- restricted input devices (1)
- only need to enter digits and make menu choices (1)

Graphical User Interfaces (GUIs) are easy to use, but have implications for the demands made on system resources.

## **System resources for GUI**

- hard disk drive/ backing store (1)
  - a GUI requires a large program / many images which need to be stored (1)
- ram/memory/ immediate access store (1)
  - large amounts of code/images need to be held in memory for execution (1)
- processor time (1)
  - to display visual interface details/ track mouse movements/ identify selections
- graphics card (1)
  - to process / store images (1)
- monitor / pointing device (1)
  - more visual interface / colour / high resolution/ rapid, accurate selection of options(1)

## **Psychological factors, with examples, that an HCI designer should consider along**

- give help to novices (1)
  - cash machine/ATM/ bank “hole in wall” has clear instructions on screen (1)

- for card insertion, use of buttons **(1)**
- provide short cuts for experts **(1)**
  - pc/pc application has hot keys **(1)**
  - to enable expert to access functions quickly **(1)**
- make use of human memory **(1)**
  - mobile phone has menu-driven interface **(1)**
  - user can remember how to navigate menus **(1)**
- make use of human perception **(1)**
  - calculator has colour coded function buttons **(1)**
  - to help user remember **(1)**

## 14.8 Software Development

### Ways of providing software other than using a 'generic applications package'

- User written (1)
  - internal development team/ department can write it(1)
- "buy a specific purpose applications package (1)
  - which already meets users specification (1).
- External Software house writes it(1) to users specification

### Issues that should be considered when making a choice about which method to use to make a system

- 1 mark for naming the issue, 1 mark for a sensible explanation or elaboration
- **Development time (1):**
  - generic may take less time to develop c/w other methods (1)
  - may not have time to carry out project if not part of strategy / may delay other key strategic projects [I]
- **Development costs (1):**
  - contrast external costs with those incurred if an in-house team exists or shared development costs for mass purchased generic application (1) ,
  - may not be able to afford project if not part of strategy (1)
- **Compatibility with existing hardware/software (1):**
  - need for new system to interface with existing applications (1),
  - may not be compatible with other aspects of strategy [I]
- **Organisation's policies on hardware/ software (1) :**
  - explained that these may dictate a particular solution [I].
- **availability of documentation (1):**
  - widely available for generic applications. (1)
- **user training issues/ policies (1):**
  - availability of training material for generic packages/ transferable skills (1)/
  - may be skills shortage/training needs not covered by strategy (1)
- **software support issues (1) :**
  - bug fixing, installation & maintenance (1)
- **upgradability (1) –**
  - control over upgrade path/contrast ease of upgrade for different methods (1)
- **robustness/reliability (1) –**
  - e.g. generic package tested on wider audience than in-house solution

### Features you would expect in a statistical software package used by a market research company

- Generic functionality such as print, save, import/export data to/from other packages etc. (1)
- Complex/sophisticated HCI to ease data manipulation (1)
- standard statistical functions such as mean, standard deviation, probabilities, averages, etc (1)
- user defined functions/macros (1)
- forecasting/modelling/identify trends (1)
- tabulation of data (1)
- output of data in graphical form (1)

- e.g. Histograms/bar charts/pie charts (1)
- carry out standard statistical tests (1)
- access to standard statistical tables (such as normal distribution) (1)
- methods to facilitate input and management of volumes of data. (accept sorting) (1)
- for survey work- questionnaire design ( for OCR/OMR input perhaps) (1)

## **Reasons why testing may not be completely successful**

- Requirement to keep development cost to defined limits (1)
- requirement to keep development time to deadlines (1)
- in order to gain/maintain edge over competition - get product to market first (1)
- user has used product in a way that no-one has previously done (1)
- new hardware/ software is released the company was not aware of (1)
- inadequate test plan/ data (1)

[3]

## **Effects that a fixed deadline for a project might have on the final product.**

- Testing may not be fully carried out (1)
  - so e.g. only the major functions of the software are checked/ only checked against a small set of hardware (1)
- Functionality may be left out (1)
  - as it is deemed superfluous to requirements (1)
- Programming is not fully documented (1)
  - so it is difficult to improve/ correct the software (1) 2 x

## **Benefits of separating a project into sub-tasks, and allocating those sub-tasks to separate development teams**

- This should reduce the development time (1)
  - as parts can be worked on simultaneously (1)
- Personnel with particular expertise can be given parts of the system (1)
  - so that the parts of the system are as efficient as possible (1)
- By using a modular approach (1)
  - the system should be easier to test/ modify/ maintain (1)

## **What a company should do in a situation where there are reports of problems in a package.**

- Produce a maintenance release/ software patch/ update (1)
  - so that the software can operate with the operating system/ hardware that the colleges have (1)
- Provide a website/ document (1)
  - so that technical staff have instructions on how to address the issue (1)

## **Why Evaluation criteria that should be established before comparing the packages**

- So that developer and end-user understand the requirements of the system/ agree on how to establish if the proposed system will be successful (1)

## criteria that could also be used as evaluation criteria for a piece of software

Criterion	Reason
Robustness	The company will be dealing with vast quantities of data (1) and the software will have to deal without crashing (1).
Performance	The company will require results to be produced in a reasonable time (1) so the software package must be more efficient than current methods (1).
Support	The company will require access to support initially as training (1), but also in future if things go wrong (1).
Portability	The company may use other software to print the final quotations (1), and so this package must have an export function (1).
Transferability	Any existing data the company holds with regard to insurance groups, customer details etc. need to be available (1) without the need for re-entering data (1).

## Advantages of having a bespoke solution

- No need to employ permanent team for this one-off project (1) 1
- Solution should exactly fit with end-user requirements (1)
- Documentation provided should be exact and of high quality (1)

## Limitations/disadvantages of having a bespoke solution.

- Expensive option compared with others (1) 1
- Time from inception to solution can be long (1)
- Availability of support is restricted (1)
- Possibility of sharing sensitive data with outside workers (1)

## Why do companies use teams to develop a software solution, rather than have just one individual make the whole thing?

- Because then, you are able to split the task and give each part to those with the skills to tackle those parts (1);
- Can use a modular approach to reduce the time to completion of the project (1);
- changes to any part of the system do not affect other parts (1);

## Advantages and limitations of Software created by the user.

### *Advantage*

- solution will be exactly what the user wants (1)
  - as solution is not being generated by a third party (1)
- user will know exactly how the system functions (1)
  - so maintenance/ adaptation of the solution later on should be simple (1)
- relatively short time to implementation (1)
  - as no external consultation required (1)

### *Limitation*

- skills of user may not be up to the task (1)

- so the solution may not be elegant (1)
- solution may store data in an unusual format (1)
  - so data cannot be shared with other applications (1)
- if the system is used by more people, support may suffer (1)
  - e.g. the user does not have time to support others (1)
- lack of documentation (1)
  - e.g. the user is unlikely to produce manuals/ on-line help (1)

## **Advantages and limitations of software created by an internal development team.**

### ***Advantage***

- security (1);
  - the system may contain data that the company wish to keep secret (1)
- solution should be a perfect fit (1);
  - development team employed should be working towards business goals (1)
- progress can be tightly monitored (1);
  - one manager may have direct control over the whole project (1)
- specialism (1)
  - experts can work on what they do best (1)
- cost benefit (1)
  - as developers are already employed by the company (1)

### ***Limitation***

- understanding of the processes and computer systems required (1)
  - which may require a very specific skill set, that may not be available (1)
- team may be working on other developments for the company (1)
  - and so may be getting pressure from others who see their project as more important (1)

## **Software created by an external development team.**

### ***Advantage***

- availability of large skills base (1)
  - i.e. individual/ company specializing in this type of system can be hired (1)
- external team may have previous experience of a similar system (1)
  - and so may provide a system in a shorter timeframe (1)
- no need to employ specialists full time (1)
  - solution should be a perfect fit (1)

### ***Limitation***

- possibly a long lead time (1)
  - external team needs to understand exactly what the problem is before offering a solution (1)
- little control over the external development team (1) everything needs to be detailed in the contract (1)
- cost benefit may be an issue (1);
  - use of external developers is an expensive option (1)
- issue of testing (1) + expansion (1)

## **An Advantage and Limitation of purchasing “off-the-shelf” packages.**

### ***Advantage***

- Cheaper than bespoke (1)
  - as mass produced (1)

### ***Limitation***

- As designed for many (1)
  - may lack functionality required (1)

## **An Advantage and limitation of leasing software licences**

### ***Advantage***

- Cheaper to pay for lease than having to purchase software (1)
  - so may be able to have more copies available for use (1)

### ***Limitation***

- When the lease ends all copies of the software must be removed (1)
  - which will take time (1)

## **Advantages and limitations of using an in-house development team to create bespoke solutions**

### ***Advantage***

- Support should be easily available (1)
  - as the development team are already part of the company (1)

### ***Limitation***

- Solution may require skills that the team do not possess (1)
  - meaning that more people have to be employed (1)

## **Advantages and limitations of using an external software house to create a bespoke solution**

### ***Advantage***

- A contract is in place (1) so there can be clauses to do with late delivery (1)

### ***Limitation***

- It may take a long time to produce the system (1)
- as the external team has to find out how the system fits company business needs(1)

## **Factors that might affect a company’s final decision on the method to use to obtain some software**

Company policy (1)	does the company insist on using a certain method? (1)
Time considerations (1)	how long is there until the new software has to be in place? (1)
Cost comparisons (1)	Why a difference in cost arises (1)

Personnel (1)	are there people with the skills available to create the new software? (1)
Reputation (1)	Is the company trustworthy?/established/experienced in the field (1)

## Ways in which a company could obtain software, along with the benefits of this way (1)

- external consultancy/ development/ IT solutions (1) no need to employ specialist staff (1)
- purchasing pre-written/ off-the-shelf software (1) cheaper than bespoke/ timescale advantage / economies of scale (1)

leasing pre-written/off-the-shelf software (1) lease cheaper than purchase / upgrade advantages

### Benefits to an organization of using 'off-the-shelf' packages:

- It is immediately available (1) because it has been produced for mass market(1)

### Benefits to an organization of leasing licences:

- cheaper than purchasing software (1) so may be able to have more copies available for use (1)

### in-house bespoke solutions:

- support is readily available (1) because the development team are already part of company (1)

### external software house bespoke solutions:

- contract is in place (1) so there can be clauses to do with late delivery (1)

## 14.9 Software Reliability

### Reasons why a maintenance release may be needed for an accounting package

- ADAPTIVE MAINTENANCE: EG
  1. To deal with external issues such as tax law, budgetary, tax rate, etc (1)
  2. To deal with hardware or software developments, new processors, new operating systems, etc (1)
- PERFECTIVE MAINTENANCE: EG
  - To enhance functionality/introduce new features of the package (1)
  - To decrease processing time (1)
  - To improve (1)
- CORRECTIVE MAINTENANCE: EG
  - To fix bugs/logic errors, coding errors, etc -

### B1. Definition of alpha testing

- alpha testing is testing carried out by a software house / software company (1)

### B2. Definition of beta testing

- beta testing is carried out by a selection of software users (1)

### reasons why testing may not be completely successful

- requirement to keep development cost to defined limits (1)
- requirement to keep development time to deadlines (1)
- in order to gain/maintain edge over competition - get product to market first (1)
- user has used product in a way that no-one has previously done (1)
- new hardware/ software is released the company was not aware of (1)
- inadequate test plan/ data (1)

### Difference between alpha-testing and beta-testing

- Alpha-testing:
  3. Performed in-house - by the developer of the software (1)
  4. using a fixed set of data to generate predicted results/ to ensure that each part of the solution does what it is supposed to do (1)
- Beta-testing:
  5. Performed by a select set of end-users outside of the developing organisation (1)
  6. using data, hardware or performing tasks that may not have been considered by the developers to ensure that solution works in real situations/ so end-users can provide feedback to the developers (1).

### reasons why newly purchased software may fail to operate successfully/not work properly, even if the developer has followed an extensive testing programme.

- cannot be tested with every combination of hardware/ software available (1)

- 7. so new software may cause established systems to fail or vice versa (1)
- software now tends to be complex (1)
  - 8. so every single part of a system will not have been tested with every other part (1)
- new software may not be able to use older file formats (1)
  - 9. causing the company to have to re-enter data (1)
- user uses the software in a way that has not been considered (1)
  - 10. causing the software to behave in an unusual way/ unexpected results (1)

### **reasons why a test plan is important**

- Provides a structured approach to the testing (1)
  - 11. All required options are covered (1)
- Documents the testing procedure (1)
  - 12. Testing can be carried out by anyone (1)
- Provides a reference (1)
  - 13. When testing is carried out it can be referenced back to the plan (1)

### **reasons why alpha testing is important.**

- Testing carried out by developer (1)
  - 14. Developer has some knowledge that their system works (1)
- Tests all the parts of the system (1)
  - 15. It is known that the individual parts work as the developer expects (1)
- Ensures that the systems generally works before release outside the company (1)
  - 16. Ensures that product meets requirements(1)

### **reasons why beta testing is important**

- Testing carried out by potential end users (1)
  - 17. Who are likely to use the system in unpredicted ways (1)
- Provides a more extensive method of testing (1)
  - 18. A wider variety of issues with the system are likely to be highlighted (1)
- Acts as a useful marketing tool (1)
  - 19. By letting reviewers test the system, this is a source of relatively cheap advertising (1)

### **methods a company can use to distribute a solution to a problem/distribute a software update for a program that has been found to have a bug in it**

- 1 mark for HOW to provide the fix, and 1 mark for a reason/ expansion.
- Post software patches on their website (1)
  - 20. so that those affected can download and install the patch (1)
- Send out CD-ROM/ floppy disks/e-mail containing the software patch(es) (1)
  - 21. to users that have registered for this support/ users that have informed the company of the problem (1)
- Release a new version of the software (1)
  - 22. so that future users are not affected (1)
- Product recall (1)
  - 23. so users get a 'fixed' version of the software (1)
- Have fix available to anyone who wants it (1)
  - 24. e.g. keep supplies of CD-ROMs at certain locations (1)      2 × (2,1,0) marks

## Description of the process of testing that would happen before a new software package is released to the general public.

- First alpha testing (1)
  - 25. testing done by the development company itself (1)
  - 26. unit and system testing (1)
  - 27. using a restricted test data set (1)
  - 28. to make sure that all the components work together as expected (1)
- afterwards, beta testing (1)
  - 29. testing done by a select number of end-users (1)
  - 30. user acceptance testing (1)
  - 31. using real data in a real environment /using the software in unexpected ways (1)
  - 32. to get feedback to fix/enhance/improve the software (1)

## Reasons why newly released software may crash, despite testing

- Software is complex (1)
- even after release it still may be used unexpectedly (1)
- Combination with other hardware or software (1)
- conflicts causing unexpected problems (1)    2 × 1 mark

## reasons why maintenance releases may be required

- corrective maintenance (1)
  - 33. in order to fix logical errors in the software (1)
  - 34. example in context e.g. misinterpreting graphic file type (1)
- adaptive maintenance (1)
  - 35. in order to deal with changes that may affect use of the software (1)
  - 36. example in context e.g. introduction/change to 'standard' graphics file formats (1)
- perfective maintenance (1)
  - 37. in order to add extra functionality to the software (1)
  - 38. example in context e.g. add rotate function (1)    3 × (2,1,0) marks

## Description of *alpha* and *beta* testing

### **Alpha**

- carried out by developer / designer / in house (1)
- systematic testing (any good description / terminology) (1)
- against expected outcomes / test plan (1)
- ensures that system performs correctly before release outside the company (1)
- ensures that product meets requirements specification (1)

### **Beta**

- carried out by potential end users (1)
- who have volunteered / been invited (1)
- who are likely to use the system in unpredicted ways (1)
- live data used (1)
- in a variety of operating environments / platforms / hardware / software (1)
- a wider variety of issues with the system are likely to be highlighted (1)

- acts as a useful marketing tool / by letting reviewers test the system, is a source of relatively cheap advertising (1)
- to provide developer with feedback on software (1)

## reasons why an OS may still function incorrectly, even if it has been tested thoroughly

- Reason for failing (1) description / expansion (1)
- cannot be tested with every combination of hardware/ software available (1)
  - 39. so new software may cause established systems to fail or vice versa (1)
- hardware specification inadequate (1)
  - 40. insufficient RAM / processor speed (1)
- software tends to be complex (1)
  - 41. so every single part of a system will not have been tested with every other part (1)
- new software may not be able to use old file formats / data (1)
  - causing the company to have to re-enter data (1)
- user uses the software in a way that has not been considered (1)
- causing the software to behave in an unusual way/ unexpected results (1)

## reasons why the maintenance releases may be necessary

- Difficult to make alpha tests complete (1)
- Software house cannot know all users' experiences on beta tests (1)
- Testing Software is complex (1)
- May receive unexpected uses (1)
- May be in new software environment (1)
- May be in new hardware environment (1)
- 

to fix errors (1)	system does not behave as expected when large files are opened / corrective maintenance (1)
to deal with changes affecting the software (1)	protect against new security threats / adaptive maintenance (1)
to add extra functions (1)	wizard for handling mobile phone connections / perfective maintenance (1)

## 14.10 Portability of Data

### Distinct ways in which standards can arise within the ICT industry

- Formal/ de jure standards (1)
  - set by professional bodies/ governments/ official bodies and then passed on to the industry (1)
- De facto standards (1)
  - arisen through historic precedent/ sales success i.e. through popular choice (1)

### Ways by which data can be transferred between different software applications on the same computer system

- Standard data formats/a recognisable example of a standard file format e.g. .jpeg, .mp3, gif/Import and Export (1)
- OLE/DDE (1)
- Copy and Paste /Drag and Drop (1)

### Ways by which data can be transferred between different computer systems.

- Compatible media formats/example of a standard format
  - e.g. ISO CD-ROM, ZIP disks. (1)
- E-mail file attachments (1)
- Sharing over a network/example of a network
  - e.g. LAN, WAN (1) 2 × 1 mark

### Reasons why protocols are necessary

- enable communication / the proper transfer of data between devices (1)
- facilitate open systems (1)
- specify data formats (1)
- specify control signals (1)
- minimise communication errors (1)

### Rasons for having standards for the operation of the Internet

- so devices are configured the same (1)
- enable communication (1) (not if given in b)
- enable open systems / different manufacturers devices compatible (1)
- different software can read data (1)
- different hardware can read data (1)
- provide error detection/correction (1) (not if given in b)

### Definition of a *de facto* standard

- Arise through historic precedent – either through sales success or popular choice (1)
- They are adopted without formal acceptance by professional / official bodies
- Eg. Using shortcut like ctrl+O ctrl+s to open and save files.(1)

### Why modems are required for data transmission

- Data stored on computer systems is normally digital (1),
- Some data links between systems are analogue (1),

- Eg telephone lines (1),
- Modem performs translation between digital and analogue (1)

## What are protocols, and why are they required

- Protocols are a set of rules (1)
  - covering standards for:
    - physical connection,
    - cabling,
    - mode of transmission,
    - speed,
    - data format,
    - error detection,
    - and error correction
- Protocols are needed to allow equipment from different suppliers to be connected (1)
  - and to encourage development of more open systems (1)
  - and to allow the proper transfer of data between devices (1)

## The seven layers in the OSI model

- physical layer
- Application layer
- Presentation layer
- Session layer
- Network layer
- data-link layer
- transport layer

## The role of the physical layer

- The physical layer is concerned with:
  - mechanical connections (1) ,
  - electrical connections (1)
  - and procedures for connecting devices (1)
    - E.g. Number of pins a network connector should have (1)
    - And how each pin is wired (1)

## Why a printer driver is necessary

- Printer driver translates document into a form usable by the printer (1)
  - e.g. deals with margins/ fonts/ paper sizes/ etc. (1)
- enables communication between printer and OS/ application package (1)

## What does the “http” part of a website address represent?

- The protocol being used (1)

## Why Internet addresses are important for the correct functioning of the Internet

- Needs to be unique so that only one machine is identified (1)
- if more than one machine has the same address, data cannot be routed towards it (1)  
Provides a consistent way to refer to a specific machine (1)
- formal standard for addressing (1)

- hierarchical addressing scheme (1)
- DO NOT accept answers about URLs – question specifically asks about IP addressing.

## **Why a Uniform Resource Locator/http address is used to provide access to specific systems/website over the Internet, instead of an address**

- Points to a specific website/ unique website identifier (1)
- Maps to an IP address for a target device (1)
- Is in human readable form/ is more understandable for humans (1)
- Is more memorable/ more likely to be remembered (1)
- Can be redirected to map to changing IP addresses (1)

## **Definition of the term *protocol* in relation to networking**

- A set of rules (1)
  - that defines how devices communicate over a network (1).

## **Why standards are important for communication over the Internet**

- provides an addressing mechanism so devices can be uniquely identified (1)
- ensures that all devices are set up in similar ways (1)
- provides error detection and correction mechanisms (1)
- provides for a reliable connection between devices (1)
- allows for open systems/ no reliance on one manufacturer (1)
- mentioning the use of appropriate protocols e.g. TCP/IP (1) 3

## **Why standard data representations are needed for networking and the Internet**

- to allow different software to understand the data (1)
- to allow different hardware platforms access to the data (1)
  - e.g. HTTP, MP3, GIF (1)

## **reasons why PDF is selected as the format in which to provide specifications for subjects**

- standard for document sharing on the web (1)
  - organisation cannot guarantee the system type that viewers will have (1)
  - software to read the document is freely available (1)
- formatting is retained... (1)
  - ...e.g. logos/forms/fonts (1)
- content can be copied and pasted into other applications (1)
  - content of this document format is easily accessible but harder to change (1)

## **The role of IP addresses in the functioning of the Internet**

- uniquely identifies single machine (1)
- if more than one machine has same address, data cannot be routed towards it (1)
- provides a consistent way to refer to a specific machine (1)
- formal standard for addressing (1)
- hierarchical addressing scheme (1)

## **Benefits to the college staff of using the URL**

- staff find it more readable/ understandable than IP address (1)
  - well-chosen name easier to recognize than numbers (1)
- staff more likely to remember (1)
  - don't have to remember IP addresses (1)
- staff able to view selected information (1)
  - points to a specific web page / website (1)
- staff don't have to be aware of changing IP addresses (1)
  - can be redirected (1)

## **benefits to a company of offering training and assessment across their entire organization over the internet**

- Training is consistent across the company (1)
  - irrespective of physical location (1)
- Able to move staff around (1)
  - without need for retraining/ they can continue current training (1)
- Able to change content at one time (1)
  - so that latest training is available to employees (1)
- Quality Assurance (1)
  - easy to track online assessment and see if there are areas to work on (1)
- Cost benefit (1)
  - e.g. no need to employ an instructor to deliver the courses/ no need to send staff on courses
- Time factor (1)
  - employees can train during quiet periods for the company (1)

## **benefits to an employee of having training and assessment done over the internet**

- Access to curriculum all the time (1)
  - so missed sessions can be caught up with (1)
- Instant feedback on assessment (1)
  - so that weak areas can be addressed immediately (1)
- Ability to work at own pace (1)
  - so misunderstood parts can be repeated over and over until they are understood (1)
- Stimulating learning environment (1)
  - some people do not learn well in a classroom situation/ very hands on approach (1)
- Ability to work for different sites (1)
  - so training can be carried out when convenient to the student not the trainer (1)

## **Factors that should be considered when planning an online training system considering interaction of the employee**

- User friendliness
- ICT literacy of the student
- Use of shortcuts
- Familiar/ meaningful icons
- Consistent layout
- Informative response from system/ error messages
- Forgiveness (system has to cope with 'odd' responses)
- Feeling of control - employee controls system not the other way around