A2 MODULE 5 (ICT5) 14.5 HUMAN COMPUTER INTERACTION

• *Describe the physical factor which effect human / computer interaction;*		
screen is always visible	*not facing window*	*space required by user*
colour schemes suited to environment.		

• *Describe the psychological factors which effect human / computer interaction*		
user friendly	*give help to novices*	*provide short cuts for experts*
make use of human long term memory to maximise efficiency.		

Chapter 61

http://goanna.cs.rmit.edu.au/~ghassan/what_is_hci.html	Psychological
http://www.cdc.gov/od/ohs/Ergonomics/compergo.htm	Ergonomics

Computers in the workplace p.331

Ergonomics is ' the study of efficiency of workers and working arrangements'
Ergonomics is the design and functionality of the environment. The whole office environment should be studied to see how it can be made more comfortable, safe and productive.

The problem

If workstation facilities and the working environment are inadequate,
- Computer users will tend to be inefficient
- May suffer from general fatigue and boredom
- Health and safety issues

Maintaining a safe and healthy working environment is of course not only a legal requirement; enthusiastic staff are effective staff and poor working conditions do much to destroy morale and motivation.

Simple ways of increasing motivation include having

- Comfortable seats
- Leg room
- Regular breaks
- An adjustable terminal
- Good lighting - rooms should be neither over-lit nor under-lit
- Persuading staff to tidy their desks or rearranging furniture so that there are no trailing cables, and so on.
- Furniture - should be comfortable and adjustable. Poorly designed chairs can be responsible for back trouble. Chairs at the wrong height can be responsible for RSI. Short people are legally entitled to ask for a footrest.

Workstation Design

Depends on **WHO** (gender, physical or mental handicap, age range, height, build and **HOW** (transcription method, side-by-side working, mouse use etc)

Furniture and Computer equipment-

- **Work surface** is there enough thigh clearance? Can someone sit cross-legged? A matt surface will avoid screen reflection. Height and area of workstations need to be considered for comfort.
- **Document holders** will reduce eye movement

- **Chair movement** A footrest, height and back support is required, particularly lower back support.
- Quality and position of **screen display**. Clarity can deteriorate with age. Correct adjustment of contrast and brightness controls. Not facing window.
- **Lighting**. Try to avoid glare and reflection on screen
- **Cabling**. Loose cabling can be a hazard
- **Floor covering** Carpets are more 'comfortable' and will absorb noise, will also restrict slippage of chairs on castors
- **Static electricity** can be caused from carpets with a high proportion of synthetic material. An anti-static mat will earth a person.

Office and Workstation Layouts

- Staff or computers should not have to experience extremes of temperature i.e. neither next to draughts or to radiator
- Screens should protect systems from direct sunlight
- Sufficient space should be provided for staff to move around without moving equipment or furniture
- A sensible colour scheme should be adopted so that the working environment is pleasant and relaxing. Colour clashes should be avoided.
- Fire exits and access to fire-fighting equipment is required.
- Maintenance of equipment should be systematic.
- The interface should be user-friendly so that the operator can feel confident in using the system. User confidence can be enhanced by providing on-line support and help screens.
- Expert users can become frustrated if they are slowed down by methods designed for novice users. Short cuts - e.g. hot keys should be provided for expert users.
- The system should make use of human strengths so that the operator feels valued and competent and also to increase efficiency. The operator might, for example, be able to set up a more efficient search query by adding additional criteria based on previous experience and understanding. This makes use of the human ability to remember and interpret data

Memory p.332

Short-term memory can be improved by remembering patterns.
Long-term memory is less likely to be forgotten.
A guiding principle for good interface design is not to contradict our mental image of how things should be e.g. red means danger, green means go.

Psychological Factors p.331

Psychological factors include intuitiveness, ease-of-learning, methods of alerting the user (vision or hearing).

Understanding how we receive, process and store information can be used to design effective and user-friendly systems.

Humans receive information through the senses

Possible Problems

- In traditional communication head nods, smiles, eye contact, distance, tone of voice, etc give speakers and listeners information on how to use exchanges.
- Social influence is weakened - hugs, screams and kisses.
- Software is blind with respect to the vertical hierarchy in social relationships and organisations - charisma counts for less?
- Is electronic communication depersonalising?
- Lack of distinction between conventional time boundaries between office and home - pagers, mobile phones, e-mail.

Software and Hardware considerations

- Is the system suitable to the task?
- Is the system User friendly?
- Is appropriate documentation available?
- The eye is less sensitive to blue light than to red or green, therefore, important information shouldn't be displayed in blue text. Many people are colour blind, especially between red/green, therefore, an interface shouldn't depend on everyone being able to distinguish between colours.
- Humans respond more quickly to sound than to visual stimuli, therefore, sound effects can be used to give prompts e.g. a sound effect can be played to alert the user that he has received a new message.
- Touch
- Movement

People who work with the system

- Were they involved in the systems design and development ?
- Is there top management support and backing?
- Were they Involved in decision making?
- Are people sure of their status? - use of Industry Structure Model to provide structure?
- Are Codes of Conduct and Disciplinary procedures clearly set out and understood by all?

Staff development

- Has adequate training been provided? Consider the level of training i.e. Is help given to novices? Are short cuts provided for experts?

EXAMINATION QUESTIONS

1997.7 (12 marks)
(a) Give **SIX** of the physical and psychological factors, which govern how people interact with computer systems. (6)
(b) Give three factors, which should be considered when providing a sophisticated human computer interface, explaining the impact of each one on the system's resources. (6)

(a*) We would like to see a 3-3 split here but accept up to 4-2 in either direction.*
- *Physical factors: Max. 4 @ 1 each from : position of screen, lighting conditions, seating conditions, choice of colour schemes, etc., ergonomics/design of mouse/keyboard ventilation/room temperature*
- *Psychological factors: Max. 4 @ 1 each from : user friendly interface(qualified), help available for novice users, short cuts for expert users, make use of human long term memory to maximise efficiency, functionality, technophobia*
 (b) Three points. In each case:
for the factor (1) for a clear explanation of its impact on systems resources (1)
NB: More than one of the resource implications: a greater demand for memory/IAS/backing store and processor functionality and time/speed, might apply to the same factor of the H.C.I. However, candidates can only gain 1 mark for the resource implications of each factor.

1999.7 (12 marks)
A supermarket chain has recently implemented a new stock control system in each of its branches. This has affected those staff who have not used computer systems before. Many of the staff have described the system as being 'user friendly'. However, when the package was implemented in one particular store, it was not well received by its staff.
(a) Give **four** features of software packages, that would merit the description 'user-friendly'.
(b) Both physical and psychological factors can influence how people interact with computer systems. Both may have contributed to the poor reception of this system in that store.
(i) Describe two such physical factors.
(ii) Describe two such psychological factors.

7 (a) intuitive to use (1) *ability to customise tool bars/menus (1)* *context sensitive help (1)* *effective use of colour/sound to assist users (1)* *effective diagnostic messages on screen (1)* *any 4*1=4*	*command, menus etc in familiar places on screen –similar menu structure to other packages (1)* *help readily available on- line (1)* *short cuts available for expert users (1)* *use of wizards to assist with complex tasks (1)* *Well suited to task- not unnecessarily complicated (1)*
7 (b) (i) Physical factors:	
position of screen/ lighting (1) - always visible/not facing *window/avoiding glare or reflections (1)* *ergonomics of hardware (1) problems such as RSI, mention of* *keyboard design or wrist rests, etc. (1)* *arrangement of seating (1) -adjustable level of chair (1)*	*work patterns (1) ability to take frequent breaks (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) Etc.*

(ii) Psychological:	
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 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 (1)* *Sound effects associated with tasks (1) initially helpful could become irritating (1), etc.*	*Different background or experience (1) -These users may have used a* *different previous system to those in the other store (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)*

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a. Describe **two** factors that need to be considered when designing for human/computer interaction. (4 marks)

b. Describe **two** resource implications of providing an effective interface. (4 marks)

c. Some users may customise their interface. Describe **one** consequence this may have for support staff when providing technical assistance. (2 marks)

a.

Give one mark for a factor, and one mark for a relevant reason. Only credit the reason where it supports the factor and is relevant to the context and is ICT specific.

Do not accept environmental factors. All factors should address issues related to input / process / output to an ICT system.

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 customise 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
b. Give one mark for a factor and one for a related reason. Do not credit the same reason twice for different resource requirements, e.g. 'large graphic files...' being given as a reason for two different resources will only gain 1 mark.	
Capacity of Backing Store/Hard Disk	*Operating system (OS) will consist of large graphics Drive files that require Comprehensive help systems will have a large number of files to be stored. Storing* *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.* *Documents created my 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 where 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.* *DO NOT CREDIT TERMS PROCESSING POWER OR MEMORY WITHOUT QUALIFICATION*
c. 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)*	