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SUMMARY OF CIT353 WITH PAST QUESTIONS

«Human-computer interaction is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them».

Overview

On the machine side, techniques in computer graphics, operating systems, programming languages, and development environments are relevant.

[...]

– Design systems that minimize the barrier between the human's cognitive model of what they want to accomplish and the computer's understanding of the user's task. Part of research in human-computer interaction involves exploring easier-to-learn or more efficient interaction techniques for common computing tasks.

The computing perspective of interaction technique

Here, an interaction technique involves one or several physical input devices, including a piece of code which interprets user input into higher-level commands, possibly producing user feedback and one or several physical output devices. Consider for example, the process of deleting a file using a contextual menu.

The user view of interaction technique

Here, an interaction technique is a way to perform a simple computing task and can be described by the way of instructions or usage scenarios. For example «right-click on the file you want to delete, then click on the delete item».

The conceptual view of interaction technique

Here, an interaction technique is an idea and a way to solve a particular user interface design problem. It does not always need to be bound to a specific input or output device. For example, menus can be controlled with many sorts of pointing devices. Interaction techniques as conceptual ideas can be refined, extended, modified and combined.

In general, a user interface can be seen as a combination of many interaction techniques, some of which are not necessarily widgets. Interaction techniques that share the same metaphor or design

principles can be seen as belonging to the same interaction style. Examples are command line and direct manipulation user interfaces. More details are provided in subsequent chapter of this guide.

The world wide web Ubiquitous Computing

The study of paradigms is concerned and how that usability can be demon The history of interactive system des Paradigms of interaction conceptuall the human-computer relationship.

[...]

This was followed by another paradi The graphical display was an innovat devices. Ubiquitous computing can be regard The image cannot be displayed. Your computer may not have enough memory to open the image, or the image may have been corrupted. Restart your computer, and then open the file again.

If the red x stil appears, you may have to delete the image and then insert it again.

Personal computing

The era of personal computing came on board in 1970s with the introduction of the Papert's LOGO language for simple graphics programming by children. This system became popular as it became easier to use. The era of computing in small but powerful machines dedicated to the individual was witnessed such as was demonstrated by Kay at Xerox PARC with the Dyna-book as the ultimate personal computer.

The Window systems and the WIMP interface

This became a reality in 1981 with the Xerox Star as the first commercial windowing system comprising windows, icons, menus and pointers as familiar interaction mechanisms.

Direct manipulation

In 1982, Shneiderman improved upon direct manipulation of objects on the computer by introducing a graphically-based interaction of visibility of objects. This provided incremental action and rapid feedback, its reversibility facility encouraged exploration and syntactic correctness of all actions. It replaced language with action.

In 1984 using the Apple Macintosh , the model-world metaphor 'What You See Is What You Get

' became popular. The direct manipulation interface replaced underlying system of language paradigm and interface as mediator. In mid 1960s, Ted Nelson described hypertext as non-linear browsing structure. It comprises simple, universal protocols and mark-up languages that made publishing and accessing easy.

It allowed emancipation of critical mass of users that led to a complete transformation of our information economy. Applying hypertext technology to browsers allows one to traverse a link across the world with a click of the mouse. 5. The use of a mouse for graphics was demonstrated in NLS .

Xerox PARC's Bravo was the first WYSIWYG editor-formatter developed in 1974. It was designed by Butler Lampson and Charles Simonyi who had started working on these concepts around 1970 while at Berkeley.

Spreadsheets: The initial spreadsheet was VisiCalc which was developed by Frankston and Bricklin between 1977 and 1978 for the Apple II while they were students at MIT and the Harvard Business

The solver was based on a dependency-directed backtracking algorithm by Sussman and Stallman at the MIT AI Lab.

Crowther at BBN, and Don Woods developed this into a more sophisticated Adventure game at Stanford in

1966 Conway's game of LIFE was implemented on computers at MIT and Stanford in 1970. Sketchpad used light-pen gestures . Teitelman in 1964 developed the first trainable gesture recognizer. It was quite common in light-pen-based systems to include some gesture recognition.

A gesture-based text editor using proof-reading symbols was developed at CMU by Michael Coleman in 1969. Interactive Graphical Documents project at Brown was the first hypermedia system, and used raster graphics and text, but not video between 1979 and 1983. The Movie Manual at the.

D: The first

Larry Roberts was an ultrasonic 3D location sensing system, developed at Lincoln Labs in 1966. That system also had the first interactive 3-D hidden line elimination. An early use was for molecular modeling. Also, the military-industrial flight simulation work of between the 60's and the 70's led the way to making 3-D real-time with commercial systems from some firms.

Doug Engelbart's 1968 demonstration of NLS included the remote participation of multiple people at various sites. Electronic mail, still the most widespread multiuser software, was enabled by the ARPAnet, which became operational in 1969, and by the Ethernet from Xerox PARC in 1973. Most of today's applications are implemented using various forms of software tools.

UIMSs and Toolkits: The first User Interface Management System was William Newman's Reaction

Most of the early work was done at the university of Toronto, George Washington University and Brigham Young University. Early window managers such as Smalltalk developed in 1974

and InterLisp, both from Xerox PARC, came with a few widgets, such as popup menus and scrollbars. The Xerox Star of 1981 was the first commercial system to have a large collection of widgets. The Apple Macintosh was the first to actively promote its toolkit for use by other developers to enforce a consistent interface.

The Steamer project at BBN carried out between 1979 and 1985 was probably the first object-oriented graphics system. Trillium was developed at Xerox PARC in 1981. Another early interface builder was the MenuLay system and was developed by Bill Buxton at the University of Toronto in 1983. The Macintosh in 1984 included a «Resource Editor» which allowed widgets to be placed and edited.

Jean-Marie Hullot created «SOS Interface» in Lisp for the Macintosh while working at INRIA in 1984.

Component Architectures: The idea of creating interfaces by connecting separately written components was first demonstrated in the Andrew project by Carnegie Mellon University's Information Technology Center in

Electronic mail is most prominent success of Computer Supported Cooperative Work.

Agent-based Interfaces

It involves direct manipulation using the WIMP interface. Commands are performed on «world» representation and it is action based. The agents return to the language by instilling proactively and «intelligence» in command processor. Example is found in Avatars, a natural language processor.

Ubiquitous Computing

Virtually all software written today employs user interface toolkits and interface builders, concepts which were developed first at universities. Computers will communicate through high speed local networks, nationally over wide-area networks, and portably via infrared, ultrasonic, cellular, and other technologies. Data and computational services will be portably accessible from many if not most locations to which a user travels.

Sensor-based and Context-aware Interaction

Humans are good at recognizing the «context» of a situation and reacting appropriately. Some of these paradigm shifts can be traced in the history of interactive technologies as outlined. Its study requires the knowledge of computer graphics, operating systems, programming languages, cognitive psychology, and human performance among others. The study of HCI paradigms concerns its development while the history concerns the understanding of the paradigm shifts.

The unit has looked at the concepts and techniques of HCI, the history of paradigm shifts, the history of basic interactions and the personalities behind the innovations of HCI.

Explain what you understand as the paradigms of human Computer interaction

Explain any 5 innovations relating to the history of paradigm shifts of Andrew Sears and Julie A. Jacko .

Nature of Interactivity

If we use different devices, then the interface will support a different style of interaction. This unit sets out to remind you of the various nature of human-computer interaction that you may have normally come across.

O P

Most of these common text input devices allow rapid entry of text by experienced users and usually connected by cable but can also be wireless.

An example of QWERTY arrangement is shown above

Alternative designs however allow faster typing but large social base of QWERTY typists produces reluctance to change.

[...]

This has common letters under dominant fingers with bias towards right hand. Common combinations of letters alternate between hands resulting in 10-15% improvement in speed and reduction in fatigue. Expectedly, large social base of QWERTY typists produce market pressures not to change.

Special keyboards

These are designed to reduce fatigue for RSI and also for one handed use. Example is the Maltron left-handed keyboard shown above.

[...]

This allows typing as if single key for each letter. It uses dictionary to 'guess' the right word
Numeric keypads These are also developed for easier human computer interaction since they provide the means of entering numbers quickly. They could be found in calculators, PC keyboards and telephones.

Telephone Calculator

If you compare your phone keyboard with your calculator keyboard, you would notice the difference as shown above.

Cursor keys

The keys are very, very cheap, but slow and provide basic motion for text-editing tasks. There is no standardised layout, but inverted «T» that is most common with discrete positioning controls. 3 Handwriting, Speech Recognition and other Devices Handwriting Recognition.

[...]

They are commonly used in PDAs, and tablet computers.

The speech recognition is improving rapidly and is most successful when a single user has initial training

External noise interfering, imprecision of pronunciation, large vocabularies, and variation effects due to it has two characteristics, the planar movement and the buttons.

Mechanical

Usually from Ito 3 screen cursor is oriented in x.

[...]

It has two dials for X-Y cursor positioning.

Joystick and keyboard nipple

Touchpad These are small touch sensitive tablets with 'stroke' to move mouse pointer used mainly in laptop computers.

[...]

Stylus is a small pen-like pointer to draw directly on screen which may use touch sensitive surface or magnetic detection.

It is used in PDA, tablets PCs and drawing tables

Digitizing tablet This is a mouse like-device with cross hairs used on special surface and it is rather like stylus.

It uses laser beam reflected off retina at a very low power laser!

They have cursor pads or mini-joysticks with discrete left-right and up-down movement used mainly for menu selection.

Health hazards of CRT!

The Intensity is dependent on distance and humidity and this can cause rashes to the user. Electromagnetic fields between 50Hz and 0.5MHz create induction currents in conductive materials, including the human body.

[...]

They are found on PDAs , portables and notebooks, and increasingly on desktop and even home TV. Bottom plate reflects the light that passes through the top plate and crystal, and reflects back to user's eye. The voltage applied to the crystal changes polarisation and hence the colour. The light from the display is reflected and not emitted and so causes less eye strain.

Special displays of LCD

The lines need to be constantly redrawn.

[...]

The video walls contain lots of small screens together and has projected RGB lights or LCD projector.

[...]

Sounds are beeps, bongs, clonks, wh confirmation of actions e.g. key click.

However, current technology in text

BMW iDrive This is used for controlling menus wi options by feel.

The following elements of interaction are provided by the print technology

Printing This is an image made from small dots. It allows any character set or graphic to be printed. Critical features are resolution expressed in size, spacing of the dots in dots per inch . Speed is usually measured in pages per minute.

They have line of pins that can strike the ribbon hence dotting the paper.

Dot matrix printer uses same print head for several paper rolls; may also print cheques

They are used in some fax machines.

Fonts

Size of a font is measured in points , about related to its height.

Serif fonts: helps your eye on long lines of printed text but sans serif is often better on

screen Page Description Languages

Description languages can convert all into a bitmap and send to the printer. Using a page description language sends a description of the page for example, instructions for curves, lines, text in different styles, etc. can be sent.

[...]

Scanners are used in desktop publishing for incorporating photographs and other images. They are used in document storage and retrieval systems thereby doing away with paper storage.

Optical Character Recognition

Optical character recognition converts bitmap back into text with different fonts creating problems for simple «template matching» algorithms. Paper-based interaction Paper is usually regarded as output only but can be input too in OCR, scanning, etc. operations.

Xerox Paper Works is a paper based interaction that involve glyphs containing small patterns of /WW//WWW

Special 'pen' can read locations to know where they are writing.

Exists in form of short term and long term

One needs to have knowledge of the characteristics of a particular memory for an effective and valuable interaction.

Short-term Memory

Most RAMs have 100 nano-second access time and are usually volatile, losing information if power is turned off.

Some non-volatile RAMs are used to store basic set-up of information

Optical disks that use lasers to read and sometimes write.

They include CD-ROMs that have same technology as home audio, with storage capacity approximating

PDAs that often use RAM for their main memory.

Virtual memory

Each program could be very large but with insufficient RAM size to run it, hence the need for the use of Virtual memory. The solution provided by Virtual memory is to store some programs temporarily on disk thereby making RAM appear bigger. Compression This is the reduction in

the amount of storage required. Here, the exact text or image is recovered e.g. as in GIF, ZIP formats.

Methods of access

Whatever is indexed is what can be accessed. Simple index needs exact match.

[...]

There is finite speed applicable to processing which is also governed by Moore's law. There are also limits of interaction both in single user and networked computing.

Finite processing speed

Designers tend to assume fast processors and therefore make interfaces more and more complicated.

Moore's law The Moore's law observes that computers get faster and faster!

PC in 1987, speed was 1.5 Mhz, up till 2002 when the speed became 1.5 GHz.

Maximum Hard disk requirement in 1991 was 20 Mega bytes but rose in 2002 to 30 Giga bytes
The myth of the infinitely fast machine

The implicit assumption here is that there are no delays in processing on an infinitely fast machine.

[...]

In 1971, the sites increased to 2³. In 1984, it became 1,000 and in 1989, it increased to 10,000 .

[...]

The knowledge of the computer systems and the types of user interface devices such as the text entry, hand writing and speech recognition, pointing and drawing, display and storage together with the kind of network facilities have their individual impacts on human computer interactions.

Mention 2 advantages and 2 disadvantages of the touch sensitive screen interface

Explain the characteristics of the eye gaze interaction.

[...]

The usefulness of the WIMP Interface.

[...]

Gulf of Execution that evaluates the user's formulation of actions where actions expectation of changed system state represent errors which may be slips and mistakes.

[...]

Ending interaction are that interaction is not components involved in interaction should be allowed. The framework also consists of electronic identified.

Examples of Ergonomics include

Surrounding environment such as the seating arrangements adaptable to cope with all sizes of user, health issues such as the physical position, environmental conditions, lighting, and noise. Use of colour such as the use of red for warning, green for okay, and awareness of colour-blindness etc. The user interacts with real world through interface issues, feedback and delays.

[...]

The interface is better designed for expert users than novices because it offers direct access to system functionality. A typical example is the Unix system command line interface. Menus is a set of options displayed on the screen. The Menu Options are visible, it has a less recall characteristic that make it easier to use.

The visible options rely on recognition so the names should be meaningful. The selection is done through numbers, letters, arrow keys, mouse and/or combination of any of them e.g. mouse plus accelerators. Often, the options are hierarchically grouped. But sensible grouping is needed.

Menus are restricted form of full WIMP system. Problems with in this kind of interaction are that the language may be vague, ambiguous, and hard to be recognised. Design solutions to language interface problems are for the user to try to understand a subset and pick on key words. These comprise question and answer interfaces in which the user is led through interaction via series of questions.

Though with restricted functionality, this kind of interface is suitable for novice users. It is often used in information systems. Query languages This is used to retrieve information from database. Form-fills are primarily designed for data entry or data retrieval.

It is a screen like paper form to which data is put in relevant place.

See illustration below

The user can enter and alter data in spreadsheet to maintain consistency. The first spreadsheet introduced was VISICALC, followed by Lotus 1-2-3.

The interface is the default style for majority of interactive computer systems, especially PCs and desktop

Elements of the WIMP interface The elements include windows, icons, menus, and pointers. In some other cases they may be buttons, toolbars, palettes, and dialog boxes.

The combination of the appearance and the behaviour is the 'look and feel'

They can contain text or graphics and can be moved or resized. They can overlap and obscure each other, or can be laid out next to one another Icons are small pictures or images that represent some object in the interface. Windows can be 'iconised' that is closed down. Icons can be many and various.

They can be highly stylized with realistic representations. The required option is selected with the pointer. However, this takes a lot of screen space i. Pie menus are arranged in a circle such that it is easier to select item over larger target area.

Selection is also quicker because it can move same distance to any option.

[...]

They are activated by the use of mouse, track pad, joystick, trackball, cursor keys or keyboard shortcuts.

Title bars describe the name of the window These are information windows that pop up to inform of an important event or requested information, for The interactivity of dialogue boxes

They are easy to focus on look and feel. These are virtual reality 'ordinary' window systems highlighting visual affordance.

+ System reflects back its understanding «you want a ticket from New York to Boston?»

Three-dimensional graphics are currently mostly used in computer games, art and computer-aided design . Sun's Project Looking Glass. A three-dimensional computing environment could be used for collaborative work. For example, scientists could study three-dimensional models of molecules in a virtual reality environment, or engineers could work on assembling a three-dimensional model of an airplane.

Another branch in the three-dimensional desktop environment is the three-dimensional GUIs that take the desktop metaphor a step further, like the BumpTop, where a user can manipulate documents and windows as if they were «real world» documents, with realistic movement and physics. The Zooming User Interface is a related technology that promises to deliver the representation benefits of 3D environments without their usability drawbacks of orientation problems and hidden objects. It is a logical advancement on the GUI, blending some three-dimensional movement with two-dimensional or «2.5D» vector objects. These issues and concerns involve all possible interactions between a user and a system during its lifecycle, including the development stage, use in context, and the impact of such use on

individuals, organizations, society, and future systems development.

Context Analysis Context analysis includes understanding the technical, environmental and social settings where the information systems will be used. It examines whether and how the interaction between physical and social environment and the physiological and psychological characteristics of the user would impact users interacting with the system. Overall, context analysis can provide ideas for design factors such as metaphor creation, selection and patterns of communications between users and the system. These environments provide different levels of lighting, crowdedness, and noisiness.

Interactions are also affected by other social and organizational context as follow

Existing inadequate systems that may cause frustration and lack of motivation The organizational, social and cultural context in which humans interact with IT is largely the result of the broad adoption of IT by organizations and society to support organizational functions and goals and to enhance society's development. This assertion is in line with the issues of determining IT values in organizations and societies. While each of these HCI concerns may have its own importance in different situations in relation to human motivation, it would be helpful for designers to see an overview picture of the potential HCI concerns and goals. The knowledge of the basic components of human computer interaction aids in giving direction, focus and human considerations pertaining to interactive design.

There are variations of interaction models of the interface established between the user and the computer system. These models are presented as a loop in the execution and evaluation of an interactive design.

[...]

These are innovations that improve upon the user interface, particularly those innovations benefiting the disabled. Technologies such as the phonetic typewriter, the ear cons, the auditory icons, the recognition and gesture devices for the disabled and the elderly are described.

[...]

They are used in a range of applications particularly for users with special needs and virtual reality.

[...]

We can ideally utilise the Computers to use all the available senses but this becomes practically impossible because computers rarely offer such a rich interaction. We can use the sight, sound, and sometimes the touch senses, but we cannot yet use the taste and smell.

Simple terminologies used to describe speech

The structure of speech is called phonemes and there are 40 of them. The phonemes as basic

atomic units that sound slightly different depending on the context they are in, the larger units of phonemes are the a a l o l u.

[...]

For This is developed for Finnish - a phonetic language. When recognising speech, the sounds uttered are allocated character for that output is printed.

[...]

Its great potential value however manifests when users hands are already occupied as in driving or during s, stress, pauses and pitch. Syntax is the term used for the structure of sentences while semantics is the collective term used for the semantics are also needed.

However, it has its own problems similar to speech recognition particularly in pro can arise from intrusion calling the n transient nature is a problem when i'

Few examples occur in screen reade impaired people. Also in warning sig and haptic skills are already fully occ eed for headphones particularly due to nois t becomes harder to review and browse. Nd can be used as a ion, window active, disk t and background status information e.g. So osh. Also, almost any user action can have a different sound associated w ith it.

Op have associated sounds. For example, fol id being poured into a receptacle while rising pitch indicates the ders have a papery noise ller ones. Earcons are easily grouped and refined due to compositional and hierarchical nature. It is harder to associate with the interface task since there is no natural mapping.

Touch recognition

Haptic interaction made up of cutaneous perception that provide tactile sensation and vibrations on the skin ii. Large tablets available are suitable for digitising maps and technical drawings. Smaller devices, some incorporating thin screens are used to display the information. Such include PDAs such as Palm Pilot and tablet PCs.

The problems associated with handwriting recognition are personal differences in letter formation and coarticulation effects.

The technology is usable even without training though many people prefer to use the keyboards!

This can be found in its various applications such as in gestural input - e.g. «put that there» and sign The technology comprises data glove and position sensing devices such as MIT Media Room. Gesture provides the benefits of natural form of interaction by pointing. Issues of co articulation are also considered as problems.

[...]

Children use appropriate input and output devices for education, games and fun. In solving cultural differences, the influence of nationality, generation, gender, race, sexuality, class, religion, political persuasion etc. are affected by the interpretation of interface features.

[...]

Mention areas where each is effectively applied. S. Mention any 3 devices that aid the elderly and the disabled in human computer interaction.

This unit concerns socio-organizational issues and stakeholder requirements

This event is the sociological, organizational, and cultural impact of computing. This context is largely the result of the broad adoption of IT by organizations and society to support organizational functions and goals and to enhance society's development.

[...]

The balance of power in the organisation and how the system will be affected.

Organisational structures

Because technology can be used to change management style and power structures, the implementation of such technology would improve upon organizational efficiency. Telecommunications improvements allow neighbourhood work centres and home-based tele-working. Many ecological and economic benefits arise from tele-working such as reduced travel and flexible family commitments.

The new system should benefit all. Disproportionate effort should be avoided.

[...]

There is the need to identify requirements within context of use and the need to take account of stakeholders. Work groups and practices should be identified in organisational context contextual inquiry are used.

Who are the stakeholders?

The system will have many stakeholders with potentially conflicting interests. Stakeholder is anyone affected by success or failure of system. The primary stakeholders actually use the system, the secondary receive output or provide input, while the tertiary have no direct involvement but are those affected by the success or failure of the new system. Facilitators are those involved in the development or deployment of the system.

[...]

Designers need to meet as many stakeholder needs as possible. Usually needs may be in conflict so they have to prioritise, often priority decreases as one moves down the categories. This is a response to technological determinism and it is concerned with the technical, social, organizational and human aspects of design. Several approaches to be considered are the Stakeholders' Focus and the ESTA. This comprises six stage processes that focus on stakeholders. The first describes the organizational context, including primary goals, physical characteristics, political and economic background. The second identifies and describes the stakeholders including personal issues, role in the organization and their job.

[...]

At the seventh stage, the performance satisfaction criteria are established, indicating social and technical requirements of the system. The last stage specifies the new technical system.

The soft systems methodology considers the broader view of human and organizational issues

Determines actions to effect changes. CATWOE further defines and explains the soft systems methodology.

[...]

The user is an active member of the design team. Characteristics: Participatory design is context and work oriented rather than system oriented. Ethics: The ethics involved the participatory socio-technical approach devised by Mumford. It states that the system development is about managing change and that non-participants are more likely to be dissatisfied.

Design groups including stakeholder representatives make design decisions and job satisfaction is the key to solution. This is very influential in CSCW.

Here inquiry is conducted in ethnographic tradition but acknowledges and challenges investigator focus. It creates a model of investigator being apprenticed to the user in order to learn about the work. The investigation takes place in the workplace with detailed interviews, observation, and analysis of communications, physical workplace, and artefacts. In concluding, there is the need to identify requirements within context of use and the need to take account of stakeholders.

The socio-human thrust analysis explains the socio-technical models of human and technical requirements, the systems methodology that considers human and organizational issues, the participatory design that includes the user directly in the design process and the ethnographic methods that study users in context with unbiased perspective. Explain the concepts of this expression as it affects users in an organization when designing a new interactive computer system. What do you understand by a Computer Supported cooperative Work in an organization.

What are the factors used in evaluating whether a designed and implemented system is

successful in an organization?

Differentiate between a primary stakeholder, a secondary stakeholder and a facilitator of a newly designed interactive system. Differentiate between the different goals of the six stage model of Stakeholders' focus and the eight stage model of ESTA within the human aspects of interactive design.

What is the full meaning of the acronym «CATWOE»?

Cognitive modeling involves creating a computational model to estimate how long it takes people to perform a given task. Models are based on psychological principles and experimental studies to determine times for cognitive processing and motor movements. Cognitive models can be used to improve user interfaces or predict problem errors and pitfalls during the design process.

[...]

With parallel design, several people create an initial design from the same set of requirements. Each person works independently, and when finished, shares his/her concepts with the group. The design team considers each solution, and each designer uses the best ideas to further improve their own solution. This process helps to generate many different, diverse ideas and ensures that the best ideas from each design are integrated into the final concept.

This process can be repeated several times until the team is satisfied with the final concept. Goals are what the user has to accomplish. Selection rules specify which method should be used to satisfy a given goal, based on the context. Sometimes it is useful to break a task down and analyze each individual aspect separately.

This allows the tester to locate specific areas for improvement. A model of the human processor is shown below. Many studies have been done to estimate the cycle times, decay times, and capacities of each of these processors. Variables that affect these can include subject age, ability, and the surrounding environment.

Keystroke level modeling

Keystroke level modeling is essentially a less comprehensive version of GOMS that makes simplifying assumptions in order to reduce calculation time and complexity. These usability evaluation methods involve observation of users by an experimenter, or the testing and evaluation of a program by an expert reviewer. They provide more quantitative data, as tasks can be timed and recorded. Card sorting is a way that involves users in grouping information for a website's usability review.

Participants in a card sorting session are asked to organize the content from a Web site in a way that makes sense to them. Ethnographic analysis is derived from anthropology. Field observations are taken at a site of a possible user, which track the artifacts of work such as Post-It notes, items on desktop, shortcuts, and items in trash bins. It involves having a small set of

evaluators examining the interface and using recognized usability principles .

Heuristic evaluation was developed to aid in the design of computer user-interface design. It relies on expert reviewers to discover usability problems and then categorize and rate them by a set of principles. It is widely used based on its speed and cost-effectiveness. Jakob Nielsen's list of ten heuristics is the most commonly used in industry. By determining which guidelines are violated, the usability of a device can be determined.

Usability Inspection is a review of a system based on a set of guidelines. The review is conducted by a group of experts who are deeply familiar with the concepts of usability in design. The experts focus on a list of areas in design that have been shown to be troublesome for users. Pluralistic Inspections are meetings where users, developers, and human factors people meet together to discuss and evaluate step by step of a task scenario.

As more people inspect the scenario for problems, the higher the probability to find problems. In addition, the more interaction in the team, the faster the usability issues are resolved. In consistency inspection, expert designers review products or projects to ensure consistency across multiple products to look if it does things in the same way as their own designs. Activity analysis is a usability method used in preliminary stages of development to get a sense of a situation.

The data collected is qualitative and useful for defining the problem. The following usability evaluation methods involve collecting qualitative data from users. Although the data collected is subjective, it provides valuable information on what the user wants. Task analysis means learning about users' goals and users' ways of working.

Task analysis can also mean figuring out what more specific tasks users must do to meet those goals and what steps they must take to accomplish those tasks. Although typically used as a marketing tool, Focus Groups are sometimes used to evaluate usability. Focus groups are typically videotaped to help get verbatim quotes, and clips are often used to summarize opinions. The data gathered is not usually quantitative, but can help get an idea of a target group's opinion.

Surveys have the advantages of being inexpensive, require no testing equipment, and results reflect the users' opinions. When written carefully and given to actual users who have experience with the product and knowledge of design, surveys provide useful feedback on the strong and weak areas of the usability of a design. Rapid prototyping is a method used in the early stages of development to validate and refine the usability of a system. It can be used to quickly and cheaply evaluate user-interface designs without the need for an expensive working model.

One such method of rapid prototyping is paper prototyping. These usability evaluation methods involve testing of subjects for the most quantitative data. Usually recorded on video, they provide task completion time and allow for observation of attitude. The Thinking Aloud Protocol is a method of gathering data that is used in both usability and psychology studies.

It involves getting a user to verbalize their thought processes as they perform a task or set of tasks. Often an instructor is present to prompt the user into being more vocal as they

work. Subjects-in-Tandem method, it is useful in pinpointing problems and is relatively simple to set up. Additionally, it can provide insight into the user's attitude, which can not usually be discerned from a survey or questionnaire.

Subjects-in-tandem is pairing of subjects in a usability test to gather important information on the ease of use of a product. Subjects tend to think out loud and through their verbalized thoughts designers learn where the problem areas of a design are. Subjects very often provide solutions to the problem areas to make the product easier to use. Other methods Cognitive walkthrough is a method of evaluating the user interaction of a working prototype or final product.

It is used to evaluate the system's ease of learning. Once there is a benchmark, other designs can be compared to it to determine the usability of the system. Meta-Analysis is a statistical procedure to combine results across studies to integrate the findings. This phrase was coined in 1976 as a quantitative literature review.

This type of evaluation is very powerful for determining the usability of a device because it combines multiple studies to provide very accurate quantitative support. Personas are fictitious characters that are created to represent the different user types within a targeted demography that might use a site or product. Personas is a usability evaluation method that can be used at various design stages. Personas are the archetypes that represent actual groups of users and their needs, which can be a general description of person, context, or usage scenario.

This technique turns marketing data on target user population into a few physical concepts of users to create empathy among the design team. Regardless of how carefully a system is designed, all theories must be tested using usability tests. Usability tests involve typical users using the system in a realistic environment. Observation of the user's behavior, emotions, and difficulties while performing different tasks, often identify areas of improvement for the system.

It is often very difficult for designers to conduct usability tests with the exact system being designed. Cost constraints, size, and design constraints usually lead the designer to creating a prototype of the system. Instead of creating the complete final system, the designer may test different sections of the system, thus making several small models of each component of the system. The types of usability prototypes may vary from using paper models, index cards, hand drawn models, or storyboards.

Designers must use usability metrics to identify what it is they are going to measure, or the usability metrics. The number of subjects being tested can also affect usability metrics, as it is often easier to focus on specific demographics. Qualitative design phases, such as general usability, and user satisfaction are also typically done with smaller groups of subjects. Using inexpensive prototype on small user groups, provide more detailed information, because of the more interactive atmosphere, and the designers ability to focus more on the individual user.

Testing the metrics As the designs become more complex, the testing must become more formalized. Testing equipment will become more sophisticated and testing metrics become more quantitative. With a more refined prototype, designers often test effectiveness, efficiency, and subjective satisfaction, by asking the user to complete various tasks. The ultimate goal of

analyzing these metrics is to discover a prototype design that users like to successfully perform given tasks.

[...]

The improved interface would also tend to lower the time needed to perform necessary tasks, and so would both raise the productivity levels for employees and reduce development time and costs. All the factors analysed above aid the design process and Increase usability in the workplace. They aid in fostering several responses from employees. Along with any positive feedback, workers who enjoy their work do it better, stay longer in the face of temptation, and contribute ideas and enthusiasm to the evolution of enhanced productivity.

Cognitive human thrust comprises cognitive psychology and modeling. Cognitive psychology studies human traits such as perception, memory, mental models and metaphors, among others- those that have direct implications to HCI design. Cognitive modeling enables estimation of how long it takes people to perform a given task. Inspection method is the process of observing users by an experimenter, or the testing and evaluation of a program by an expert reviewer.

Prototypes enable the designer test different sections of the system by making several small models of each component of the system. Evaluation methods test and correct errors in implemented design.

[...]

Task analysis, Group Focus, Questionnaire and Survey methods. In designing and evaluating usability, prototyping methods have been very valuable.

IMPROVING UPON THE USER'S TECHNOLOGICAL PERSPECTIVE

There are different types of support available to the users at different times particularly important during the implementation and presentation stages. Know how to design user supports.

[...]

Ensure that the help request is interpreted according to context in which it occurs. e.g. tool tips
The on-line tutorials allow the user to work through the basics of application in a test environment. Though often inflexible, it can be useful. The on-line documentation though available in paper documentation is also made available on the computer.

It should be continually available in common medium as well. Adaptive Help Systems These use knowledge of the context, the individual user, the task, the domain and the instruction to provide help adapted to the user's needs. The problems with adaptive help systems are that they require considerable knowledge, the interaction is not controlled and it is difficult knowing what should be adapted and the scope of the adaptation.

Wizards specific questions

It may be a single or generic user . The models could be an adaptable user-configured or adaptive system-configured.

Approaches to user modelling

In a special case, the user behaviour is compared to a known error catalogue. Knowledge representation Knowledge representation occurs when knowledge is presented as rules, and facts are interpreted using inference mechanism. The domain and task modelling of the knowledge representation covers common errors and tasks particularly the current task. Problems with knowledge representation and modelling The problems here include knowledge acquisition, the resources and the interpretation of user behaviour User support is not an 'add on' but should be designed integrally with the system.

The designer should concentrate on content and context of help rather than on technological issues.

[...]

The designer should note that effective presentation requires clear, familiar, and consistent language. It should contain instructional rather than descriptive languages. Blocks of text should be avoided. Implementation issues are whether the help is in form of an operating system command, a Meta command or an application.

There should be a clear indication of summary and example information.

[...]

Other issues concern the flexibility and extensibility of implementation and whether it is made in hard copy or by browsing. The design should ensure that there are different types of support available to the users at different times particularly during the implementation and presentation stages.

Effective design of technical support reflects in continuous access concurrent to main application being made available

Knowledge representation is the presentation of knowledge as rules and facts, and interpreted using inference mechanism. User support should be designed integrally with the system. Mention three kinds of Help Support that can be designed for the Computer System Users.

Describe the rule based, the frame based and the networked based techniques of Knowledge representation. Designing the user support requires considering some presentation and implementation issues. An Interaction style can be described as an interaction technique that shares the same metaphor or design principle. [...]

This is the way of expressing instructions to the computer directly and it comprises the function

keys, single characters, short abbreviations, whole words, or a combination of them.

It is a restricted form of full WIMP system This is a language that should be familiar to the user It is in a form of speech recognition or typed natural language

Problems with the use of natural language are that it could be vague, ambiguous, and hard to use. Part of the solutions to this is for the user to try and to understand a subset of the language thereby picking on key words. Query interfaces This basically comprises Question and answer interfaces where the user is led through interaction via series of questions to be answered. Some of these Query languages include the SQL used to retrieve information from database.

An example of a Form-fill

The first spreadsheet was VISICALC followed by Lotus 1-2-3. However MS Excel is the most common spreadsheet today having a sophisticated variation of form-filling. This is used in multimedia, web browsers and hypertext. It is sometimes called 'just click something!' using icons, text links or location on map.

[...]

They are made up of ii. scrollbars that allow the user to move the contents of the window up and down or from side to side iii. A small representation may fit into many accessible windows. The icons can be many and various.

In tear-off and pin-up menus, menu 'tears off' to become palette These are information windows that pop up to inform of an important event or request information, for.

[...]

By behavior This describes the action the toolkit carries out on your behalf and this can be controlled. Examples are drawing and such interactions between the widgets themselves. But timing issues of this behavior should be watched such as the large selections under Windows applications.

By semantics

Although widgets may link direct to database, even then, you say what links to the database.

[...]

The guidelines are proposed here as a potential tool for designers of user interface software. Design guidelines can help ensure the value of that investment.

SELECTION OF DESIGN GUIDELINES

Not all of the guidelines can be applied in designing any particular system. For any particular

system application, some of the guidelines will be relevant and some will not. Design guidelines must be generally worded so that they might apply to many different system applications. Thus generally-worded guidelines must be translated into specific design rules before they can actually be applied.

The process of selecting relevant guidelines for application and translating them into specific design rules is referred to here as «tailoring». It should be the joint responsibility of system analysts and human factors specialists assessing design requirements, of software designers assessing feasibility, and of their managers. Once all relevant guidelines have been identified, a designer must review them and decide which ones actually to apply. There are two reasons why a designer might not wish to apply all relevant guidelines.

First, for any given application, some guidelines may conflict, and the designer must therefore choose which are more important. Second, budgetary and time restrictions may force the designer to apply only the most important guidelines -- those that promise to have the greatest effect on system usability.

EXPERTISE EXPERIENCE VERSUS GUIDELINES

Few designers will find time to read an entire book of guidelines. If they do, they will find it difficult to digest and remember all of the material. Guidelines cannot take the place of expert design consultants, or at least not entirely. A design expert will know more about a specific topic than can be presented in the guidelines.

An expert will know what questions to ask, as well as many of the answers. An expert will know how to adapt generally-stated guidelines to the specific needs of a particular system design application. For maximum effectiveness, guideline tailoring must take place early in the design process before any actual design of user interface software. In order to tailor guidelines, designers must have a thorough understanding of task requirements and user characteristics.

Thus task analysis is a necessary prerequisite of guidelines tailoring. The result of guidelines application will be a design for user interface software that may incorporate many good recommendations. Certainly the common application of design rules by all designers working on a system should result in more consistent user interface design. And the single objective on which experts agree is design consistency.

TRANSLATION OF SELECTED GUIDELINES INTO DESIGN RULES

Because guidelines are intended for use on a variety of systems, they are worded in general terms. Before a guideline can actually be applied it must be translated into specific design rules. Any guideline can have different possible translations. The result will surely be an inconsistent.

DOCUMENTATION, IMPLEMENTATION AND EVALUATION OF DESIGN RULES

Documentation of agreed rules, subject to periodic review and revision as necessary, will help coordinate the design process. With appropriate modifications, rules adopted for one application might later be used for other applications. In the course of design, it may be determined that a particular design rule cannot be used. Therefore, some means must be provided to deal with exceptions.

If a design rule is not appropriate for one particular display, then an exception can be made by whoever has been appointed to make such decisions. But if a design rule cannot be implemented at all, perhaps due to other design constraints, then all designers for that particular system must be notified, and perhaps another design rule must be substituted. To help in the exception process and in the evaluation process, it may be useful to assign different weights to the various rules, indicating which are more important than others. Since design rules suggest how to increase usability, they may differ in generality and authority, therefore there exist various standards that guarantee uniformity of application.

The standards set by national or international bodies to ensure compliance by a large community of designers. These standards require sound underlying theory particularly on this slowly changing technology.

Principles of robustness are made up of

The goal of interaction design is to design for maximum usability. Design rules comprise the principles of usability which look at the general understanding of the design, the standards and guidelines which set the direction for design, and the design patterns that capture and reuse design knowledge. In designing computer-based information systems, special attention must be given to software supporting the user interface. Those rules should be documented for reference by software designers and others involved in system development. For maximum effectiveness, guideline monitoring must take place early in the design process before any actual design of user interface software.

There should be early creation of an operational prototype to evaluate interface design concepts interactively with users. There are certain design principles of learnability, flexibility, and robustness that are formulated to support usability. Mention those responsible for selecting relevant guidelines for application and translation into design rules.

When is it most appropriate to monitor design guidelines and carry out prototype testing and why?

Distinguish between rules based on principles, those based on standards and those derived from guidelines.

[...]

The evaluation technique which covers both design and implementation should be considered at all stages in the design life cycle. The goals of evaluation are to assess extent of system functionality, to assess effect of interface on user, and to identify specific problems from design

and implementation. Express your understanding of the three main evaluation techniques viz a viz the cognitive walkthrough, the heuristic, and the review-based evaluations.

Evaluation Techniques The Evaluation Design Techniques include

The Cognitive Walkthrough The Heuristic Evaluation The Review-based evaluation User Participation This technique was proposed by Polson et al It evaluates design on how well it supports user in learning task and is usually performed by expert in cognitive psychology.

The design expert 'walks through' the design to identify potential problems using psychological principles with forms used to guide the analysis

The analysis focuses on goals and knowledge to establish whether the design leads the user to generate the correct goals. This was proposed by Nielsen and Molich.

Testing whether the system behaviour is consistent

Testing whether a feedback is provided Heuristic evaluation 'debugs' design. This evaluation reviews results from the literature that are used to support or refute parts of the design. However, care is needed to ensure the results are transferable to new design.

It is a model-based evaluation which in addition encompasses cognitive models that can be used to filter design options

Disadvantages could be lack of context and difficulty in observing several users cooperating. Field Studies approach This approach is appropriate where context is crucial for longitudinal studies The advantages are that studies are carried out in a natural environment where context of evaluation is retained. Though observation may alter such context. Obvious disadvantages are that there could be distractions and noise particularly in which the location of the field is within a public place.

The changes in behavioural measure are attributed to the different conditions.

[...]

Examples of the characteristics include the interface style and number of menu items. The dependent variable characteristics are those measured in the experiment. Examples of such characteristics include the time taken and number of errors. Hypothesis experimental factor This is a prediction of outcome framed in terms of IV and DV.

For example, «error rate will increase as font size decreases». For example ,if the null hypothesis states that there is no difference between conditions, our aim is to disprove this e.g. A null hypothesis may be stated that there is «no change with font size».

Experimental design factors

The advantage here is that transfer of learning is made possible. It is also less costly and less likely to suffer from user variation. The choice of statistical technique depends on type of data and the information required.

Parametric test

This does not assume a normal distribution.

Some of the problems identified with subject groups are

It creates an even more variation that makes it difficult to adhere to timetable. Therefore, only three or four groups are recommended. The tasks involved in experimental studies on groups are the needs to encourage cooperation among the groups through the use of multiple channels.

Creative task such as writing a short report on a particular experiment

Decision games such as desert survival task games modelling a decision phenomenon Control task such as demonstrated in a particular firm. This can be done using several video cameras with direct logging of application data. The problems with data gathering are synchronisation of data and the sheer volume of data required. The one solution to this is to record from each perspective.

Additional advantages here are that:-It is less constrained and easier to use The user is encouraged to criticize the system

It uses audio that is good for think aloud but difficult to match with other protocols.



NATIONAL OPEN UNIVERSITY OF NIGERIA

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FACULTY OF SCIENCES

NOVEMBER, 2018 EXAMINATIONS

COURSE CODE: CIT353

COURSE TITLE: Human Computer Interaction

CREDIT: 2 Units

TIME ALLOWED: 2 Hours

INSTRUCTION: Answer Question ONE (1) and any other THREE (3) Questions

1a) Briefly describe the following effects:

Hypertext (3 marks)

Hypermedia (3 marks)

Animation (3 marks)

b) State the management issues concerned with:

i) Interactive design (3 marks)

ii) prototyping techniques (3 marks)

c) Briefly state and explain the four (4) tasks of the software process of Human Computer Interaction. (6 marks)

d) How many stages are involved in the *Donald Normans model* ? State them. (4 marks)

2a) Explain the term 'Ergonomics'. Give any two examples. (4 marks)

b) Compare Participatory design and Ethnography design in Human Computer Interaction (2 marks)

c) State the characteristics of Participatory design. (2 marks)

d) State the ethics and methods involved in Participatory design (5 marks)

e) Differentiate between the objectives of interactive design and prototyping. (2 marks)

3a) (i) State the various knowledge required to build an adaptive help system. (4 marks)

(ii) Which of the knowledge in (i) above is easiest to provide? Where can the knowledge be got? What is its disadvantage? (3 marks)

b) Which of the knowledge in (a) above is most difficult to provide and why? (3 marks)

c) State the various positive and negative issues that have emanated from embodying speech act in a specific system. (5 marks)

4a) Extensively discuss video and audio effects in human computer interaction (7 marks)

b) Give **two** (2) advantage and **one** (1) challenge arising from the application of video and audio effects in web browsing and hypertext (3 marks)

c) Give two methods by which universal design can be realized? Give an example of each method. (4 marks)

d) What is the function of the Boolean search used in conducting web search (1 mark)

5a) (i) Describe "the Waterfall model" in the software design process of human computer interaction? (5 marks)

(ii) Draw a well-labelled diagram of the Waterfall model (2 marks)

b) State and briefly explain the activities involved in the Software lifecycle (8 marks)