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Chapter 1 : ICS - ICS - HCI: User Interfaces For All

User Interfaces for All is the first book dedicated to the issues of Universal Design and Universal Access in the field of Human-Computer Interaction (HCI). Universal Design (or Design for All) is an inclusive and proactive approach seeking to accommodate diversity in the users and usage contexts of interactive products, applications, and services, starting from the design phase of the.

Contemporary interactive technologies and environments are used by a multitude of users with diverse characteristics, needs and requirements, including able-bodied and disabled people, people of all ages, people with different skills and levels of expertise, people from all over the world with different languages, cultures, education, etc. Additionally, interactive technologies are penetrating all aspects of everyday life, in communication, work and collaboration, health and well being, home control and automation , public services, learning and education, culture, travel, tourism and leisure, and many others. New technologies targeted to satisfy human needs in the above contexts proliferate, whether stationary or mobile, centralized or distributed, visible or encapsulated in the environment. A wide variety of devices is already available, and new ones tend to appear frequently and on a regular basis. In this context above, interaction design acquires a new dimension, and the question arises of how it is possible to design systems that permit systematic and cost-effective approaches to accommodating all users. Design for All is an umbrella term for a wide range of design approaches, methods, techniques and tools to help address this huge diversity of needs and requirements in the design of interactive technologies. Design for All entails an effort to build access features into a product, starting from its conception and throughout the entire development life-cycle. Design for All in HCI is rooted in the fusion of three traditions: It is an iterative process whose goal is the development of usable systems, achieved through the involvement of potential users during the design of the system. Definition User-centered design An approach to designing ease of use into the total user experience with products and systems. It involves two fundamental elementsâ€"multidisciplinary teamwork and a set of specialized methods of acquiring user input and converting it into design. Copyright terms and licence: See section "Exceptions" in the copyright terms below. Active involvement of users and clear understanding of user and task requirements. The active involvement of end-users is one of the key strengths, as it conveys to designers the context of use in which the system will be used, potentially enhancing the acceptance of the final outcome. The appropriate allocation of functions between the user and the system. It is important to determine which aspects of a job or a task will be handled by users and which can be handled by the system itself. This division of labor should be based on an appreciation of human capabilities and their limitations, and on a thorough grasp of the particular demands of the task. Iteration of design solutions. Iterative design entails receiving feedback from end-users following their use of early design solutions. The feedback from this exercise is used to further develop the design. User centered system development is a collaborative process that benefits from the active involvement of various parties, each of whom have insights and expertise to share. Therefore, the development team should be made up of experts with technical skills in various phases of the design life cycle. The team might thus include managers, usability specialists, end-users, software engineers, graphic designers, interaction designers, training and support staff, and task experts. User-centered design claims that the quality of use of a system, including usability and user health and safety, depends on the characteristics of the users, tasks, and the organizational and physical environment in which the system is used. Also, it stresses the importance of understanding and identifying the details of this context in order to guide early design decisions, and provides a basis for specifying the content in which usability should be evaluated. While user-centered design focuses on maintaining a multidisciplinary and user-involving perspective into systems development, it does not specify how designers can cope with radically different user groups. For example, someone with limited visual functions will not be able to use an interactive system which only provides graphical output, while someone with limited bone or joint mobility or movement functions, affecting the upper limbs, will encounter difficulties in using an interactive system that only accepts input through the standard keyboard and mouse. Accessibility in the context of HCI aims to overcome such barriers by making the interaction experience of people with diverse functional or contextual limitations as near as possible to that of people without such limitations. The interaction process can be roughly analyzed as follows: A physical device is an artifact of the system that acquires input device or delivers output device information. Examples include keyboard, mouse, screen, and loudspeakers. An interaction technique involves the use of one or more physical devices to allow end-users provide input or receive output during the operation of a system. An interaction style is a set of perceivable interaction elements used by the user through an interaction technique or the system to exchange information sharing common aesthetic and behavioral characteristics. In graphical user interfaces the term interaction style is used to denote a common look and feel among interaction elements. Typical examples are menu selection and direct manipulation. Interaction elements compose the user interface of a system with user interaction resulting from physical actions. A physical action is an action performed either by the system or the user on a physical device. Typically, system actions concern feedback and output, while user actions provide input. Examples of input actions include pushing a mouse button or typing on a keyboard. Different interaction techniques and styles exploit different sensory modalities. In practice, the modalities related to seeing and hearing are the most commonly employed for output, whereas haptics is less used. Interestingly, however, haptics remains the primary modality for input e. Taste and smell have only recently started being investigated for output purposes. In summary, the actual human functions involved in interaction are motion, perception and cognition. In this context, accessibility implies that: Given the degree of human diversity as regards the involved functions, accessibility requires the availability of alternative devices and interaction styles to accommodate different needs. In traditional efforts to improve accessibility, the main direction followed has been to enable disabled users to access interactive applications originally developed for able-bodied users through appropriate assistive technologies. Assistive Technology AT is a generic term denoting a wide range of accessibility plug-ins including special-purpose input and output devices and the process used in selecting, locating, and using them. AT promotes greater independence for people with disabilities by enabling them to perform tasks that they were originally unable to accomplish, or had great difficulty accomplishing. In this context, it provides enhanced or alternative methods to interact with the technology involved in accomplishing such tasks. Definition Assistive or Adaptive Technology commonly refers to " Used without permission under the Fair Use Doctrine as permission could not be obtained. Footmouse Assistive Technologies are essentially reactive in nature. They provide product-level and platform-level adaptation of interactive applications and services originally designed and developed for able-bodied users. The need for more systematic and proactive approaches to the provision of accessibility has led to the concept of Design for All. Such shift from accessibility, as traditionally defined in the assistive technology sector, to a Design for All perspective, is due to: Under this perspective, accessibility has to be designed as a primary system feature, rather than decided upon and implemented a posteriori, thus integrating accessibility into the design process of all applications and services. The term Universal Design was coined by the architect Ronald L. Mace to describe the concept of designing all products and the built environment to be both aesthetically pleasing and usable to the greatest extent possible by everyone, regardless of their age, ability, or status in life Mace et al. Although the scope of the concept has always been broader, its focus has tended to be on the built environment. The intent of Universal Design is to simplify life for everyone by making products, communications, and the built environment more usable by as many people as possible at little or no extra cost. Universal Design benefits people of all ages and abilities. Other examples are low-floor buses, cabinets with pull-out shelves, as well as kitchen counters at several heights to accommodate different tasks and postures. Mohammed Yousuf and Mark Fitzgerald. Accessible traffic light Perhaps the most common approach in Universal Design is to make information about an object or a building available through several modalities, such as Braille on elevator buttons, and acoustic feedback for traffic lights. People without disabilities can often benefit too. For example, subtitles on TV or multimedia content intended for the deaf can also be useful to non-native speakers of a language, to children for improving literacy skills, or to people watching TV in noisy environments. The seven Principles of Universal Design were developed in by a working group of architects, product designers, engineers, and environmental design researchers, led by Ronald Mace at North Carolina State University. The Principles "may be applied to evaluate existing designs, guide the design process and educate both designers and consumers about the characteristics of more usable products and environments. The design is useful and marketable to people with diverse abilities Flexibility in use: The design accommodates a wide range of individual preferences and abilities Simple and intuitive: The design minimizes hazards and the adverse consequences of accidental or unintended actions Low physical effort: The design can be used efficiently and comfortably and with a minimum of fatigue Size and space for approach and use: The term Design for All either subsumes, or is a synonym of, terms such as accessible design, inclusive design , barrier-free design, universal design, each highlighting different aspects of the concept. This entails an effort to build access features into a product starting from its conception, throughout the entire development life-cycle. It follows that accessibility is a fundamental prerequisite of usability, since there may not be optimal interaction if there is no possibility of interaction in the first place. Understanding the various dimensions of user diversity helps design and develop user interfaces that maximize benefits for different types of users. Main efforts in this direction are concerned with the identification and study of diverse target user groups e. Much experimental work has been conducted in recent years in order to collect and elaborate knowledge of how various disabilities affect interaction with technology. This allows grouping and analysis of limitations that are not only due to impairments, but also, for example, due to environmental reasons. Blindness means anatomic and functional disturbances of the sense of vision of sufficient magnitude to cause total loss of light perception, while visual impairment refers to any deviation from the generally accepted norm. Blind users benefit from using the auditory and the haptic modality for output and input purposes. The latter are haptic devices, but require knowledge of the Braille code. Blind users can use keyboards and joysticks, though not the mouse. Therefore, all actions in a user interface must be available without the use of the mouse. It is also important for both output and input that the provided user interface is structured in such a way as to minimize the time required to access specific important elements e. Less severe visual limitations are usually addressed by increasing the size of interactive artifacts, as well as color contrast between the background and foreground elements of a user interface. Specific combinations of colors may be necessary for users with various types of color-blindness. Hearing impairments include any degree and type of auditory disorder, on a scale from slight to extreme. Hearing limitations can significantly affect interaction with technology. Familiar coping strategies for hearing-impaired people include the use of hearing aids, lip-reading and telecommunication devices for the deaf. Deaf users may not be comfortable with written language in user interfaces, and may benefit from sign-language translations of the information provided see section Sign Language. Individuals with severe physical impairments usually have to rely on assistive devices such as mobility aids, manipulation aids, communication aids, and computer interface aids Keates, Motion impairments interfere with the functions that are necessary for interacting with technology. For example, using a mouse and a keyboard can be challenging or painful. Therefore, motor-impaired users may benefit from specialized input devices minimizing movement and physical effort required for input, including adapted keyboards, mouse emulators, joystick and binary switches, often used in conjunction with an interaction technique called scanning see section Scanning-based Interaction , as well as virtual on-screen keyboards for text input, sometimes supported by text prediction systems. Other interaction techniques which have been investigated for use by people with motion functions limitations are voice input of spoken commands see section Speech , keyboard and mouse simulation through head movements see section Gestures and Head Tracking , and eye-tracking see section Eye-tracking. Brain-computer interfaces which allow control of an application simply by thought are also being investigated for supporting the communication of people with severe motor impairments see section Brain Interfaces.

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Chapter 2 : dblp: User Interfaces for All

"User Interfaces for All" unfolds the various aspects of this ongoing evolution from a variety of viewpoints. It is a collection of 30 chapters written by leading international authorities, affiliated with academic, research and industrial organizations and non-market institutions.

These inspiring user interface designs all pushed the envelope and delighted users. So read on and discover cutting edge and well thought out products, apps, and operating systems that focus on creating a great user experience through design The company pioneered the use of the GUI graphical user interface with the introduction of the Lisa computer in and later made it mainstream with the release of the Macintosh in Then, when it introduced the iPhone in , it brought a unique and user-friendly experience to the mobile phone market. For years, mobile phone users had been managing with just scroll wheels or arrow buttons to navigate through their phones. Little has changed regarding the core functionality of the iOS platform since , playing to the old saying: Microsoft has been playing catch-up in the smartphone market since Apple and Google took centre stage a few years ago. In Microsoft introduced their latest mobile phone operating system, Windows 8, along with a similar desktop version. Windows 8 for mobile features the use of live interactive tiles. See your latest tweets or text messages with just a glance and all in one spot. Not to mention that the arrangement and importance of the tiles are completely customizable. The overall look is distinctively different from iOS , which focuses on the use of static icons to navigate and pop-up like notifications to catch incoming data. Case in point, the household thermostat. In fact, new digital thermostats tend to be much more difficult to program, with their confusing multiple menu systems and complicated displays. So, the designers of the Nest thermostat has simplified the process for you. Turn it up when you want it hotter and turn it down when you want it colder. The thermostat does the rest by learning every time you make an adjustment and building a heating and cooling schedule based on your changes. You can even control it from your Smartphone via Wi-Fi. This 3D effect is created by using some fancy HTML5 and CSS3 coding that makes the websites background move at a slower rate then objects set in the foreground. This creates a unique user interface that is visually more interesting than the traditional, flat two-dimensional up and down scrolling found on most websites. The site is a great example of parallax scrolling and how it creates a unique user experience. The World Wildlife Fund has released a free new iPad app called WWF Together that is a stunning example of what you can do with gesture-based interactions. All of this wrapped up in an elegantly simple interface that is easy to follow and informational. WWF app in action: Ben Whitesell is a media designer specializing in a variety of different types of content creation including tradition print page layout, poster design and illustration.

Chapter 3 : Accessible Design for Users With Disabilities

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A graphical user interface following the desktop metaphor The user interface or humanâ€”machine interface is the part of the machine that handles the humanâ€”machine interaction. Membrane switches, rubber keypads and touchscreens are examples of the physical part of the Human Machine Interface which we can see and touch. In complex systems, the humanâ€”machine interface is typically computerized. The term humanâ€”computer interface refers to this kind of system. In the context of computing, the term typically extends as well to the software dedicated to control the physical elements used for human-computer interaction. The engineering of the humanâ€”machine interfaces is enhanced by considering ergonomics human factors. The corresponding disciplines are human factors engineering HFE and usability engineering UE , which is part of systems engineering. Tools used for incorporating human factors in the interface design are developed based on knowledge of computer science , such as computer graphics , operating systems , programming languages. Nowadays, we use the expression graphical user interface for humanâ€”machine interface on computers, as nearly all of them are now using graphics. Often, there is an additional component implemented in software, like e. There is a difference between a user interface and an operator interface or a humanâ€”machine interface HMI. The term "user interface" is often used in the context of personal computer systems and electronic devices Where a network of equipment or computers are interlinked through an MES Manufacturing Execution System -or Host to display information. An operator interface is the interface method by which multiple equipment that are linked by a host control system is accessed or controlled. For example, a computerized library database might provide two user interfaces, one for library patrons limited set of functions, optimized for ease of use and the other for library personnel wide set of functions, optimized for efficiency. Another abbreviation is HCI, but is more commonly used for humanâ€”computer interaction. In science fiction , HMI is sometimes used to refer to what is better described as direct neural interface. However, this latter usage is seeing increasing application in the real-life use of medical prostheses â€”the artificial extension that replaces a missing body part e. A means of tracking parts of the body is required, and sensors noting the position of the head, direction of gaze and so on have been used experimentally. This is particularly relevant to immersive interfaces. Batch interface[edit] IBM In the batch era, computing power was extremely scarce and expensive. User interfaces were rudimentary. Users had to accommodate computers rather than the other way around; user interfaces were considered overhead, and software was designed to keep the processor at maximum utilization with as little overhead as possible. The input side of the user interfaces for batch machines was mainly punched cards or equivalent media like paper tape. The output side added line printers to these media. Submitting a job to a batch machine involved, first, preparing a deck of punched cards describing a program and a dataset. The software interface was similarly unforgiving, with very strict syntaxes meant to be parsed by the smallest possible compilers and interpreters. Holes are punched in the card according to a prearranged code transferring the facts from the census questionnaire into statistics Once the cards were punched, one would drop them in a job queue and wait. Eventually, operators would feed the deck to the computer, perhaps mounting magnetic tapes to supply another dataset or helper software. The job would generate a printout, containing final results or all too often an abort notice with an attached error log. Successful runs might also write a result on magnetic tape or generate some data cards to be used in a later computation. The turnaround time for a single job often spanned entire days. If one were very lucky, it might be hours; there was no real-time response. But there were worse fates than the card queue; some computers required an even more tedious and error-prone process of toggling in programs in binary code using console switches. The very earliest machines had to be partly rewired to incorporate program logic into themselves, using devices known as plugboards. These used a monitor program which was always resident on the computer. Programs could call the monitor for services. Another function of the monitor was to do better error checking on submitted jobs, catching errors earlier and more intelligently and generating more useful feedback to the users. Thus, monitors represented the first step towards both operating systems and explicitly designed user interfaces. Command-line user interface[edit] Main article: Their interaction model was a series of request-response transactions, with requests expressed as textual commands in a specialized vocabulary. Latency was far lower than for batch systems, dropping from days or hours to seconds. Accordingly, command-line systems allowed the user to change his or her mind about later stages of the transaction in response to real-time or near-real-time feedback on earlier results. Software could be exploratory and interactive in ways not possible before. But these interfaces still placed a relatively heavy mnemonic load on the user, requiring a serious investment of effort and learning time to master. Teleprinters had originally been invented as devices for automatic telegraph transmission and reception; they had a history going back to and had already become well-established in newsrooms and elsewhere by In reusing them, economy was certainly a consideration, but psychology and the Rule of Least Surprise mattered as well; teleprinters provided a point of interface with the system that was familiar to many engineers and users. These cut latency further, because characters could be thrown on the phosphor dots of a screen more quickly than a printer head or carriage can move. They helped quell conservative resistance to interactive programming by cutting ink and paper consumables out of the cost picture, and were to the first TV generation of the late s and 60s even more iconic and comfortable than teleprinters had been to the computer pioneers of the s. Just as importantly, the existence of an accessible screen â€" a two-dimensional display of text that could be rapidly and reversibly modified â€" made it economical for software designers to deploy interfaces that could be described as visual rather than textual. The pioneering applications of this kind were computer games and text editors; close descendants of some of the earliest specimens, such as rogue 6 , and vi 1 , are still a live part of Unix tradition. This defined that a pulldown menu system should be at the top of the screen, status bar at the bottom, shortcut keys should stay the same for all common functionality F2 to Open for example would work in all applications that followed the SAA standard. This greatly helped the speed at which users could learn an application so it caught on quick and became an industry standard. No overlapping windows tiled instead.

Chapter 4 : 5 innovative examples of user interface design | Creative Bloq

In this section, several different kinds of user interfaces are described, including natural-language interfaces, question-and-answer interfaces, menus, form-fill interfaces, command-language interfaces, graphical user interfaces (GUIs), and a variety of Web interfaces for use on the Internet.

Processes[edit] Printable template for mobile and desktop app design pdf. User interface design requires a good understanding of user needs. There are several phases and processes in the user interface design, some of which are more demanded upon than others, depending on the project. Functionality requirements gathering â€" assembling a list of the functionality required by the system to accomplish the goals of the project and the potential needs of the users. What would the user want the system to do? How technically savvy is the user and what similar systems does the user already use? Prototyping â€" development of wire-frames , either in the form of paper prototypes or simple interactive screens. Usability inspection â€" letting an evaluator inspect a user interface. This is generally considered to be cheaper to implement than usability testing see step below , and can be used early on in the development process since it can be used to evaluate prototypes or specifications for the system, which usually cannot be tested on users. Some common usability inspection methods include cognitive walkthrough , which focuses the simplicity to accomplish tasks with the system for new users, heuristic evaluation , in which a set of heuristics are used to identify usability problems in the UI design, and pluralistic walkthrough , in which a selected group of people step through a task scenario and discuss usability issues. Usability testing â€" testing of the prototypes on an actual userâ€"often using a technique called think aloud protocol where you ask the user to talk about their thoughts during the experience. Graphical user interface design â€" actual look and feel design of the final graphical user interface GUI. It may be based on the findings developed during the user research, and refined to fix any usability problems found through the results of testing. Once a decision is made to upgrade the interface, the legacy system will undergo another version of the design process, and will begin to repeat the stages of the interface life cycle. This standard establishes a framework of ergonomic "principles" for the dialogue techniques with high-level definitions and illustrative applications and examples of the principles. The principles of the dialogue represent the dynamic aspects of the interface and can be mostly regarded as the "feel" of the interface. The seven dialogue principles are: Suitability for the task: Conformity with user expectations: The concept of usability is defined of the ISO standard by effectiveness, efficiency, and satisfaction of the user. Part 11 gives the following definition of usability: Usability is measured by the extent to which the intended goals of use of the overall system are achieved effectiveness. The resources that have to be expended to achieve the intended goals efficiency. The extent to which the user finds the overall system acceptable satisfaction. Effectiveness, efficiency, and satisfaction can be seen as quality factors of usability. To evaluate these factors, they need to be decomposed into sub-factors, and finally, into usability measures. The information presentation is described in Part 12 of the ISO standard for the organization of information arrangement, alignment, grouping, labels, location , for the display of graphical objects, and for the coding of information abbreviation, color, size, shape, visual cues by seven attributes. The "attributes of presented information" represent the static aspects of the interface and can be generally regarded as the "look" of the interface. The attributes are detailed in the recommendations given in the standard. Each of the recommendations supports one or more of the seven attributes. The seven presentation attributes are: The user guidance in Part 13 of the ISO standard describes that the user guidance information should be readily distinguishable from other displayed information and should be specific for the current context of use. User guidance can be given by the following five means: Prompts indicating explicitly specific prompts or implicitly generic prompts that the system is available for input. Error management including error prevention, error correction, user support for error management, and error messages. On-line help for system-initiated and user initiated requests with specific information for the current context of use. Research[edit] User interface design has been a topic of considerable research, including on its aesthetics. One of the structural bases has become the IFIP user interface reference model. The model proposes four dimensions to structure the user interface: The desire to understand application-specific UI issues early in software development, even as an application was being developed, led to research on GUI rapid prototyping tools that might offer convincing simulations of how an actual application might behave in production use.

Chapter 5 : User Interface | HowStuffWorks

The user interface or human-machine interface is the part of the machine that handles the human-machine interaction. Membrane switches, rubber keypads and touchscreens are examples of the physical part of the Human Machine Interface which we can see and touch.

How to design websites for universal access, including users with visual, auditory, motor, and cognitive disabilities. Using good ALT-text only gets you so far. Making the Web more accessible for users with various disabilities is to a great extent a matter of using HTML the way it was intended: As long as a page is coded for meaning, it is possible for alternative browsers to present that meaning in ways that are optimized for the abilities of individual users and thus facilitate the use of the Web by disabled users. Before discussing the difficulties disabled users may have in accessing Web information, we should note that online information provides many benefits compared with printed information: Indeed, many disabled users are empowered by computers to perform tasks that would have been difficult for them with traditional technology. You can even hear how the article sounds through a screen reader - note how reading is done at very high speed access to the Times site requires registration. I refer you to these guidelines for more detail and will focus on broader issues in this column. The Web Access Symbol for people with disabilities This symbol can be used to signify sites or pages for which an effort has been made to enhance access for disabled users. Visual Disabilities The most serious accessibility problems given the current state of the Web probably relate to blind users and users with other visual disabilities since most Web pages are highly visual. For example, it is quite common to see combinations of background and foreground colors that make pages virtually unreadable for colorblind users. Textual pages are reasonably easy to access for blind users since the text can be fed to a screen reader. Long pages are problematic since it is harder for a blind user to scan for interesting parts than it is for a sighted user. In order to facilitate scanning it is recommended to emphasize the structure of the page by proper HTML markup: Most people already know about the use of ALT attributes to provide alternative text for images, though there are still many Web pages without ALTs. Some accessibility specialists advocate so-called described images , where text is provided to verbalize what a seeing user would see. For example, the Web Access Symbol shown above might be described as "a glowing globe with a keyhole. All imagemaps should be client-side and should use ALT attributes for each of the link options so that a user who cannot see the image can have descriptions of the destination read as he or she moves the cursor around. There are still some browsers that only support server-side imagemaps, but client-side imagemaps are clearly the way to go in the future. In general, it is often the case that design rules that may have been intended to help users with disabilities end up being of benefit to all users. In addition to completely blind users, there are many users who can see but have reduced eyesight. These users typically need large fonts which is a standard feature of most Web browsers. To support these users, never encode information with absolute font sizes but use relative sizes instead. For example, when using Style Sheets, do not set the font-size attribute to a number of points or pixels but set it to a percentage of the default font size. Full support of users with reduced eyesight would require pages to look equally well at all font sizes. Doing so is often not practical, and it might be acceptable to make pages look slightly worse at huge font sizes as long as the basic page layout will still work. It is recommended to test pages with the default font set to 10, 12, and 14 point to ensure that the design is optimal for these common font sizes and then to make additional checks with default fonts of 18 and 24 points to make sure that the design still works at these accessibility-enhancing sizes. Auditory Disabilities People who are deaf or have other auditory disabilities rarely have problems on the Web since sound effects are usually totally gratuitous. The usability of a site almost always stays the same when the sound is turned off. With the trend toward more multimedia this is not going to remain the case, though. In particular, transcripts should be made available of spoken audioclips and videos should be made available in versions with subtitles which will also benefit users who are not native speakers of the language used in the video. Motor Disabilities Many users have difficulty with detailed mouse movements and may also have problems holding down multiple keyboard keys simultaneously. Most of these issues should be taken care of by improved browser design and should not concern content designers except for the advice not to design imagemaps that require extremely precise mouse positioning. Client-side imagemaps will work even for users who cannot use a mouse at all: Cognitive Disabilities By cognitive disabilities, I do not refer to below-average intelligence, though many sites will have to support such users as broader segments of the population go online. Currently, the Internet is so difficult to use that users need to be fairly intelligent to figure it out, but even these smart users sometimes have cognitive disabilities. Unfortunately, cognitive disabilities have not been the focus of as much user interface research as physical disabilities, so I only have a few examples. People vary in their spatial reasoning skills and in their short-term memory capacity. Programmers and graphic designers tend to get uncommonly high scores on tests of spatial reasoning skills and are therefore good at visualizing the structure of a Web site. Similarly, young people i. It is safe to assume that most users will have significantly greater difficulty navigating a Web site than its designers have. Simplified navigation helps all users, but is a required enabler for users at the opposite extreme of the scales. People who have difficulty visualizing the structure of an information can be helped if the site designers have produced such a visualization for them in the form of a sitemap; they would be further aided if the browser updated the display of the sitemap with the path of the navigation and the location of the current page. Users with dyslexia may have problems reading long pages and will be helped if the design facilitates scanability by proper use of headings as noted above. Selecting words with high information content as hypertext anchors will help these users, as well as blind users, scan for interesting links no "click here", please. Most search user interfaces require the user to type in keywords as search terms. Users with spelling disabilities and foreign-language users will obviously often fail to find what they need as long as perfect spellings are required. A first suggestion is to for search engines to include a spelling checker; other ideas from advanced information retrieval like query-by-example and similarity search can also help these users and benefit everybody else at the same time. I realize that my own pages do not follow every last guideline. I have a very pragmatic approach to usability and may cut a corner in order to meet deadlines or satisfy other design trade-offs. There is a great difference between less-than-perfect design and completely reckless design, though.

Chapter 6 : 5 of the Worst User-Interface Disasters - Scientific American

The key difference between user interfaces for sighted users and blind users is not that between graphics and text; it's the difference between 2-D and 1-D. Optimal usability for users with disabilities requires new approaches and new user interfaces.

These heuristics have been reflected in many of the products designed by some of the most successful companies in the world such as Apple, Google, and Adobe. Further evidence of how their design teams incorporate these rules into their design process is reflected in the user interface guidelines published and shared by these companies. This article will teach you how to follow the ten rules of thumb in your design work so you can further improve the usability , utility, and desirability of your designs. Visibility of system status. Users should always be informed of system operations with easy to understand and highly visible status displayed on the screen within a reasonable amount of time. Match between system and the real world. Designers should endeavor to mirror the language and concepts users would find in the real world based on who their target users are. User control and freedom. Offer users a digital space where backward steps are possible, including undoing and redoing previous actions. Interface designers should ensure that both the graphic elements and terminology are maintained across similar platforms. For example, an icon that represents one category or concept should not represent a different concept when used on a different screen. Whenever possible, design systems so that potential errors are kept to a minimum. Users do not like being called upon to detect and remedy problems, which may on occasion be beyond their level of expertise. Eliminating or flagging actions that may result in errors are two possible means of achieving error prevention. Recognition rather than recall. Minimize cognitive load by maintaining task-relevant information within the display while users explore the interface. Human attention is limited and we are only capable of maintaining around five items in our short-term memory at one time. Due to the limitations of short-term memory, designers should ensure users can simply employ recognition instead of recalling information across parts of the dialogue. Recognizing something is always easier than recall because recognition involves perceiving cues that help us reach into our vast memory and allowing relevant information to surface. For example, we often find the format of multiple choice questions easier than short answer questions on a test because it only requires us to recognize the answer rather than recall it from our memory. Flexibility and efficiency of use. With increased use comes the demand for less interactions that allow faster navigation. This can be achieved by using abbreviations, function keys, hidden commands and macro facilities. Users should be able to customize or tailor the interface to suit their needs so that frequent actions can be achieved through more convenient means. Aesthetic and minimalist design. Keep clutter to a minimum. Therefore, the display must be reduced to only the necessary components for the current tasks, whilst providing clearly visible and unambiguous means of navigating to other content. Help users recognize, diagnose and recover from errors. Designers should assume users are unable to understand technical terminology, therefore, error messages should almost always be expressed in plain language to ensure nothing gets lost in translation. Ideally, we want users to navigate the system without having to resort to documentation. However, depending on the type of solution, documentation may be necessary. When users require help, ensure it is easily located, specific to the task at hand and worded in a way that will guide them through the necessary steps towards a solution to the issue they are facing. Jon Wiley, the head designer of Google Search in once said: One of their most popular products, Adobe Photoshop, which is a raster graphics editor exhibits the characteristics of a well designed user interface that reflects these guidelines. We will take a closer look at how Adobe Photoshop reflects each of these guidelines in order to inspire you to improve the usability, utility, and desirability of your own designs by incorporating the 10 rules of thumb into your own work. For example, when users move layers around in the Layers palette, they can visually see the layer being represented as physically dragged within the space. Copyright terms and licence: Fair Use The cursor graphic goes from representing an open-hand to a gripped hand when the user drags a layer around within the Layers palette. System Match to the Real World An example of Photoshop mimicking the real world in terms and representations that their target users would understand, is where they design the information structure and terminology to mirror the same wording we would use in the world of photography or print media. User Control and Freedom Photoshop is very good at providing users with control every step of the way. As the user makes changes to an image or adds various artistic effects, they are able to quickly and easily take a step backwards if they make an error, for instance. Fair Use The File menu in Photoshop displays a variety of highly familiar options. Error Prevention To prevent users from making errors, Photoshop provides a brief description or label of the tools when a user hovers over it to help make sure users are using the proper tool for the task at hand. Recognition rather than Recall Whether it be making a selection from the artistic filters menu, or opening a new image file, Photoshop provides a sample view for users to make the right choice. Perhaps you have encountered other photo editing programs which ask you to recall and type the name of the file you want to work on. This can indeed be really difficult to recall as it is often something to the effect of: Fair Use The user is able to visually recognize the sunset image by its thumbnail and select it. Flexibility and Efficiency of Use One of the many reasons for frequent users to love Photoshop is for its flexibility and efficiency. Users are able to utilize its flexibility by organizing and adding to their Workspace, as well as making things more efficient by saving it for future use. Fair Use Photoshop gives frequent users the ability to save their preferred workspace-setup. Aesthetic and Minimalist Design The toolbar in Photoshop only displays the icons and is neatly tucked to the side to help keep clutter to a minimum, and maintain a minimalist aesthetic. Fair Use The Photoshop toolbar is minimalist and avoids clutter by representing the tools with icons only. Help Users Recognize, Diagnose and Recover from Errors Whenever there is an error, Photoshop provides dialogue that lets the user know what went wrong and how to fix it. Help and documentation Help and documentation can be accessed easily via the main menu bar. From there, you can find a wide variety of help topics and tutorials on how to make full use of the program. Fair Use The window displays information on how to create rollovers in the context of web graphics. The user is also able to see a list of topics on the side menu. To practice recognizing these 10 rules of thumb, go ahead and work through the exercise outlined in the attached file from the above section. Where To Learn More.

Chapter 7 : Design for All | The Encyclopedia of Human-Computer Interaction, 2nd Ed.

Interfaces release the potential of complex systems and technologies to the users who need them. And every once in a while, they change everything. We believe user interfaces have been pivotal to some of the world's most important innovations.

The user interface has two main components: Together, both concepts cover the form and content of the term user interface. Natural-Language Interfaces Natural-language interfaces are perhaps the dream and ideal of inexperienced users, because they permit them to interact with the computer in their everyday, or natural, language. No special skills are required of the user, who interfaces with the computer using natural language. The display depicted in the figure below lists three natural-language questions from three different applications. Notice that interaction with each seems very easy. For instance, the first sentence seems straightforward: The subtleties and irregularities residing in the ambiguities of English produce an extremely exacting and complex programming problem. Attempts at natural-language interfacing for particular applications in which any other type of interface is infeasible say, in the case of a user who is disabled are meeting with some success; however, these interfaces are typically expensive. Implementation problems and extraordinary demand on computing resources have so far kept natural-language interfaces to a minimum. The demand exists, though, and many programmers and researchers are working diligently on such interfaces. It is a growth area, and it therefore merits continued monitoring. Question-and-Answer Interfaces In a question-and-answer interface, the computer displays a question to the user on the display. To interact, the user enters an answer via a keyboard stroke or a mouse click , and the computer then acts on that input information in a preprogrammed manner, typically by moving to the next question. A type of question-and-answer interface called a dialog box is shown in the figure shown below. A dialog box acts as a question-and-answer interface within another application, in this case a PERT chart for a systems analysis project for the Bakerloo Brothers. The main interface for this application need not necessarily be question and answer. Rather, by incorporating a dialog box, the programmer has included an easy-to-use interface within a more complicated one. Wizards used to install software are a common example of a question-and-answer interface. The user responds to questions about the installation process, such as where to install the software or features. This is a typical way of setting up a technical support interface in order to winnow down problems and do more accurate troubleshooting. Menus A menu interface appropriately borrows its name from the list of dishes that can be selected in a restaurant. Similarly, a menu interface provides the user with an onscreen list of available selections. In responding to the menu, a user is limited to the options displayed. The user need not know the system but does need to know what task should be accomplished. For example, with a typical word processing menu, users can choose from the Edit, Copy, or Print options. To utilize the menu best, however, users must know which task they desire to perform. Menus are not hardware dependent. Menus can be set up to use keyboard entry, light pen, touch screen, or mouse. Selections can be identified with a number, letter, or keyword, or users can click on a selection with a mouse. Consistency is important in designing a menu interface. Menus can also be put aside until the user needs them. Figure illustration below shows how a pull-down menu is used while constructing a PERT diagram for a systems analysis project being completed for the Bakerloo Brothers. The user puts the pointer on Dates and pulls it down. Then the user puts the pointer on Calendar, selecting the option to display the project on a conventional monthly calendar. A pull-down menu is there when the user needs it. Menus can be nested within one another to lead a user through options in a program. Nested menus allow the screen to appear less cluttered, which is consistent with good design. They also allow users to avoid seeing menu options in which they have no interest. Nested menus can also move users quickly through the program. GUI menus are used to control PC software and have the following guidelines: The main menu bar is always displayed. The main menu uses single words for menu items. Main menu options always display secondary drop-down menus. The main menu should have secondary options grouped into similar sets of features. The drop-down menus that display when a main menu item is clicked often consist of more than one word. Secondary options perform actions or display additional menu items.

Menu items in gray are unavailable for the current activity. An object menu, also called a pop-up menu, is displayed when the user clicks on a GUI object with the right mouse button. These menus contain items specific for the current activity, and most are duplicate functions of main menu items. Experienced users may be irritated by nested menus. They may prefer to use a single-line command entry to speed things up. The form often is a facsimile of a paper form already familiar to the user. Figure below shows a form-fill interface. A pull-down menu for Part No. When the user tabs to the Quantity field and enters the number of items being purchased, the software automatically calculates the Extended Price by multiplying Quantity by Unit Price. An example of the form-fill interface. Forms for display screens are set up to show what information should be input and where. Blank fields requiring information can be highlighted with inverse or flashing characters. The cursor is moved by the user from field to field by a single stroke of an arrow key. This arrangement allows movement one field backward or one field forward by clicking the appropriate arrow key. It provides the user good control over data entry. Web-based forms afford the opportunity to include hyperlinks to examples of correctly filled-out forms or to further help and provide examples. Form input for displays can be simplified by supplying default values for fields and then allowing users to modify default information if necessary. For example, a database management system designed to show a form for inputting checks may supply the next sequential check number as a default when a new check form is exhibited. If checks are missing, the user changes the check number to reflect the actual check being input. If numbers are input where only letters are allowed, the computer may alert the user via audio output that the field was filled out incorrectly. It shows field labels as well as the context for entries. In addition, Web forms can return incomplete forms to the user with an explanation of what data must be entered to complete the transaction. Often, fields with missing data are marked with a red asterisk. Web-based documents can be sent directly to billing if a transaction is involved, or they can go directly to a real-time database if a survey is being submitted. Web-based forms push the responsibility for accuracy to the user and make the form available for completion and submission on a hour, 7-day-a-week, worldwide basis. Command-Language Interfaces A command-language interface allows the user to control the application with a series of keystrokes, commands, phrases, or some sequence of these three methods. The simple syntaxes of command languages are considered to be close to natural language. Two application examples of command language are shown in the figure below. The first shows a user who asks to use a file containing data on all salespeople, then asks the computer to display all last names and first names for all salespeople whose current sales CURSALES are greater than their quotas. After that is done, the user asks to go back to the top of the file and to print out LIST the file. The command language has no inherent meaning for the user, and that fact makes it dissimilar to the other interfaces discussed so far. Command languages manipulate the computer as a tool by allowing the user to control the dialog. Command language affords the user more overall flexibility and control. When the user employs command language, the command is executed by the system immediately. Then the user may proceed to give it another command. Command languages require memorization of syntax rules that may prove to be obstacles for inexperienced users. Experienced users tend to prefer command languages, possibly because of their faster completion time. Graphical User Interfaces The key to graphical user interfaces GUIs is the constant feedback on task accomplishment that they provide to users. Continuous feedback on the manipulated object means that changes or reversals in operations can be made quickly, without incurring error messages. The creation of GUIs poses a challenge, because an appropriate model of reality or an acceptable conceptual model of the representation must be invented. Designing GUIs for use on intranets, extranets, and on the Web requires even more careful planning. Most users of Web sites are unknown to the developer, so design must be clear-cut. The choice of icons, language, and hyperlinks becomes an entire set of decisions and assumptions about what kinds of users the Web site is hoping to attract. The designer must also adhere to conventions that users now expect to encounter on Web sites. Other User Interfaces Other less common user interfaces are growing in popularity. They include pointing devices such as the stylus, touch-sensitive screens, and speech recognition and synthesis. Each of these interfaces has its own special attributes that uniquely suit it to particular applications. The stylus a small pointed stick that resembles a pen is used with handwriting recognition software for mobile phones acting as PDAsâ€”personal digital assistants and PC devices. They have been a success because they integrate many functions and are easy to use. Additionally, they are portable and sell for a comparatively low price. Data entry is also facilitated with a docking cradle so that data can be synchronized with your PC. A tablet PC is a notebook computer with a stylus or touch-sensitive display.

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User Interface (UI) Design focuses on anticipating what users might need to do and ensuring that the interface has elements that are easy to access, understand, and use to facilitate those actions. UI brings together concepts from interaction design, visual design, and information architecture.

Human Computer Interaction 3 Summary: Optimal usability for users with disabilities requires new approaches and new user interfaces. The typical advice for making websites accessible is to create a single design for all users, then ensure that it complies with additional guidelines for use by people with disabilities. This is also the approach we take in our own guidelines for accessibility: They aim at improving usability for users with disabilities by tweaking traditional websites and intranets to take special needs into account. The main reason for this single-design-for-multiple-audiences approach is the assumption that most companies are unable to keep two different designs up-to-date. For most websites, this assumption is probably true. The average company allocates very limited resources to serving users with disabilities, so their best approach is to use these resources to improve the main design, rather than to design, implement, and maintain a separate site. However, perfect usability for users with disabilities requires separate designs optimized for each of the main access modalities. An interface for blind users, for example, should be designed for auditory presentation. Such a design is inevitably better than simply reading out loud something designed for screen-based visual presentation, even if that presentation is modified to take blind users into account. Of course, in an ideal world, separate and equally targeted designs would also be available for low-vision users, users with motor skills challenges, and so on. Optimize for Linear Access The biggest potential gains reside in creating a special design optimized for auditory presentation. A good 1-D audio design not only serves blind and low-vision users, but will also help users in cars and other settings as auditory access to Internet content increases. Linearizing a 2-D layout is simply not as usable as having a good designer create a targeted 1-D layout. Although a targeted 1-D audio presentation should start with the most important information, most audio translations simply read a 2-D page aloud, starting at the top left, which mainly contains information that sighted users typically skip. Also, simply reading aloud eliminates size distinctions, which are key elements in 2-D designs. The fundamental difference between user interfaces for sighted users and blind users is thus not the distinction between graphics and text, but that between 2-D and 1-D. Thus, a design for auditory use might end up being more N -dimensional than purely 1-dimensional. Blind users might also benefit more from a 3-D user interface than sighted users. I imagine a gestural interface, where users are surrounded by different types of information located at different spots. Thus, designers could "park" search results and other key pieces of information in particular locations, where users could retrieve them with a gesture. For sighted users, such an interface would be useless: There would be no words floating in space -- unless they used a clumsy VR helmet. For blind users, however, gestures and unseen but easily remembered 3-D locations might beat linear read-outs. Users with low vision, for example, can only see small amounts of information at any given time. Optimizing the design to suit their needs also benefits users of mobile devices or other small-screen devices, who essentially have the same limitations. Regardless of the targeted user group, all designs must offer the same functionality and provide access to the same content. A good content management system will be necessary to ensure that all versions are kept in synch and no one misses out on updates. Of course, the approach I advocate here is overly Utopian. I doubt at present that companies will spend enough money on users with disabilities to create sufficiently good alternative designs -- especially when such designs will require a completely new set of usability guidelines. However, the future is more promising: Once auditory access to Internet content becomes more mainstream, I expect that resources to create optimal audio designs will be more readily available.

Chapter 9 : User interface - Wikipedia

User interface design (UI) or user interface engineering is the design of user interfaces for machines and software, such as computers, home appliances, mobile devices, and other electronic devices, with the focus on maximizing usability and the user experience.

Bad design wastes our time, makes us feel incompetent, interferes with productivityâ€”and, sometimes, really messes things up. Five of the worst digital user-interface debacles of all time. Each had a separate Web browser, Control Panel, e-mail program and type of programs. Twice the learning, twice the confusionâ€"and people hated it. Microsoft ditched that approach in Windows The system was called iDrive, and it was a disaster. It was slow, complex and infuriating to owners. In BMW overhauled the system completely. Say, in my TV room, in the dark? Interface-disaster remotes have rows and columns of identical buttonsâ€"with no differentiation between the ones you use all the time, like the volume and pause buttons, and the ones you rarely need. Part of the reason may be that the watch is, for Apple, uncharacteristically complicated to use. There are eight different ways to interact with it: Turn or click the knob on the side, tap or hold the side button, tap the screen, hard-press the screen, swipe across the screen and pinch the screen. Recent notifications appear as a vertical scrolling list, but "glances" display screens for stocks, weather, battery charge, steps taken and so on are arranged horizontally. But in the right or wrong situations, it can cost lives. On July 3, , the U. It fired two missiles at the airliner and killed all onboard. In the aftermath a number of factors turned out to have been at playâ€"one of them was poor interface design. An operator must summon that information manually, and it appears on a tiny inch screen. Had the Vincennes crew been able to see the correct trajectory of Flight [pdf], they might not have fired.