Usability Principles Concepts, Principles, Guidelines Agenda ● Usability Principles – Why? – Systems of categorization – Levels of detail – Example system of Principles 2 Why Principles & Guidelines? ● ...Because, well, not everything goes... ● Intended to prevent many bad designs, before they begin, or evaluate existing designs on a scientific basis ● Guidelines based on previous designs, experimental findings ● Rules can all be "broken" (but usually in order to satisfy another principle) 3 Concepts, Principles, Guidelines ● No "cookbooks" ● No simple, universal checklists ● There are many concepts, principles, and guidelines ● Understand the higher level principles that apply across situations, display types, etc. ● Implement the standards and guidelines ...a few details... 4 Levels of Consideration 1. Meta-display level – Apply to the whole system, across media & across displays – Focus on this in Basic Layout Stage 2. Display Layout – Apply to groups of elements in a display – Focus on this in Prototyping and Redesign 3. Element level – Details about specific parts of a display – Colors, sound attributes, symbols 5 UI Design Principles (Dix et al.) ● Categories 1. Learnability ● support for learning for users of all levels 2. Flexibility ● support for multiple ways of doing tasks 3. Robustness ● support for recovery ● Think about these in terms of meta-display, display, and element levels 6 1. Learnability Principles ● Ease with which new users can begin effective interaction and achieve maximal performance – Predictability – Synthesizability – Familiarity – Generalizability – Consistency 7 Predictability ● What will this action do?.... ● Operation visibility – can see avail actions – grayed menu items – menus vs. command shell 8 Synthesizability ● Support for user in assessing the effect of past operations on current system state Can the user figure out what caused this error? – Moving a file in UNIX shell vs. GUI – Is same feedback needed for all users, all apps? 9 Familiarity ● Does UI task leverage existing real-world or domain knowledge? – Really relevant to first impressions – Use of metaphors ● Potential pitfalls (see next page) – Are there limitations on familiarity? ● (e.g. parking lot colors and traffic light) 10 Generalizability ● Can knowledge of one system/UI be extended to other similar ones? – Example: cut & paste in different applications – Does knowledge of one aspect of a UI apply to rest of the UI? ● e.g. file browser in OS, file locater in MS-Word – Aid: UI Developers guidelines 11 Consistency ● Likeness in behavior between similar tasks/operations/situations – In different things ● interacting ● output ● screen layout ● Is this always desirable for all systems, all users? 12 2. Flexibility Principles ● Multiplicity of ways that users and system exchange information – Dialog Initiative – Multithreading – Task migratability – Substitutivity – Customizability 13 Dialog Initiative ● Not hampering the user by placing constraints on how dialog is done – User pre-emptive ● User initiates actions ● More flexible, generally more desirable – System pre-emptive ● System does all prompts, user responds ● Sometimes necessary 14 Multithreading ● Allowing user to perform more than one task at a time ● Two types – Concurrent ● Input to multiple tasks simultaneously – Interleaved ● Many tasks, but input to one at a time 15 Task migratability ● Ability to move performance of task to entity (user or system) who can do it better – Auto-pilot/FMC in planes – Spell-checking – Safety controls in plant ● For what kinds of tasks should the user be in control? 16 Substitutivity ● Flexibility in details of operations – Allow user to choose interaction methods – Allow different ways to ● perform actions ● specify data ● configure – Allow different ways of presenting output ● to suit task, user 17 Customizability ● Ability of user to modify interface – By user – adaptability ● Is this a good thing? – By system – adaptivity ● Is this a good thing?

18 3. Robustness Principles ● Supporting user in determining successful achievement and assessment of goals – Observability – Recoverability – Responsiveness – Task Conformance 19 Observability ● Can user determine internal state of system from what she perceives? – Browsability ● Explore current state (without changing it) – Reachability ● Navigate through observable states – Persistence ● How long does observable state persist? 20 Recoverability ● Ability to take corrective action upon recognizing error – "UNDO" – Difficulty of recovery procedure should relate to difficulty of original task – Forward recovery ● Ability to fix when we can't undo – Backward recovery ● Undo previous error(s) 21 Responsiveness ● Users perception of rate of communication with system – Response time ● Time for system to respond in some way to user action(s) – Users perceptions not always right – Consistency important – Response OK if matches user expectations 22 Task Conformance ● Does system support all tasks user wishes to perform in expected ways? – Task completeness ● Can system do all tasks of interest? – Task adequacy ● Can user understand how to do tasks? – Does it allow user to define new tasks? 23 Application of Principles ● In doing design and implementation of your project, revisit this list ● Assess your design against these usability principles ● REMEMBER: There are other principles! 24 Upcoming ● Human Capabilities – Physical – Cognitive 25 Some Practical Principles ● The following pages contain a number of different, practical guidelines at each of the three levels (meta, display, and element levels) ● Some are the same or similar to ones we have discussed in class ● Some are more specific ● They have proven useful to me, but, of course, your mileage may vary 26 Meta–display Principles, I ● Navigation model – Decide on one navigation metaphor (e.g., menu structure vs. home page), and use it consistently. ● Consistent navigation cues – Families of logos, color schemes, and sounds used to indicate displays are related. Be subtle, consistent, and don't forget aesthetics! ● Fail–safe design principle – Allow user to go back to previous items, steps, screens, etc. Allow user to undo as many actions as possible. Provide a true "Quit" or "Cancel" option. 27 Meta–display Principles, II ● Open–ended vs. Task completion model – Distinguish between browsing (open–ended) interaction, and task completion behavior. ● Concert vs. Conversation model – A continuum of interaction types from passive recipient of the information ("concert") to ask–and–respond dialog between the user and the system ("conversation"). ● Computer vs. Appliance model – May need to avoid "computerese" and jargon. 28 Meta–display Principles, III ● Logo/icon principle – Top level has a logo (or melody). Lower levels have icon version of logo (or "theme" of melody). ● Family of logos principle – Related applications have icons (and earcons) that form a "family;" in fact, a simple symbolic language to help users navigate. ● Process preview and progress indicators – Provide a preview or summary of what is to come, and provide an indication of how far along the user is at all times. 29 Display Level Principles, I ● Compatibility (cognitive and physical) – Left is left, up is up. Align display dimensions (in all modalities!) with real–world data dimensions. ● Familiarity principle – Provide users with interface items that relate to their real world. ● Appropriate medium/modality – Choose the best medium to display a given type of information (like function allocation). ● Population stereotypes and mappings – Where possible, build on the expectancies of your user population (red = stop; high pitch = hot). 30 Display Level Principles, II ● Process flow = display flow – (Western) readers work left–to–right, top–to–bottom. If there is a most frequent order of actions, design display to correspond (left or up = "back;" right or down = "continue"). ●

Conceptual size = hierarchical position – Items, objects, groups that are larger (even conceptually) or hierarchy are displayed before smaller items (take note of process flow). ● Group like items – Items similar in content or function should be grouped together n space or time. They should share spatial, physical, or temporal attributes. 31 Display Level Principles, III ● Continuous vs. Discrete data – Does data "flow" or is it displayed in "chunks"? ● Object + action vs. Action + object (action grammar) – Is an object selected, then an action indicated, or vice versa? ● Most important info in "center" – Center the important info in the display space (both visual and auditory). Controls in the periphery. ● Avoid modes – Each display should have one meaning only, and certainly only one meaning with a screen's context. 32 Element Level Guidelines, I ● A few "controls" guidelines… ● Label–Action match – Controls say what they do, and do what they say. Consistent both within and across applications. Note: "OK" is not okay! ● Button location / icon /action compatibility – (1) Control icon is compatible with action – (2) Control location is compatible with the action (and with the icon) ● Consistent menus – Menus should be consistent within and across applications. Most frequently used options located to the top and left. 33 Element Level Guidelines, II ● Several auditory guidelines… ● Duration: 100 ms minimum ● Loudness: 10–15 dB over ambient; max 90 dB ● Onset ("attack") rate: 1–5 dB per second; 20 ms minimum ● Frequency: 300 – 3000 Hz. Varies with age. ● Levels of data in a dimension: – Intensity (pure tones) 4–5 – Frequency 4–7 – Duration 2–3 34 Element Level Guidelines, III ● More auditory guidelines… ● Appropriate spectrum – Complex spectral features for warning or detection; transients for localization; simple spectrum for discrimination ● Avoid similar frequencies – (Leads to "beating", poor discrimination) ● Use population expectancies for mappings – Louder, brighter, faster, higher pitch = "more" or "up" – Rising pitch = "moving up" or "getting full" – Major key, bright spectrum = "happy" or "good" Note: Make sure you know which population stereotypes apply (e.g., sighted vs. blind listeners) 35