Interaction Design

Human Computer Interaction Research Group
Department of Computer Science

Tools of the Trade

- So up until now we have a set of tools that allows us to create new interfaces
- Like any toolbench, we need principles on how to use them to create new artefacts
- Consider a clockmaker – it isn't enough to have a screwdriver, hammer, or even cogs and wheels – you need a guide that tells you what a clock is and how it is made

Levels of Guidance

- Principles
  - High level ideas about how best to support users
- Guidelines
  - Formalised guidance, usually based on some evidence
- Standards
  - Broadly agreed guidelines, usually prepared by standards bodies
- Design Pattern
  - A specific solution to an existing problem, usually with rationale as to why it works
- Style Guides
  - Specific styles for specific platforms
- Heuristics
  - Rules of thumb for checking interfaces for specific properties

Norman's Principles

- Rules making designer's conceptual model less ambiguous to the user:
  1. Visibility
  2. Feedback
  3. Physical, logical & cultural constraints
  4. Mappings
  5. Consistency
  6. Affordances

Shneiderman's 8 Golden Rules

- Rules of interface design:
  1. Strive for consistency
  2. Cater to universal usability
  3. Offer informative feedback
  4. Design dialogs to yield closure
  5. Prevent errors
  6. Permit easy reversal of actions
  7. Support internal locus of control
  8. Reduce short-term memory load

Tog’s Principles

- Aesthetics
- Anticipation
- Autonomy
- Color
- Consistency
- Defaults
- Discoverability
- Efficiency of the User
- Explorable Interfaces
- Fitts's Law
- Human-Interface Objects
- Latency Reduction
- Learnability
- Metaphors
- Protect Users' Work
- Readability
- Simplicity
- State: Track it
- Visible Interfaces

Neilsen's Heuristics

- Rules for evaluating interactive systems
  1. Visibility of system status
  2. Match between system and the real world
  3. User control and freedom
  4. Consistency and standards
  5. Error prevention
  6. Recognition rather than recall
  7. Flexibility and efficiency of use
  8. Aesthetic and minimalist design
  9. Help users recognize, diagnose, and recover from errors
  10. Help and documentation

Shared Principles

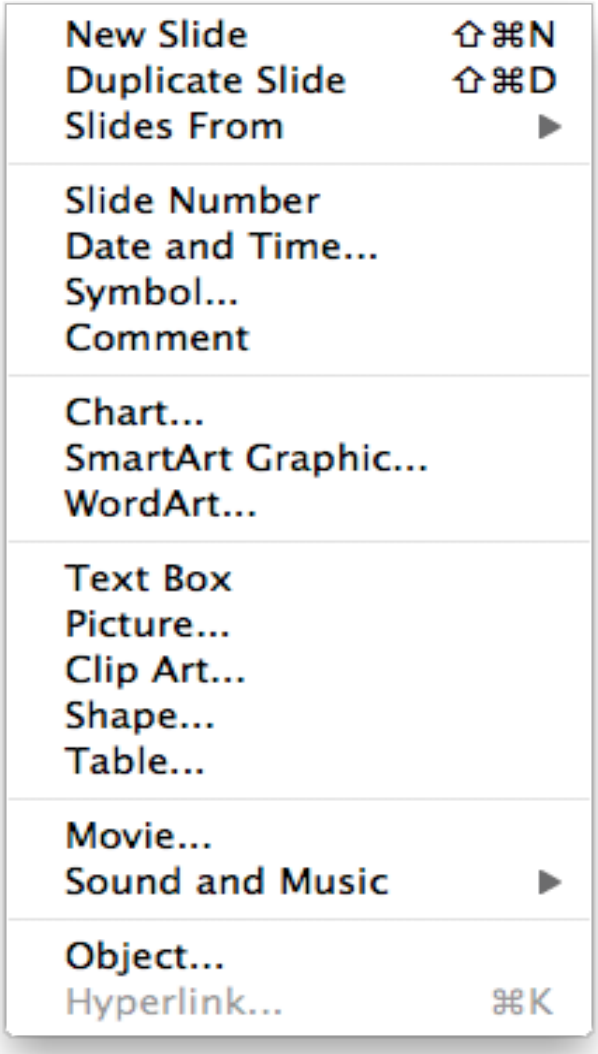
- All sets of guidelines share certain aspects that are important
- We will go through some of the more important ones today
- You should definitely review each of the above in some detail

Memory load

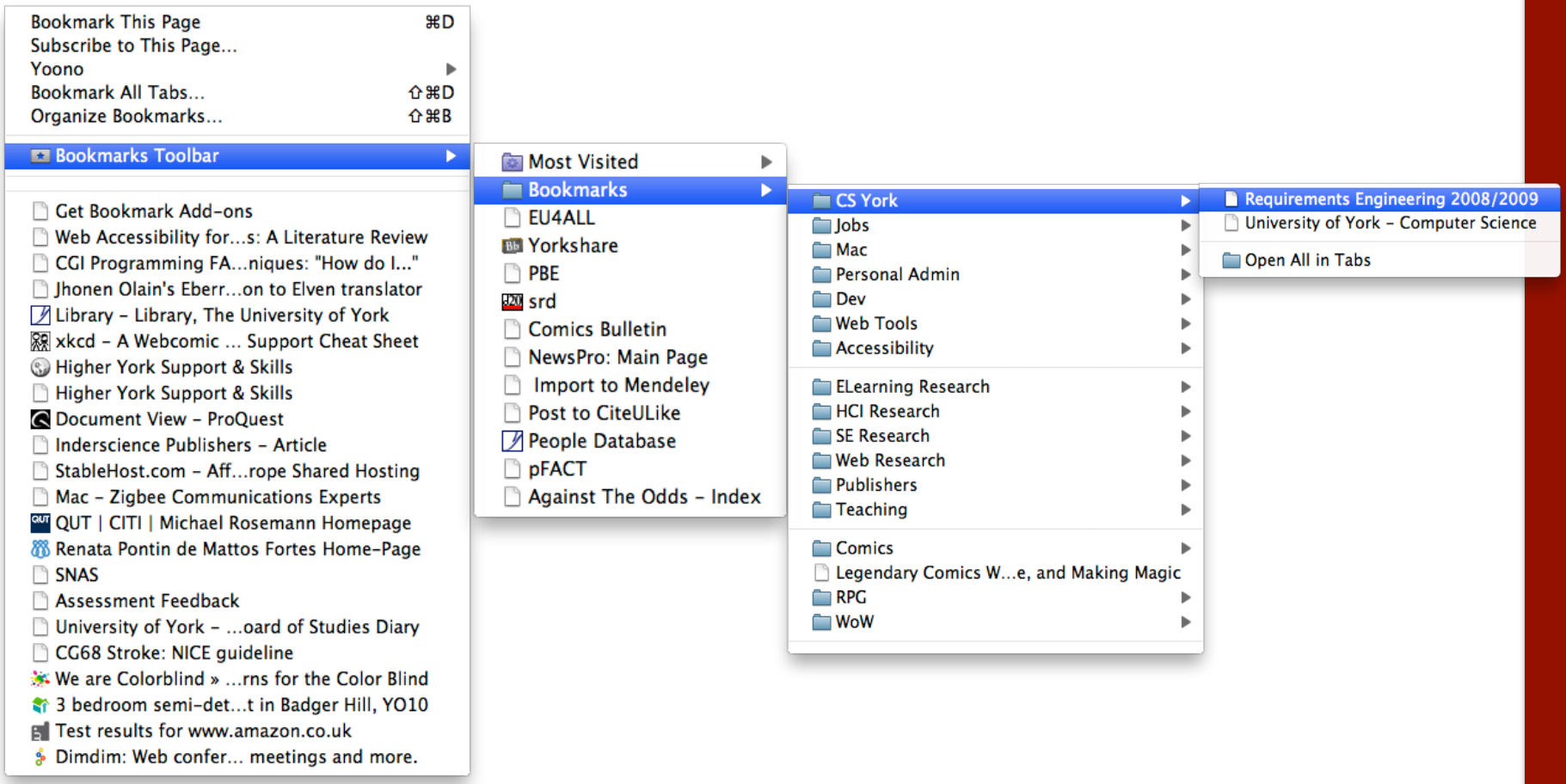
- Shneiderman Golden Rule 8:
  - Reduce short-term memory load
- Nielsen Heuristic 6: Recognition rather than recall

Memory: Use recognition not recall

- One of our key reasons from moving to direct manipulation – do not have to rely on recall memory
- Menus use this principle – but deeper and deeper menus cause the same problems for memory



How is this helpful to anyone?



Visibility

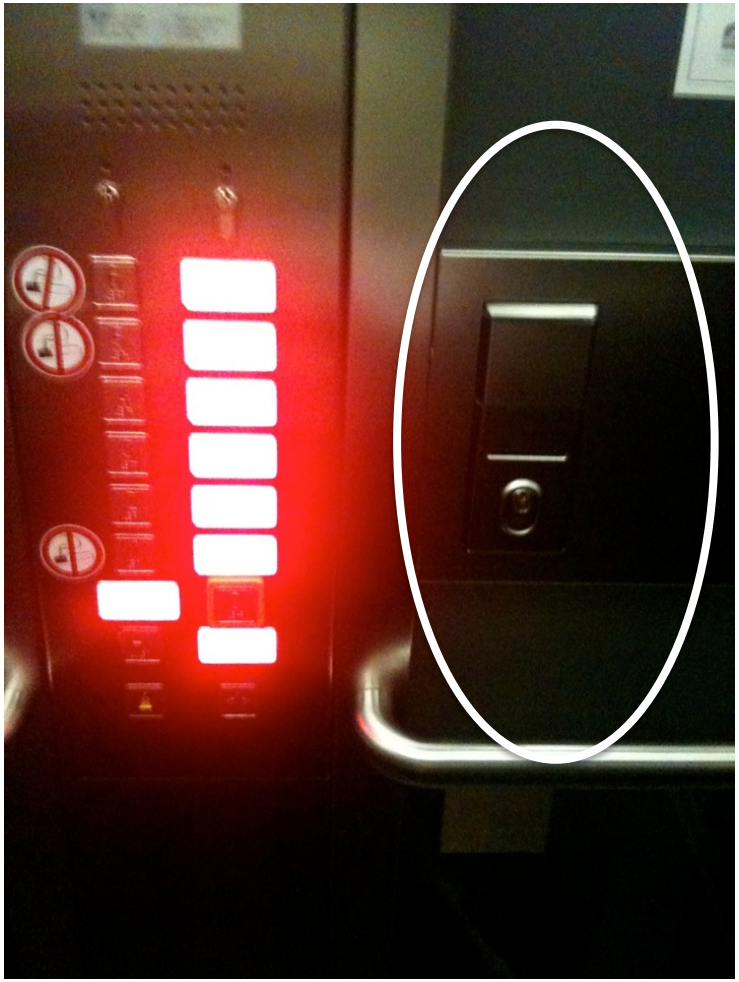
- Nielsen Heuristic 1 - Visibility of system status
- Tog – Anticipation, Visible Navigation
- Various things that need to be made visible in the interface:
  - System status – what is the system waiting for?
  - Order of operations – what do you need first?
  - Options – what options are available, and for complex functionality where do I discover it?
  - Navigation – how do you get around?

System visibility

- This is a control panel for an elevator for my hotel
- How does it work?
  - Push a button for the floor you want.
  - Nothing happens.
  - Push another button.
  - Still nothing. What do you need to do?

System visibility

- …you need to insert your room card in the slot by the buttons to get the elevator to work!
- How would you make this action more visible?
  - make the card reader more obvious
  - provide an auditory message, that says what to do (which language?)
  - provide a big label next to the card reader that flashes when someone enters
  - make what has to be done completely obvious



System visibility - order of interaction

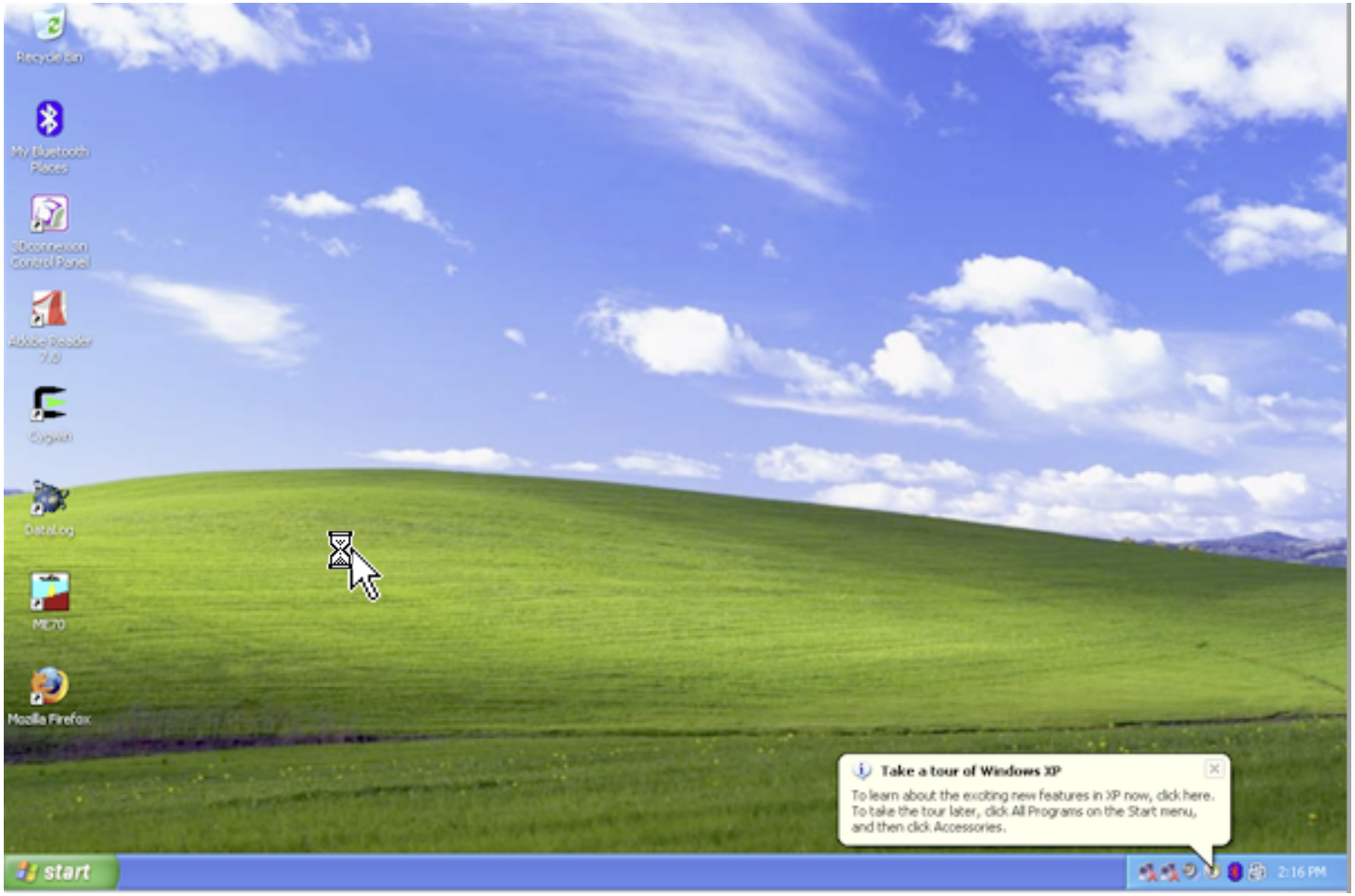
Feedback

- Shneiderman Golden Rule 3: Offer informative feedback
  - Already discussed in some detail in a previous lecture

Feedback and delays

- Feedback
  - Immediate
    - Presentation and observation of state change are perceived as occurring immediately after user input
  - Delayed
    - Presentation or performance is perceived as non-instantaneous
    - Delays become ‘no responses’ and the user gives up or takes actions that are at best superfluous or at worst erroneous

Example: Feedback of Application Startup on Windows XP



Example: Feedback of Application Startup on Mac OSX

Delays and the web

- Nielsen's 0.1, 1.0, 10 sec. rule
  - 0.1 sec the limit for the feeling of direct manipulation
  - 1.0 sec the limit for users flow of thought to be uninterrupted
  - 10 secs about the limit for keeping the user focussed in the interaction
- Delays lead to frustration and also effect trust
- Variability and predictability
  - A predictable delay is better
  - Feedback about the length of delay is better

Consistency

- Shneiderman Golden Rule 1: Strive for consistency
- Tog First Principle 4: Consistency
- Nielsen Heuristic 4: Consistency and standards

Consistency

- Design interfaces should have similar operations and use similar elements for similar tasks
- For example:
  - Dragging files into trash = delete
  - Dragging your stick/CD into trash = remove
    - Only bad thing in the Apple interface
- Main benefits are consistent interfaces are easier to learn and use, can predict operations, less likely to make errors

Consistency

- Have forward/back buttons in the same place on each page
  - may seem common sense, but DirectGov systems don't always do this
- Use same layout, colour scheme, font etc
- A change indicates something important
- But will users notice?
  - British Museum had colour coding for different types of information about key objects (info about the object itself, where it was found, how it was made) – users never noticed

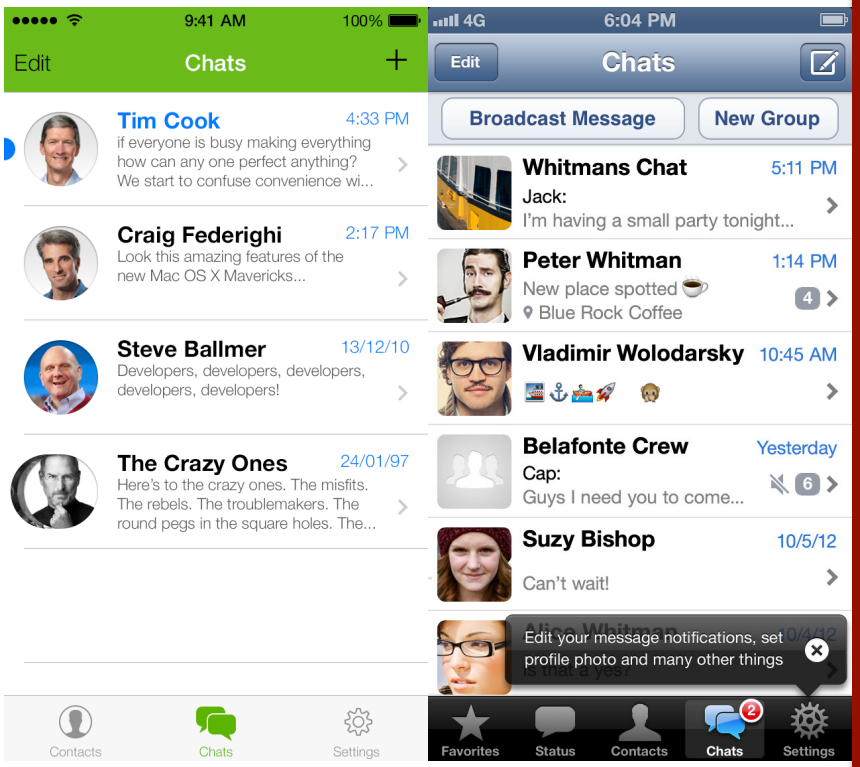
Internal and external consistency

- Internal consistency refers to designing operations to behave the same within an application

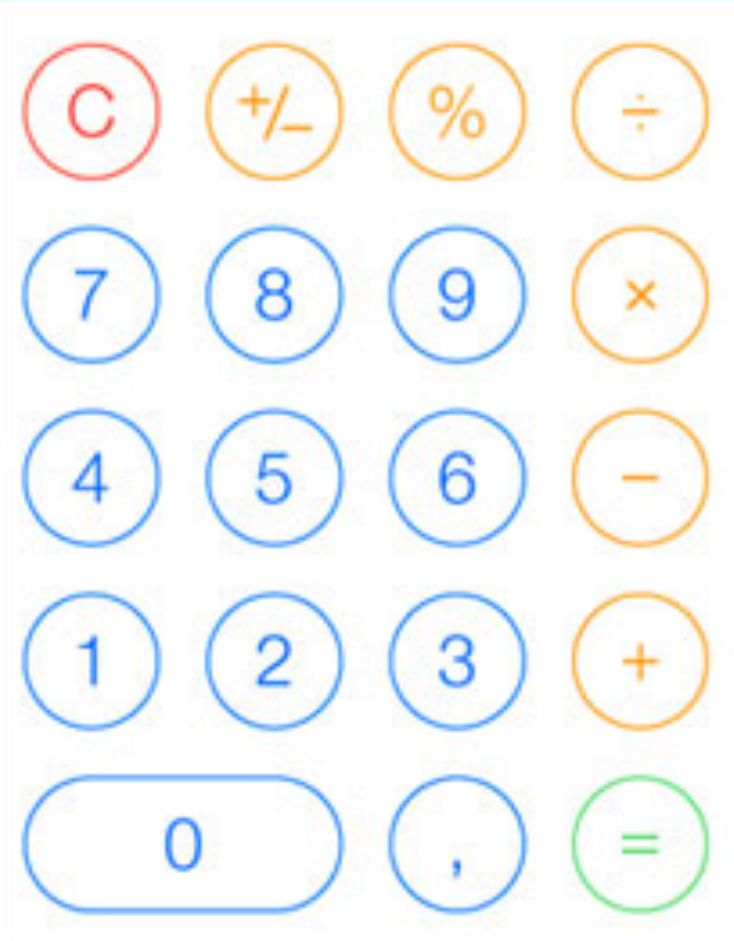
- External consistency refers to designing operations, interfaces, etc., to be similar across applications and devices (e.g. all Windows/Apple applications follow the same conventions)

Tog goes even further …

- Top level consistency
  - Platform consistency – within the device and "style of the time"
  - In house consistency – shared style across different applications owned by one development house
- Consistency across a suite
  - All items together as part of a family
- Consistency within a specific app – splash screens, buttons, navigation menues



Does this violation impact users in general?



Closure

- Shneiderman Golden Rule 4: Design dialogues to yield closure
- Dialogue exchanges should lead to users feeling like they have accomplished their goals

Closure

- Clearest example – bank ATMS
- Initial design – get money, get card
- Many people were leaving their cards in the machine
- Getting the money gives a sense of closure, have it last
  - (still not universal)

Readability

Tog First Principle 14: Readability

Fonts

- The quick brown fox jumps …
- The quick brown fox jumps …

- To serif or not to serif, that is the question …
- No agreement on which is easier to read

Colour and background

- aesthetically pleasing designs
  - increase user satisfaction and improve productivity
- beauty and utility may conflict
  - mixed up visual styles ⇒ easy to distinguish
  - clean design – little differentiation ⇒ confusing
  - backgrounds behind text

    … good to look at, but hard to read

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- aesthetically pleasing designs
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    … good to look at, but hard to read
- but can work together
  - e.g. the design of the counter
  - in consumer products – key differentiator (e.g. iMac)

bad use of colour

- over use - without very good reason (e.g. kids' site)
- colour blindness
- poor use of contrast
- do adjust your set!
  - adjust your monitor to greys only
  - can you still read your screen?

Alignment - numbers

- think purpose!
- which is biggest?

```
532.56
179.3
256.317
15
73.948
1035
3.142
497.6256
```

Alignment - numbers

- visually:
  - long number = big number
- align decimal points
- or right align integers

```
  179 . 30
  256 . 317
   15 . 00
   73 . 948
 1035 . 00
    3 . 142
  497 . 6256
```

Multiple columns

- scanning across large gaps is hard:
  (can't make the right gestalt - shortbread + 75)

  shortbread……..75

  toffee……..120

  chocolate……..35

  fruit gums……..27

  coconut dreams……..85

Multiple Columns

shortbread	75
toffee	120
chocolate	35
fruit gums	27
coconut dreams	85

Multiple columns

- or even (with care!) ‘bad’ alignment

sherbet	75
toffee	120
chocolate	35
fruit gums	27
coconut dreams	85

Match between system and real world

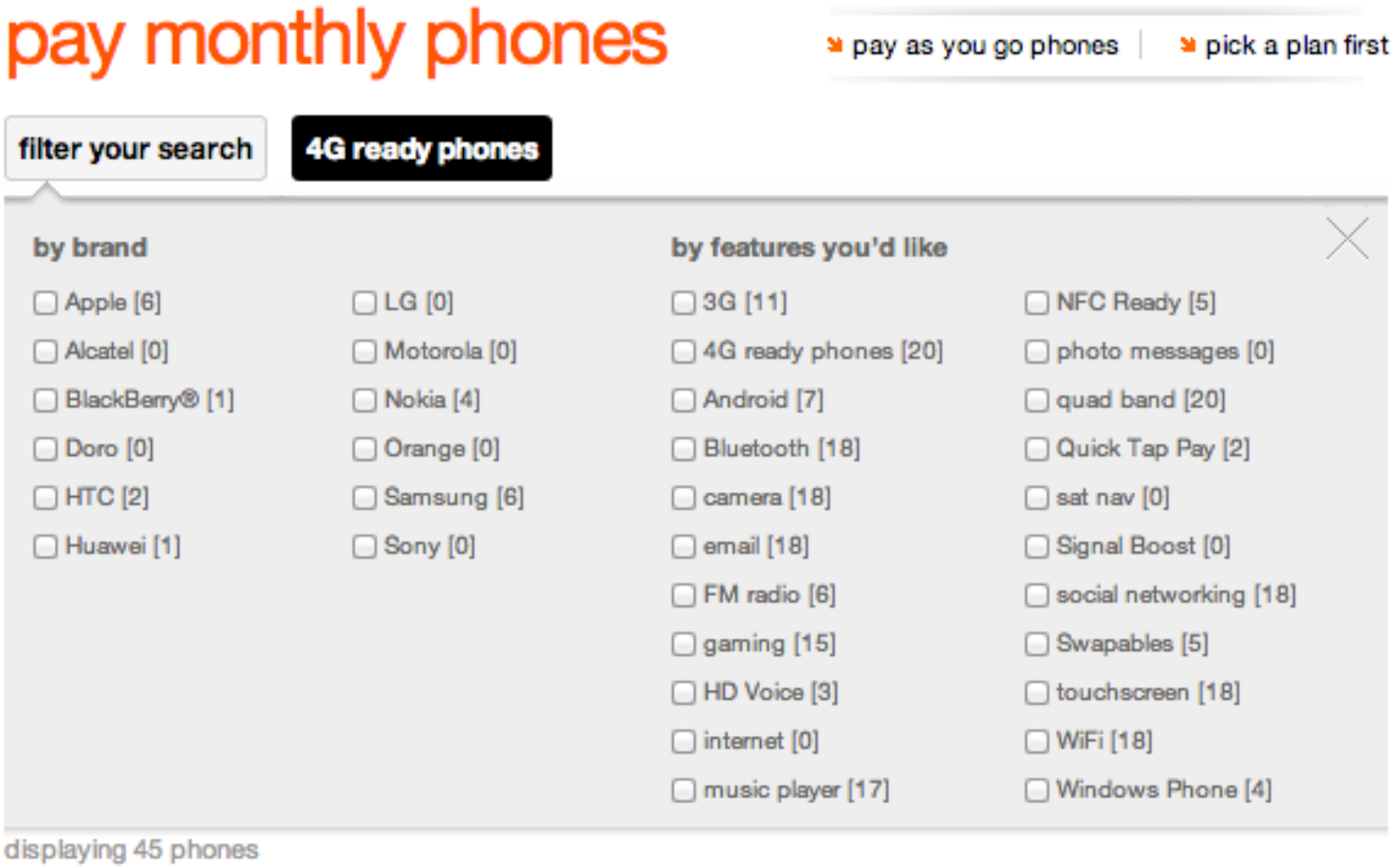
Nielsen Heuristic 2: Match between system and real world

… speak the users' language … follow real-world conventions, making information appear in a natural and logical order

Match between system and real world

- Nielsen Heuristic 2: Match between system and real world
  - … speak the users' language … follow real-world conventions, making information appear in a natural and logical order
- Use the language of the real users of the system, not computing language or HCI language

User's Language vs. System Language



Summary

- The above are all samples of different principles from across the spectrum of design principles
- Many of these come with compromise – design takes practice and evaluative thinking

Readings

- Most of the readings we have had contain various design principles. Each chapter in the Cooper book has a list – summarised in Appendix A
- Shneiderman's 8 Golden Rules no longer appear in most texts, which is unfortunate
  - A copy of them appear here http://faculty.washington.edu/jtenenbg/courses/360/f04/sessions/schneidermanGoldenRules.html
- Norman's Design Principles appear with discussion in the Rogers, Sharp and Preece book – Chapter 1, pg 25-29
- Tog's Principles are available online at:
  - http://asktog.com/atc/principles-of-interaction-design/ (big update March 2014)