Why are good UIs important?

- Distinguishing full and partial control rod levers in a nuclear plant

R. Sugarman, Nuclear power and the public risk, IEEE Spectrum, 16(11), November 1979, 58–79.
Why are good UIs important?

Lenovo
ThinkPad Carbon X1
Why are good UIs important?

Stock Selloff May Have Been Triggered by a Trader Error

Published: Thursday, 6 May 2015 | 7:58 PM ET

By: CNBC.com with Reuters

In one of the most dizzying half-hours in stock market history, the Dow plunged nearly 1,000 points before paring those losses—all apparently due to a trader error.

According to multiple sources, a trader entered a "b" for billion instead of an "m" for million in a trade possibly involving Procter & Gamble (PG 60.75 ▼ -1.41 (-2.27%) ) , a component in the Dow. (CNBC's Jim Cramer)

Summary of the Amazon S3 Service Disruption in the Northern Virginia (US-EAST-1) Region

We'd like to give you some additional disruption that occurred in the Northern Virginia (US-EAST-1) Region on the morning of February 28th, 2017. The (S3) team was debugging an issue when progress more slowly than expected. At 9:37AM PST, an authorized S3 team member using an established playbook executed a command which was intended to remove a small number of servers for one of the S3 subsystems that is used by the S3 billing process. Unfortunately, one of the inputs to the command was entered incorrectly and a larger set of servers was removed than intended. The servers that were inadvertently removed supported two other S3 subsystems. One of these subsystems, the index subsystem, manages the metadata and location information of all S3 objects in the region. This subsystem is necessary to serve all GET, LIST, PUT, and DELETE requests. The second subsystem, the placement
Why are good UIs important?

https://nest.com/support/article/Nest-Protect-Safety

As of April 3rd, 2014, Nest Wave has been disabled on all Nest Protects.

During internal testing, we discovered that movements near Nest Protect that are not intended as a wave can be misinterpreted by the Nest Wave algorithm. If this occurs during a fire, this could delay or prevent the alarm going off. So, we have removed this feature.

Why are good UIs hard to build?

- **User** interface
- **Human**–computer interaction
People are human

- People like “features”!

You might think, then, that companies could avoid feature creep by just paying attention to what customers really want. But that’s where the trouble begins, because although consumers find overloaded gadgets unmanageable, they also find them attractive. It turns out that when we look at a new product in a store we tend to think that the more features there are, the better. It’s only once we get the product home and try to use it that we realize the virtues of simplicity. A recent study by a trio of marketing academics—Deborah Viana Thompson, Rebecca W. Hamilton, and Roland T. Rust—found that when consumers were given a choice of three models, of varying complexity, of a digital device, more than sixty per cent chose the one with the most features. Then, when the subjects were given the chance to customize their product, choosing from twenty-five features, they behaved like kids in a candy store. (Twenty features was the average.) But, when they were asked to use the digital device, so-called “feature fatigue” set in. They became frustrated with the plethora of options they had created, and ended up happier with a simpler product.
People differ

- Physical abilities
  - **Anthropometry**: Study of human body measurements
    - Static vs. dynamic properties
      - Height, weight, reach,…
      - Speed at which you read, “double click”,…
  - **Ergonomics**: Design of places and tools in and with which we work; “human engineering”
    - Design of work surfaces, chairs, keyboards, mice,…

People differ

- Perceptual abilities
  - Screen refresh rate, flicker
  - Depth perception
  - Hearing
  - Color
    - Color blindness (color vision deficiency)
      - ~ 8% males vs. ~ 0.4% females ("red-green" color blind)
    - Tetrachromacy
      - 4th cone with sensitivity between r and g, > 3-channel system + higher-dimensional perceptual experience (females only)
People differ

- Cognitive processes
  - Individual differences
    - Short-term memory (STM)
    - Long-term memory (LTM)
    - Ability to solve problems, make decisions, search, attend

People differ

- Cognitive processes
  - Gender differences
    - Participants navigate in 3D environment presented on
      - Small displays with a narrow field of view
      - Large displays with a wide field of view
    - Results
      - Narrow field of view: Men outperform women (well replicated finding)
      - Wide field of view: Women and men both perform better, and gender bias is significantly reduced
People differ

- Cultural differences
  - Tone of interface
  - Reading left-to-right, right-to-left, top-to-bottom
  - Formats
    - Date, time, currency, capitalization, spelling, punctuation, colors
  - Icons
    - Garbage can, mailbox

Cultural differences: color

P. Russo & S. Boor, How fluent is your interface? Proc. INTERCHI ’93

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Geographic differences: time zones

People differ

- Age
  - Childhood
    - Literacy
    - Motor skills
    - Abstraction
  - Old age
    - Vision
      - Large fonts
      - Dark adaptation
      - Focus
    - Hearing
    - Memory
People differ

- Disabilities
  - Vision
  - Hearing
  - Motor skills

Section 504

- Section 504 of US Rehabilitation Act of 1973
  - “No otherwise qualified handicapped individual in the United States...shall, solely by reason of his handicap, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.”
ADA  www.ada.gov

- Americans with Disabilities Act of 1990 (ADA)
  - Equal opportunity law for people with disabilities
  - Issues with screen readers
    - http://www.columbiaspectator.com/2012/02/09/exclusion-google-docs-avoids-ada-challenges
      - Notably, while LionMail Drive will be available for classroom use, because of the lack of access for certain types of disabilities, the University prohibits faculty from requiring it for any academic interaction. Requiring its use might exclude some students from full class participation and access to the full academic environment.

  —Email from LionMail Team, July 9, 2014

ADA

EdX Online Accessibility Settlement Reached

By TAMAR LEWIN  APRIL 3, 2017

EdX, the nonprofit online-learning venture M.I.T. and Harvard formed in 2012, agreed to a settlement with the Department of Justice under which it will make its 450 massive open online courses accessible to blind and hard-of-hearing students, and to those with other disabilities, such as a tremor that makes it difficult to operate a mouse.

EdX did not admit any wrongdoing, and maintains that its online operations are not covered by the Americans With Disabilities Act. The settlement underscores the government’s policy of ensuring that online education is as accessible to those with disabilities as on-campus education is.

http://www.nytimes.com/2015/04/03/us/online-accessibility-settlement-reached.html

Feiner, COMS W4170, Fall 2018
Section 508  www.section508.gov

- 1998 US Congressional amendment to Rehabilitation Act of 1973
  
  Now called ICT (Information and Communication Technology)

- Requires Federal agencies to make EIT (Electronic and Information Technology) accessible to people with disabilities

- Federal agencies must procure EIT that gives disabled employees and members of the public access that is comparable to that available to others
  
  Except where it imposes a documented “undue burden” (significant difficulty or expense)
  
  In that case, “alternative means of access” must be provided

  Except for “national security systems”: intelligence, command & control, weapons,…

Website Accessibility

- Website accessibility
  
  Standards

  - Web Content Accessibility Guidelines (WCAG) 2.0
    
    - http://www.w3.org/TR/WCAG20/
  
  - Accessible Rich Internet Applications Suite
    
    - http://www.w3.org/WAI/intro/aria

  - Compliance analysis
    
    - http://wave.webaim.org
Situations differ

- Work ↔ Play
- Routine ↔ Emergency
- Individual ↔ Group
- Stationary ↔ Mobile
- Indoors ↔ Outdoors

Devices differ

- Old ↔ New (e.g., slow ↔ fast, less memory ↔ more memory)
- Disconnected ↔ High bandwidth connectivity
- Size, weight, shape, look, feel
- Display/Interaction
  - Small ↔ Large
  - One ↔ Many
  - Low res ↔ High res
  - Vertical ↔ Horizontal (↔ Wearable)
  - No touch input ↔ Multitouch (↔ 3D)
  - ...

Feiner, COMS W4170, Fall 2018