



Introduction to HCI

DR. FARMAN MARWAT

Definition of HCI

- Human-computer interaction is a discipline concerned with the *design, evaluation and implementation of interactive computing systems* for *human use* and with the study of *major phenomena* surrounding them.
- ACM SIGCHI Curricula for HCI (Hewett et al. 1992)
- <http://sigchi.org/cdg/cdg2.html>

What fields does HCI cover?

- Computer Science
- Psychology
- Communication
- Education
- Anthropology
- Design (e.g. graphic and industrial)

Outline

- Design
 - What is design?
 - How can we have a higher likelihood of good design?
 - How do we design for different user groups?
- Implementation
- Evaluation

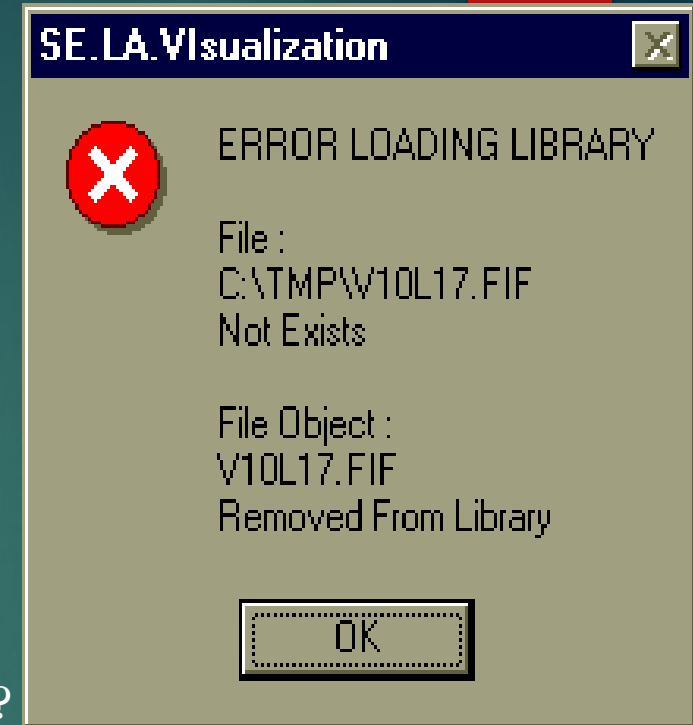
Norman Doors

- How do you open this door?



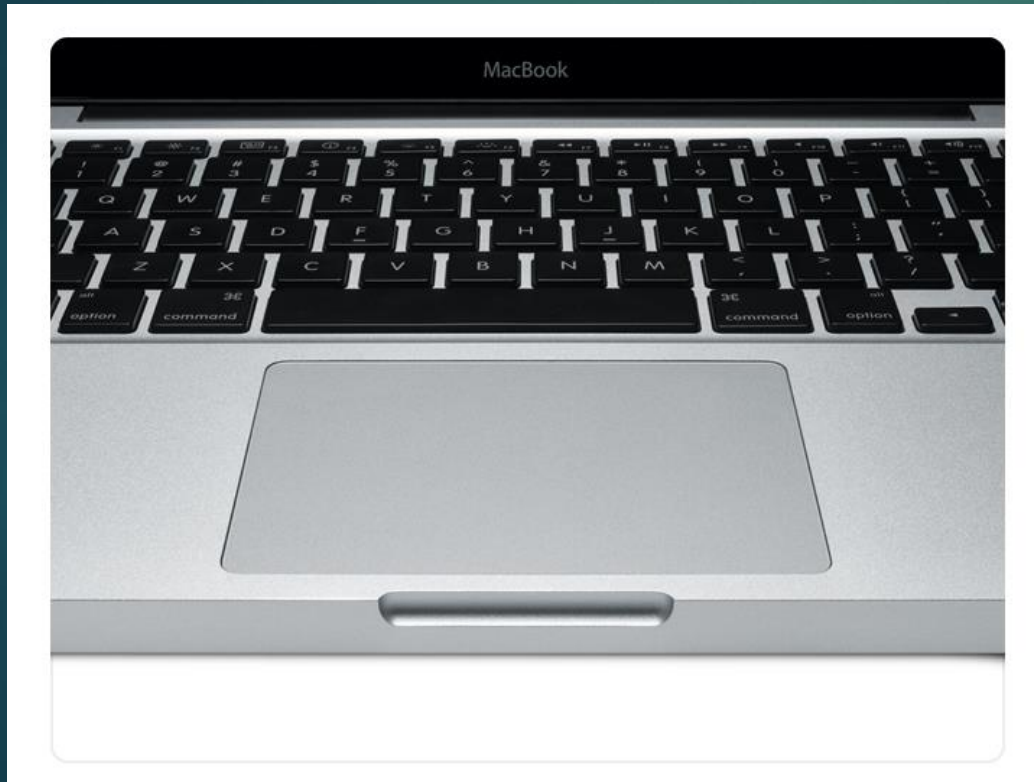
Why we care about HCI

- Why do we care about interfaces?
- We see this all the time.
 - What's good about the design of this error box?
 - The user knows there is an error
 - What's poor about the design of this error box?
 - Discouraging (who gets the blame?)
 - Not enough information
 - No way to *resolve* the problem (instructions or contact info)
 - Whose fault is this?



HCI Design

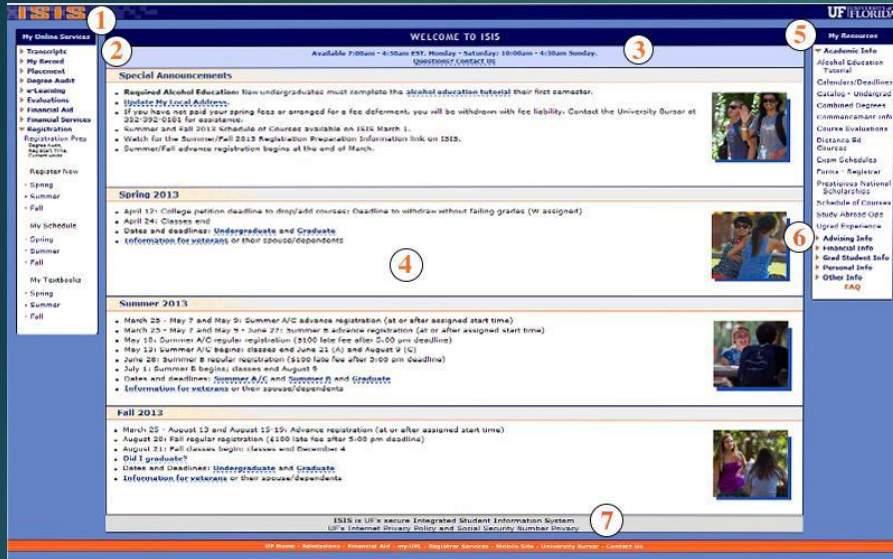
- What's possible



<http://www.techlivez.com/wp-content/uploads/2008/10/apple-new-macbook-trackpad.jpg>

http://0.tqn.com/d/cars/1/0/P/I/1/ag_08e320_pwrseat.jpg

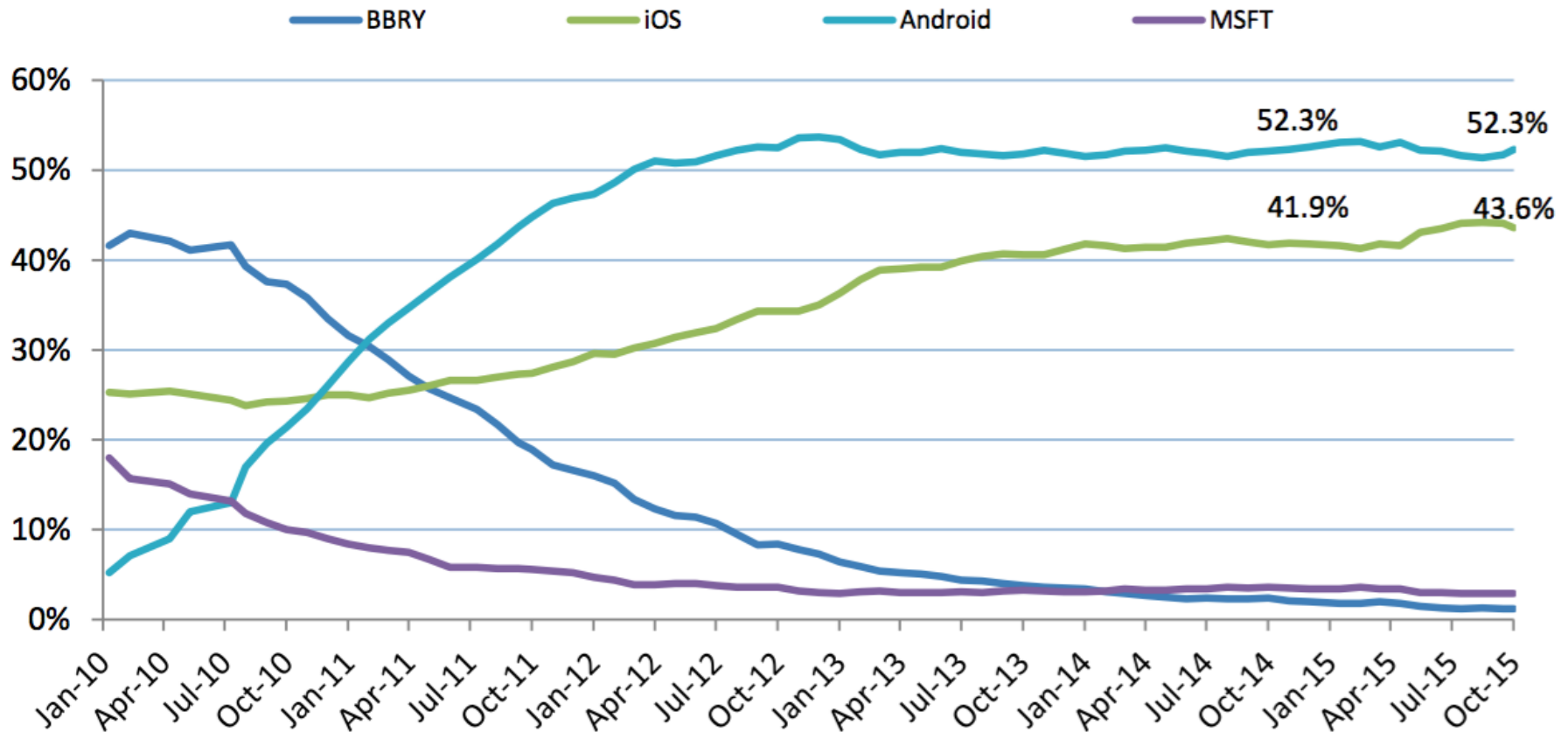
What do you feel about...



What makes developing good interfaces challenging?

Commercial Example: Phones

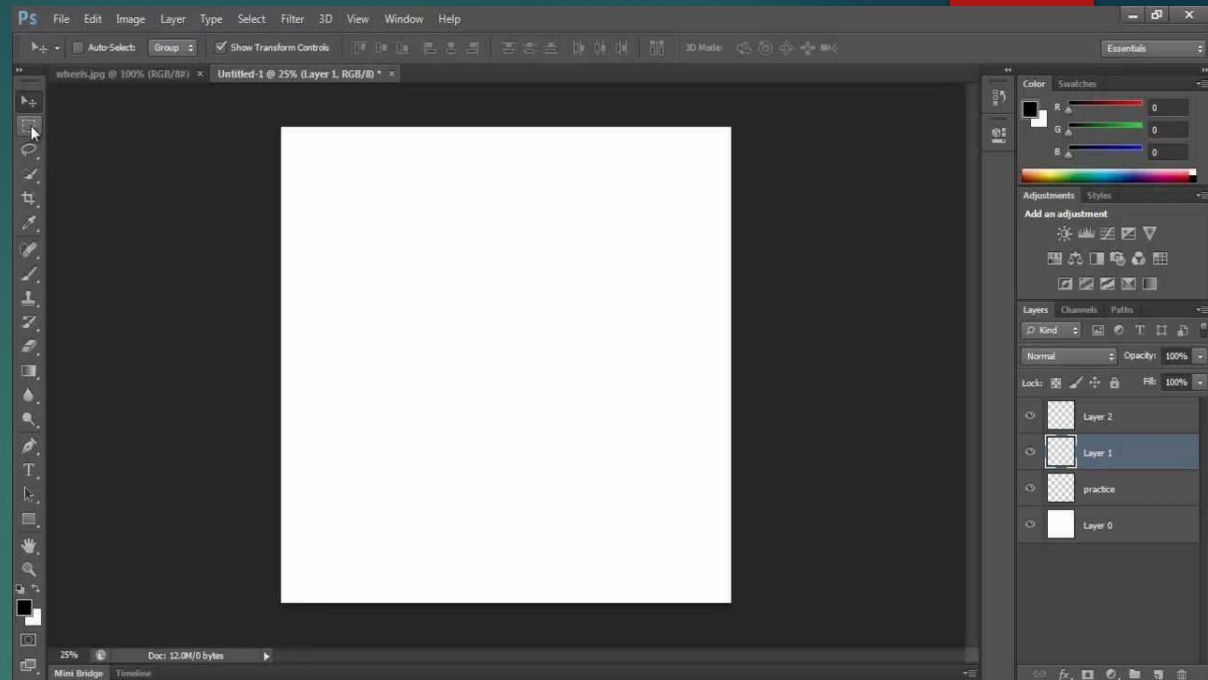
comScore US Smartphone Platform Share



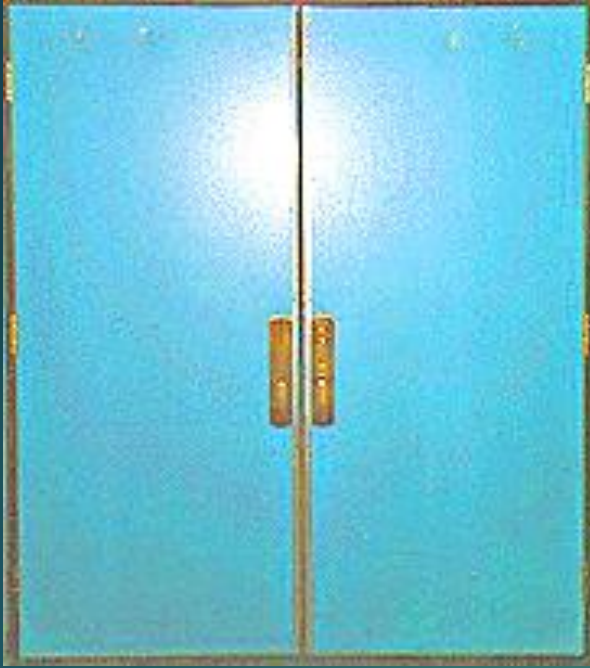
source: comScore.com, Raymond James research

Bad Interfaces

- Encumbering
- Confusing
- Slow
- Trust (ex. windows crashing)



- What's wrong with each?
 - Type of error
 - Who is affected
 - Impact
- What's a redesign solution?



Coke freestyle



http://www.creativecrash.com/system/photos/000/106/144/106144/big/Freestyle_th007.jpg?1285438080

<https://www.youtube.com/watch?v=btMzicBpSK0>

Importance of Design

- http://www.masternewmedia.org/news/2005/04/17/bad_user_interface_design_can.htm

So how do you avoid bad design?

- Example:
 - Design the ultimate fast food hamburger drive through



Image from:
<http://pigjockey.com/wp-content/uploads/2009/10/mcdonalds-6.jpg>

User persona

user: <https://xtensio.com/user-persona/> to
create a persona for

A. the person you were considering when you
developed your interface

B. someone different than your first user
persona

Did your design support?

- A customer who can't read English?
- A customer who is hearing impaired?
- A customer who has never eaten a hamburger before?
- A customer who is health conscious?
- A customer who has an IQ of less than 80?
- A customer who is over 7' tall
- Did you design an interface for you?
- Is not that what someone already did?

Reflection

- Brainstorm a list of different perspectives.
- **I am thinking of ...** A drive-through interface...
From the point of view of ... the viewpoint you've chosen
- **I think ...** describe the drive-through interface from your viewpoint. Be an actor - take on the character of your viewpoint
- **A question I have from this viewpoint is ...** ask a question from this viewpoint
- **Wrap up:** What new ideas do you have about the drive-through that you didn't have before? What new questions do you have?

Good HCI

- You can't create one just by sitting around and dreaming one up
- What do you rely on?
 - Known design solutions
 - Research
 - User feedback
- When in the development process should HCI be considered?
 - Throughout the development process (Lean UX)

Cultural and International Diversity

- Language
- Date / Time conventions
 - 1/4/15
- Weights and Measures
- Reading: left-to-right, up-and-down
- Telephone #s and addresses
- Names, titles, salutations
- SSN, ID, passport
- Icons, buttons, colors
- Etiquette, tone, formality
- Real world case: creating a simulation for nursing students. Standards of care vary by area.

Elderly

- How are elderly users different than 18-65 year old users?
- How would design for elderly users?
- Reduced
 - Motor skills
 - Perception
 - Vision, hearing, touch, mobility
 - Speed
 - Memory
- Other needs
 - Technology experience is varied (How many grandmothers use email? mothers?)
 - Uninformed on how technology could help
 - Practice skills (hand-eye, problem solving)
- Touch screens, larger fonts, louder sounds



Children

- How are children different than 18-65 year old users?
- How would design for children?
- Technology familiarity
- Age changes:
 - Physical dexterity
 - (double-clicking, click and drag, and small targets)
 - Attention span
- Varied backgrounds (socio-economic)
- Goals
 - Educational acceleration
 - Socialization with peers
 - Psychological – improve self-image, self-confidence
 - Creativity – art, music, etc. exploration

Children

- Teenagers are a special group
 - Next generation
 - Beta test new interfaces, trends
 - Cell phones, text messages, simulations, fantasy games, virtual worlds
- Requires Safety
- They
 - Like exploring (easy to reset state)
 - Don't mind making mistakes
 - Like familiar characters and repetition
 - Don't like patronizing comments, inappropriate humor
- Design: Focus groups

Users with Disabilities

- How would design for users with vision limitations?
- 1998 Amendment to Rehabilitation Act
- Federal law to ensure access to IT, including computers and web sites
- Vision (text-to-speech)
 - Blind (braille-reader)
 - Low-vision
 - Color-blind
- Hearing (conversion of tones to visual signals)
 - Deaf
 - Limited hearing
- Mobility (eye-gaze control, head-mounted optical mice)
- Learning
 - Dyslexia
 - Attention deficient, hemisphere specific, etc.
- Keyboard, mouse, color alternatives

Universal Usability

- Does not mean ‘dumbing down’
 - Ex. Helping disabled has helped others (parents w/ strollers, elderly)
 - Ex. Door handles
- Goal: Address the needs of more users - unlike yourself!
- Everyone is often not at full faculties at all times



Universal Usability

- Interface should handle diversity of users
 - Backgrounds
 - Abilities
 - Motivation
 - Personalities
 - Cultures
 - Technical capacity (e.g. Shadow Health and Alcorn state example)



Physical Variation

- Field of **anthropometry**
 - Basic data about human dimensions
 - Is no 'average' user
 - Measures of what is 5-95% for weight, height, gender, culture, etc.
 - Large variance reminds us there is great 'variety'
 - Name some devices that this would affect...

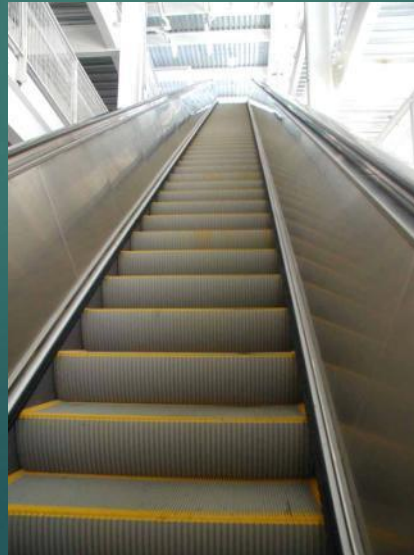


Outline

- Course Information and motivation for HCI
- Design
- Implementation
 - How can we implement a good interface?
- Evaluation

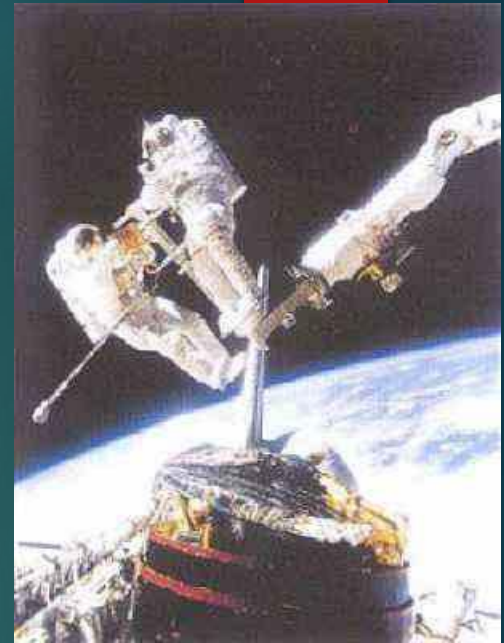
Requirements Analysis

1. In designing a building I want inhabitants to move between floors
 1. (who are the users) Ascertain users' needs
 2. (how often do they move) Ensure proper reliability
 3. (what approaches are likely users familiar with) Promote appropriate standardization, integration, consistency, and portability



Ascertain User's Needs

- Develop use cases
 - Actors (who)
 - Goals (what)
 - Scope (for which situations)
 - Environment (where)
 - Minimal Guarantee (minimum to deliver)
 - Satisfaction (when are you done)
 - Equipment (with what)
- Let's look at a use case for project 1



Standardization, Integration, Consistency, Portability

- **Standardization** – common user-interface features across multiple applications
 - Apple
 - Web
 - Windows
 - Smart phones
- **Integration** – across application packages
 - file formats
- **Consistency** – common action sequences, terms, units, layouts, color, typography within an application
- **Portability** – convert data and interfaces across multiple hardware and software environments
 - Word/HTML/PDF/ASCII/Flash

Outline

- Course Information and motivation for HCI
- Design
- Implementation
- Evaluation
 - How do you measure a good interface

Usability Measures

- How can we measure the 'goodness' of an interface?
- What are good metrics?
- ISO 9241
 - Effectiveness
 - Efficiency
 - Satisfaction
- Schneiderman
 - Time to learn
 - Speed of performance
 - Rate of errors
 - Retention over time
 - Subjective satisfaction



Usability Motivations

- Time to learn
- Speed of performance
- Rate of errors
- Retention over time
- Subjective satisfaction

- Life-Critical systems
 - **Applications:** air traffic, nuclear reactors, military, emergency dispatch
 - **Requirements:** reliability and effective (even under stress)
 - **Not as important:** cost, long training, satisfaction, retention
- Industrial and Commercial Use
 - **Applications:** banking, insurance, inventory, reservations
 - **Requirements:** short training, ease of use/learning, multiple languages, adapt to local cultures, multiplatform, speed
- Office, Home, and Entertainment
 - **Applications:** E-mail, ATMs, games, education, search engines, cell phones/PDA
 - **Requirements:** Ease of learning/use/retention, error rates, satisfaction
 - **Difficulties:** cost, size

Usability Motivations

- Time to learn
- Speed of performance
- Rate of errors
- Retention over time
- Subjective satisfaction

- Exploratory, Creative, Collaborative
 - **Applications:** Web browsing, search engines, simulations, scientific visualization, CAD, computer graphics, music composition/artist, photo arranger (email photos)
 - **Requirements:** remove the 'computer' from the experience,
 - **Difficulties:** user tech savvy-ness (apply this to application examples)
- Socio-technical systems
 - **Applications:** health care, voting, police
 - **Requirements:** Trust, security, accuracy, veracity, error handling, user tech-savvy-ness

Reliability

- Actions function as specified
- Data displayed must be correct
- Updates done correctly
- Leads to trust! (software, hardware, information) – case: 1994 Pentium FDIV bug
 - Cost to Intel: \$475 million
- Privacy, security, access, data destruction, tampering



No More Norman Doors!



From: <http://lcc3710.comprss.com/?p=140>

Changing Behavior with Good Design



- [Piano Stairs – TheFunTheory.com](http://www.goodexperience.com/broken/i/04/02/america-fitness-s.jpg)

Images from: <http://www.goodexperience.com/broken/i/04/02/america-fitness-s.jpg>
<http://failblog.files.wordpress.com/2009/08/fail-owned-lazy-escalator-fail.jpg?w=500&h=375>