

CIS 443/543
User Interfaces

Lecture 1: Motivations and Contexts

Topic for Today's Lecture

- Why study user interfaces?

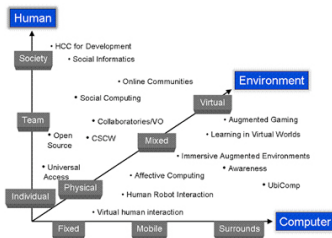
Why study user interfaces?

- Because it's one of the most exciting areas in future computing
- Because there does seem to be a problem
- Because the problem is
 - Extensive and getting bigger
 - Expensive
 - Dangerous

Computing = User Interfaces!

- Computing + Communication
- New Technology
 - chat rooms, digital libraries, touchable interfaces, intelligent agents, video conferencing, social networks, mobile and wearable computing, PDAs, VR, multimedia, speech recognition
- Social & ethical issues
 - Privacy, copyright, safety-critical systems

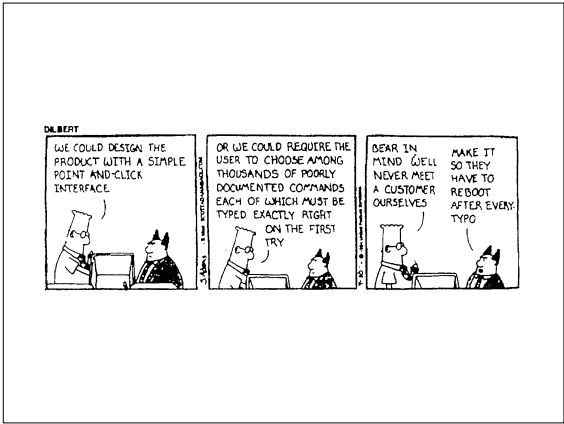
Human-Centered Computing NSF Research Agenda 2008

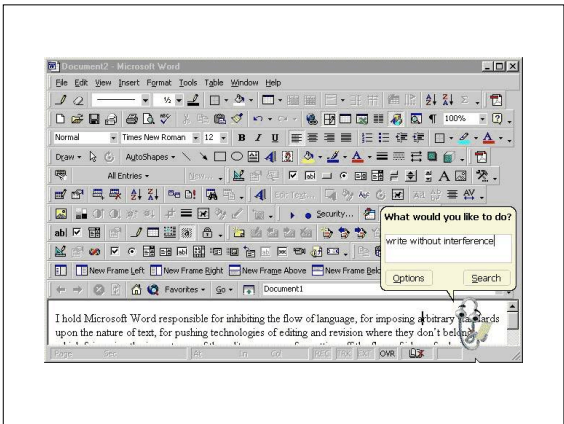


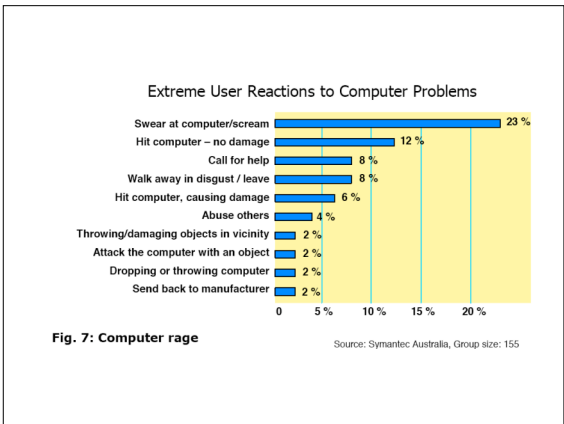
But is it all good?

Recent Book:

The Inmates Are Running the Asylum : Why High Tech Products Drive Us Crazy and How To Restore The Sanity by Alan Cooper, Paul Saffo

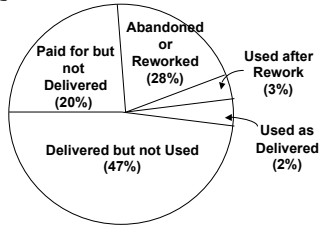


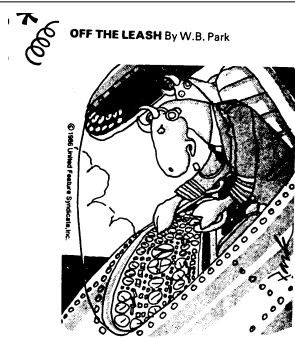




How Bad is it?

- Software Costs vs. Results (US Federal Software Projects, 1999)





"Damn these hooves! I hit the wrong switch again! Who designs these instrument panels, raccoons?"

What is the problem here?

- Actually it is an old problem:
The designer fails to communicate the design!
 - How does the user know what to do next?
 - What do those knobs and dials mean?
 - How can the task be designed so that it is easy to learn and do with minimal failure?



First part of the old problem

- How do I know what to do next?
- What do those knobs and dials mean?

Solution late 1940's

- New science: Applied psychology and human factors
 - Group and sub-group things by function to reduce complexity & improve performance
 - Make things suggest their function
 - Create unique shapes for different functions
 - Make dials readable; make controls fit human body and behavior
 - Make it hard to do risky things
- Test ideas with experiments, engineer based on those findings



The other old problem is.....

- How can we design a task so that it is easy to learn and do with minimal failure?

Solution early 1900's

- An "easy" task is one which takes less time to perform, has fewer problems, and maintains quality.
- A easy task is created by
 - Breaking the overall task down into steps which are fast to perform
 - Repeating these over and over so that the person improves performance by practice
- Tasks and work can be *designed* and *analyzed*

1911-1920's



Frederick Taylor



Henry Ford



Frank Gilbreth



Lillian Gilbreth

Henry Ford

- Designed his own assembly line in 1913
- Wrote that the assembly line should be based on three basic principles:
 1. the planned, orderly, and continuous progression of the commodity through the shop;
 2. the delivery of work instead of leaving it to the workman's initiative to find it;
 3. an analysis of operations into their constituent parts.



Ford's Efficiency

- This assembly line could reduce the time for creating a new magneto from 20 to 5 minutes. On April 1, 1913, Ford began to experiment with his assembly line. First, he had one workman assemble a new magneto using the usual method. He accomplished his task in approximately 20 minutes.
- This job was then split into 29 individual jobs. This cut down the assembly time to 13 minutes, 10 seconds. In 1914 the height of the assembly line in Ford's factory was raised 8 inches, lowering the amount of time it took to build a magneto to 7 minutes. With further experimentation, the time was cut to 5 minutes.

Frank and Lillian Gilbreth

- The Gilbreth's were concerned with the operational aspects of individual worker efficiency, using photography to study the various motions as workers completed tasks to achieve the greatest economy of effort. Their studies, for example, helped reduce the number of motions in the bricklaying process from 18 1/2 to 4, significantly improving output.
- Also interested in reducing worker fatigue/stress
- Created task analysis and time-motion study



Human Factors Summary

- Assembly lines (circa 1911-20)
 - Time and errors are important to business
 - Repetitive operations are faster overall (learning curve)
 - Task analysis
 - Tasks are composed of sub-tasks with elementary human physical movements such as "reach"
 - Motion studies to reduce overall task time (labor time = \$\$\$)
- Airplane cockpits (circa 1943-1948)
 - Indirect complex operation: flying a plane occurs through indirect physical motions (controls) and decision-making based on information (instruments)
 - Knobs and dials problem: input and control complexity
 - New science of human factors (applied psychology)
 - Task analysis includes safety, human decision-making
