

# CHAPTER 1:

## Usability of Interactive Systems

### *Designing the User Interface: Strategies for Effective Human-Computer Interaction*

*Sixth Edition*

Ben Shneiderman, Catherine Plaisant,  
Maxine S. Cohen, Steven M. Jacobs, and Niklas Elmqvist

*in collaboration with  
Nicholas Diakopoulos*

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# Usability of Interactive Systems

## Topics

1. Introduction
2. Usability Goals and Measures
3. Usability Motivations
4. Goals for Our Profession

# Introduction

- The Interdisciplinary Design Science of Human-Computer Interaction (HCI) combines knowledge and methods associated with professionals including:
  - Psychologists (incl. Experimental, Educational, Social and Industrial Psychologists)
  - Computer Scientists
  - Instructional and Graphic Designers
  - Technical Writers
  - Human Factors and Ergonomics Experts
  - User experience designers
  - Anthropologists and Sociologists

# Introduction (continued)

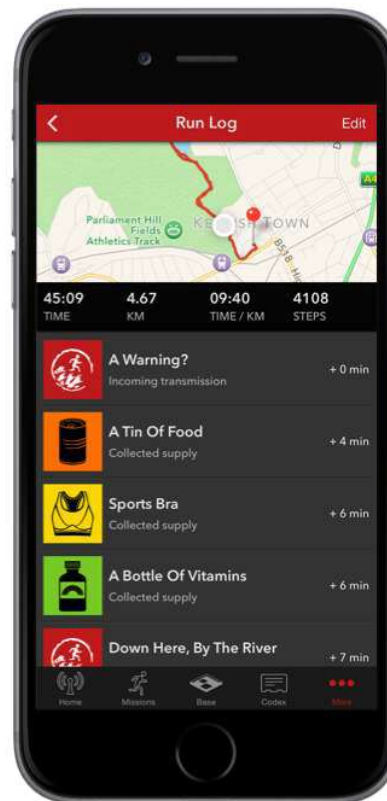
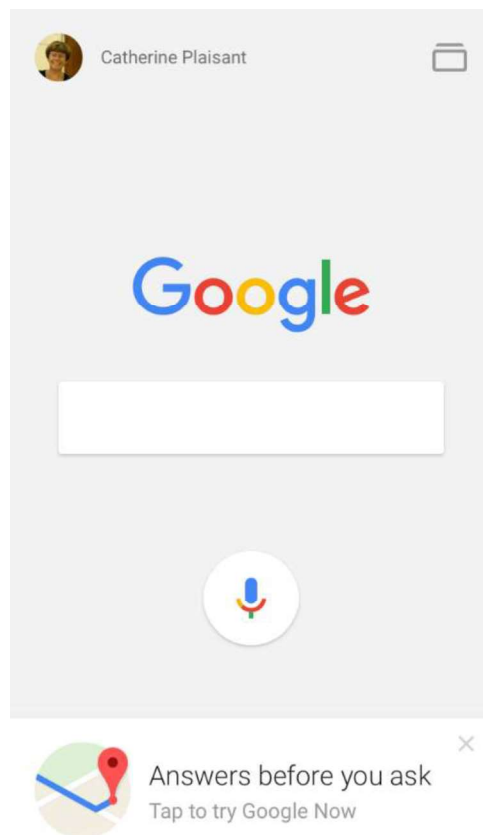
- Individual User Level
  - Routine processes: tax return preparation
  - Decision support: a doctor's diagnosis and treatment
  - Education and training: encyclopedias, drill-and-practice exercises, simulations
  - Leisure: music and sports information
  - User generated content: social networking web sites, photo and video share sites, user communities
  - Internet-enabled devices and communication

# Introduction (continued)

- Communities
  - Business use: financial planning, publishing applications
  - Industries and professions: web resources for journals, and career opportunities
  - Family use: entertainment, games and communication
  - Globalization: language and culture

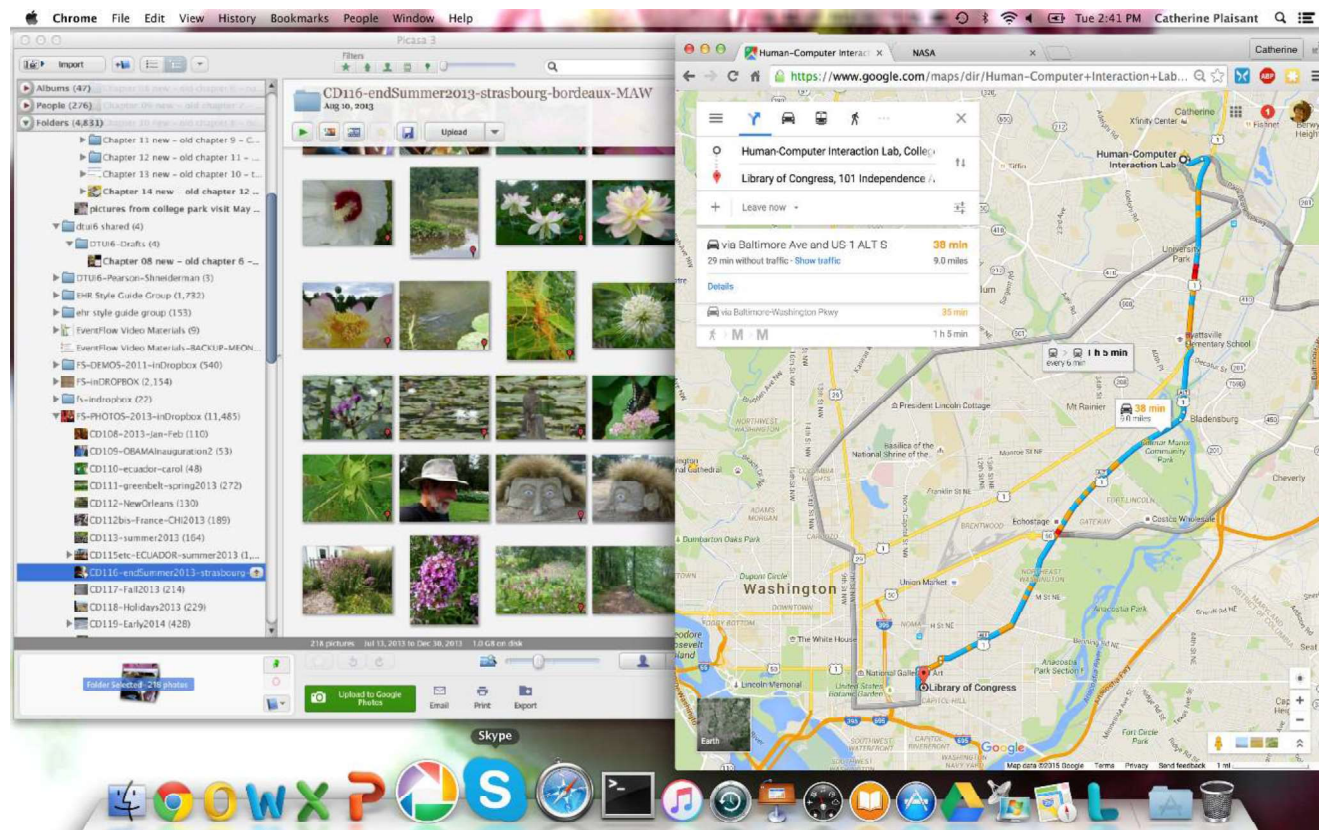
# Introduction (continued)

- Smart phones have high quality displays, provide fast Internet connections, include many sensors and support a huge variety of applications



# Introduction (continued)

- Apple® Mac OS X® showing Picasa for photo browsing and Google Map in a web browser
- The bottom of the screen also shows the Dock, a menu of frequently accessed items whose icons grow larger on mouse-over





# Introduction (continued)

- Ben Shneiderman at a standing desk with two high-resolution screens.
- The displays include a MS Word document (with six pages visible), two web browsers and the Outlook email application in a Windows environment.





# Introduction (continued)

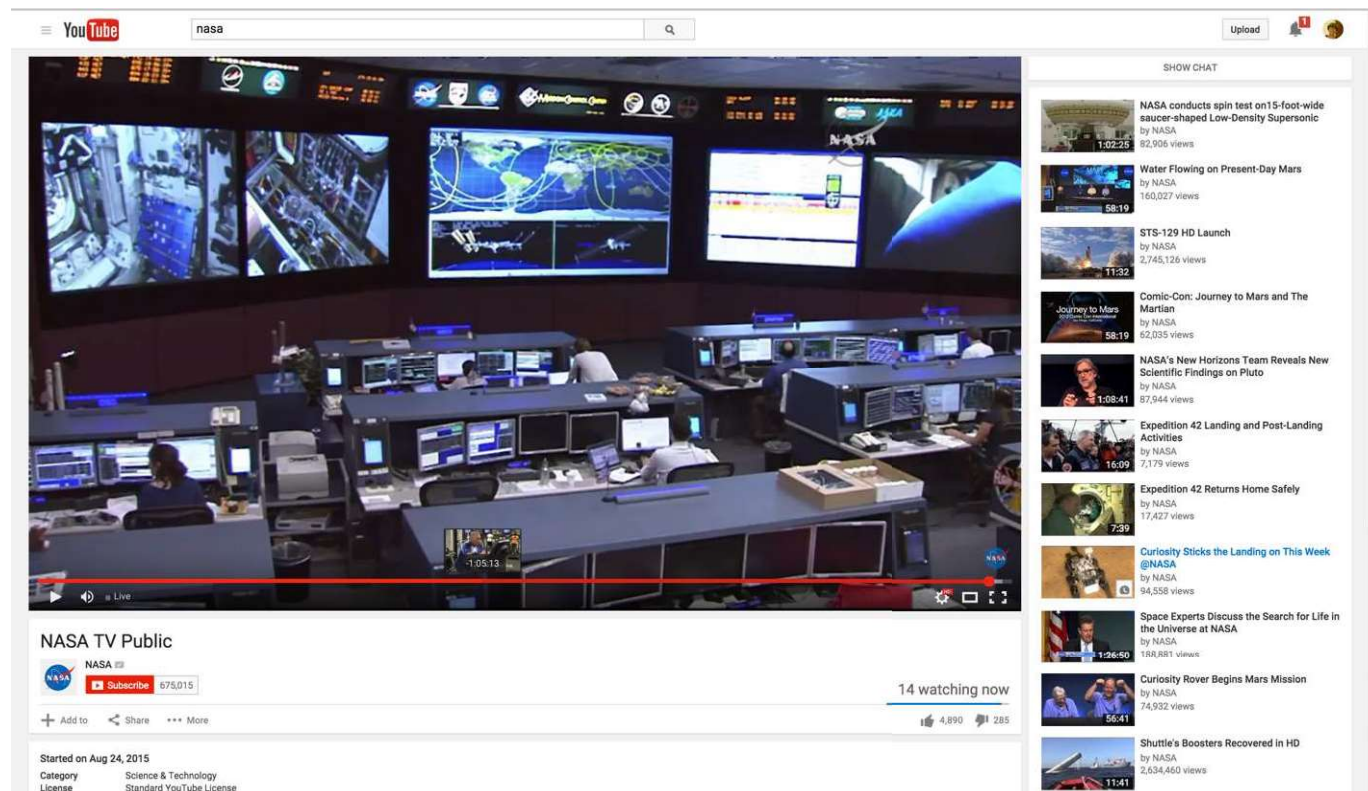
- The Amazon.com web site (<http://www.amazon.com/>) showing the books published by Jen Golbeck
- Facebook will make book and product recommendations based on a user's personal history with the site

The screenshot shows the Amazon.com website interface. At the top, the Amazon Prime logo is visible, along with a search bar and navigation links. The main content area is titled "Jennifer Golbeck" and features a portrait of the author. Below the portrait, a list of books by Jennifer Golbeck is displayed, including "The Walking Dead Psychology: Psych of the Living Dead", "Introduction to Social Media Investigation", "Analyzing the Social Web", "Computing with Social Trust", "Art Theory for Web Design", and "Trust on the World: A Survey". Each book entry shows the cover, title, author, and price. A detailed view of "The Walking Dead Psychology: Psych of the Living Dead" is shown below the list, including the book's title, author, publication date, and a table of prices for different formats.

Format	Price	New	Used
Paperback	\$14.95	\$8.79	\$4.42

# Introduction (continued)

- YouTube showing a video showing NASA TV, and other available related videos on the side
- The NASA video shows an example of control center with multiple large wall displays and workstations



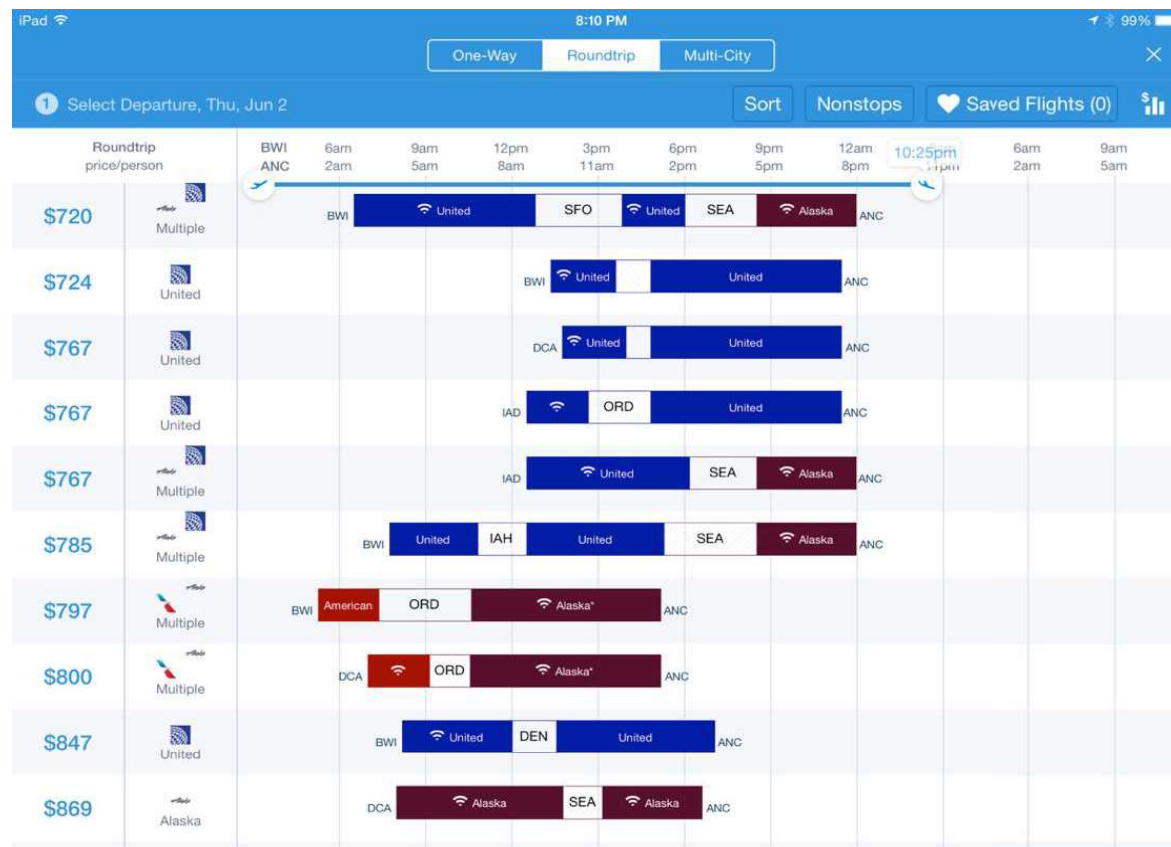
# Introduction (continued)

- Two children learn about the human body using a wearable, e-textile shirt displaying real-time visualizations of how the body working via “organs” with embedded LED lights and sound



# Introduction (concluded)

- The HIPMUNK travel search shows available flights visually as seen on a Apple iPad tablet
- The slider at the top allows users to narrow down the results, e.g. here we see only the flights landing before 10:25 pm





# Book overview

- Chapter 1:
  - A broad overview of human-computer interaction from practitioner and research perspectives
- Chapter 2:
  - Universal usability
- Chapter 3:
  - Guidelines, principles, and theories
- Chapters 4-6:
  - Managing design processes, evaluating designs, and case studies
- Chapters 7-11:
  - Interaction styles, devices, communication and collaboration
- Chapters 12-16:
  - Critical design issues, search and visualization
- Afterword:
  - Societal and individual impacts of user interfaces

# Usability Goals and Measures

- Successful designers:
  - Go beyond vague notions of “user friendliness”, “intuitive”, and “natural” doing more than simply making checklists of subjective guidelines
  - Have a thorough understanding of the diverse community of users and the tasks that must be accomplished
  - Study evidence-based guidelines and pursue the research literature when necessary
  - [US Web Design Standards](#)

# Usability Goals and Measures (continued)

- Great designers:
  - Are deeply committed to enhancing the user experience, which strengthens their resolve when they face difficult choices, time pressures, and tight budgets
  - Are aware of the importance of eliciting emotional responses, attracting attention with animations, and playfully surprising users



# Usability Goals and Measures (continued)

- Ascertain the user's needs
  - Determine what tasks and subtasks must be carried out
    - Include tasks which are only performed occasionally
    - Common tasks are easy to identify
  - Functionality must match need or else users will reject or underutilize the product

# Usability Goals and Measures (continued)

- Ensure reliability
  - Actions must function as specified
  - Database data displayed must reflect the actual database
  - Appease the user's sense of mistrust
  - The system should be available as often as possible
  - The system must not introduce errors
  - Ensure the user's privacy and data security by protecting against unwarranted access, destruction of data, and malicious tampering

# Usability Goals and Measures (continued)

- Promote standardization, integration, consistency, and portability
  - *Standardization*: use pre-existing industry standards where they exist to aid learning and avoid errors (e.g. the W3C and ISO standards)
  - *Integration*: the product should be able to run across different software tools and packages (e.g. Unix)
  - *Consistency*:
    - compatibility across different product versions
    - compatibility with related paper and other non-computer based systems
    - use common action sequences, terms, units, colors, etc. within the program
  - *Portability*: allow for the user to convert data across multiple software and hardware environments

# Usability Goals and Measures (continued)

- Define the target user community and class of tasks associated with the interface
- Communities evolve and change (e.g. the interface to information services for the U.S. Library of Congress)
- 5 human factors central to community evaluation:
  - *Time to learn*  
How long does it take for typical members of the community to learn relevant task?
  - *Speed of performance*  
How long does it take to perform relevant benchmarks?
  - *Rate of errors by users*  
How many and what kinds of errors are made during benchmark tasks?
  - *Retention over time*  
Frequency of use and ease of learning help make for better user retention
  - *Subjective satisfaction*  
Allow for user feedback via interviews, free-form comments and satisfaction scales

# Usability Goals and Measures (concluded)

- Trade-offs in design options frequently occur
  - Changes to the interface in a new version may create consistency problems with the previous version, but the changes may improve the interface in other ways or introduce new needed functionality
- Design alternatives can be evaluated by designers and users via mockups or high-fidelity prototypes
  - The basic tradeoff is getting feedback early and perhaps less expensively in the development process versus having a more authentic interface evaluated

# Usability motivations

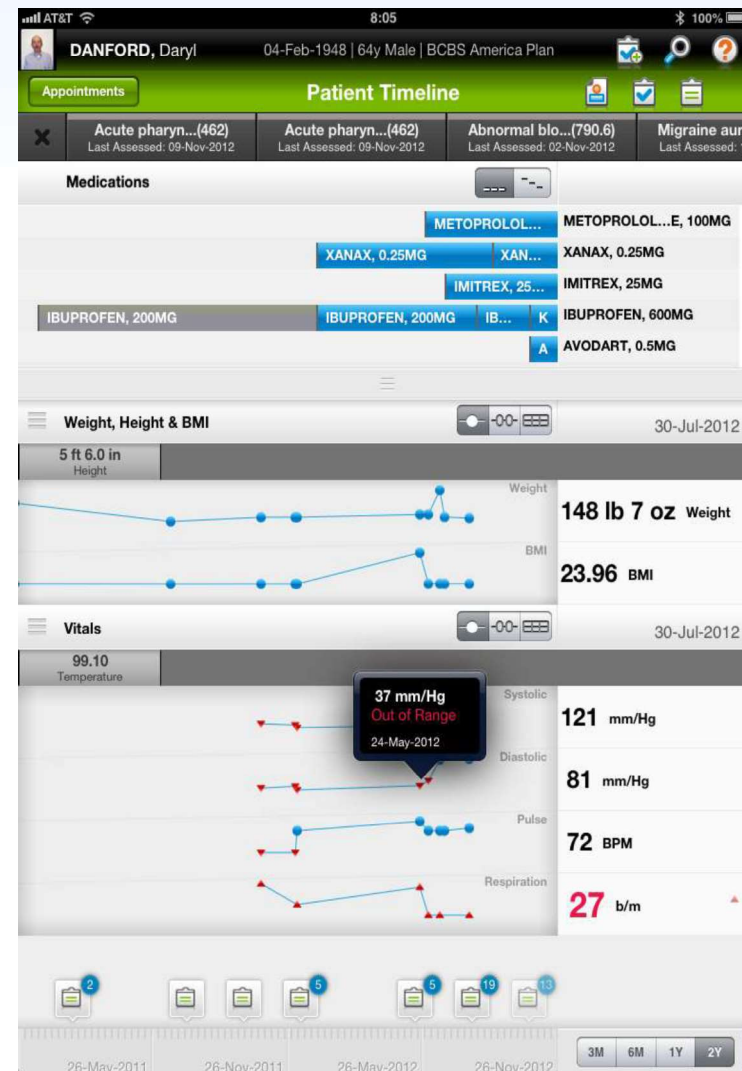
Many interfaces are poorly designed and this is true across domains:

- Life-critical systems
  - Air traffic control, nuclear reactors, power utilities, police and fire dispatch systems, medical equipment
  - High costs, reliability, and effectiveness are expected
  - Lengthy training periods are acceptable despite the financial cost to provide error-free performance and avoid the low-frequency but high-cost errors
  - Subject satisfaction is less an issue due to well motivated users

# Usability motivations (continued)

Example life-critical application:

The Wand timeline view  
of a patient record in  
Allscript's ambulatory  
Electronic Health  
Record iPad  
application





# Usability motivations (continued)

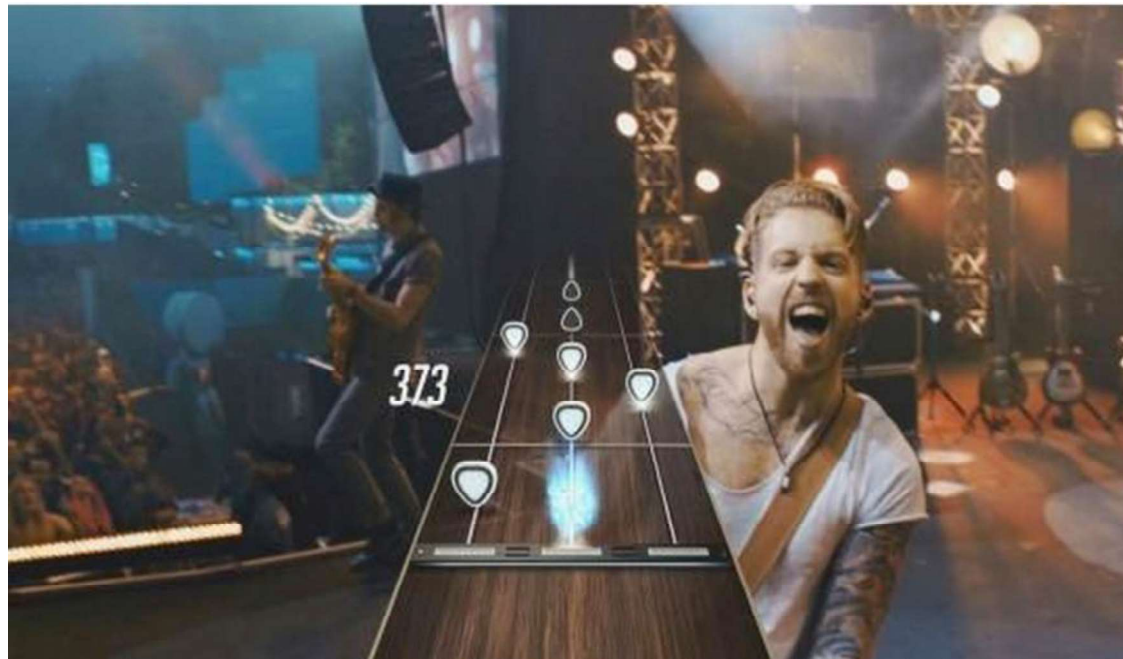
- Industrial and commercial uses
  - Banking, insurance, order entry, inventory management, reservation, billing, and point-of-sales systems
  - Ease of learning is important to reduce training costs
  - Speed and error rates are relative to cost
  - Speed of performance is important because of the number of transactions
  - Subjective satisfaction is fairly important to limit operator burnout

# Usability motivations (continued)

- Office, home, and entertainment applications
  - Word processing, electronic mail, computer conferencing, and video game systems, educational packages, search engines, mobile device, etc.
  - Ease of learning, low error rates, and subjective satisfaction are paramount due to use is often discretionary and competition fierce
  - Infrequent use of some applications means interfaces must be intuitive and easy to use online help is important
  - Choosing functionality is difficult because the population has a wide range of both novice and expert users
  - Competition cause the need for low cost
  - New games and gaming devices!

# Usability motivations (continued)

- Guitar Hero, a highly successful music playing game in which users learn to play popular songs and earn points for how well they keep up
- The Guitar Hero web site shows potential users how to use the provided special small guitar and also hosts a community for discussions and runs contests

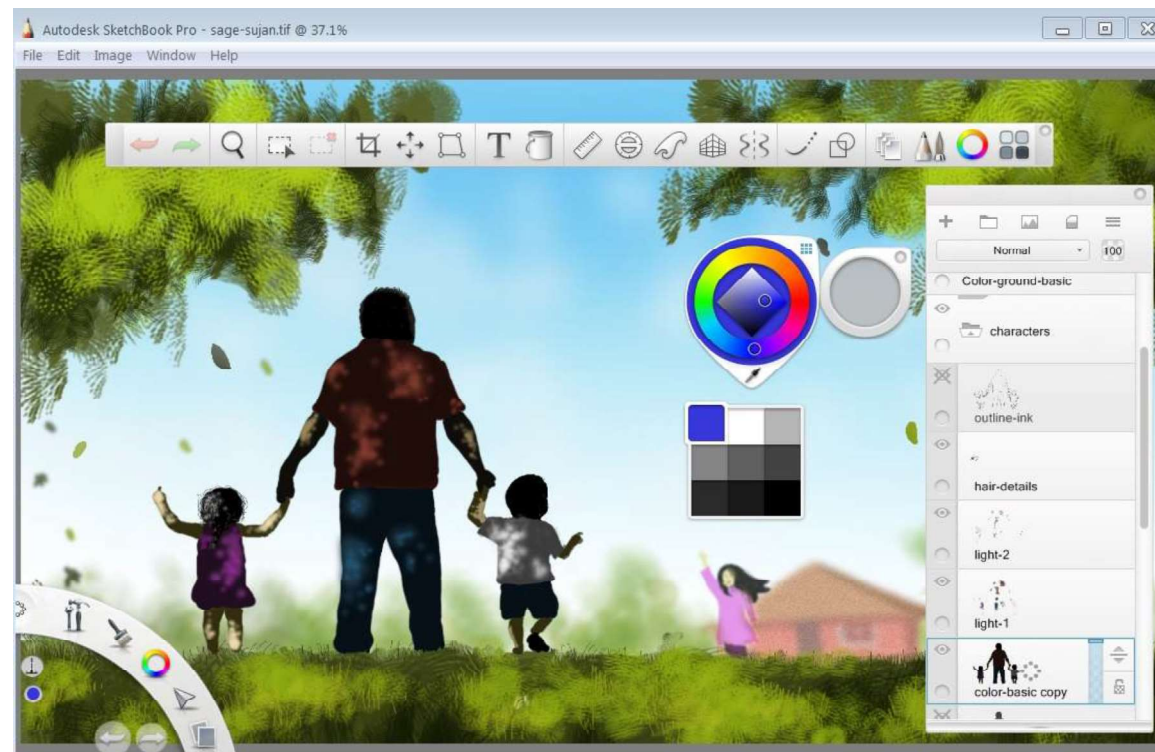


# Usability motivations (continued)

- Exploratory, creative, and cooperative systems
  - Web browsing, search engines, artist toolkits, architectural design, software development, music composition, and scientific modeling systems
  - Collaborative work
  - Benchmarks are hard to describe for exploratory tasks and device users
  - With these applications, the computer should be transparent so that the user can be absorbed in their task domain

# Usability motivations (continued)

- Sketchbook™ design tool for digital artists from Autodesk™
- A large number of tools and options are available through a rich set of menus and tool palettes (<http://www.sketchbook.com>)



# Usability motivations (concluded)

- Social-technical systems
  - Complex systems that involve many people over long time periods
  - Voting, health support, identity verification, crime reporting
  - Trust, privacy, responsibility, and security are issues
  - Verifiable sources and status feedback are important
  - Ease of learning for novices and feedback to build trust
  - Administrators need tools to detect unusual patterns of usage

# Goals for our profession

- Potential research topics
  - Reducing anxiety and fear of computer usage
  - Graceful evolution
  - Social media participation
  - Input devices
  - Information exploration



# Goals for our profession (concluded)

- Providing tools, techniques, and knowledge for system implementers
  - Rapid prototyping is easy when using contemporary tools
  - Use general or self-determined guideline documents written for specific audiences
  - To refine systems, use feedback from individual or groups of users
- Raising the computer consciousness of the general public
  - Some novice users are fearful due to experience with poor product design
  - Good designs help novices through these fears by being clear, competent, and non-threatening