

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***

Addison Wesley
is an imprint of



© 2017 Pearson Education, Inc., Hoboken, NJ. All rights reserved.

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)

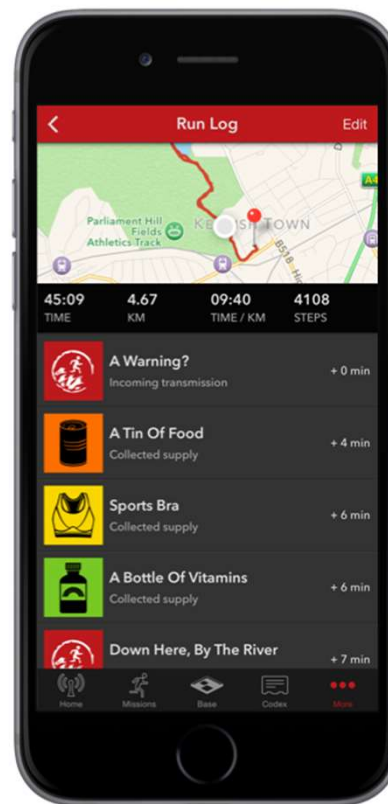
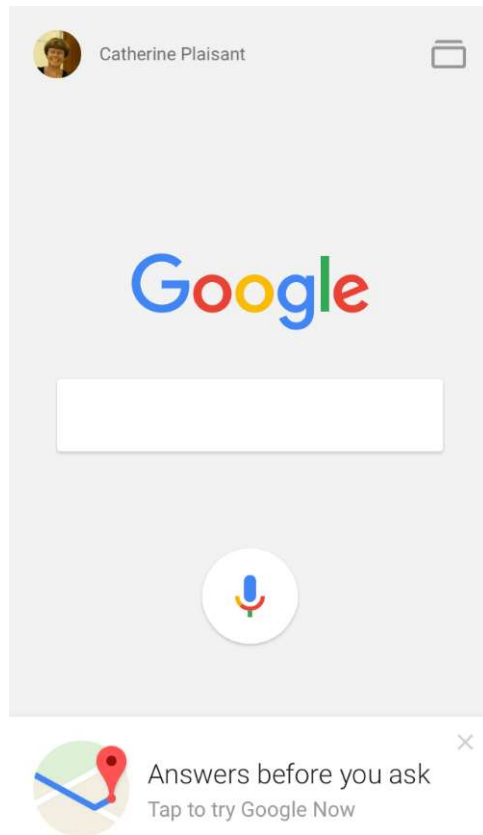
- Individual User Level
 - Routine processes: tax return preparation
 - Decision support: a doctor's diagnosis and treatment
 - Education and training: encyclopedias, drill-and-practice exercises, simulations
 - Leisure: music and sports information
 - User generated content: social networking web sites,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

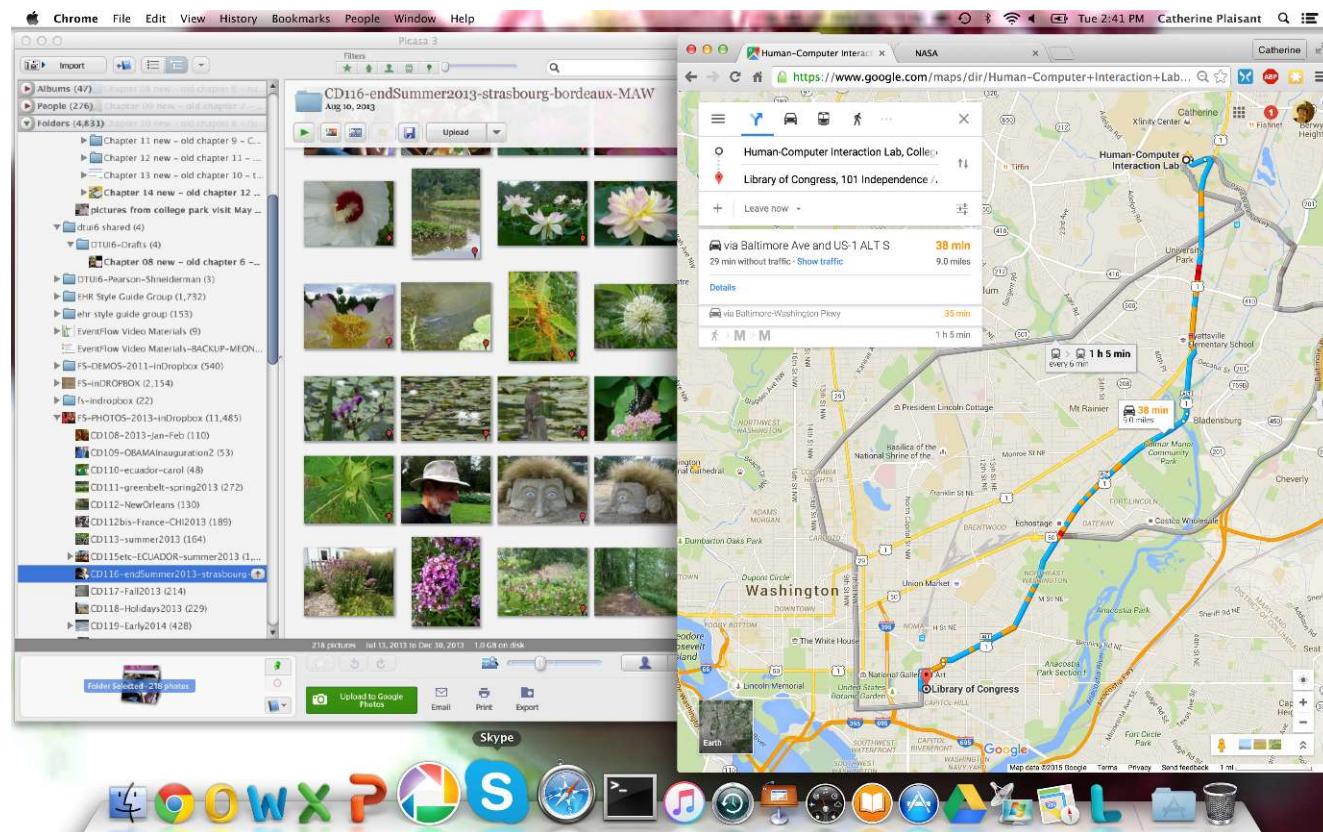
Introduction (continued)

- 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 with the author page for Jennifer Golbeck. The header includes the Amazon Prime logo, a search bar, and navigation links. The main content area features a portrait of Jennifer Golbeck and a list of her books. Below the list, there is an 'Amazon Follow' section and a detailed view of one of her books, 'The Walking Dead Psychology: Psych of the Living Dead'.

Books by Jennifer Golbeck

Book Title	Format	Price
THE WALKING DEAD PSYCHOLOGY	Paperback	\$8.79
INTRODUCTION TO SOCIAL MEDIA INVESTIGATION	Paperback	\$49.71
Analyzing the Social Web	Kindle Edition	\$25.83
Computing with Social Trust	Hardcover	\$189.00
ART THEORY FOR WEB DESIGN!	Paperback	\$0.73
Trust on the World: A Survey	Paperback	\$60.00

Books by Jennifer Golbeck

Showing 6 Results | Sort by: Featured

Amazon Follow

Follow authors to get new release updates, plus improved recommendations and more coming soon.

The Walking Dead Psychology: Psych of the Living Dead by Travis Langley and John Russo (Aug 4, 2015)

★★★★★ (8)

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

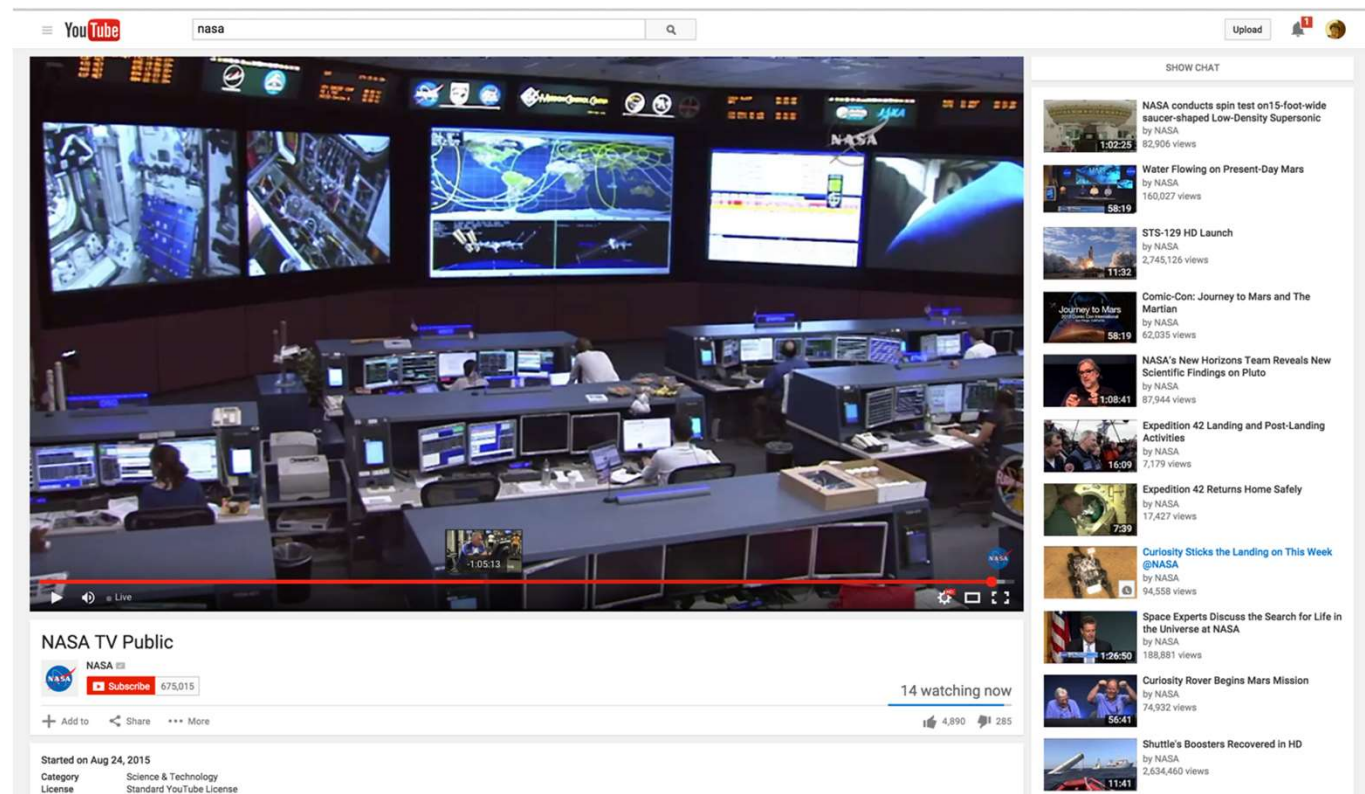
Get it by Wednesday, Oct 7

Introduction to Social Media Investigation: A Hands-on Approach by Jennifer Golbeck (Mar 27, 2015)

★★★★★ (4)

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



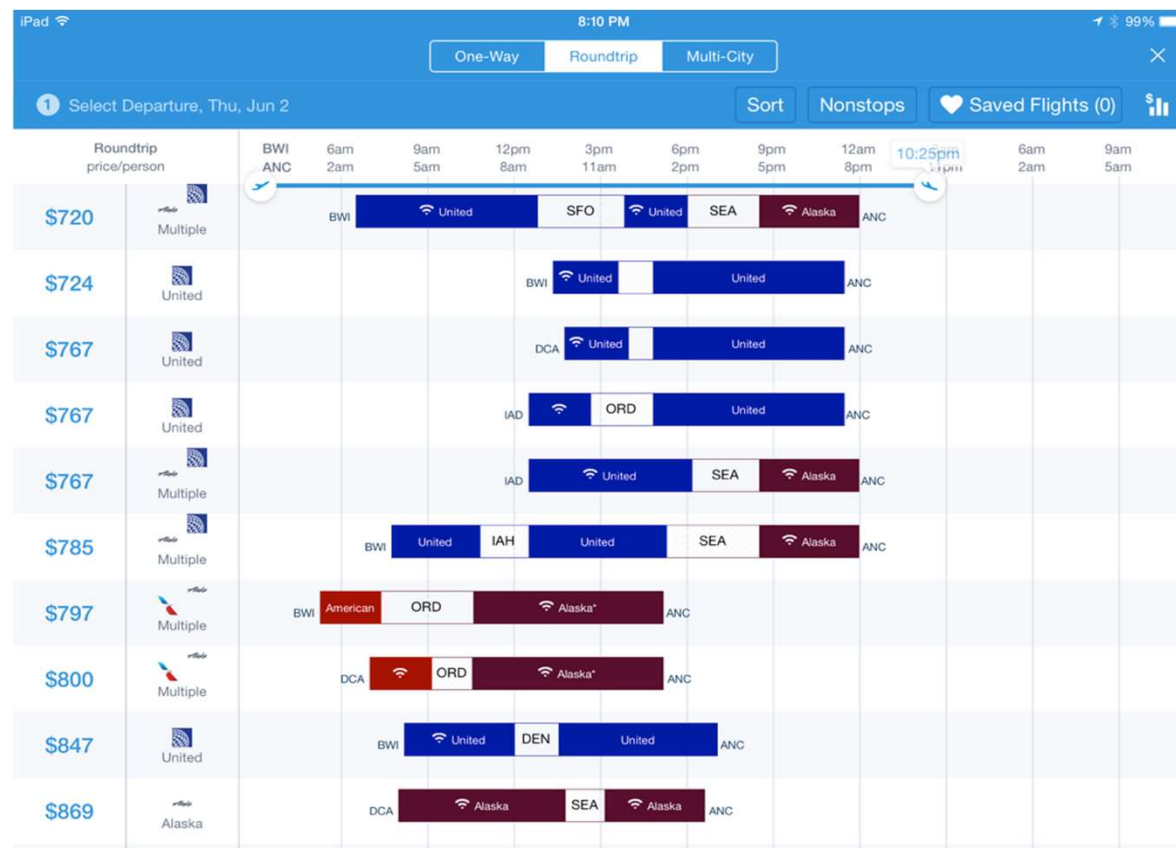
Introduction (continued)

- 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

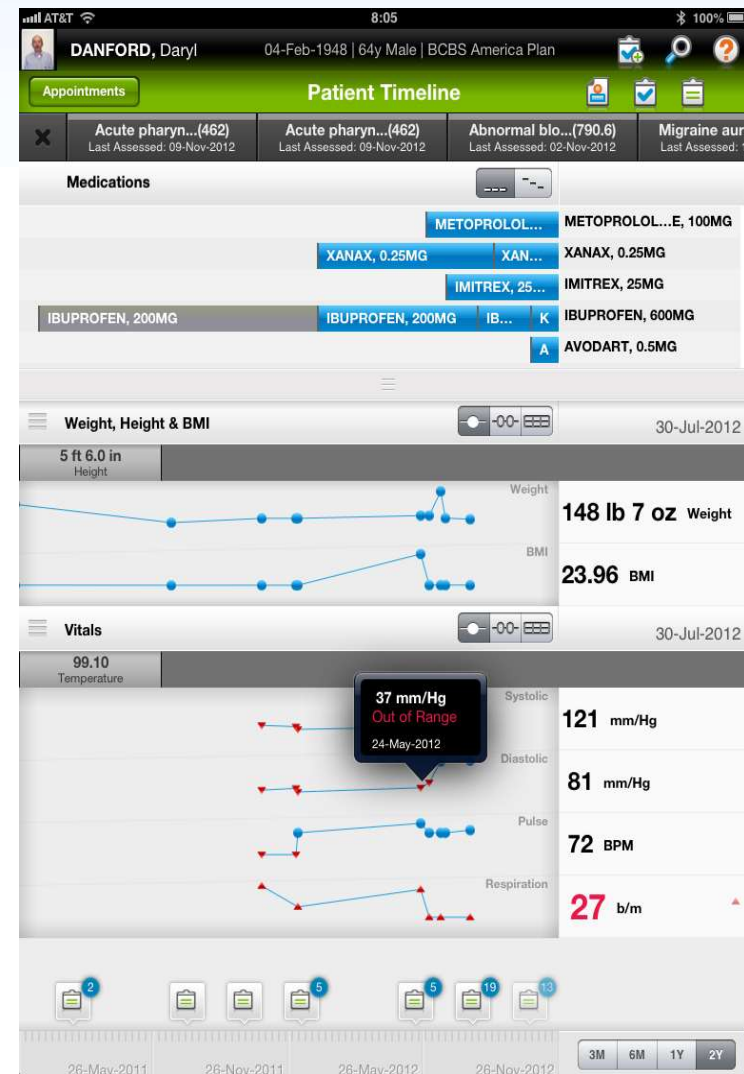
Many interfaces are poorly designed and this is true across domains:

- 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)

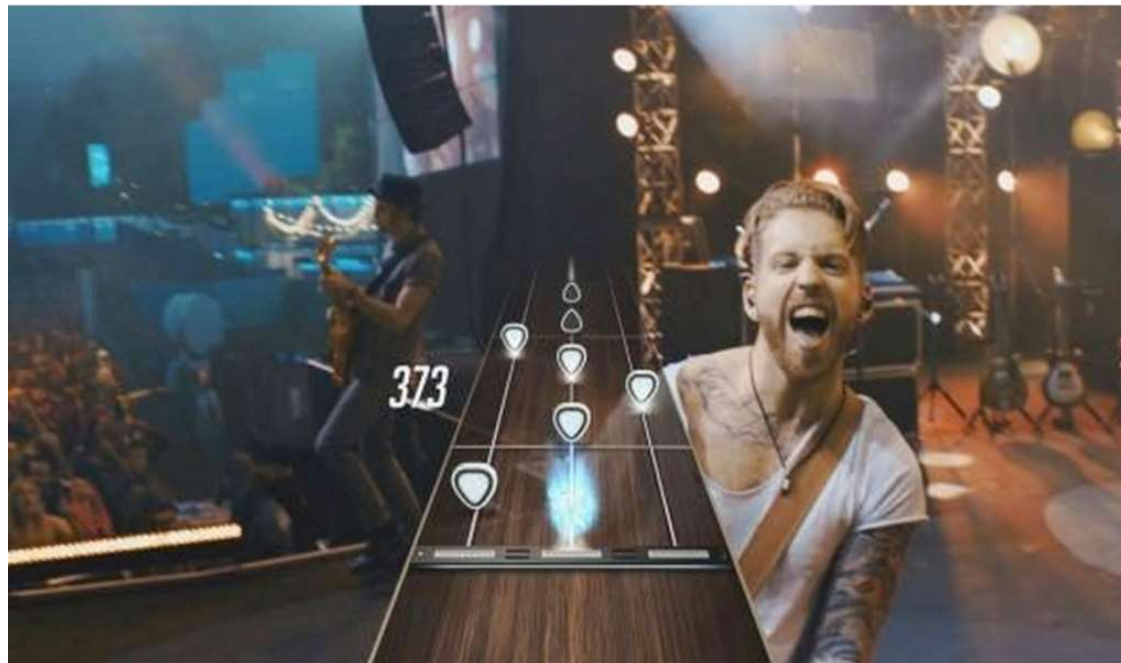
- Industrial and commercial uses
 - Banking, insurance, order entry, inventory management, reservation, billing, and point-of-sales systems
 - Ease of learning is important to reduce training costs
 - Speed and error rates are relative to cost
 - Speed of performance is important because of the number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

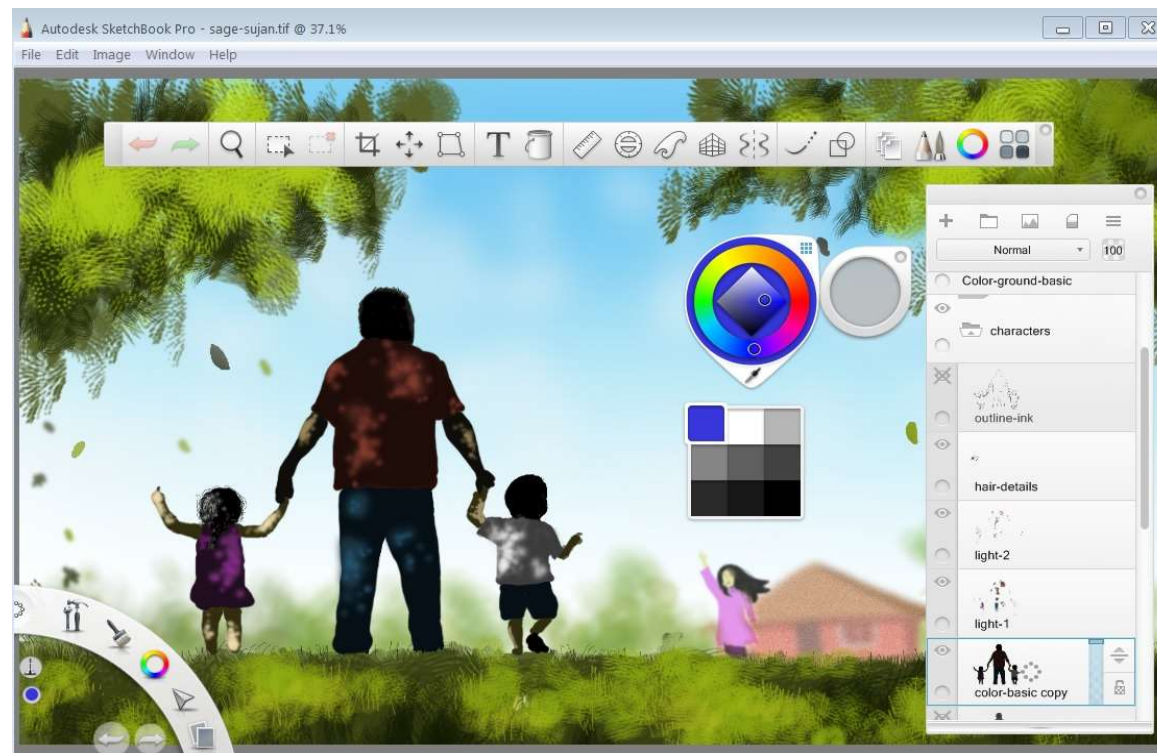


Usability motivations (continued)

- 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