NANYANG TECHNOLOGICAL UNIVERSITY

Introduction to HCI

CZ2004 Human–Computer Interaction

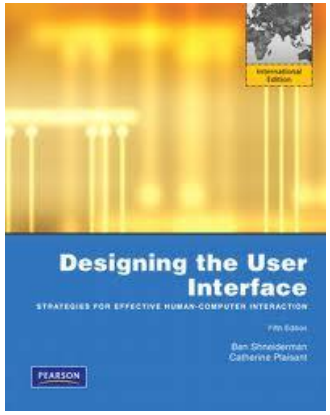
TextBook

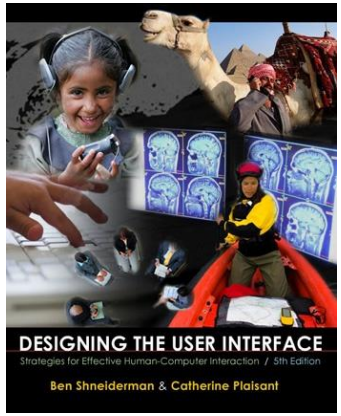
Recommended Text:

"Designing the User Interface -- Strategies for Effective Human-Computer Interaction"

6th Edition (2016)

Ben Shneiderman and Catherine Plaisant
Pearson/Addison Wesley, ISBN: 0-321-60148-3





Comments on text:
This book gives a nice overall view of the entire HCI field. As a result, there are lots of facts and principles in each chapter.

This book is not like a traditional textbook. There are no questions at the end of the chapters. Lectures and assignments will be the basis of knowledge you'll need for the final exam (see also past exam questions).

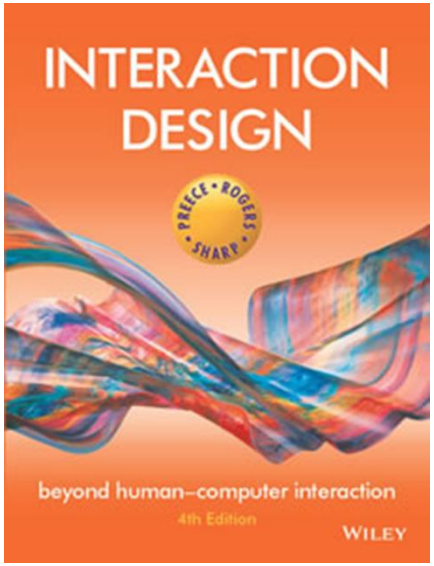
TextBook (Additional)

Beyond Human-computer interaction:

"Interaction Design"

4th Edition (2015)

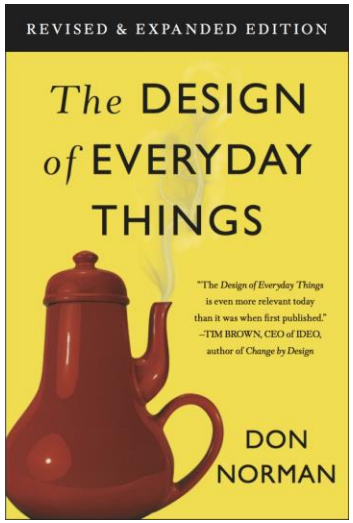
Yvonne Rogers, Helen Sharp, and Jenny Preece
Pearson/Addison Wesley, ISBN: 978-1-119-02075-2

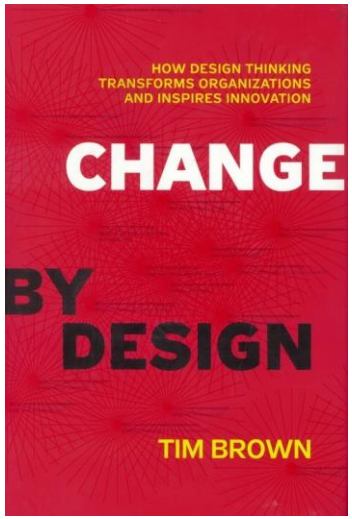


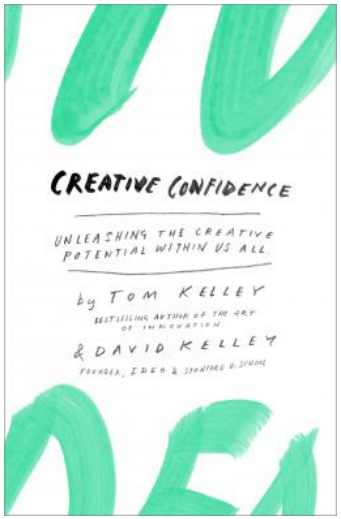
Comments on text:
"Designing interactive products to support the way people communicate and interact in their everyday and working lives."

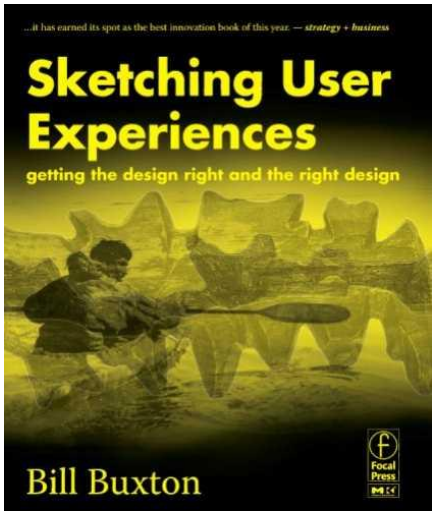
This book is called Interaction Design: Beyond Human-Computer Interaction because interaction design is concerned with a border scope of issues, topics, and methods than was traditionally the scope of human-computer interaction (HCI), with a focus on the diversity of design and evaluation process involved.

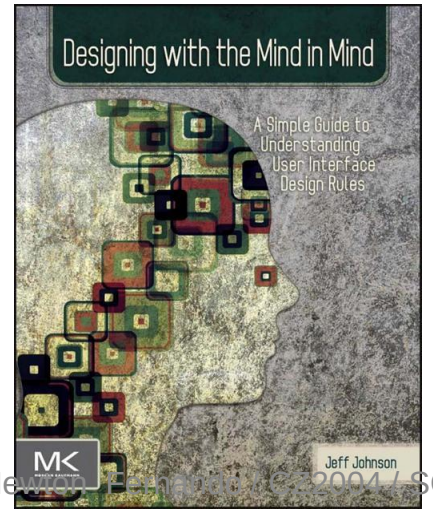
Other Reading Materials

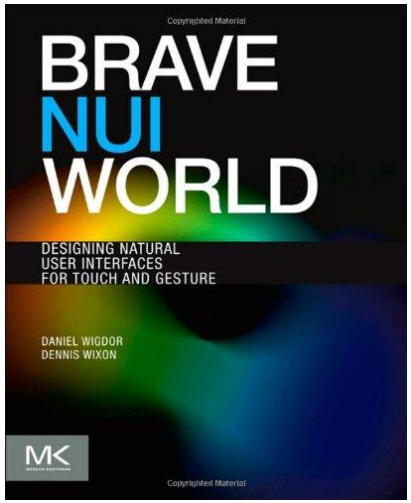












Course Modules

- Module 0: Introduction to HCI
- Module 1: Usability
- Module 2: Guidelines, Principles, and Theory
- Module 3: Prototyping and Evaluation

Dr Fernando

- Module 4: Humans (sensing, perception, etc.)
- Module 5: Human-Computer Interfaces
- Module 6: Interaction and Design Concepts

Prof Cham

Goals of this Course (1)

- HCI is an interdisciplinary subject
  - Involves technology, design, sociology, psychology, anthropology, etc . . . .
  - Most of us are from engineering or IT and come with a strong background in technology and little else

- Goal of this course is to give you an overview of HCI
  - To help you think about HCI matters!
  - To understand the principles of HCI
  - To understand methods for user-studies and feedback
  - To learn the “vocabulary” of HCI researchers
  - To make you want you to learn more about HCI . . ☺

Goals of the course (2)

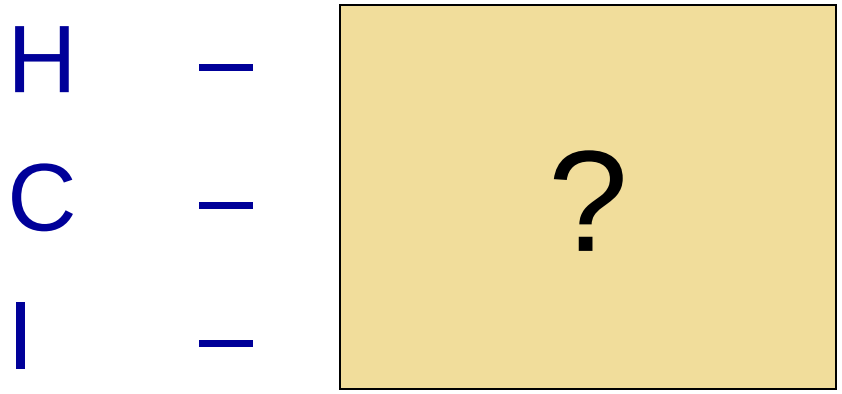
- To examine the problems that people face when using modern computer-based technology
- To present solutions to those problems
- And…to enable you to appreciate what is involved in designing complex interactive systems
- To make you understand
  - The potential of a range of interaction techniques
  - Techniques and methods to help design and improve interfaces

Contents: Introduction to HCI

- What is HCI?
- Why study HCI – significance & difficulty
  - Difficult because ***we are not users***
- A crude first view of *users*
- A crude first view of *features vs. usability*
- Rethinking of HCI / design

Part 1:
What is HCI?

Part 1: What is HCl?



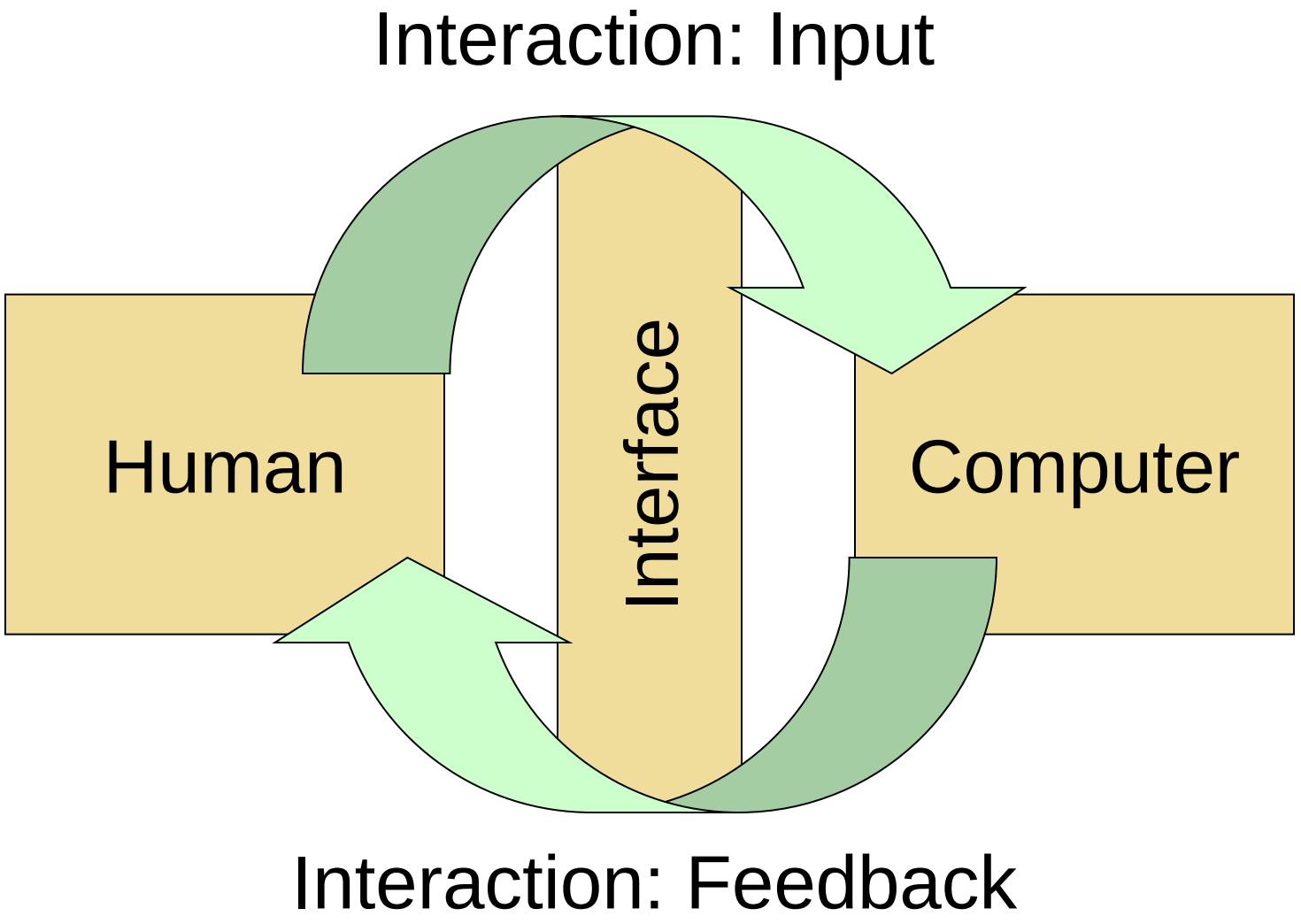
Part 1: What is HCI?

- 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

Part 1: What is HCI?

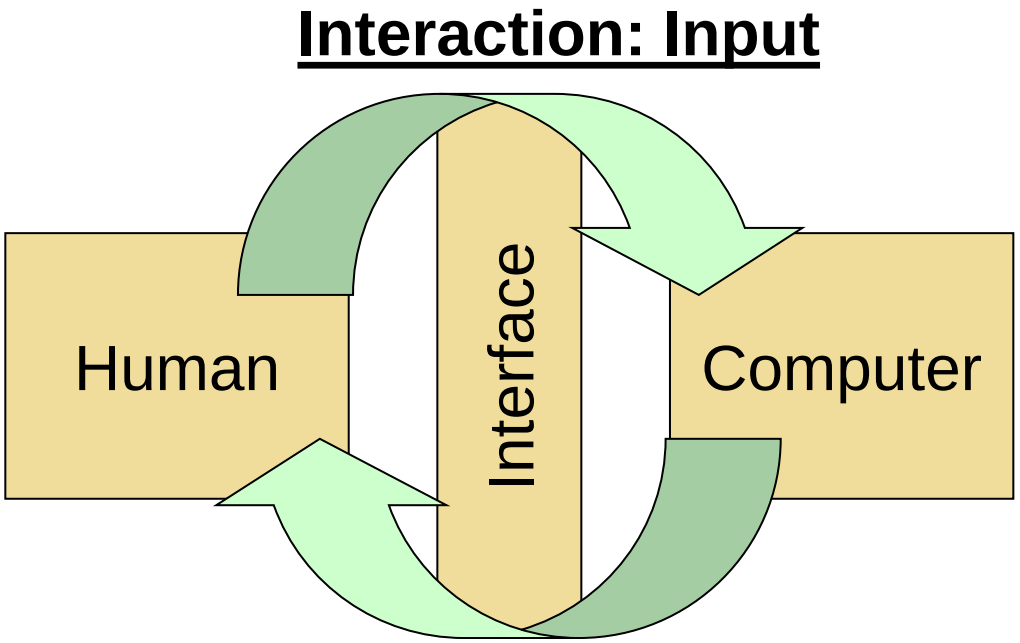


Case study: Siri

As for the Interaction: Input? Feedback?

http://www.youtube.com/watch?v=8ciagGASro0

Part 1: What is HCI?

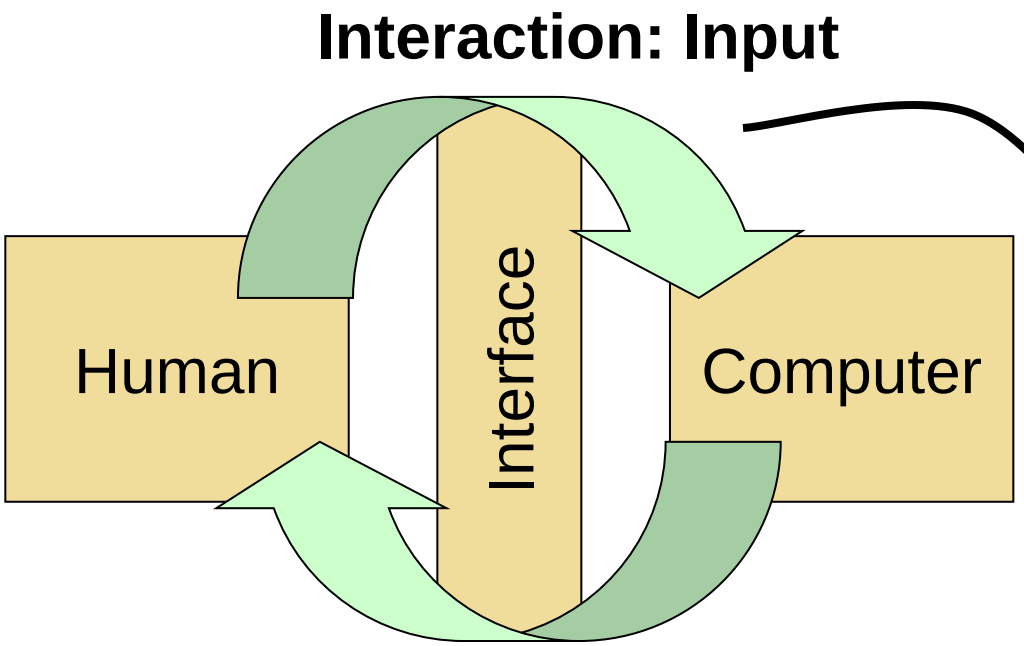


Continuous Cycle!!!

- Think about those games that you like
- Think about successful software / products

Likely not one-way!!!
…. If one-way?

Part 1: What is HCI?



Usability

A task

- Effective
- Efficient
- Satisfactory

In this course, we will look at different parts of this diagram

Part 1: What is HCI?

- Human
  - Users, single, group working together, etc.
  - His / Her mind: User tries to complete a task
- Computer
  - Not just desktop computers
  - Systems: super computer, tablet, phone, etc.
- Interaction
  - Between two parties
  - Communication, direct/indirect
  - Task oriented
  - Will see a lot more later in this course…

Part 1: HCI – Multi-disciplinary

- Human-Computer Interaction is a ***discipline*** concerned with
  - Design,
  - Evaluation, and
  - Implementation

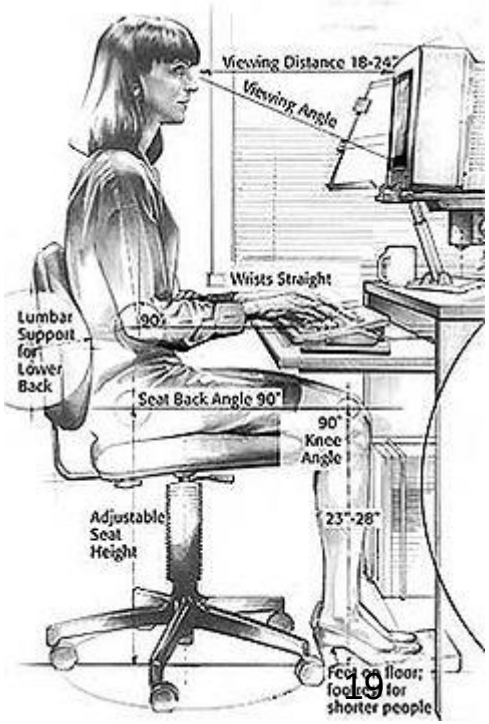
  of *interactive computer systems* for
  - *human use*, and
  - with the study of the *major phenomena* surrounding them

Part 1: Who Contributes to HCI

- Computer scientists
  - Modeling, specifying & analyzing *interaction*
- Psychologists
  - *User* as perceiver, thinker
- Software engineer
  - *Interaction* design is part of overall system development
  - Knowledge of *users*, tasks necessary to capture and understand requirements

Part 1: Who Contributes to HCI

- Linguists and philosophers
  - *Interaction* as communicative and conceptual activity
- Artificial intelligence researchers
  - *Interactive* systems exhibiting (or simulating) intelligent
  - Behavior
- Ergonomists
  - *Interaction* is physical as well as conceptual
- Sociologists and anthropologists
  - *Interaction* as social activity



Part 1: What is HCI?

- Now, you know what is HCI…
- Interesting terms for fun
  - HRI –
  - SCI –
  - ACI –

Don’t Google… just guess reasonably

Part 2:
Why study HCI – significance & difficulty

Part 2: Why Study HCI?

- **HCI is everywhere!!! Important part in our life…**

- **Major part of work for "REAL" software**
  - UI design
  - takes approximately 50% of time & resources [Myers & Rosson '92]

- **At a company YOU work on "REAL" software**
  - intended for *users* other than "us"
  - you are *not the user*!

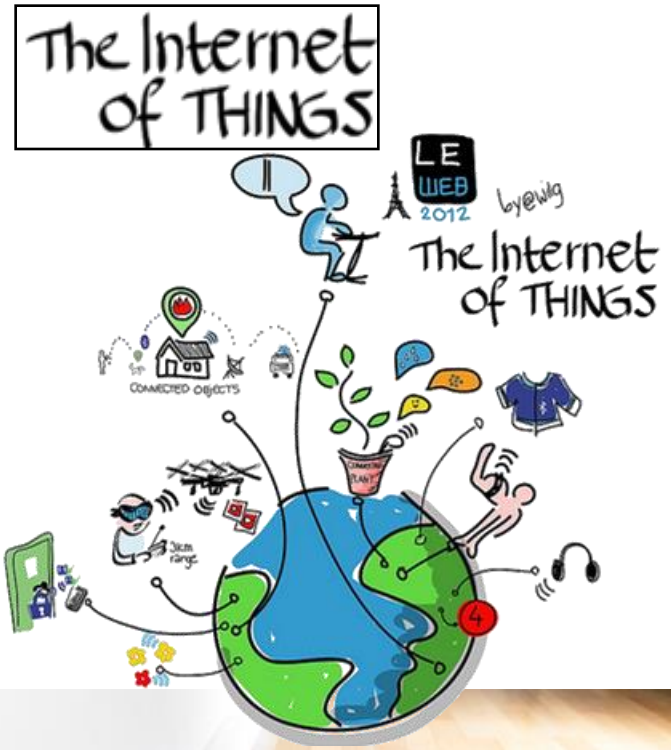
- **Bad UIs cost**
  - dissatisfaction user results is substantially lower profits
  - depending on the application... CAN cost lives!!!

- **User interfaces are hard to get right**

HCI is everywhere (1)

- HCI is everywhere!

Anything else?



HCI is everywhere (2)

- HCI is everywhere!

Anything else?

Part 2: Why Study HCI?

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Design is an important step…

- Specifications are often got wrong:
  - "Only slightly more than 30% of the code developed in application software development ever gets used as intended by end-users. The reason for this statistic may be a result of developers not understanding what their users need."

    -- Hugh Beyer and Karen Holtzblatt, "Contextual Design: A Customer-Centric Approach to Systems Design," *ACM Interactions*, Sep+Oct, 1997, iv.5, p. 62.

Part 2: Why Study HCI?

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Case study: drinking water?

Different views: UI designers and Users

Need: *Prototyping*, *User Evaluation,* and *Iteration*

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Case study: Road signs

The State of Georgia paid $3 million to the crash victim due to claims of negligent design of the ramp, intersection and signage.

Seven fatalities overall were recorded

http://en.wikipedia.org/wiki/Bluffton_University_bus_accident

Is this a better design?

Part 2: Why Study HCI?

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Why Hard to Design UIs

- No silver bullet (straightforward solution to have extreme effectiveness, for productivity, quality and control)

- User Interface design is a creative process

- Designers have difficulty thinking like users
  - Often need to understand task domain
  - Can't "unlearn" something

"*It is easy to make things hard.*
It is hard to make things easy." <- check this when you do your assignments…

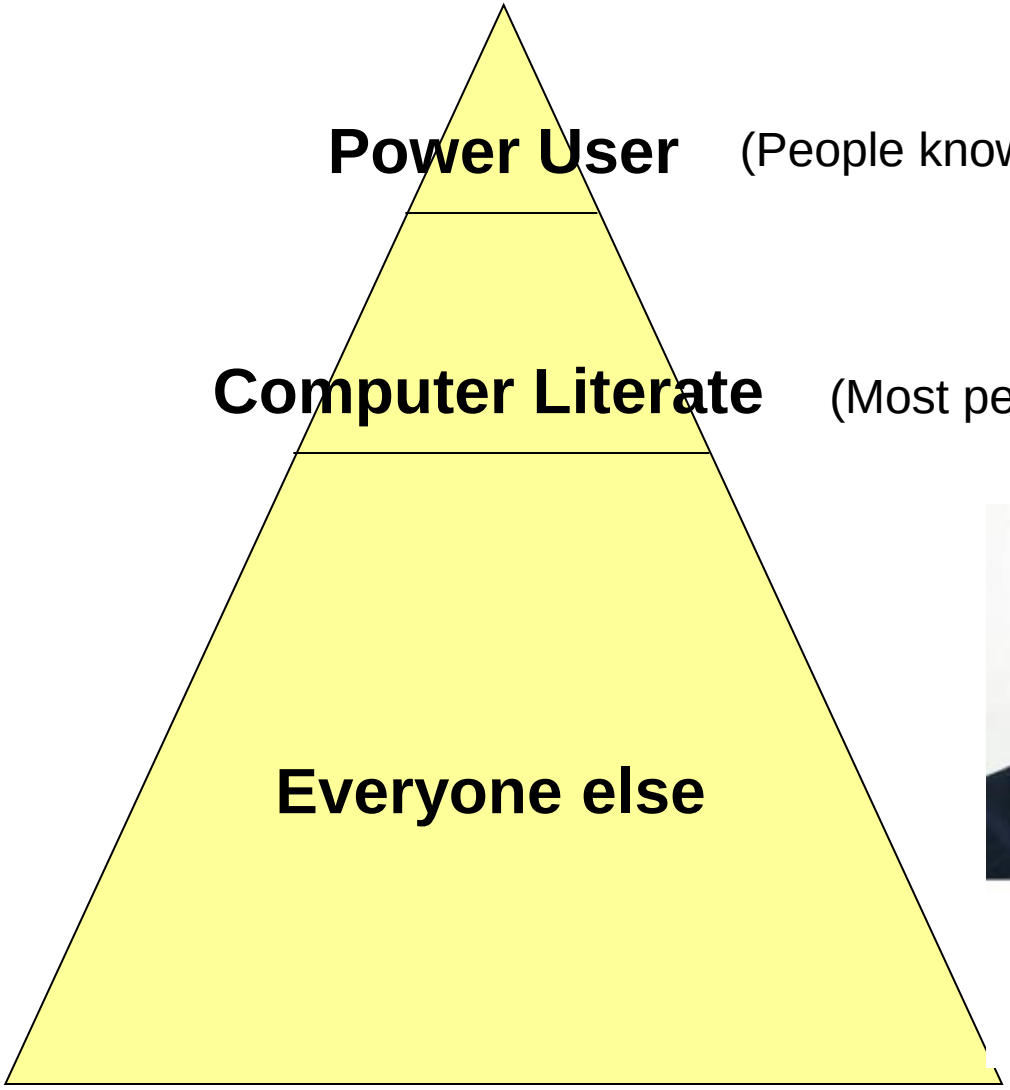
Can’t Unlearn Something

What do you see?

After you know what is there, it is hard to remember *how* "not" to see it!
Similarly… Software – Workable (traditional training) and Usable

Part 3:
A crude first view of users

Part 3: User Population Distribution



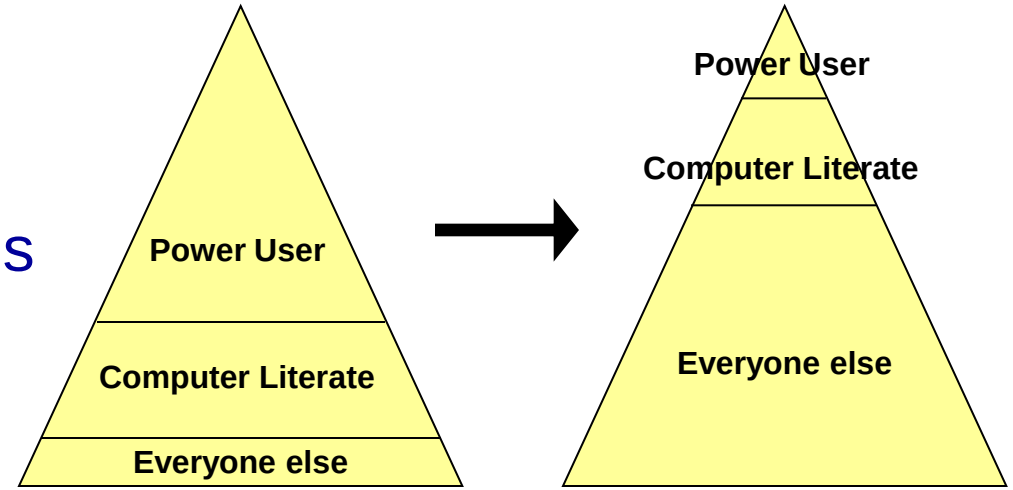
(People know & use the advanced features)

(Most people in this class – including me)

Power Users

- Often feel important because they can use complex software
- A status symbol!
- Such users are often engineers, and the ones who write software!

Think about the changes from 1970 to 2010:



Problem with Programmers

- Very technically savvy users! (Nerds!)
- Enjoy complex software and features
- Enjoy the “exclusiveness” of being able to use complex software
  - Esp: “UNIX” / “Linux” users
- As a result, they may try to provide a collection of “features” versus usable software

  (Think about this when you do your assignment)

Part 4:
A crude first view of features vs. usability

Part 4: Features

Baking a Cake

- Think of features as the ingredients
- If you have Flour, Sugar, Butter, Eggs, and Milk, is it a cake?
- The ingredients don't make the cake.

Features

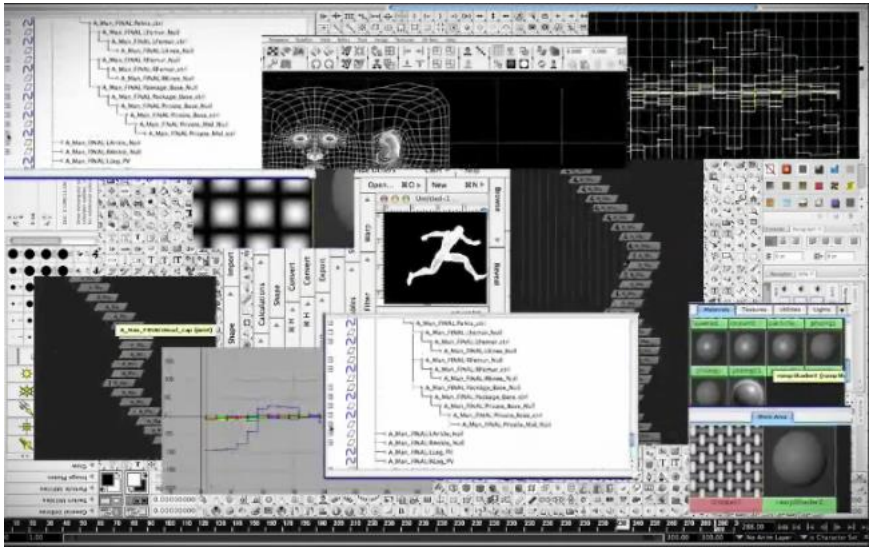
≠

The Goal

Features vs. Easy to Use

- One problem is that software developers tend to equate "features" with design
- Provide more features -> the user will be happy, right?
- This is not necessarily the case. In some cases, less is better.
- Or, if you have lots of "free" features, design the basic usage to be good.

Features vs. Easy to Use



Upgrades (by Anya Belkina)
SIGGRAPH 2010 (awarded animation)
http://vimeo.com/11192174

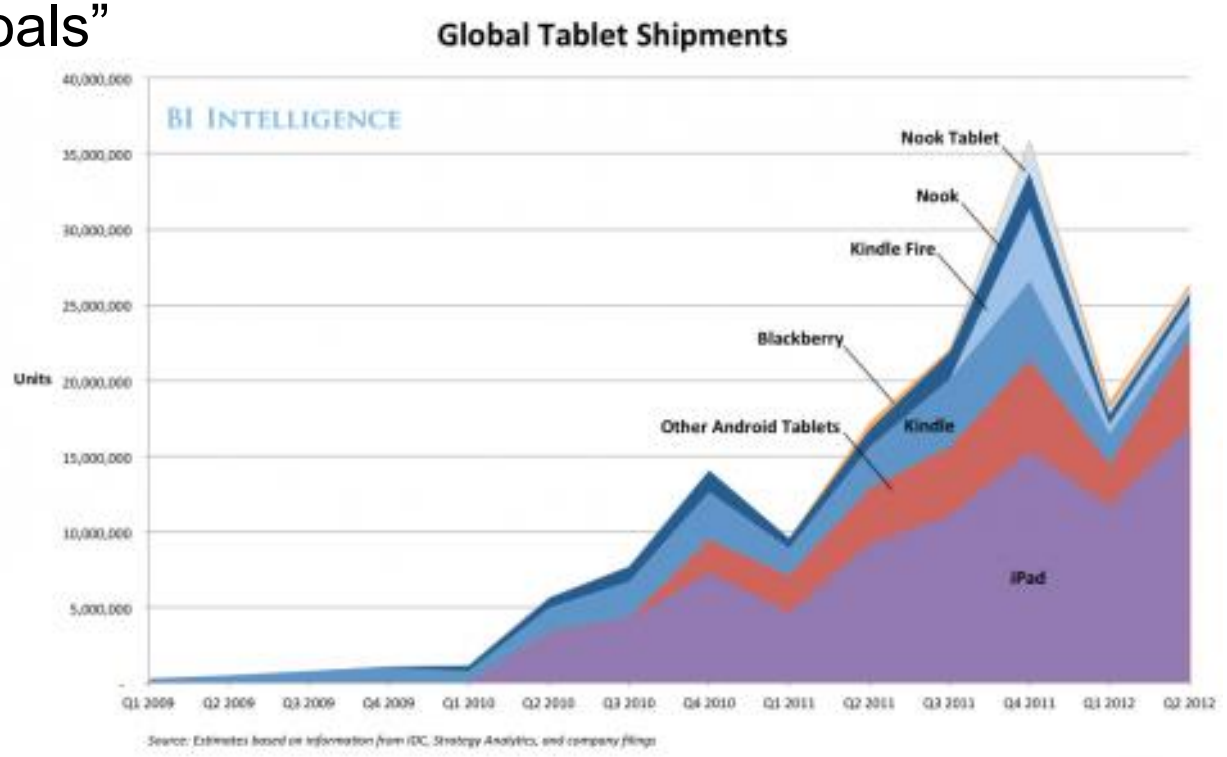
Features vs. Easy to Use

- It isn't about adding more features

- Its about adding the **right features** to allow the user to accomplish their "goals"

* Compare tablet and a PC?

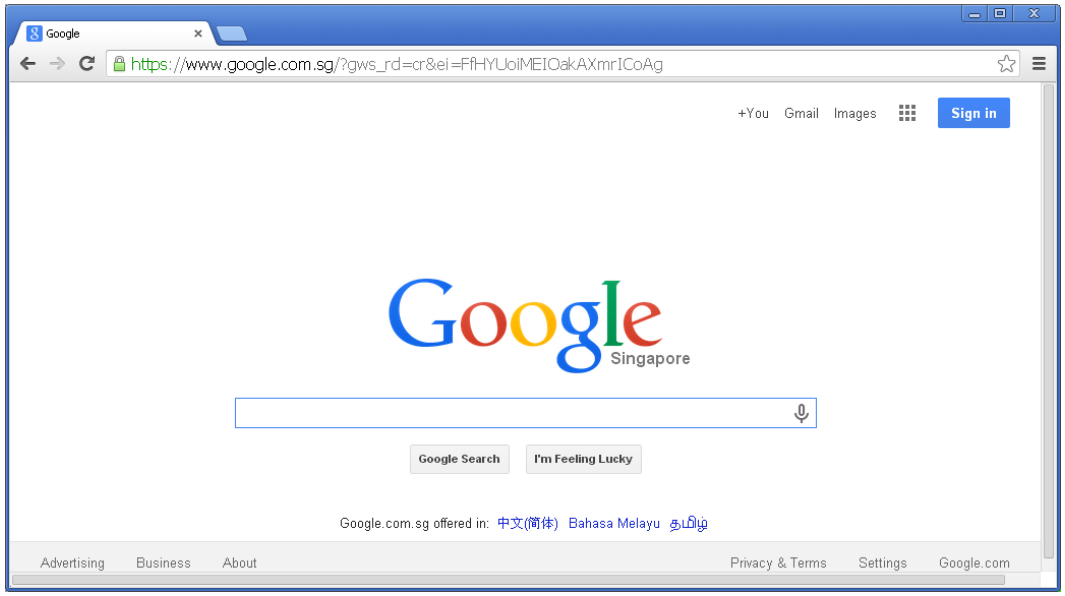
* How you choose a tablet?



http://www.businessinsider.com/bii-report-how-annual-tablet-sales-will-explode-to-400-million-by-2016-2012-8

Features vs. Easy to Use

- It isn't about adding more features
- It's about adding the right features to allow the user to accomplish their "goals"
- Sometimes, less is more... E.g., Google search…



Features vs. Easy to Use

- Smartphone: Google's Android VS Apple's iOS
  - **Functionalities** are all similar, nearly the same

- Factors for consumer?
  - Features
  - Cost (roughly the same)
  - Interface and design






NOKIA  MOTOROLA ?

Nov, 2016

Period	Samsung	Apple	Huawei	OPPO	vivo	Others
2015Q4	20.4%	18.7%	8.2%	3.6%	3.0%	46.2%
2016Q1	23.7%	15.4%	8.4%	5.9%	4.4%	42.2%
2016Q2	22.8%	11.7%	9.3%	6.6%	4.8%	44.9%
2016Q3	21%	12.5%	9.3%	7.1%	5.9%	44.2%

Source: IDC, Nov 2016

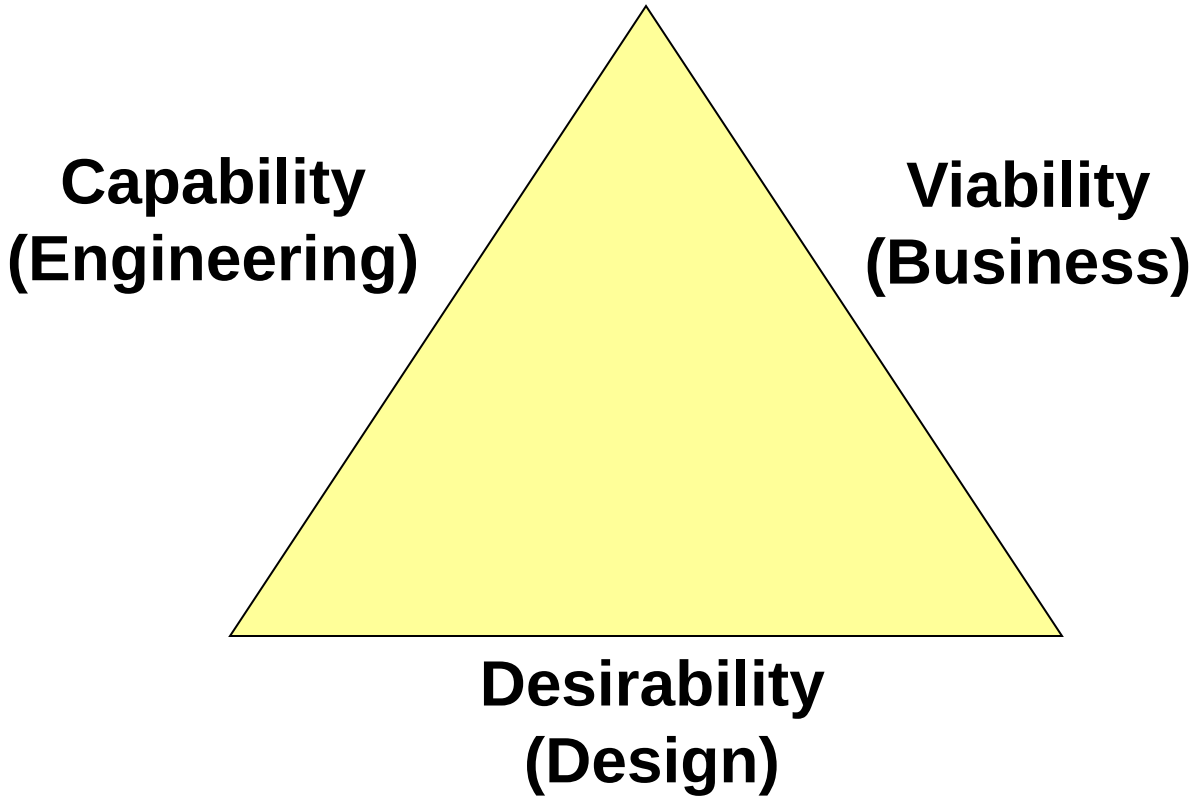
http://www.idc.com/promo/smartphone-market-share/vendor

Nov, 2017

Period	Apple	Samsung	Huawei	Xiaomi	OPPO	Others
2016Q4	18,2%	18,0%	10,6%	3,3%	7,3%	42,5%
2017Q1	14,7%	23,3%	10,0%	4,3%	7,5%	40,2%
2017Q2	11,8%	22,9%	11,1%	6,2%	8,0%	40,0%
2017Q3	12,4%	22,1%	10,4%	7,5%	8,1%	39,5%
2017Q4	19,7%	18,9%	10,7%	7,2%	6,9%	36,6%

Source: IDC Quarterly Mobile Phone Tracker - Final Historical, 2017Q4

Product Triangle



Good high-tech products require three components.
Unfortunately, the “design” is sometimes omitted.

A case study: Software Products

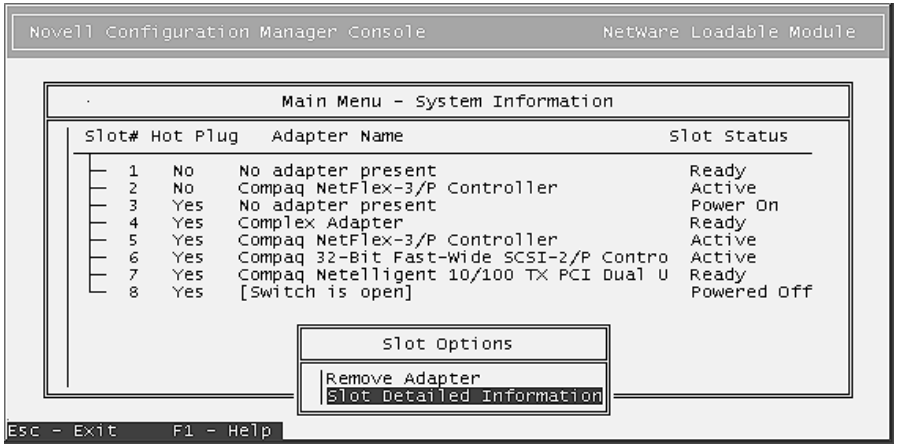
- How many software products enjoy a true monopoly?
  - That is, there is no competitor, consumer has no choice.
- What are the deciding factor to the consumer between choosing products?
- How important is "interface" to you as a consumer?
  - What is different about you compared to others?
    - How does those differences affect your preferences?
  - What percentage of the market are people like you?

Design and Loyalty

- Case study, Let's examine 4 companies
  - Novell (Netware)
  - Microsoft
  - Apple
  - Google

Novell

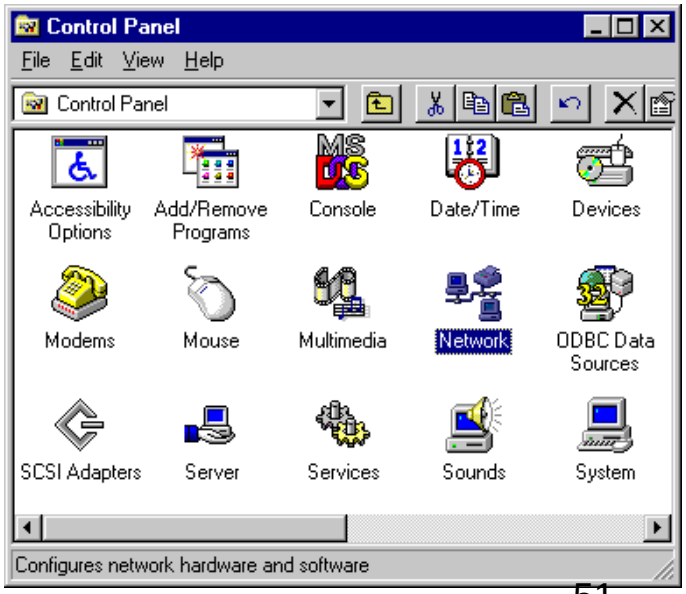
- Early 90's 1st company to provide real support for LANs
  - Connecting desktop computers!!!
- Provided a solution to "network" your office PCs together to share resources
- Software very difficult to use; basically, unloved…
- Needs "trained Novell specialist"



Nowell

Novell

- Other companies started to provide similar services
- Microsoft Windows 98/NT/XP, 3Com, etc.
- As soon as competition arose, Novell fell from the lead
  - Why? No customer loyalty!
  - Why use complicated software?



Win NT

Microsoft

- Products are technically competent, but rarely innovative
- Microsoft often copies others / buys other companies…
  - Legal case against Windows with Apple's UI
  - Legal case against IE and Netscape
- Bill Gates is an amazing businessman, almost everything he touches turns to "Gold"
- MS as a software manufacturer:
  - Relatively no design, but offers lots of features
  - Products are relatively cheap (i.e. good value)
  - Recently… perhaps more successful on hardware side…
- How much loyalty to Microsoft?

Apple

(Steve Jobs 1955-2011)

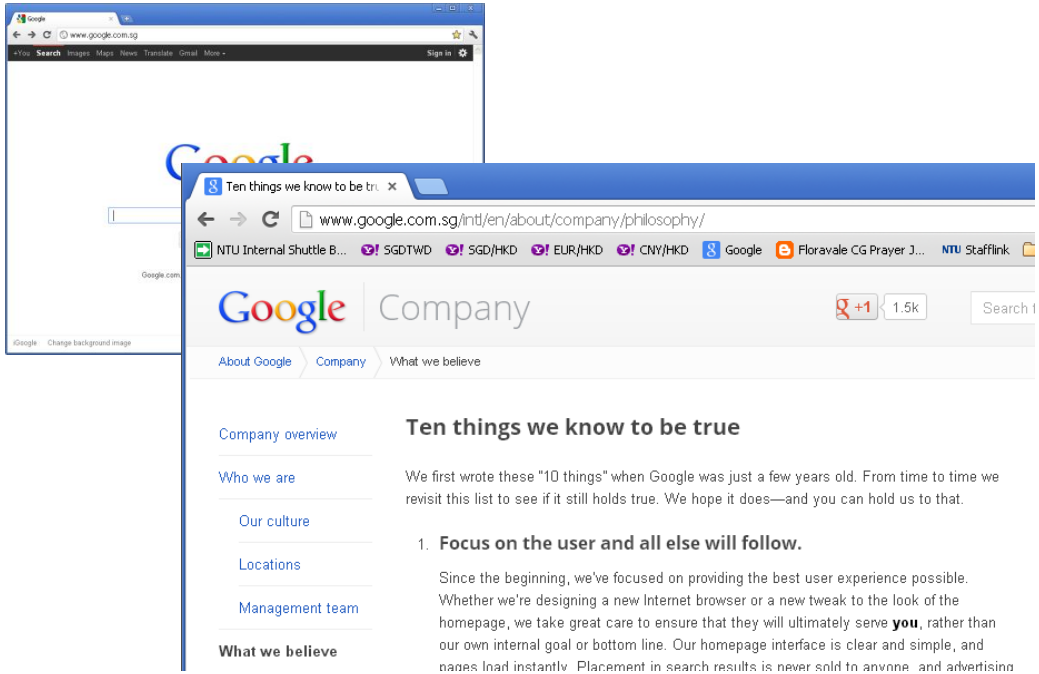
- Design is at the heart of Apple
- Apple users are often “fanatics”
  - Even though apple tends to cost more
- Through the mid-90s when Steve Jobs had been “ousted”, apple customers remained loyal
  - While the business ran poorly, design stayed the focus

- Steve Jobs came back and launched a series of really cool new designs . .
  - Company is doing well and maintains a huge loyalty base

Google

- Though started from 1996, it is now another major player
- Lots of very neat software…
  - From search engine to Android, Google Chrome, etc.
- First principle in Google's philosophy:

  Focus on the user
  and all else will follow

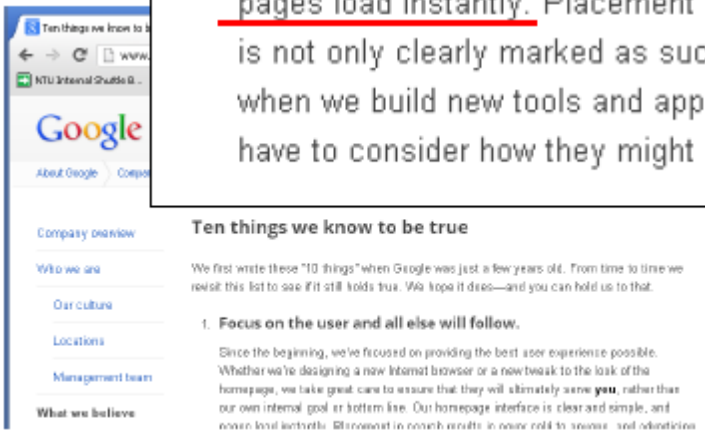


http://www.google.com.sg/intl/en/about/corporate/company/tenthings.html

Google

1. **Focus on the user and all else will follow.**

Since the beginning, we've focused on providing the best user experience possible. Whether we're designing a new Internet browser or a new tweak to the look of the homepage, we take great care to ensure that they will ultimately serve **you**, rather than our own internal goal or bottom line. Our homepage interface is clear and simple, and pages load instantly. Placement in search results is never sold to anyone, and advertising is not only clearly marked as such, it offers relevant content and is not distracting. And when we build new tools and applications, we believe they should work so well you don't have to consider how they might have been designed differently.



https://www.google.com/about/philosophy.html

Part 5:
Rethinking of HCI / design

Part 5: Rethinking the Design

- Users Goal
  - Not feel stupid
  - Not make mistakes
  - Get an adequate amount of work done
  - Have fun (if possible)
- Corporate Goal
  - Increase profit
  - Increase market share
  - Defeat competitor
- Programmers Goal
  - Save memory
  - Save keystrokes
  - Increase graphics beauty
  - Use cool technology or features
  - Increase efficiency

There is nothing in the corporate goals that conflicts with making software to satisfy the user goals.

The programmers goals often have no relationship to users' goals.

To satisfies the corporate goals, you need to satisfy the user/customer …
not the programmer!

Part 5: Designing for People

- Find out what people *really* want to do
  - Daily-Use Scenarios
    - Main actions/goals that user needs to perform
    - Scenarios that need the most robust interaction support
  - Necessary-Use Scenarios
    - Other actions that must be performed
    - May not be that frequently
  - Edge-Case Scenario
    - Rarely used, but must be included (like configuration)

A Case Study: Scanner

- Logitech Scanner (“Peacock Scanner”)

- Company performed a detailed user study with three users (of different background)

- Their finding, all 3 users shared similar goals:
  - They don’t want to manage the scanner, i.e. resolutions or other settings
  - They want to find their scanned images quickly and easily
  - They want to get their scanned images into other documents and programs quickly and easily

What about the expert

- One of the users was an expert
  - Expert image processing person
    - Used Photoshop for complex manipulation
  - Was concerned about resolution
    - However, the only reason the user wanted this, was for speed (i.e. lower DPI meant faster scan on other scanners)
    - For the Peacock scanner, there was *relatively no difference in scan-speed with DPI setting*
    - So, they decided to keep DPI set to **max**

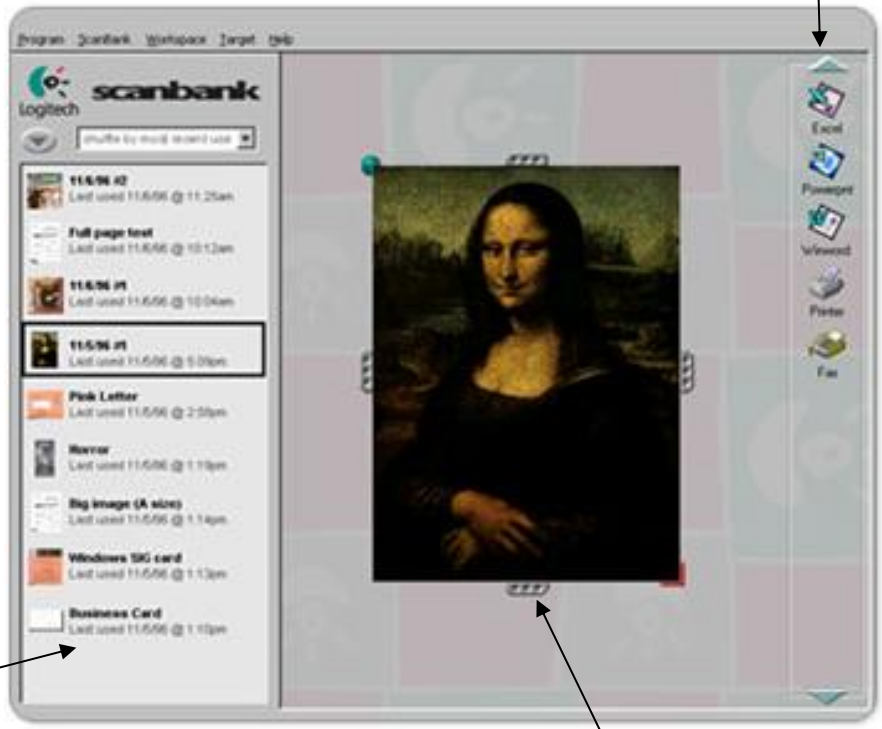
Logitech

- Design concentrated on three aspects
  - Eliminated all scanner-management interface idioms (on the main interface)
  - Made it *impossible* to lose scanned images
  - Made it *trivially easy* to put scanned images into other documents

- Also focused on interaction
  - Make it easy and simple to crop, rotate, and scale scanned images

Logitech Scanbank

Copy, paste, email, print, fax.



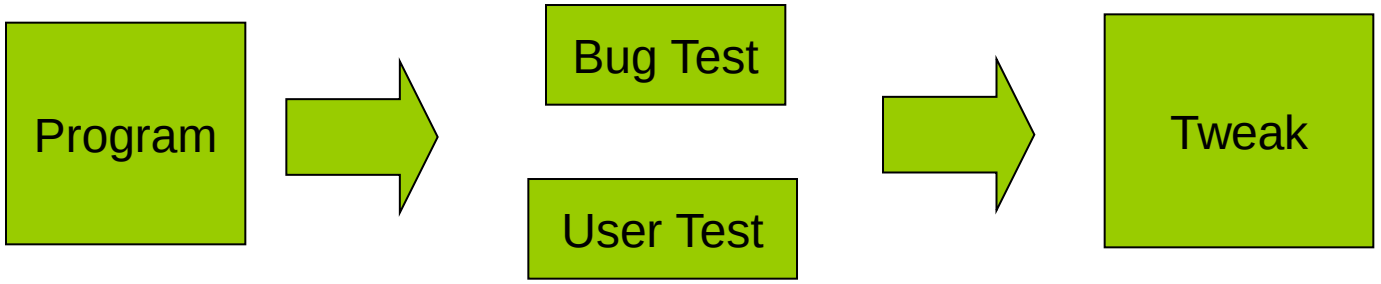
Previous scans, easy to find.

Manipulation (scale, rotate) very easy.

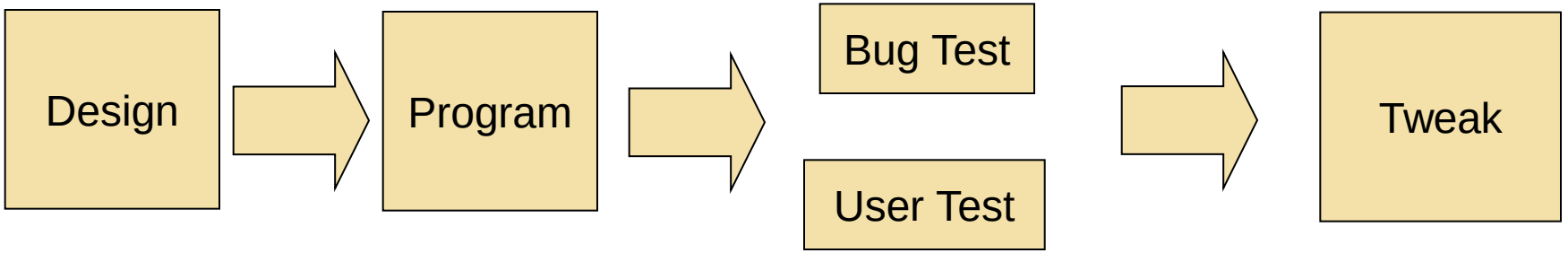
Follow up studies on the Peacock

- Performed user studies testing against other software
- Developers/designers expected users to realize the software was designed to be “easy to use”
- Instead, the users not only found it to be the best interface, they thought it was the “most powerful”
  - Interesting, this software provided less features than other software however, they had picked the “right features” and as a result the users thought it was powerful.

Rethinking software development



OLD STYLE



NEW STYLE

Recommendations

- Have design at the "heart"
  - Which includes user studies and clear understanding of the users desires/needs
  - Apply all the principles and practices of good design
- Separate UI from Programming
  - As much as reasonable
  - UI can be designed before the programming starts
- People-oriented design
  - Goals versus Features!
  - What are the goals, not features of the system

Again, is it worth it?

- What are the costs of bad software?
  - Requires endless revisions
  - May lose customer loyalty
  - Tech support costs

- What are the costs of good design?
  - May appear to cost more at first
    - Extra-personnel, design time, etc. .
  - But, the pay-off
    - Loyalty, lower tech costs, better focused software engineering
  - In practice, studies find it doesn't hold up production
    - Productions are more focused when the design is clear

Conclusion

Design may be the most important consideration

Every morning software engineers should chant:

"I am not the user"
"I am not the user"
"I am not the user"

Innovation

“You can't connect the dots looking forward; you can only connect them looking backwards. So you have to trust that the dots will somehow connect in your future. You have to trust in something--your gut, destiny, life, karma, whatever. This approach has never let me down, and it has made all the difference in my life.”

- Steve Jobs

Information

- **Owen Noel** Newton Fernando
- **Email:** ofernando@ntu.edu.sg
- **Office:** N4-02c-80
- **Office hours:**
  - Monday 1030-noon (no appointment needed)
  - Other times by appointment (Email)