Human Factors in Information System Design

ISMT S-170 (Course #32596)
Harvard Summer School– Summer 2012
Tentative Syllabus

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While many organizations have outsourced the design of production systems, the recent Internet and e-commerce explosion has created the need to design corporate web sites. These sites are being developed by people of various backgrounds, but organizational practices must exist to make sure they take into account what we know about human factors engineering. Furthermore, many of us, employees or independent workers, should know how to evaluate proposed information systems and their fit with organizational practices and personal preferences.

The course will focus on how to gather requirements, achieve a usable first draft, and test and improve the draft. Tools such as Publisher or Dreamweaver can be used for course projects. The course is designed to be flexible, offering many options for earning your grade. However, please do not attempt extra points through extra projects. Choose only the number of points you need and do your best at them.

Texts:

- Te’eni, Carey, and Zhang: *Human-Computer Interaction: Developing Effective Organizational Information Systems*, 2007
- Norman, Donald A. *The Design of Everyday Things*, New York: Doubleday (256 pgs)

Other readings: A few additional readings each class, along with extensive web references. Many will report studies in our labs. Some might be replaced if a newer paper is finished in time for the course.

• Norman D. and Nielsen J., Gestural Interfaces: A Step Backward In Usability, Interactions, 2010
Grading

Undergraduate: Attempt exactly 110 points  
Graduate: Attempt exactly 135 points

**Required** (all students):
- Attendance/participation ................................................................. 10
- Weekly Assignments (all 5 @ 5) ............................................................. 25
- Integrated Design project ..................................................................... 25

**Menu:** (Undergraduates choose 50 points; Graduates choose 75 points)
- Book review .......................................................................................... 25
- Weekly Research Reality Checks (weeks 1-5 @ 5) .......................................................... 25
- Mobile/Tablet Novice Walkthrough .......................................................... 25
- YouTube project ....................................................................................... 25
- Research project design (especially useful for students headed to a PhD program) ....... 50

Schedule

**Week 1: Galletta**

- June 25: Chapter 1: Introduction  
  - In-Class Design Critique  
  - Chapter 2: Organizational and Business Context
- June 27: Galletta (2006) reading  
  - Galletta, Durcikova, Everard, Jones (2005) reading

**Week 2: Galletta**

- July 2:  
  - Chapter 3: Interactive Technologies  
  - Norman & Nielsen (2010) reading  
  - Dunn and Galletta (2013) reading  
  - Watch Xerox Star videos on Youtube:  
    - Part 1: [http://www.youtube.com/watch?v=Cn4vC80Pv6Q](http://www.youtube.com/watch?v=Cn4vC80Pv6Q)  
  - Norman, chaps 1-2
- **Due:** Future Interaction weekly assignment

Tentative Syllabus – please do not print
July 4: Holiday – No class
   1. Watch Jef Han’s Multitouch video from 2006
      http://www.youtube.com/watch?v=QKh1Rv0PIOQ
   2. Watch the Xoom video
      http://www.youtube.com/watch?v=BGtXmtAzzQw&feature=related
   3. Watch the new Microsoft Surface video (June 2012)

**Week 3: Te’eni**

July 9: Norman, chaps 3-5
   Chapter 5: Cognitive Engineering
   Everard & Galletta (2004-2005) reading

July 11: Chapter 6: Affective Engineering
   Carroll reading
   Ronen reading
   **Due: Bad Forms project**

**Week 4: Te’eni**

July 16: Bewley et al. reading
   Chapter 7: Evaluation
   Chapter 8: Design Principles and Guidelines

July 18: **Field Trip to Federated (instructions and directions forthcoming)**
   Gould and Lewis reading
   National cancer Institute (browse the site to see basically what is there)
   Koyani, Bailey, and Nall: Web design Guidelines (become familiar with the resource)
   Galletta, Chung, Haney, Pike, Polak (2007) reading
   **Due: User Misunderstanding project**

**Week 5: Galletta**

July 23: **Guest speaker: Kris Durgin, Microsoft**
   Chapter 4: Physical Engineering
   Chapter 9: Tasks in the Organizational Context
   Chapter 10: Componential Design
   Vessey & Galletta (1991) reading
July 25: Chapter 11: HCI Development Methodology  
Chapter 12: Interpersonal Relationships, Collaboration, and Organization  
Norman, chaps 6-7  
Galletta, Ahuja, Hartman, Peace, and Teo (1995) reading  
Due: Text Screen project

Week 6: Te’eni

July 30: Chapter 13: Social and Global Issues – including social media  
Shirky and Carr reading  
Jagatic et al. reading  
Moody, Galletta, Walker, Dunn (2011) reading  
Avital & Te’eni reading  

Aug 1: Chapter 14: Meeting the Changing Needs of IT Development and Use – including mobile applications  
Catch-up for guest speaker/field trips  
Due: Icon Design project

Final exam day

August 6: Due: Book Review (print; perhaps 5 minute video), YouTube (10 min), Novice Walkthrough (10 min), Integrated Design (20 min), and Research Project Design Presentations (10 min) (all students must attend; presentations are due for YouTube, Integrated Design, Novice Walkthrough, and Research Projects.) These times are tentative and might be adjusted after projecting the number of presentations by the 5th week.

Weekly Assignments (5 points each):

Future Interaction (due July 2)

Your task is to search for depictions of future technology and pick out what you believe is most representative of how you would like to interact with home and/or office technology in the foreseeable future. Don’t get too wild: That is, don’t invent the obvious ultimate machine that would read your mind and do everything not only that you think of, but also what you fail to think of. Present your findings to the class. We will have an informal vote to see whose technology is most exciting.

What is required:

1. Identify and show a short video to the class. The ideal length would be 5 minutes to provide focus, but the absolute limit will be determined by the subject matter. You can get the video from any source, including YouTube, vendor sites, movies, etc. If you want to show part of a DVD, please note the precise time the segment begins.
2. Provide a list of advantages afforded by this technology. Tell us what problems this technology will solve. Refer to our list of outcomes we would want in improving the user experience. What will be faster? More accurate/effective? Less effortful/stressful? More interesting/fun? Easier for intermittent use?

3. Now, go past the hype and spoil our excitement. What will be slower? Less accurate/effective? More effortful/stressful? Less interesting/less fun? Easier to forget how to use it?

Bad Forms (due July 11)

Most people encounter forms at least a few times per month, in everyday situations such as buying a car, ordering goods on line, visiting a medical doctor, etc. Students in universities probably encounter more forms than others. Some of those forms require a bewildering amount of repetition, require large amounts of text in very small areas, and require responses to undecipherable questions.

Your job is to find an example of a form you have seen and have judged to be terrible. Please download, screen capture, or scan and submit the form electronically. Please do not divulge confidential information to the class. That is, the form should either be blank or any material filled out redacted.

We will discuss in class potential defenses for the use of such forms, origins of the problems, and perhaps see another side of the issue. The goal is for you to better understand the genesis of design problems and ultimately avoid creating such problems for others.

User Misunderstandings (due July 18)

There is a famous story about a user not being able to find the “any” key on his keyboard, so he called tech support to find out what to do when the documentation said to “hit any key.” Another story tells us about the person who broke the “cupholder” on his computer and called tech support. It was determined that the “cupholder” was actually a CD tray.

These stories have been published on line in the past. A good source is the “Computer Stupidities” page at http://www.rinkworks.com/stupid/. Your job is to find the funniest story you can, and then share it with the class. We might vote on the best of the stories. You are permitted to use any other resources on line or in print to find such stories.

Usually the reason for these funny situations is a result of an interaction between user misunderstandings and design choices.

The deliverable is for you to:

- Read your story to the class. Videos are also welcome.
- Point out the design choices and misunderstandings you believe might have led to the funny situation.
For example, the “any key” person could not differentiate between key words and common words, and the designer of the documentation did not realize that people need to differentiate the two. The “cupholder” person was not familiar with the concept of a CD-ROM, and the designer decided to leave a round hole in the bottom for mechanical engineering reasons.

Text Screen Design (due July 25)
The goal of this assignment is for you to try and apply some of the screen design issues discussed in the text, and to discover how difficult it is to design even a simple output screen. We will use software to evaluate your screen, however, your grade will be assigned by your instructor.

You are to develop ONE information (not input) screen that contains the requisite information (see below). The contents of the screen should be a customer’s order, and should show:

- identifying information like company (filling the order) name and system/screen information;
- all pertinent customer information like name, billing address, and shipping address;
- all pertinent item information like description, price, quantity and product number showing exactly 8 items purchased;
- system information like how to get help, how to continue, what choices there are, etc.

Please submit a text file that is 80 “columns” (characters) wide by no more than 22 lines. Name your file "HCI: (your name) SCREEN.TXT". Do not use a proportionally-spaced font (use Courier or similar font). Ideal for this would be Notepad with Courier Font. Keep track of spacing by using a line at the top 123456789012345...etc and then delete that line after you finish. Do not use boldfacing, italics, or underlining. Do not use any design tools that create graphic images or proprietary file formats. Finally, do not pad spaces with a letter such as “X” (eg., John DoeXXXXXXXX). If a name is short, just leave blank space to the right of the name.

In class, we will evaluate the screen using software developed by Tullis (yes, our potential guest/host speaker), described in the reading, on an LCD projector.

Icon Design (due Aug 1)
Most people encounter graphical user interfaces these days, which include icons that a person must recognize and click. For example, in Microsoft Word, there is a printer icon that looks like a little printer. These icons do not just “happen,” and are often the result of careful design, rigorous testing, and endless modification.

The Bewley, et al. reading discusses computer icons for the Xerox Star, predecessor to the Apple MacIntosh. After reviewing these materials, you should have a good idea of the difficulties involved in designing icons. You will be using a graphics program (to be identified later) to design the icons. The objectives of this assignment are twofold: (1) to give you some practice in, and understanding of the difficulty involved in designing an icon, and (2) to give you some practice in, and understanding of the difficulty involved in making it legible in a tiny space on the screen.
Before you begin the steps below, choose any competitive Mac or Windows spreadsheet package (most likely Excel). Scan all of the icons and notice (1) how much meaning is expressed in each one that captures its function, (2) how well differentiated its drawing is from the other icons, and (3) how creative it is in expressing its specialized meaning. Your icons will be given points by me and by your peers on each of these criteria (meaning, differentiation, and creativity) in creating your three icons. Note: You need not provide the actual macro; in class we will only focus on the three icons themselves.

An icon editor called "Iconedit2" is a good bet for this assignment. Please cruise to download.com, search for "iconedit2" and download and install it. It is a 453 kilobyte download. Please set it (or any other icon editor) to 32x32 for the assignment. Any larger and it is a less useful assignment.

Required:

1. Create an icon that would center a title line on the screen, assuming the user has highlighted the range containing the cell (at the left) in which there is a title, and the cells over which it is to be centered.
2. Create an icon that would (given the user has selected a range) sum all columns and sum all rows in the selected range, placing the row totals to the right of each row of the range and placing column totals at the bottom of each column under the range. (many spreadsheets have this simple format...for example, in a list of products sold with each product as a row and each month as a column, this macro will create totals for each product across the months and each for each month across products.
3. Create an icon that would allow the user to select a range with column/row totals, and have the spreadsheet make sure the column totals equal the row totals.

Integrated Design Project (25pts)(due Aug 6)

Working in a group of 2-5 people, develop an actual, working system (web site or installable program; a simulation via PowerPoint might also be acceptable depending on our resources; we will decide during the first class session) that will solve a real organizational problem. Please record your presentation and place it (perhaps in segments) on YouTube so that Prof. Galletta can watch it too. Provide the following:

1. Context of the design: Why is the system needed? What tasks will be aided by the system?
2. User needs: Specify the user’s stated needs that you discovered by interviewing users.
3. System design: Provide the sketches and narrative that helped formulate the system design.
4. Build the system: Use any tools to build the system, such as Visual Studio.net, Dreamweaver, Microsoft Publisher, Office Live, FrontPage, or others. PowerPoint might also be acceptable; this will be decided during the first week.
5. In class, other members of the class will evaluate the design.
6. Provide a list of modifications that were made or that would be made in the future.
Optional Reality Checks (25pts) (due each week)

Your assignment is to seriously evaluate relate a good portion of the readings in this course to your own working or personal life, and to think towards the future.

To satisfy this assignment, provide a list of “gems” for any two of the readings each week, one from a chapter reading and one from an article. These gems should NOT be bulleted lists of content of the article, but rather your own assessment of what is useful from the particular reading. I do not have a length requirement but I believe it is important to at least fill up a page (double-spaced) with your observations. A typical length for this assignment in the past has been 2 pages, but I will not “weigh” your submissions.

An excellent submission would provide (1) a short synopsis of what you got from the reading, (2) what you believe is valuable and why, (3) how practitioners could benefit from the material, (4) a particular situation that you were in that would have been different if the parties involved would have read it, (5) shortcomings of the study/chapter: what is missing, and (6) future research that you think should be done in the subject area.

You do not have to address all 6 items in each submission, as some will not apply. Also, don’t hesitate to be creative with this assignment.

Optional Book Review (25 pts) (due Aug 6)

Buy, rent, or borrow (but do not steal) any one of the following books. Other similar books are also permitted with the permission of one of the professors. Titles are first-come, first-served and no two students should cover the same book. Notify one of the professors of your choice by the 3rd class session. Provide a written (3-5 page) review and a short (approximately 10 minute) presentation during the final class. Please have someone shoot video and put it on YouTube so that the other professor can see it. Please make sure the presentation describes:

- The main issues covered by the book
- What is particularly valuable about the book
- What seems to be missing or problematic in the book

The sample titles, in alphabetical order:

- *3D User Interfaces: Theory and Practice* by Doug A. Bowman, Ernst Kruijff, Joseph J. LaViola, Jr., and Ivan Poupyrev
- *Alone Together: Why We Expect More from Technology and Less from Each Other* by Sherry Turkle
- *Designing Personalized User Experiences in eCommerce* (Human-Computer Interaction Series) by Clare-Marie Karat, Jan O. Blom and John Karat
- *Designing Interfaces* by Jenifer Tidwell
• Designing Interactions by Bill Moggridge
• Emotional Design: Why We Love (or Hate) Everyday Things by Donald A. Norman
• The Elements of User Experience: User-Centered Design for the Web and Beyond (2nd Edition) (Voices That Matter) by Jesse James Garrett
• Human-Computer Etiquette: Cultural Expectations and the Design Implications They Place on Computers and Technology (Supply Chain Integration Modeling, Optimization, and Applications) by Caroline C. Hayes and Christopher A. Miller
• Living with Complexity by Donald A. Norman
• Measuring the User Experience by Tom Tullis and Bill Albert
• The Man Who Lied to His Laptop: What Machines Teach Us About Human Relationships by Clifford Nass and Scott Brave
• Neuro Web Design: What Makes Them Click? by Susan M. Weinschenk
• The Impact of Tablet PCs and Pen-based Technology on Education: Going Mainstream, 2010 by Robert H. Reed and Dave A. Berque
• Undercover User Experience Design (Voices That Matter) by Cennydd Bowles, James Box
• Wired for Speech: How Voice Activates and Advances the Human-Computer Relationship by Clifford Nass and Scott Brave

Optional YouTube Project (25pts) (due Aug 6)

Working in a group of 3-5 people, your assignment is to provide a 6-minute (minimum) to 10-minute (maximum) video that provides instruction on any core topic in this course. PLEASE use a little humor, but on a modest basis or it might dilute your material too much or it might become unfunny. Please choose one of the following topics (and inform us of your choice so we do not have duplicates) or seek pre-approval from one of us for a topic of your choice:

- How to do a usability test in a web context
- Summary of your usability test of two competing websites
- Importance of usability engineering in designing an organizational website
- Fitt’s Law demonstration (there are some awful ones on YouTube now. Do a good one!)
- Mobile shootout: Comparison of Android, Blackberry, iPhone, and Windows Phone 7. Use the “overall” benchmark set of tasks discussed in the Dunn and Galletta (2013) reading as your basis for the comparison. Find two “experts” (self-proclaimed highly experienced students) on each platform and time them while they go through the benchmark tasks. You can speed up the action during the task and show real time numbers at the end to compare the experts. Be objective; you will be downgraded if you show bias.
- OBJECTIVE usability comparison of Mac and Windows platforms (Again, a balanced presentation is required)
- What web designers should know about interface design
Optional Mobile or Tablet Novice Walkthrough (25 pts)

Due Aug 6. Working in a group of 2-5 people, decide if you want to evaluate a novice’s uninformed use of a tablet or a smartphone. Identify 2 novices (preferably but not necessarily in your group) in each of 3 platforms on the tablet or smartphone, and perform a walkthrough of the novice. That is, provide a list of tasks (see below) and see what happens when the novice tries to accomplish those tasks. Choose the device you want to examine—you can choose to examine (1) tablets (e.g., iPad, Motorola Xoom, Samsung Galaxy Tablet, or Asus Transformer) or (2) smartphones (Android, Apple, Blackberry, or Windows). If you to examine smartphones, use the “overall” or “novice” set of benchmark tasks discussed in the Dunn and Galletta (2013) reading and justify your choice. If you choose a tablet, remove the phone-related tasks and use the longer set of benchmarks that will be provided in class.

- Choose tablets or smartphones
- You should have two novices each in at least 3 platforms on the device type you chose (6 total)
- Film them on video (on someone’s smartphone).
- Record timings of these novices in doing the tasks.
- Make notes of when they get stuck. If someone is stuck and takes more than 3 minutes at one task, you can give them a solution so they can move forward
- Provide a write-up that describes how you believe the design choices that the vendors made either reinforce or violate design principles discussed in the course and presented in the Te’eni text.
- Provide a YouTube video that provides the full length of each interaction, but speed up the video where needed so that the video is shorter than 10 minutes.
- Please save the real-time videos in the iSite dropbox.

Optional Experimental Research Proposal (50pts)

Due Aug 6. Particularly useful for doctoral students or those intending to become doctoral students. Please choose the topic only with the approval of one of the professors. There is an opportunity to work with one or both of the professors after the course is finished to actually conduct the study and publish the results. Carrying out the study is purely optional and will be outside the scope of the course (not graded). Please record your presentation and place it (perhaps in segments) on YouTube so that Prof. Galletta can watch it too. The end-product should be a proposal for a study that has:

- A research question with a convincing context (why it is important; what problem it will address)
- Previous literature related to the question
- A theoretical context: what might be predicted and why
- Hypotheses motivated by the problem, the previous literature, and the proposed theory to use
- A description of the methodology/materials that should be used to test the hypotheses