HCIN.620 Information and Interaction Design

Course Notes

Draft of January 29, 2015

INTRODUCTION

Materials You Need. You need a notebook, pencil or pen, and a phone or small tablet with a camera in it.

A. Notebook. The notebook should be approximately 5 × 8 in. This is so that I can more easily manage collecting them and returning them to you. I have had students insist that they need larger notebooks and it has been problematic. Please restrict yourself to this approximate dimension. The number of pages is not important. If you run out of pages, you can start a new notebook.

B. Phone. You will need a phone, preferrably a smartphone running Android, iOS, or Windows. Any other OS needs consultation with the instructor. The phone should have a camera, capable of sending the most recent picture to an email address or other network destination. A small tablet *may* make an acceptable substitute for a phone but please see the instructor if you are considering such a substitution.

Please do not bring any laptops to class unless required for assistive technologies. If you normally require a laptop in class for any other reason, try to think of this class as an opportunity to try something different. If you must bring a laptop into the classroom, try to keep it in a covered container, like a beverage.

Definitions. We need working definitions of the words in the course title and description, even though these words are notoriously resistant to definition.

A. Information. Defining information is the subject of a lot of fighting among people who get paid by the word. Some valuable information about information can be found in a dictionary.

From The Collaborative International Dictionary of English
    v.0.48 [gcide]:

Information \In`for*ma"tion\, n. [F., fr. L. information
   representation, conception. See {Inform}, v. t.]
   1. The act of informing, or communicating knowledge or
      intelligence.
      [1913 Webster]
            The active informations of the intellect.
               --South.
      [1913 Webster]

   2. Any fact or set of facts, knowledge, news, or
      advice, whether communicated by others or
      obtained by personal study and investigation;
      any datum that reduces uncertainty about the
      state of any part of the world;
      intelligence; knowledge derived from reading,
      observation, or instruction.
      [1913 Webster +PJC]
            Larger opportunities of information.
               --Rogers.
      [1913 Webster]
            He should get some information in the
            subject he intends to handle.
               --Swift.
      [1913 Webster]

   3. (Law) A proceeding in the nature of a prosecution
      for some offense against the government,
      instituted and prosecuted, really or nominally,
      by some authorized public officer on behalf of
      the government. It differs from an indictment in
      criminal cases chiefly in not being based on the
      finding of a grand jury. See {Indictment}.
      [1913 Webster]

   4. (Information Theory) A measure of the number of
      possible choices of messages contained in a

symbol, signal, transmitted message, or other
information-bearing object; it is usually
quantified as the negative logarithm of the
number of allowed symbols that could be
contained in the message; for logarithms to the
base 2, the measure corresponds to the unit of
information, the hartley, which is log210, or
3.323 bits; called also {information content}.
The smallest unit of information that can be
contained or transmitted is the bit,
corresponding to a yes-or-no decision.

5. (Computers) Useful facts, as contrasted with
   raw data; as, among all this data, there must
   be some interesting information.
   [PJC]

From WordNet (r) 3.0 (2006) [wn]:

  information
      n 1: a message received and understood
           [syn: {information}, {info}]
        2: knowledge acquired through study or
           experience or instruction
        3: formal accusation of a crime
        4: a collection of facts from which
           conclusions may be drawn;
           "statistical data"
           [syn: {data}, {information}]
        5: (communication theory) a numerical measure
           of the uncertainty of an outcome; "the signal
           contained thousands of bits of information"
           [syn: {information}, {selective information},
            {entropy}]

From The Free On-line Dictionary of Computing
     (20 July 2014) [foldoc]:

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information

  <data> The result of applying {data processing} to
  {data}, giving it context and meaning.  Information
  can then be further processed to yield {knowledge}.

  People or computers can find patterns in data to
  perceive information, and information can be used
  to enhance {knowledge}.  Since knowledge is
  prerequisite to wisdom, we always want more data
  and information.  But, as modern societies verge
  on {information overload}, we especially need
  better ways to find patterns.

  1234567.89 is data.

  "Your bank balance has jumped 8087% to $1234567.89"
  is information.

  "Nobody owes me that much money" is knowledge.

  "I'd better talk to the bank before I spend it,
  because of what has happened to other people"
  is wisdom.

  (2007-09-10)
```

Of particular note in the above definitions is that people define information according to their work. Claude Shannon popularized the notion of information as a message received and understood because that notion served his development of information theory, which underlies the field of network communication.

Some pundits like to posit a hierarchy of data, information, knowledge, and wisdom to support their work in a field called knowledge management. This field was popular about a dozen years ago and its influence had waned by the time the last defini-

tion above had been added to the Free Dictionary of Computing.

B. Interaction.
C. Design.

Academic Communities. The topic has been studied by three main academic communities, human factors in engineering schools, human computer interaction in computer science schools, and management information systems in business schools. Each of the three has specialized to some extent but there are overlaps.

Human factors is usually the experimental study of how people operate complex machines like automobiles, ships, nuclear reactors, and aircraft. Since the researchers who identify themselves this way are usually funded by the military, they emphasize military applications although their findings are usually applicable to some degree outside the military.

Human computer interaction was, until recently, primarily the study of one person interacting with one computer system. This field began with the study of users of expensive computers performing specialized work tasks. During this period, the field mainly studied how the user interface affected some measure of productivity, usually in laboratory studies. The second period of human computer interaction research studied how people interact casually with computers. This involved field studies with very small groups of participants (formerly called users) and very limited conclusions, appropriate to the increased pace of change in user interfaces.

It's easier to identify past epochs than current ones. It appears that human computer interaction has diverged into two areas in the current era but the distinction is harder to be certain of without the advantage of years of hindsight. The two current branches appear to be *ubiquitous computing* and *computing communities*.

Ubiquitous computing is an old term referring to computers embedded in other devices and able to communicate with each

other. When first coined by Marc Weiser around 1991 (see Weiser (1991)), the term meant anything that was not a desktop computer and concerned a small, well-defined community. Today, almost no interaction between computers and people can be defined with respect to only a desktop computer, rendering the original definition moot. Now it seems to encompass all computing.

Community computing is not a broadly used term by itself. I am using it here to refer to the change in focus from a single person (formerly a user) to many people forming a community. Two types of communities exist, communities that occur in computer networks and communities that exist in the physical world. Since the latter may share sewers, electrical utilities, telecommunications utilities, roads, schools, local governments, and other aspects of physical infrastructure, it differs greatly from a network-only community such as Facebook.

Communities that can function remotely, such as Facebook, are the focus of study of Social Network Analysis and Data Science, closely related fields whose work is enabled by monitoring electronic communication networks.

Communities that exist in physical space, such as neighborhoods and cities, are obviously the subject of study of architects, social workers, and people in many other disciplines. Recently, many of these researchers and their sponsors have aligned with computer scientists identified with human computer interaction.

Management Information Systems a discipline professed in some business schools, has long been concerned with the adoption and diffusion of technological innovation in productive organizations. This concern has led to many psychological studies of groups of users of information systems in organizations.

Industrial and Government Communities.

> You want me to deprioritize my current reports until you advise of a status upgrade?

> Make these your primary action items.

> —dialog from *Fight Club*, 1999

Suppliers of IT.
Customers of IT.

Contextual Inquiry

Rapid Contextual Design : A How-to Guide to Key Techniques for User-Centered Design by Burns Wendell, Jessamyn Holtzblatt, Karen Wood, Shelley

User experience. User experience is often abbreviated UX. Please read Spinuzzi (2000), wherein Clay Spinuzzi introduces three ways to study the user experience *in situ*. Spinuzzi (2000) compares contextual inquiry with other approaches, so you can see why we emphasize contextual inquiry and what we might do instead (ethnography or participatory design). The key sentence in the article suggests using contextual inquiry to make radical changes in a short time frame. It relies on an underlying work structure that reduces the amount of time you have to spend to understand the workplace, so it's not suitable for completely alien work processes. Participatory design works well for incremental changes and empowering users. Ethnography works best if a great deal of time (both client time and designer time) is available and a detailed understanding is required. The classic example of this in information technology is Stephen Barley's studies of technology adoption by radiologists. Barley obtained an MD in the course of his study.

Spinuzzi (2000) on contextual inquiry

- radical changes
- reliance on underlying structure
- minimal client time

Spinuzzi (2000) on ethnography

- radical changes
- only choice in exotic workplace

- maximal client time

Spinuzzi (2000) on participatory design

- incremental changes
- empowers users
- maximal client time

The second required reading for this section, `08contextualDesign.pdf`, describes the most commonly used of the above three methods. It's the most common for a chain of reasons. First, the reliance on an underlying work structure minimizes the need for client time, always an attractive feature in a resource-constrained workplace. Second, the direct manipulation of the underlying work structure means that existing design artifacts can be sidestepped and radical changes are possible without time-consuming study and modification of existing design artifacts.

Because contextual inquiry and its umbrella, contextual design, have been so successful and so inexpensive to implement, you are more likely to participate in it in the workplace than in any other design method. One hallmark of contextual design you may experience is the method's reliance on extremely large numbers of post-it notes containing atomic observations about the subject work. A team conducting a contextual inquiry typically immerses itself in a mass of these post-it notes, following a structured method for grouping and regrouping the notes to make sense of the subject work and to organize the observations of the client participants to reveal the essential characteristics that will inform the new design. Beyer and Holtzblatt's picture of immersion follows.

Personas

See Pruitt and Grudin (2003). See Cooper and Reimann (2007).

Scenarios

Prototypes

Iterative Development

- Design
- Prototype
- Evaluate

Design

- Intuition
- Educate your Intuition
- Empirical Evidence
- Principles
- Generating Alternatives: Divergent Thinking

- Selecting From Alternatives: Convergent Thinking
- Design Patterns
- Iterative Development Revisited

DESIGN GUIDELINES FROM VENDORS

Much of the design action in the world today is taking place in the battle between Android and iOS for market share and mind share. Some other firms, primarily Samsung and Microsoft, have published meaningful design guidelines. Most interaction designers today, whether or not they work in the mobile space, are familiar with the following three sets of guidelines.

Android
iOS
Windows

LESSONS FROM HISTORY

People.

- Individuals doing work
- Individuals making discretionary use of computers
- Workgroups
- Hierarchies
- Commuties of Practice
- Communities of Life

Perspectives.

- Human Factors
- MIS
- HCI

HCI Tools through History.

- Heuristic Evaluation

Information

Information can be controversial to define. Widespread agreement exists, though, about some properties and uses of information.

Personal information systems. Extensive research over the past twenty years, some of it by Tom Malone at MIT and Susan Dumais at Microsoft Research, has explored how people organize personal information.

One example that helps people understand the problem of personal information is the knife analogy, described below.

One important finding about personal information management has been that people are prone to do one or some combination of these two things: filing and piling.

After reviewing the following topics, conclude the study of personal information systems by doing the *share best practices* exercise.

Knives in the home. Suppose you have just won a complete set of knives for your home. Where should you put them? You could have a single cabinet to store all knives, but it is more likely that you will distribute the knives to different rooms, placing them near where they will be used: steak knives in a buffet in the dining room, cooking knives in the kitchen, handyman knives in a garage workshop.

When you need a particular knife, it will be in the context of a current task, such as preparing food, setting a table, or cutting a length of rope for a clothesline. In each room, there is some place where the tools appropriate to the tasks performed in that room are stored.

Filing: using hierarchies to organize information. Filing refers to organizing items according to categories or classifications or clusters. (Researchers define these three words differently.) When a filer looks for information, it is found in a place where like in-

formation is found. That information may be in a nested structure containing more general information at the higher levels and more specific information at the lower levels.

For example, information relevant to your work as a student may be kept in files on a usb drive in a folder called schoolwork. Within that folder may be a separate folder for each course, as well as a separate folder for administrative documents not related to any given course. There might be a folder for each term containing a schedule for that term, grades for that term, and more. On the other hand, you may divide such folders differently: into group work and individual work. Or you may organize according the types of files, with videos in one folder, music in another, and text documents in another.

Piling: using tags to organize information. Piling refers to dumping information where it is most convenient. The piler makes no effort to move information around. Instead, the piler usually uses tags of some kind to find information. The piler may create these tags or take advantage of existing tags.

For example, Mac users employ Spotlight, a local search engine to find files using (mostly) words in the files. Those words are automatically indexed by Spotlight into a tagging system, especially while the computer is otherwise idle. As another example, the IMDB has a file containing keywords for each movie recorded—if someone cares enough about that movie to type in keywords. You can search for a movie by entering any of these keywords.

What's problematic about such a system? One issue is that a given user does not necessarily know what keywords are available to describe a given concept. The IMDB tries to overcome this be presenting a display of all the keywords that appear in movies that share the keyword being searched. How else could you try to overcome this limitation?

Another limitation of tags is that words have different *senses* so that searches for words like net and rock return results that may not be of interest depending on whether the search is for tennis or

the web or music or geology. How can you try to overcome this limitation?

One way is to use context. For instance, your browser by default saves the most recent URL you visited as a *referrer* and makes it possible for the administrator of the next URL to identify it. If my referrer has the string *wimbledon* in it, am I more likely to be looking for tennis or the web?

A typical business use of tags can be found in Adwords, the main way Google earns revenue. An adword is a tag associated with an advertisement. A business can pay to be advertised when an adword appears in the Google search window.

exercise: share best practices.

1. Form an ad hoc group of four (four is an ideal number—three or five if you must).

2. Share a google doc between the four group members and the instructor.

3. Each member of the group writes three paragraphs describing your personal information process. The first paragraph describes what you do. The second paragraph describes what works well about it. The third paragraph describes what does not work well about it.

4. Discuss the resulting paragraphs

5. Write two paragraphs as a group describing the strengths of individual members you all agree should be carried forward and the weaknesses of individual members you all agree you do not want to include in your personal information management process.

Some valuable readings can be found at the following URLs. These were all obtained by googling the expression *pilers-vs-filers* and appeared in the first three pages of results. These are replicated in the resources folder on MyCourses. The names are the MyCourses files, while the links are the google result links.

01pimFilersVsPilersForbes.pdf
01pimFilersVsPilersEconomist.pdf
01pimJones2011.png

Note that each of these readings has a different form of credibility, to be discussed in a later section of the course. When you use a search engine to discover information about a topic, you must be sensitive to issues related to the search engine and to the information sources linked. Here, I will just give a brief blurb about each source.

Forbes was a US magazine for decades before it created an online presence. It cultivates an image as a maverick business publication, espousing values favoring considerable social and economic freedom for individuals, and a blunt style, connecting business success to individuals rather than organizations.

The Economist is a conservative British weekly magazine. A policy advisor to US President Clinton once told me that The Economist is the most widely read publicly available weekly publication among presidents and prime ministers of nations worldwide.

The Google Books result is a page from a book called *Personal Information Management*, edited by William P Jones and Jaime Teevan. This book is a collection of chapters by scholars who write about information systems. This book introduces the mainstream academic thinking about personal information management. It introduces what scholars who do studies about personal information management have concluded over the past thirty years of study.

Information

People studied *information overload* long before the Internet made it a tired phrase. In psychology classes you may have seen videos of famous experiments such as passing the basketball. In this experiment, a person watches a group of people passing basketballs and is asked to count the number of total passes and keep them in mind. The person is told that accuracy is very important. The real purpose of the basketball passing is to overload the person with in-

formation. Meanwhile, a person wearing a gorilla costume walks through the room. After the exercise, the researchers ask the person if anything unusual happened. The person invariably replies that nothing unusual has happened. The researchers then show the person a video of the preceding few minutes, including the person in the gorilla costume. Invariably the person is shocked. The person almost *never* accepts that someone in a gorilla costume walked in front of them until they see the video evidence. This demonstrates the astounding power of information overload to shut down our perceptions of our environment.

Similar experiments abound. There is, for instance, one experiment where a researcher with a map in hand walks up to someone on a crowded London sidewalk and asks for directions. While the bystander tries to think of the best route, two uniformed workmen walk between the researcher and the bystander, carrying a large heavy mirror. Concealed behind the mirror is another researcher of a different race and sex but carrying an identical map in the same folded orientation. The original researcher moves along with the two workmen who speed past so that there is only a moment when the bystander can't see the researcher. The new researcher, of a different race and sex, tries to carry on the same line of questioning as if nothing had happened. Video of the encounters suggests that the bystander usually does not realize the change because of the information overload resulting from trying to visualize the landmark under discussion and the route information.

Both these experiments and many similar ones are described online under information overload or cognitive overload or similar terms.

In addition to studying the effects of information, there are many scientists studying information itself and the characteristics that define information and distinguish one kind of information from another.

Unstructured information. The term unstructured information may be a bit misleading. It typically refers to information that is indeed structured but whose content does not follow very strict

rules. For example, a news article or a blog post could be considered unstructured information. An article usually has a title but not always. It does not follow a strict rule as to whether or not it is titled or subtitled. It may or may not have pictures. It may have varying numbers of paragraphs, tables, diagrams, comments from users, links to related articles, or other features. The key is that it is completely flexible about these things and the person who presents the article does not have to think about conveying the structure of the article to a computer program, only to a human reader. Human readers are much more forgiving of lapses in structure than are computer programs.

This lack of structure is really a matter of degree and is best understood by comparing it to the following terms.

Semistructured information. Semistructured information refers to labeled information such as is found in forms filled out by people. When you fill out a form, each place where you can insert information contains a label telling you what kind of information belongs there. There are some rules but it is often quite easy to break rules for completing forms.
Some forms enforce rules by not allowing you to type in any information that violates the rules. A good example of this can be found in income tax forms online.

Yet most online forms allow the person filling them in some flexibility and may contain instructions that can be disobeyed. For instance, you may be transgendered and asked to fill in M or F in a box marked gender. You may be able to enter a T or leave the box blank, depending on how much time and money was spent on developing the form. If you do enter something unexpected, the person or program processing the form has to decide how to handle it.

It is a hallmark of semistructured information that some human intervention is required to process it because some entered information can not be anticipated.

Structured information. Structured information obeys strict rules and can be processed in extremely large volumes at high speeds

and can be aggregated easily to determine, for instance, how many orange shirts in size L were ordered on game days in the 2013 season. Structured information is often passed from one computer program to another. Systems that process structured information use various techniques to diminish the effects of human error, including bar code readers, credit card readers, qr code readers, nfc readers and similar devices to obtain information. When human input is needed, it is often restricted. For instance, when a fast-food cashier takes an order, they often press a touchscreen area with a picture of the item being ordered rather than trying to type a name or a price, both of which are supplied by a computer program reading the touchscreen.

Most structured information in and between large organizations is presented in one of two main ways, as relations or as hierarchies.

Relational data. By far, the most prevalent form of data in large organizations today is relational data, stored in database products such as Oracle, SQL Server, and MySQL.

Relational data is presented in tables consisting of rows and columns. The rows refer to entities and the columns refer to attributes of the entities. An example of an entity is a customer. An example of an attribute is a zip code for that customer.

A key characteristic of relational data is that the rows and columns of one table are usually linked to the rows and columns of many other tables. In order to speed processing of relational data, a given table should be long (many rows) and thin (few columns). So, rather than have a table that describes a customer, the information about a customer may be spread over many tables, each with only a few columns.

Hierarchical data. The second most frequent way to present enterprise data is in a hierarchical format. XML and JSON are among the most common hierchical formats in general use. To illustrate what the term *hierarchical* means, consider a waybill as an example. One international waybill used by FedEx has four main headings and some required subheadings and optional sub-

headings. For instance, there can be an intermediate consignee in addition to an ultimate consignee. The description of commodities to be shipped has a number of subheadings, not all of which are applicable to every kind of commodity. Hence, for each commodity there is a choice of entering number or unit in addition to quantity. Each commodity has a number, a description, a weight, and a value.

So an example hierarchy might look like this

```
Sender
  Sender Name
  Sender Address
  Sender Account Number
Recipient
  Recipient Name
  Recipient Address
Commodities
  Commodity 1
    Quantity
    Unit / Number
    Weight
    Value
  Commodity 2
    Quantity
    Unit / Number
    Weight
    Value
Authorization
```

A key characteristic of this hierarchical form is that it can present exactly the same data as in the relational form above. In other words, the above hierarchy could be converted to tables of rows and columns. Many computer programs just translate between one form and the other, depending on immediate needs.

Big data. The term *big data* refers to collections of data that can not be processed on a single computer. The traditional tools

of computing are inappropriate for *big data* because they require that the data be available for processing on a computer.

A major breakthrough for everyday computing occurred when the founders of Google developed a way to process *big data* using large numbers of very inexpensive connected computers. The method they used has become the standard for working with *big data*. MapReduce was the name Google gave to its original framework and it has become a generic term, like Kleenex, to describe other examples of the framework, such as Hadoop, the most popular implementation.

The way in which these very inexpensive connected computers work together is in a kind of tree structure, where one computer at the top of the tree gives orders to other computers in the tree and receives results from them.

Two key characteristics of this approach are that no one computer in the tree has all the data and that no one computer is unique. These two characteristics enable scalability and fault-tolerance.

Supply chain information. Supply chains typically have a channel captain, such as Walmart in the retail world or General Motors in the US automotive world. These channel captains can dictate the flow of information through the supply chain. They typically use formal documents structured as XML or some conceptually similar format.

XML stands for eXtensible Markup Language and it belongs to the same family as HTML and SGML, as well as other such markup languages.

Exercise: mit beer game.

1. Form a group of four and create a google doc in which you choose a role for each group member. The roles are distributor, factory, retailer, and wholesaler. One person must play each role. Share the google doc with the instructor.

2. Play the MIT beer game without prior knowledge of the game except as follows. Take a snapshot of the graphics available to assess your status after playing for half an hour.

3. Do the reading about the MIT beer game and play it again for half an hour and take a corresponding snapshot of the results.

4. Write three paragraphs in the google doc. First, describe your experience running it without prior knowledge (except for the following paragraph). Second, describe your experience running it after learning about it. Third, say what you think might be key issues in the information flow through the supply chain that affect your success.

Minimal description: The MIT beer game is an online simulation of a supply chain. Each of six players represents a role in the chain between raw materials and thirsty customers. For you to succeed, you must all succeed. You must work together to succeed. The game occurs in rounds. Each member of the supply chain must make a choice before a round can begin. The game determines your performance in each round based on the choices you make and your history of choices in previous rounds and external factors such as demand fluctuations. Before you learn about the game, try playing for half an hour without resetting (each round builds on the success or failure of previous rounds) just knowing this minimal description.

Nearly half a century ago, Nobel Prize winner Herbert Simon is alleged (the origin of the quote has been the subject of some controversy) to have said that *in the future, attention will be our most precious resource.* He may have meant that so much information will be available that we will only be able to pay attention to a small fraction of it and that the problem of deciding what to pay attention to will become the prominent problem of the information-intensive era.

Relationships between businesses and between businesses and customers have been transformed by the ease with which informa-

tion can be found online. This transformation is ongoing. As an example of current change, some retail stores in 2013 still forbid the use of smartphone cameras because they fear the use of search engines to make price comparisons. This is clearly not sustainable behavior. (To see why this is not sustainable, consider the point of view of the smartphone user making price comparisons. Is it more likely that the smartphone user will eliminate this particular store from the selection set or abandon the use of their smartphone?) If behavior is not sustainable, then we have to ask whether a steady state will be achieved and, if so, how it will differ.

search engines. A person using a search engine reveals a great deal of personal information that has value for various stakeholders including business and government. Some activists believe that individuals should be compensated for the personal information they share with search engines. They believe that the contribution made by users to search engines can be quantified. Others claim that users are compensated by search results and should quit complaining about search engines getting rich. But if the value of search results can be quantified and the value of user contributions can be quantified, policy makers may be convinced that consumers are being exploited and may seek to regulate search engines. This is one way the search engine industry may change in the near future.

Reading: 03findPageRank.pdf. Page and Brin, 1998. The PageRank Citation Ranking: Bringing Order to the Web. stanford IL pub

Also, the Wikipedia entry on PageRank has some wonderful graphics illustrating the basic concept.

information scent. The term *information scent* may be a little confusing because it is borrowed from anthropology. It refers to the expectation of finding information along a given path. The strongest scents represent some balance of the easiest catches and the most nutritious meals.

The root concept comes from our primitive ancestors foraging for food and using scent to choose paths. When the scent stops

getting stronger, a given path is abandoned.

Similarly, psychologists have found that when the expectation of finding information stops growing along a given information path, the path is abandoned.

The omnipresence of Google as a way for products and services to be found has led their providers to focus on providing an appropriate information scent online. The result is that the web presence for successful enterprises fits into a predictable pattern where, to continue the food analogy, visitors can get a quick snack, the menu changes frequently and predictably, and the dishes are easy to find, understand, and digest.

Reading: 03findTrackingScent.pdf, Tracking the Scent of Information, APA Monitor, V 43, N 3, P 44. Tracking the scent of information

information credibility. Currently, information available online can come from obscured or relatively anonymous sources.

Currently, there are low barriers to presenting information online. For many reasons, information obtained online may not be credible. Using information obtained online requires consideration of credibility, a concept which has been defined differently by various communities. Some of the concepts used in describing credibility include the following.

1. Technical knowledge, skill or expertise
2. Consistency of actions, values, meathods, measures, principles, expectations, and outcomes (definition of journalistic integrity from Wikipedia)
3. Objectivity
4. Pecuniary Interest
5. Agreement with ideas and values held by the recipient
6. Community membership
7. Precision (variance)
8. Accuracy (bias)
9. Falsifiability (using scientific method)

Reading: 03findStudentCredJudgment.pdf. College Students' Credibility Judgments in the Information-Seeking Process. Chapter 3 of *Digital media, youth, and credibility*, 2011.

getting help. In a previous era, selection of computer applications was contingent in part on the availability of help for usage of the applications. Vendors providing applications had to determine optimal expenditure of resources on help facilities to be viable in the market.

Today, in contrast, the most prevalent forms of help for the use of computer applications are Youtube videos and user communities. At this writing I am specifically referring to the Youtube service rather than videos services in general, based on a 2013 study of online video traffic.

Youtube has created a low-barrier marketplace for help, allowing individuals with relatively few resources to assess the best opportunities for profiting from the provision of help for computer applications. This means that institutional adopters of computer applications can use the level of available Youtube help as a proxy for the *health* of a given computer application, replacing possibly tedious and expensive primary research.

User communities spring up around successful computer applications and can be used as a cheap and convenient way to evaluate those applications in much the same way as Youtube videos. Unlike individual videos, user communities may transcend individual products or individual vendors. An online help community such as Stack Overflow thrives on a reputation that transcends that of any individual product. The relative attention Stack Overflow pays to a given product may serve as an index of that product's health.

exercise: comparing help for two browsers. Form an ad hoc group of four. Identify two browsers, such as Chrome, Firefox, Safari, or others. Contrast the Youtube videos and user communities offering help for the two browsers.

Compare the health of the browsers.

Compare the communities supporting the two browsers and

identify differences in focus, emphasis, direction, and mission.

The term *network* is used in two main ways in the computing world. Both of these senses are critical for an understanding of the flow of information but they are very very different.

The first, and oldest, sense of the word is to describe the physical connections between computers. This includes the hardware and software that allows one computer to communicate with another computer and with larger groups of computers including the largest group of computers, the internet.

The second sense in which the word *network* is used comes from the emerging discipline of network science.
This field of study has only been named in the past twenty-five years but draws on ideas dating back much further. It is relevant to us because it explains the behavior of all kinds of networks, including computer networks. Recent advances in network science have identified phenomena like *the long tail* and growth and decline of online communities such as Facebook and Myspace.

Developing information systems

Reading: `06projmgtintro.pdf` 12 pages; exam questions from pages 5–10

Businesses spend billions of dollars developing information systems. Almost all of the knowledge used to do so has been developed in the past fifty years and is considered immature and unstable in comparison with other fields of study.

representational state transfer. Representational state transfer is the approach to the architecture of the World Wide Web. It is the most fault-tolerant approach to system development in history and businesses are increasingly seeking opportunities to adopt it. It is not appropriate for certain business functions, however, and recent research indicates that many businesses experience failure

with other approaches that they adopt because these approaches are marketed as representational state transfer. Hence, in 2014 it remains useful for general business professionals to understand enough about representational state transfer to be able to recognize prospects for its successful adoption in business and to distinguish between viable prospects and others.

development methods. Business leaders widely believe that repeatable, tunable processes are critical to management. Repeatable methods for developing information systems have been tried and studied since the nineteen seventies and, while still an immature area, a few characteristics of development methods have emerged as promising amidst the instability of the development environment. Following are a few of these characteristics.

waterfall model. Most business information systems courses teach two families of development methods. The older of these is the waterfall model. It is also called the SDLC, which stands for Systems Development Lifecycle Model. This model has the following two characteristics.

First, it occurs in clearly defined and scheduled stages. The stages are named, planned, and staffed in advance. They usually have the following names or a similar set of names: requirements gathering, analysis, design, implementation, maintenance, and sunset.

Second, each party to a given project signs a formal agreement at the end of each stage, indicating that the stage has been completed to their satisfaction. This aspect gives rise to the word *waterfall* because, once the agreement is signed, there is no option to return to a previous stage. The water has flowed from that shelf down to the next shelf and can not be put back. It is this characteristic that most certainly determines the circumstances under which the model will be used. The stages are often listed to resemble a waterfall as shown below.

These characteristics mean that the waterfall model will only be used in circumstances where there is a clear separation of customer and developer organizations. The developers report through

Initiation→ Application Description↘

 ↪Analysis → RequirementsSpecification↘

  ↪ Design→ SystemDesign↘

   ↪ Implementation→ Product

a different command chain than do the customers of the project. This approach should be used when there is the likelihood of lawsuits following disagreements. It should be used in cases where there is no clear common single point of authority over the developer and customer organizations to mediate disputes. Finally, it is most often used when extraordinarly large sums of money are involved and there must be clear consequences for failure specified at the beginning of the project.

This approach generally seems counterintuitive to students and its failures are legion. The so-called Obamacare website may be a current example, depending on which account you believe.

It may surprise students to know that this was the very first and therefore longest-lived development method despite its abysmal record. It may make a worthwhile project for students to try to figure out why smart people keep selecting it. The reason may be that, increasingly, cooperation between autonomous, conflicting groups is necessary for progress. The likelihood of disagreement may rise when a group feels powerful enough to successfully challenge another group and this likelihood is then doubly likely to arise if both groups feel powerful enough to successfully challenge each other. Also, business disagreements are often settled by litigation and preparation for litigation may be more prudent than preparation for mutual success.

Last, and most obvious, is that every method developed since the waterfall model relies in part on trust between all parties and the absence of formal communication. Will the legal department
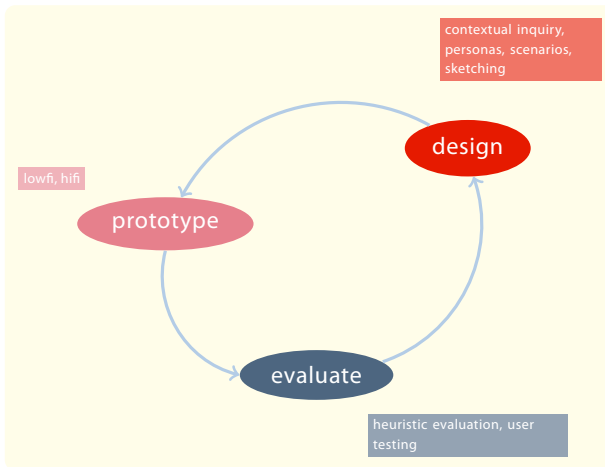
recommend such an approach? This is a question asked at the start of each large project when deciding on the best approach.

iterative model. The second method for development usually taught is the iterative model. This model follows a simple cycle without a predetermined number of repetitions: design, build, evaluate. One example follows. This example substitutes the word prototype for build and lists some common techniques for each phase. Some of these are described in more detail under the topic *user experience*.

This method is inherently more expensive than the waterfall model for a given size of computer program.

That is often difficult for students to understand because the waterfall model is usually employed when larger computer programs are contemplated. Therefore it must seem that the average cost of a program developed via the waterfall model is more expensive than the average cost of a program developed via the iterative model. Such an intuition is good but it ignores the fact that people know the iterative model costs more per line of computer code, so they simply don't use it on large programs except under certain specific conditions.

The expense of the iterative model involves several factors. One is that it is more flexible, not planned out in as much detail. It's easier to save money if you can plan each person's schedule six months in advance.

In an iterative project there are always more meetings and these meetings are often spontaneous results of unanticipated discoveries.

Another aspect of the expense of the iterative model is that it produces many intermediate results that are not intended to be part of the final project. To illustrate, consider one of the cardinal rules of the iterative approach: that each cycle should occupy no more than *n* days. Typically, *n=5* so that the evaluation step occurs on a weekly basis. This means that something must be designed and built every week. The tools used to design and build things quickly typically lead to proof of concept prototypes that can not be directly used in a production version of a system. Often, these tools involve crayons, construction paper, and flippy movies and no computer-based artifacts at all. The purpose of these prototypes is to ensure that each member of the team has a mental model of the system that agrees with that of the mental model of other members, both customer and developer.

A simple way to phrase the foregoing is that much of the expenditure of the iterative model is to get everyone on the same page. This very regularly turns out to be a non-trivial task. A good project for students is sometimes to develop a paper prototype after talking to customers and then to *overhear* the customer reaction to the paper prototype when shown it by others. Although customers may not want to hurt the feelings of the students when face-to-face, student groups have found that they will typically unleash a firestorm of disapproval over the most surprising things when reacting to a third party.

project management. The Project Management Institute (PMI) has become the world's most popular focal point for best practices in project management. For example, a recent recruiter at UO identified the PMI as the source for project management practices

at DataLogic ADC, a Eugene manufacturer of automatic data capture equipment. Some universities devote entire departments or even, as in the case of Stevens Institute of Technology, entire business schools to PMI education. PMI practices are inescapable in information systems development.

The main reference guide to these practices is called *The Project Management Body of Knowledge Guide*. The required reading for this section is an excerpt from an earlier edition of that guide, offering some general definitions for project management. In addition, the *Guide* lists all the non-controversial processes in project management and provides lists of their inputs and outputs. By *non-controversial* I mean all the process that the project management profession agrees upon as a baseline. Innumerable project management consultants offer proprietary extensions to this body of knowledge and these extensions are not covered in the guide, nor are the basic processes covered in any great depth. The *Guide* simply serves as a brief summary of the current state of agreed best practice in the field.

The significance of project management for information systems is that most information systems activities are organized as projects. Productive organizations may be managed as functional areas, operational areas, a matrix of these kinds, or entirely as projects. This latter category is extreme but it can be seen in the organization of Hollywood movies and in the activities of BP, one of the world's major oil companies.

I had the good fortune to interview a vice president of BP in 2006 and learn that BP was then trying to discover best practices from Hollywood blockbusters in order to reduce its exposure to operational management by outsourcing as much of each oil rig as possible and treating each oil rig as if it were a Hollywood feature film. Each oil rig is as large and complicated as a 70 story skyscraper, although it is meant to be used for far less time and for only one purpose. Interestingly, BP had just experienced a catastrophic oil spill (6,000 barrels) at the time and I could not help but wonder how large a role exposure to litigation may have moti-

vated its project focus. Alert readers will note that, just four years later, BP experienced a vastly more important oil spill (5 million barrels), known as the Deepwater Horizon oil spill. That event and its aftermath are far too complex to even summarize here. I just want to note that the project management approach to organization may be tied to other considerations but that they feature prominently in contexts other than information systems.

swim lane diagrams. Swim lane diagrams are used as a project management tool in IT. At a minimum, they portray roles, tasks, and handoffs. The name *swim lane* arises because they look like a swimming pool divided into lanes with a start and finish. Each role has a lane in the pool. Each task is rectangle inside a lane. Each handoff is an arrow from one lane to another.

Here is an example from processmodeling.info containing additional symbols specific to Unified Modeling Language.
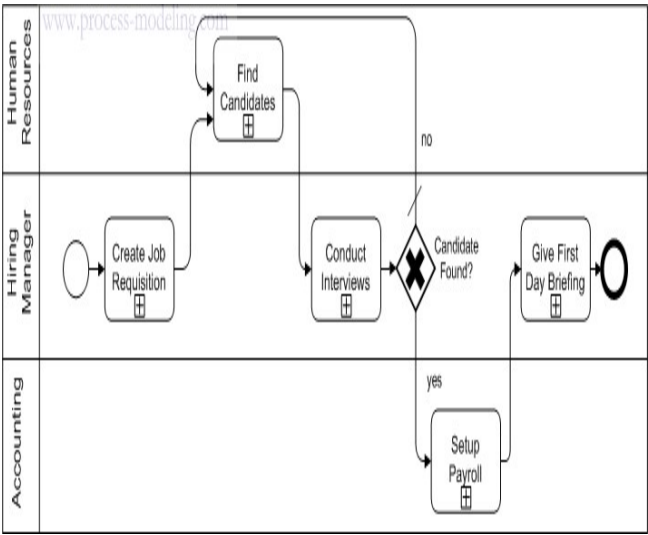
This diagram shows three roles: accounting, hiring manager, and human resources, as well as five tasks: create job requisition, conduct interviews, setup payroll, and give first day briefing. The diagram has a beginning and an end and is read from left to right.

A top to bottom version would work just as well but there must always be the sense that the diagram shows some process that has a definite start and stop and a sense of time precedence among the tasks.

The swim lane diagram is one of many project management tools. It's so successful that you can image google it and find many versions of it. You may be subjected to refinements of it in the workplace, but here let's just consider what they all have in common.

How can you produce a swim lane diagram?

The basic swim lane diagram should be easily understood by any worker in one of the roles displayed. The diagram may be drawn by asking someone in each role what they do and where their handoffs are. To construct a swim lane diagram, therefore, requires some skill in eliciting information from people about what they do. People find it notoriously difficult to describe what they do unless they are doing it. Interviewing someone about their job usually leaves critical gaps.

When visiting a worker to get help with a swim lane diagram, it's a good idea to construct a diagram before you visit them. It is easier to correct a wrong diagram than to start from scratch. It also conveys to the person that you have been trying and need their help, rather than that you are trying to slough work off onto them.

The diagram you present to someone should not look polished. If possible, do it in ballpoint pen on cheap notebook paper. The reason to do this is to make it clear that you don't believe the diagram is finished. If you produce a pretty diagram with fancy software and print it in color, the worker you interview may be more reluctant to change it than if it looks like something you did not intend as a finished product. Decorations are not helpful in eliciting information that would cause the decorations to have to be redone.

There should be a lot of room on the page that you present to a worker and you should hand them a pen or pencil of a different color than what you've already drawn so that afterward, you can

distinguish between what they've added and what you've added.

It may be better to visit alone or with another team mate. If you're interviewing a less experienced worker, they may be more intimidated by multiple visitors. On the other hand, a more experienced worker may have so much information to share that you need one team member to talk to them while another takes notes.

Recording an interview may reduce the candor of the worker being interviewed. If you must record, it's best to put the recorder within easy reach of the worker and invite them to turn it off if they want to say something off the record. Be aware that, if they turn it off at some point, they are unlikely to turn it back on for the rest of the interview. I take it as a signal that the recording makes them uncomfortable and I don't ask to turn it back on later.

Be prepared with extra paper if the interviewee wants to start over from scratch and be sure to have a camera or time to copy in case they prefer to work on a whiteboard.

One skill that's hard to teach is to know when to interrupt. If you don't understand something, you should ask about it as soon as possible but, if you disturb the flow of the interviewee's thinking, you risk never getting the info that would have flowed just after the interruption. Before you interrupt, you should have a good idea of how to proceed after the interruption is finished.

One luxury you may not have is to revisit the same worker after some other interviewee has modified what they've said. I have had this experience where two people involved in a single process have conflicting views of their roles. This presents an opportunity for process improvement that is beyond the scope of this assignment but a likely application of this tool in the workplace.

What makes a good swim lane diagram?

Hanna Jung, a brilliant designer, shows an impressive example of a swim lane diagram at tracking civic theater volunteers where she also includes some additional symbols related to *pain points* in the process. Since I worked with Hanna Jung in the past, I should add something you can learn from her. Although she excels in many, many ways, one thing that you can see within a few min-

utes of watching her work is that she begins solving problems as soon as they present themselves and organizes her time and that of others to maximize impact. I've met many students who work hard, but can only think of two other students out of a thousand who can do as much in as little time as Hanna Jung. When others are still getting started, she is close to finishing. And when she's finished, she reviews her work and that of others to decide whether to polish it or move on to the next problem. She never wastes time overthinking a problem.

I believe that she achieves this success through polishing her problem solving process. She determines how much time is available to solve a problem and divides the time into steps so that she won't get so bogged down in one step and fail to make it to the end. She writes or draws her initial plan clearly and invites others to join her, thinking about what she knows of their skills and how they could contribute. Then she ruthlessly sticks to the plan, moving on to step two even if she's not satisfied with step one. This way, there's still time to go back to the beginning if there has been a false start. If she goes back to the beginning, she replans all the steps with the remaining available time. All her planning seems to take less than a couple of minutes for the length of assignments that are given in school, but that is because she refines the planning from course to course.

exercise: diagram course registration. Please form a team and share a google doc among the team members and the instructor to create a swim lane diagram for course registration.

You should be able to think of many of the tasks involved since you are the primary customer in this process. The other roles to consider may include the registrar, departments that offer courses, instructors of courses, counselors, building managers, and office managing degree granting.

The main thing you should learn in the course of creating this diagram is how to talk to people to refine the diagram and make it a more realistic reflection of an actual process.

The secondary thing to learn is how to make a diagram that

shows handoffs well enough to identify possible problems in the process. Many, many problems in business happen in collaborations where a "chain of command" can not solve the problem because different groups are involved.

Information Architecture

Pictures

- Color
- Aesthetics
- Beauty
- Arnheim

Words

- Google
- IR
- NLP
- Typography

Exercises

Throughout the semester, we'll do exercises to integrate the ideas from lecture into your milestones or to illustrate ideas you may use in other interface and interaction design projects.

Draw a face. Draw two horizontal lines to divide your notebook page into three parts, so each part is about 2 and half inches high.

Step 1 is to draw a human face in left-facing profile in the top third of the page. It is important to do this before looking at steps 2 and 3. Looking at those steps will affect how you do this step, so quit reading this now and draw the face!

Step 2 is to first make sure you have already drawn a face in left-facing profile before reading further. Quit reading! Draw that

face in the upper third of your page. Are you sure you've drawn it? Really? Okay, then, step 2 is to draw another face in the middle third of the page but, this time, make one change. Carefully plan this head so that the eye is halfway between the top of the skull and the chin.

Step 3 is to draw a third human face in left-facing profile in the bottom third of the page. This time, use a dime and a half dollar as aids. (This exercise was conceived in an era when half dollar coins were common—your teacher can supply an appropriately sized disk as a substitute.)

Describe an experience. Spend 25 minutes using an app and describing your experience

Identify domains and skills. As a group, create an interface to help you select project groups. This interface should help you understand each other's domains of interest, as well as each other's skills. Assume that you want to form project teams with similar domains of interest, but different skills.

As you work, think about how you approach this as a design problem and how you cope with the constraints on the problem.

As an example, last semester's students created a table with one column for each domain (or, eventually, each possible project), and rows for each identifiable skill. Each student was free to enter his or her name into as many cells as they wished. When this table was printed, one could develop a project group by drawing a squiggly oval around the people interested in a domain, but with different skills.

Last semester's solution had a lot of drawbacks, some of which did not become apparent until many people tried to use it. One problem was that it became difficult to identify exact rows and columns as it expanded. Another problem was that people wanted to describe their skills or domains in greater detail than was practical in the margins of a table. For instance, several people felt they had differing levels of skill using Photoshop, so that a *Photoshop* row was too generic to be useful. A third problem was that some skills were discovered to be universal, causing needless clutter as

everyone announced that they could do *xyz*. A fourth problem was that students could not edit the table at the same time and all the relevant information was contained in the one table. It was very useful to have all the information at a glance, but very difficult to manage all that information in one big object.

I can think of a design that might be better suited to the wiki you have available, but I prefer that you discover your own design.

Widget redesign. For this exercise, define a widget to be an object on a device that permits the user of the device to change its state in some way, such as the ubiquitous five way rocker switch on recent cell phones or the wheel on an iPod. Find a real widget in one of the following contexts and redesign it: automobile, department store, kitchen, parking lot, public transit (these are overtly physical contexts, as distinct from cultural or other contexts). Present it to the class and receive critiques from other students.

Work in a small group to produce a poster as the focus of your presentation. The poster should include (1) a rendering of the widget as you found it, (2) a rendering of the widget as you redesigned it, (3) some text explaining the problem, (4) some text explaining why the redesign is a solution to that problem, (5) directions for interacting with the redesigned widget, and (6) a list of other real widgets that are similar due to either human interaction or system input.

Critique the work of other students according to three criteria, selection, solution, and craft. Selection means to critique the selection of the particular widget. Question whether it really is a widget and whether it warrants redesign. Solution means to evaluate whether the redesign really does improve the widget. Craft means to critique the visual appeal of the poster. Question the poster as a communication design. (This exercise was developed by John Zimmerman at CMU.)

Ambient notification. Work in pairs. Don't repeat last week's pairs. Develop an ambient notification *device* to improve email. Notification can be of anything related to email. (This exercise was

developed by John Zimmerman at CMU.)

Thousand floor elevator. Design an elevator for a building with 1,000 floors. This is a single elevator compartment that can travel to any floor from ground to the top. You must design a system for selecting floors and for displaying selected floors, as well as for displaying the current location of the elevator. You are free to imagine any inhabitants of the building, any users of the elevator, but not any extraordinary speed of the elevator. In other words, assume only current technology is available to physically move the elevator compartment. As with the previous exercise, present this to the class and receive critiques from other students.

As before, create a poster for your elevator. The poster should include (1) renderings of any displays and controls, (2) some text describing what the displays mean and how to operate the controls, (3) some text about the users of the elevator and their destinations, (4) some text about any problems related to the extremely large number of possible destinations, and (5) some text about how you solve any problems related to the very large number of possible destinations.

As before, you will critique the work of other students. Consider roughly the same three criteria, problem and user statement, solution, and craft. Question whether the poster really addresses problems with a 1,000 floor elevator and its users, whether the presentation offers genuine solutions, and the craft of the poster.

phone directory navigator. For this exercise, assume your design will be accessed on a QVGA (320 × 240) phone. There may be a numeric keypad and a five way rocker button, but not much else.

Design a system to navigate a corporate hierarchical directory. Plan it for Globocide Corp., which has 40,000 employees worldwide. There are seven main hierarchies of unequal depth and we'd like to be able to traverse them. We'd like to be able to find the path from any given employee to the CEO. We'd like to get a picture of an employee's surroundings. How dense is the region around an employee? How many are above or below a given employee? Who

are the peers of an employee? We'd also like to get a picture of a division in comparison with its peers. How many are in the division? How tall is its hierarchy? How does its shape differ from peer divisions?

Your design should be shown in a series of sketches that work at QVGA resolution and show interactions and their effects.

business card calendar. This exercise comes from a blogger whose 48 year old mother complained that she could not read the tiny business card sized calendars given away by her bank or other businesses. The blogger noticed that the same numbers were repeated 12 times on the card and proposed a design challenge to improve this design for readability and instant recognition. Design a business-card sized calendar for a blogger's 48-yo mom. It should be immediately understandable. maximize type size or meaningful features. It must span 1 year. For any date number, be able identify which month, weekday. Minimize steps to know a date's data. Holidays / special days should be easy to mark. Be able to count days between nearby dates.

affordance matrix. Before class, take pictures or collect pictures of affordances on devices that afford pushing, squeezing, or turning. Arrange the best of these pictures in a 3 × 3 (or 4) matrix, with pushing on the first row, squeezing on the second row, and turning on the third row. Bring your matrix to class for critiques as to how well these affordances suit the named actions, how well you have documented the affordances, and whether your matrix is pleasing to look at. In class, form a group and develop a *best of* matrix for your group, including only the very best of your individual matrices. This is part one of a two part exercise, to be done with the same team throughout.

affordance device. This is the second of a two-part exercise. Work in the same group with which you developed the affordance matrix. Before class, create an interactive object in the shape of a cube that invites the user to push it, turn it, and squeeze it. All three of these should be interaction modalities for the cube-based object. develop the physical object itself during the week between

classes and be ready to share it with your classmates at the beginning of the class listing this as the exercise. During class, put the device into a central location and take the device of another group. You will introduce that device to the class without any input from the group that created it.

Your device should have the general look and feel of a cube, even if you choose to add or subtract from its shape so that it is not *precisely* a cube. People should think *cube* when they see it. The affordances you choose should show what you learned in the affordance matrix exercise. The affordances may be visual, aural, or tactile. Although you have taken them from instrumental examples, do not reproduce the actions caused by the interactions. This is probably obvious in the case of a steering wheel, to which you do not need to attach an actual automobile to demonstrate the effect of steering (and which may complicate your presentation!). It may be less obvious in the case of a switch, where you may want to include a light that acts as an affordance but not a light that acts as illumination (the purpose of the interaction). Do not work on the actions that will be accomplished by pushing, turning, or squeezing it.

revisit picking up a key. Earlier in the semester, you storyboarded a five sentence story about picking up a key and using it to open a door. Using what you have learned since then, improve upon that storyboard. Work in pairs or trios and either refine or replace the elements you used before when you did the exercise alone.

anti-affordance matrix. A 1 square kilometer toxic dump must be marked so it will remain undisturbed for 10,000 years. Create an *anti-affordance matrix* of 1 square kilometer. The components of the marking system should be robust but have little intrinsic value (note that this does *not* mean that it will be cheap to implement) so that they will not be destroyed or recycled. Use a *Gestalt*, so more is received than sent, use a *systems approach*, so elements of the communications system link to each other, index to each other, are co-presented and reciprocally reinforcing, and use *Re-*

dundancy, where some elements of the system can be degraded or lost without substantial damage to the system's capacity to communicate.

design notebook. Please keep a design notebook throughout the semester. I prefer the 5$×$8 Moleskine unruled sketchbook with 100 pages, available at Borders and elsewhere, but feel free to select anything similar in size and number of pages. Update the notebook every week with drawings. You should document examples of good design as you encounter them. You can't get a perfect score on the design notebook without adding some good design examples each week. You should plan to sketch for half an hour per day, three days per week to make a difference in your drawing skill and to receive full credit for the notebook. There should be a noticeable progression in the quality of your results as the semester progresses, so there's no need to start as a perfectionist. This work is to help you express your design ideas, not to identify the most talented artist. Plan to turn in the notebook three times during the semester and expect examples from it to be used for this class and future classes, so don't include anything in it you'd prefer to not share with the class.

Most students use pencil for the notebook, and the characteristics of a pencil figure prominently in a few exercises. Many exercises can be done in pen and some can benefit from color but, for the most part, departure from pencil will be a distraction and a waste of your time. You can prevent your drawings from smudging by applying spray fixative to them. Many artists use Krylon Workable Fixative, for about 7USD per can. The word *workable* in the name signifies that you can apply a layer after your first layer of pencil, then begin drawing over it again. You can do this repeatedly to prevent smudging drawings in progress. Googling the term fixative just now led me to a lot of warnings about using it outdoors to avoid the toxic effects. As with any other chemical, you must exercise appropriate caution and use sensible practices.

In addition to examples of good design you encounter, please complete the following exercises, most of them from *Making Comics*

by the dates indicated. Include these in the design notebook and bring the design notebook to class on these dates to facilitate discussion. For each exercise, please be sure to include the italicized name in your notebook and the date of your completion. This will help you to revisit the context of your sketches and measure progress long after you've forgotten the details of completing them. It will be necessary for you to title and date the exercises to receive full credit. Please complete these by the indicated dates so that we can discuss your experience. Your classmates will depend on your contribution to the discussion. It's very important to your contribution that you have actually completed the exercise, not just conceptualized it.

Waiting in Line. (not in *Making Comics*) Create an approximately eight panel comic of a person waiting in line and using mobile technology. Connect the mobile technology to what the person is waiting for or to other people waiting along with the person. We should understand what the person is waiting for and experience the entire wait from start to finish.

Picking up a Key. Chapter 1. On page 13 is a five-sentence story, told in 8 panels. The character is supposed to be a man. Change the character to a woman or creature or a different man. Change the last sentence (about the lion) to a different ending. Choose your own number of panels, anywhere from 7 to 9 panels. Tell the story your own way.

Favorite Movie. Chapter 1, page 56, exercise number 1: tell the story of a favorite movie in pictures alone with no words. A peer should be able to tell us what happens in the movie without having seen it. Do not write the name of the movie on it!

Packing. (not in *Making Comics*) Create an approximately eight panel comic of a person packing. It could be a person packing for a daily commute or for a vacation or business trip. Do not include any dialog. We should be able to identify the kind and duration of the trip and should be able to learn a good deal about the person doing the packing. We should experience the entire time of

packing from start to finish.

Unoccupied Room. Chapter 1, page 57, exercise number 7: draw an unoccupied room in enough detail that a peer can tell ten meaningful things about the person who lives there. Again, this exercise should be completed in a picture alone with no words. Except the date of completion and the name of the exercise.

Two Characters. Chapter 2, page 127, exercise number 1: Create two characters, one with five key life history aspects that are the same as your own and one whose life history is different in every one of the five aspects. Include at least two sketches of each character.

Captions. Chapter 3, page 157, exercise number 1: Create a series of about eight panels to illustrate the following paragraphs from the novel **1984** by George Orwell. Select captions from the following text. Don't use all the text (!) and don't use any text that is not in the following excerpt. Do not try to reveal every detail in the following excerpt—it's purposely long to promote some flexibility and variety between the approaches of different students. Make choices that convey what is happening in the scene. This should require some design compromise on your part. You should choose what is important and leave out what is not important. This exercise is largely about sharpening your ability to choose what is important. After you have completed the eight panels, do the exercise again, using *exactly* the same captions but a different series of pictures.

Begin excerpt from **1984**

Outside, even through the shut window-pane, the world looked cold. Down in the street little eddies of wind were whirling dust and torn paper into spirals, and though the sun was shining and the sky a harsh blue, there seemed to be no colour in anything, except the posters that were plastered everywhere. The black-moustachio'd face gazed down from every commanding corner. There was one on the house-front immediately opposite. BIG BROTHER IS WATCHING YOU, the caption said, while the dark eyes looked deep into Winston's own. Down at street level another poster, torn at

one corner, flapped fitfully in the wind, alternately covering and uncovering the single word INGSOC. In the far distance a helicopter skimmed down between the roofs, hovered for an instant like a bluebottle, and darted away again with a curving flight. It was the police patrol, snooping into people's windows. The patrols did not matter, however. Only the Thought Police mattered.

Behind Winston's back the voice from the telescreen was still babbling away about pig-iron and the overfulfilment of the Ninth Three-Year Plan. The telescreen received and transmitted simultaneously. Any sound that Winston made, above the level of a very low whisper, would be picked up by it, moreover, so long as he remained within the field of vision which the metal plaque commanded, he could be seen as well as heard. There was of course no way of knowing whether you were being watched at any given moment. How often, or on what system, the Thought Police plugged in on any individual wire was guesswork. It was even conceivable that they watched everybody all the time. But at any rate they could plug in your wire whenever they wanted to. You had to live–did live, from habit that became instinct–in the assumption that every sound you made was overheard, and, except in darkness, every movement scrutinized.

Winston kept his back turned to the telescreen. It was safer; though, as he well knew, even a back can be revealing. A kilometre away the Ministry of Truth, his place of work, towered vast and white above the grimy landscape. This, he thought with a sort of vague distaste–this was London, chief city of Airstrip One, itself the third most populous of the provinces of Oceania. He tried to squeeze out some childhood memory that should tell him whether London had always been quite like this. Were there always these vistas of rotting nineteenth-century houses, their sides shored up with baulks of timber, their windows patched with cardboard and their roofs with corrugated iron, their crazy garden walls sagging in all directions? And the bombed sites where the plaster dust swirled in the air and the willow-herb straggled over the heaps of rubble; and the places where the bombs had cleared a larger patch

and there had sprung up sordid colonies of wooden dwellings like chicken-houses? But it was no use, he could not remember: nothing remained of his childhood except a series of bright-lit tableaux occurring against no background and mostly unintelligible.

The Ministry of Truth—Minitrue, in Newspeak [New-speak was the official language of Oceania. For an account of its structure and etymology see Appendix.]—was startlingly different from any other object in sight. It was an enormous pyramidal structure of glittering white concrete, soaring up, terrace after terrace, 300 metres into the air. From where Winston stood it was just possible to read, picked out on its white face in elegant lettering, the three slogans of the Party:

<div style="text-align:center">

WAR IS PEACE
FREEDOM IS SLAVERY
IGNORANCE IS STRENGTH

</div>

The Ministry of Truth contained, it was said, three thousand rooms above ground level, and corresponding ramifications below. Scattered about London there were just three other buildings of similar appearance and size. So completely did they dwarf the surrounding architecture that from the roof of Victory Mansions you could see all four of them simultaneously. They were the homes of the four Ministries between which the entire apparatus of government was divided. The Ministry of Truth, which concerned itself with news, entertainment, education, and the fine arts. The Ministry of Peace, which concerned itself with war. The Ministry of Love, which maintained law and order. And the Ministry of Plenty, which was responsible for economic affairs. Their names, in Newspeak: Minitrue, Minipax, Miniluv, and Miniplenty.

The Ministry of Love was the really frightening one. There were no windows in it at all. Winston had never been inside the Ministry of Love, nor within half a kilometre of it. It was a place impossible to enter except on official business, and then only by penetrating through a maze of barbed-wire entanglements, steel doors, and hidden machine-gun nests. Even the streets leading up

to its outer barriers were roamed by gorilla-faced guards in black uniforms, armed with jointed truncheons.

Winston turned round abruptly. He had set his features into the expression of quiet optimism which it was advisable to wear when facing the telescreen. He crossed the room into the tiny kitchen. By leaving the Ministry at this time of day he had sacrificed his lunch in the canteen, and he was aware that there was no food in the kitchen except a hunk of dark-coloured bread which had got to be saved for tomorrow's breakfast. He took down from the shelf a bottle of colourless liquid with a plain white label marked `VICTORY GIN`. It gave off a sickly, oily smell, as of Chinese rice-spirit. Winston poured out nearly a teacupful, nerved himself for a shock, and gulped it down like a dose of medicine.

Instantly his face turned scarlet and the water ran out of his eyes. The stuff was like nitric acid, and moreover, in swallowing it one had the sensation of being hit on the back of the head with a rubber club. The next moment, however, the burning in his belly died down and the world began to look more cheerful. He took a cigarette from a crumpled packet marked `VICTORY CIGARETTES` and incautiously held it upright, whereupon the tobacco fell out on to the floor. With the next he was more successful. He went back to the living-room and sat down at a small table that stood to the left of the telescreen. From the table drawer he took out a penholder, a bottle of ink, and a thick, quarto-sized blank book with a red back and a marbled cover.

*End excerpt from **1984**.*

Extreme Emphasis. Chapter 3, page 157, exercise number 5: create about eight panels from the Robin Williams monologue in the extreme-emphasis.mp4 video. This is also available on Youtube under the title, *Good Morning Vietnam - First Time on Air.* Your goal is to letter the monologue in a way that conveys the extremes of expression in the comedian's voice and face. The drawings and continuity are not the issue here—any eight moments from the sequence will do.

Together, the following milestones constitute a project that determines half of your grade.

1. Milestone 1, Feb 05, Project Focus
2. Milestone 2, Feb 26, Contextual Inquiry
3. Milestone 3, Mar 19, Personas
4. Milestone 4, Apr 23, Scenarios
5. Milestone 5, May 21, Prototype

The CTools site has a Wiki where I've listed some Project Possibilities in a section of the same name.

The semester long project is the most important as well as the most time-consuming part of this course. Past project groups claim to have spent up to 40 hours in meetings to plan and organize their projects, with an enormous time commitment of solitary work between meetings.

The outcome of this project should be a digital prototype that can be shared, preferrably via the web. There should be a web presentation even if the design itself is of something that is not inherently web-based, such as an intelligent wheelchair. It should be possible to communicate about the project outcome via the web, both for the class and so that you can use the project outcome in job searching.

Our competitors do this, and you can sometimes find remarkable project websites associated with the top schools. Please be on the lookout for similar material from other schools.

It would be best if you would not hand in any paper related to your project, but use a website that develops over the course of the semester and is used to document each milestone.

Please *do not* present your milestones as a slideshow. Please see the file `cog-style-ppt.pdf` for reasons to reject the slideshow format (e.g., low data-ink ratio, inherent ambiguity of cryptic headings, cognitive dissonance introduced by heavily nested festivals of

bullet point levels, etc.). Please use your project website to present your milestones.

milestone 1. project focus

Establish a website that identifies your team, your customer, the problem, and the general direction for solution. Be prepared for a critique of your milestone similar to the widget redesign critique. After you present this milestone, you must summarize the critiques by your classmates on your website. You will need to do this for every milestone, so develop a repeatable process.

You can use Holtzblatt, Wendell, and Wood (2005), chapter 2, to help you think about the scope of the project, its stakeholders, and your general approach. That text identifies examples of projects with a small, tight scope that can be done rapidly, such as usability fixes, market characterization for new system concepts, website evaluation and redesign, next generation systems, supporting a coherent task, and reporting. There is also a discussion of stakeholders that can inform you. You should briefly identify your proposed stakeholders and consider the following points about them: goals, worries, ideas, how to involve them, how to communicate progress, how to understand their way of communicating, and how to communicate the design to them. You should include a set of covenants to govern your group. These must be agreed to by all members and must specify grounds for expulsion from the group. Only ten percent of all groups wind up having to enforce these, but they may help stave off disaster, so everyone should form covenants.

milestone 2. contextual inquiry Conduct a contextual inquiry for your project. See Spinuzzi (2000) and Beyer and Holtzblatt (1999). You can use Holtzblatt, Wendell, and Wood (2005), chapters 3 through 8 to complete this milestone.

Conduct a contextual inquiry on a workplace to which you have access, using the techniques described by Beyer and Holtzblatt.

Revising milestone 1. Part of the purpose in looking at each other's websites after Milestone 1 was for you to see that there are things you could have done that you didn't do, or perhaps things

you did that you shouldn't have done. Your milestone 1 website work is not done. Milestone 1 was about specifying the broad outlines of your project: scope, users, problem statement, solution statement. Those broad outlines are likely to change. There should always be a place on your website where people can look to find out *the big picture* so I'm not saying that you should do away with that and replace it with a lot of details, but be flexible about it and go back and change a few words or diagrams or whatever that tell the big picture as you go along. Refer to that so that the big picture directs you when you have to decide which details are relevant.

Products. You are likely to find that there are natural products of a contextual inquiry that can be added to your website. Your website should help you as a team. Typically a team has to come together to do some activities, then go off individually to do others. Your website can be used to document the things you do as a group so that individuals can use them, and to document what individuals do that needs to be reported back to the group.

Planning. You will plan your interviews and the interpretation session that follows and the construction of any artifacts you develop like affinity diagrams. This planning can go on the website in the form of a schedule or checklist that individuals can refer to. Holtzblatt, Wendell, and Wood (2005) has several relevant checklists, such as the CI process checklist (pp 80–81).

Interviews. Individuals need to conduct their interviews so they can be used in the interpretation session which, according to Holtzblatt, Wendell, and Wood (2005), should occur within 48hrs (p 101) after the interview. Realistically, between now and Wednesday, you'll only have time for one of these cycles. By completing an entire cycle, you'll have a blueprint you can refine for future use. One timesaving feature advocated in Holtzblatt, Wendell, and Wood (2005) is to avoid discussing an interview before an interpretation session (p 101).

Interpretation session. You should have a lot of data after an interview and it should be a challenge both to share it and to make sense of it. You should review, analyze, and capture key issues

in an interpretation session. A natural product of this activity is the affinity note, which becomes a natural input into the next activity, constructing an affinity diagram. Chapters 6 and 7 of Holtzblatt, Wendell, and Wood (2005) give guidance on capturing sequence models, artifact models, and physical models, and using them to construct affinity diagrams. These are different for different projects, especially the physical models, although the use of affinity notes are likely to pervade all groups.

Affinity Diagram. Holtzblatt, Wendell, and Wood (2005) gives very detailed guidance about developing an affinity diagram from affinity notes. One thing that I would like to add is that you can probably get a lot more done by using a paper process than by using an online tool. It's harder to document a paper process on a website, though. My best suggestion is that you get two Elmer's display boards, 36" × 48" $3.60 in bulk, $7.39 individually at OfficeMax.

Use these and post-it notes and just bring the results to class to present. Last semester, the most productive groups found it difficult to fit everything onto one of these boards. Less productive groups found it quite easy and even had space left over. If you find that you have sparsely populated one of these 3' × 4' boards, you probably haven't dug deeply enough. On the other hand, adding more post-it notes until the thing is covered may only mask the problem of not digging deeply enough, rather than solve it. One group last semester made the unwise decision to omit pink and green labels altogether so they could concentrate on boosting the number of yellow post-it notes, having discovered that they could not reach the minimum specified in Holtzblatt, Wendell, and Wood (2005). (The above color scheme is clarified in detail in Holtzblatt, Wendell, and Wood (2005) — basically the above means that they did no grouping of notes into themes at all). As a result, they were unprepared to say anything analytical about what they had found, instead trapped at the individual anecdote level.

There is a lot of software for doing affinity diagrams, but the overhead is significant and it's harder for a group of people to in-

teract with tools that are inherently meant for one person, one keyboard, one mouse. If you have a bunch of post-it pads and are sitting around a posterboard display on a wall or a conference table, you can generate a lot more material faster. By the way, you could just do stuff on a wall, but then you have to figure out what to do with 500 – 1,000 post-it notes afterward. The display board gives you something you can fold up. If you tie it tightly enough or cover the surface with spray or tape or staples, you may find that post-its will retain their positioning.

milestone 3. personas & scenarios See Pruitt and Grudin (2003). You can use Cooper and Reimann (2007), chapters 4 and 5 to complete the persona portion of this milestone.

You can use Cooper and Reimann (2007), chapters 6 and 7 to complete the scenario portion of this milestone.

Expect your scenarios to differ from those produced by other teams. Most teams will provide context scenarios and will use them to address questions such as the following. (1) What is the setting in which the product will be used? (2) Will it be used for extended periods of time? (3) Will the persona be subject to frequent interruption? (4) Are there multiple users of a single device? (5) What other products is it used with? (6) How much complexity is permissible, based on persona skill and frequency of use? (7) What primary activities does the persona need to accomplish to meet his / her goals? (8) How does the product relate to the user's higher goals? (9) What is the expected result of using the product?

Not every team will address all these questions, nor will every team use context scenarios. Most teams will create scenarios of users successfully reaching goals, rather than scenarios showing dysfunctional outcomes. It's often the case that the most we can say about dysfunctional scenarios is "Okay, don't do that then." We usually prefer richer scenarios than would be possible in a scenario that shows failure to meet goals.

milestone 4. lo-fi prototype You can use Holtzblatt, Wendell, and Wood (2005), chapter 13, to complete this milestone. %Note that it may seem backward %to create a lo-fi prototype before a

scenario, but my %experience has been that there is great educational %value in creating a prototype early in the process, %particularly for inexperienced students. There is %nothing to prevent you from doing some scenario work in %preparing this milestone, but we need more iterations of %a prototype than would be practical if we switched this %milestone with the next one.

The lo-fi prototype is supposed to generate discussion and to be something you can readily throw away and rework. If it is due shortly before the hi-fi prototype, you will be tempted to refine it rather than rethink it. There'll just be too much pressure from that looming hi-fi prototype deadline. I tried to put lo-fi prototyping as early in the milestones as I could and was even tempted to try to stick them in before personas, but finally decided that that was just too early. The lo-fi prototype should generate discussion. Expect to discuss them a lot! Expect to rethink them and make better scenarios because of having rethought them.

milestone 5. hi-fi prototype The outcome of this milestone should be something viable for user testing. You should not have to modify this so you can use it for testing. Therefore, the definition of hi-fi may be relaxed. This may well be a mid-fi prototype. The goal is to prepare something you can use to gain relevant knowledge about the design from users.

final project presentation The thrust of this presentation will be to have conducted user testing on your hi-fi prototype and to be able to report on that testing. You should *briefly* summarize your project and spend at least two-thirds of your time discussing user testing and its impact on your design. You will have to have conducted user testing for this presentation to be successful. You will have to connect that testing to your design and tell how your design should change based on that testing for this presentation to be successful.

Blogs and bloggers exemplify resources that are underdocumented in the academic literature. Many designers look to *A List Apart* or *Alertbox* for ideas and inspiration. A very long list of "celebrities" maintain an online presence with a remarkable influence on contemporary designers. They include Aza Raskin, Jesse James Garrett, Mimi Ito, danah boyd, Jacob Nielsen, and many more.

Plenty of online tools are part of a typical designer's workday, such as kuler. Some platform specific tools like Axure have big followings.

I use Wikipedia as a reference for many topics. For instance, the Wikipedia entry on HSV color space provides a good introduction to some important terms about color. Wikipedia urls typically have a format so that if I refer to the entry on HSV color space, you may assume that the url (for the English language version) is `http://en.wikipedia.org/wiki/HSV_color_space`. Wikipedia remains controversial among many academicians.

A valuable resource for HCI literature can be found at hcibib. You may find it helpful for much of your work.

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