

Case Studies in Interactive Infovis Design

Spence, *Information Visualization*
Chapters 2 & 6.1, 6.2, 6.5

Thursday 8 Nov 2007
Polle Zellweger

Today's Lecture

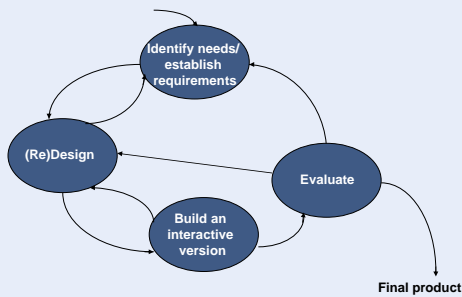
User-centered design process

- Overview
- Applied to project

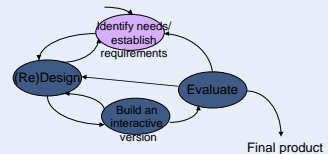
Case Studies

- EZChooser
- Baby NameVoyager
- MetroKC
- oSkope
- FishCal/DateLens
- Viz4All

A simple user-centered interaction design model



Identify needs / Establish requirements



Requirements

- Data
 - type, volatility, size/amount, persistence, accuracy, values
- User
 - user's abilities, skills, interests
 - novice/expert, casual/frequent
- Tasks *functional*
 - what the system should do
- Usability
 - learnability, efficiency, memorability, errors, satisfaction
- Context of use *environmental*
 - circumstances in which the system will operate
 - physical, social, organizational, technical

Scenarios

Describe human activities or tasks in a story that allows exploration and discussion of contexts, needs, and requirements

Concrete stories that concentrate on realistic and specific activities

Scenario for shared calendar

“A professor is trying to schedule a meeting of the faculty search committee. She selects the search committee to enter the names of meeting participants, and she also enters some constraints such as the length of the meeting and roughly when it needs to take place. The system checks the individuals’ calendars and the central departmental calendar for matching times. Because of the size of the committee, the system also checks for an available meeting room.

The system presents the professor with a series of dates on which everyone is free at the same time and a meeting room is available. She selects one of those dates, and the system adds the new meeting into the member’s calendars in a special color as an externally-scheduled meeting. The system also emails each member an alert to request confirmation for the meeting and adds the meeting to the calendar for the meeting room.”

Project: Identify needs/establish requirements

Data

- find or create a dataset
- explore: find ranges, outliers, patterns, questions, issues
- create static visualizations

User

- identify and describe the target users

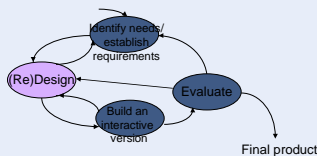
Tasks

- identify questions that target users may ask about the data
- describe the specific tasks that your system will support

Scenarios

- document and provide insight into requirements
- may demonstrate some usability requirements

(Re)Design



Using scenarios in conceptual design

Express proposed or imagined situations

Used throughout design in various ways

- scripts for user evaluation of prototypes
- concrete examples of tasks
- as a means of co-operation across professional boundaries

Plus and minus scenarios to explore extreme cases

Using prototypes in conceptual design

- Allow evaluation of emerging ideas
- Low-fidelity prototypes used early on, high-fidelity prototypes used later

Project: (Re)Design

Consider alternative visualization designs

- view examples from lectures, Viz4All, other class Resources, ...
- try different encoding schemes for data attributes
 - representation: position, color, texture, connectivity,...
 - presentation: space and time constraints
 - interaction modes

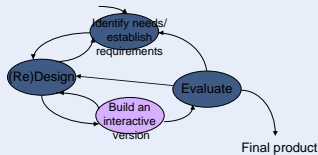
Proposal versions

- create low-fidelity prototypes
 - paper, sketches, screen composites
 - skip/fly through scenarios

Final version

- refine & iterate based on class & user feedback

Build an interactive version



Low-fidelity Prototyping

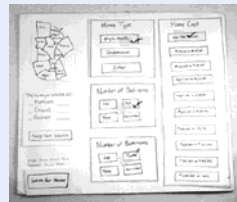
- Uses a medium which is unlike the final medium, e.g. paper, cardboard
- Is quick, cheap and easily changed
- Examples:
 - sketches of screens, task sequences, etc
 - 'Post-it' notes
 - storyboards
 - 'Wizard-of-Oz'

Storyboards

- Often used with scenarios, bringing more detail, and a chance to role play
- It is a series of sketches showing how a user might progress through a task using the device
- Used early in design

Paper prototyping

- Separate page for each screen
- Post-its, transparent overlays can help with interactive areas
- How-to video available in undergrad library



High-fidelity prototyping

- Uses materials that you would expect to be in the final product.
- Prototype looks more like the final system than a low-fidelity version.
- For a high-fidelity software prototype common environments include Macromedia Director, Visual Basic, and Smalltalk.
- Danger that users think they have a full system.....see compromises

Project: Build an interactive version

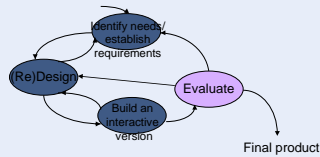
Proposal versions

- simple storyboards: 2 designs, 2 scenarios each

Final version

- choose a design & refine, iterate, improve
 - based upon class & optional user feedback
- more detailed, more polished storyboards
 - paper, Photoshop, Powerpoint, Flash, Tableau, Treemap, custom apps, ...
 - interaction techniques
- illustrates real data, not just sketched/approximated
- additional features to support user tasks
- more scenarios (3-5), alternative paths

Evaluate



Evaluation

Usability

+

Utility: Does it do what the users need?

Argument for testing with only 5 users



Testing 5 users provides the insight
 Testing 5 users finds ~80% of usability problems
 Use additional budget to iterate & run more tests [Nielsen 2000]

Project: Evaluate

Proposal versions

- class & instructor feedback on task, users, designs, scenarios, views
- optional target users outside class
 - test usability and utility for selected tasks

Final version

- evaluate final prototype with ≥ 2 participants
 - optional outside class: test & iterate intermediate designs
 - in lab Nov 30
- test usability and utility for selected tasks

P4 Presentation

In lab formal presentation

- 20 minutes/group, including discussion
- PPT or similar
- Post the PPT or similar

Presentation includes

- Overview of project and goals + user, data, tasks
- Two scenarios, two designs (4 cases)
- Your analysis of the effectiveness of the designs

Scenarios

- User and task
- Steps taken to achieve task
- Overview and details-on-demand, plus compare, filter, ...

Case Studies

Definition of Information Visualization (Spence)

Visualize:

- to form a mental model or image of something

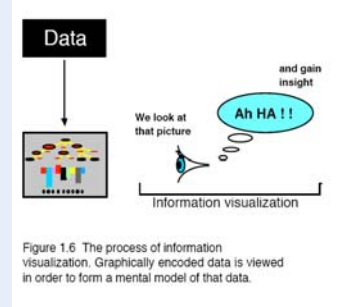
Information visualization:

- the process of forming a mental model of information

Important characteristics

- a human cognitive activity
- independent of computers
- may involve senses other than seeing: sound, touch,...

Spence's Information Visualization Model



Principal Issues in Information Visualization

Representation

- how the data is encoded
- usually in visual form

Presentation

- how suitably encoded data is laid out in:
 - available display area
 - time
 - includes choosing which data to display

Interaction

- actions performed by user to move from one view of the data to another

Recalling Shneiderman's Tasks

Overview: see overall patterns, trends

Zoom: see a smaller subset of the data

Filter: see a subset based on values, ...

Details on demand: see values of objects

Relate: see relationships, compare values

History: keep track of actions & insights

Extract: mark & capture data

Designing a Sample Visualization Tool

Selecting a car to buy

- choosing one item from many based on attributes

Layered design study

Note: selection criteria often...

- imprecise
- not known at the outset

EZChooser



Car data

- cars + attributes (rows) (columns)

Make	Price (£k)	MPG	Rating	Age (yrs)
Aster	15.49	31	****	3
Chewy	12.49	27	***	4

Creating an overview of prices

- bargram
- length proportional to number of cars in each subrange

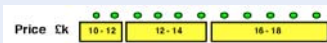


Car appearance

- object vector of car icons



Showing individual cars on bargrams



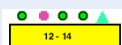
Color coding to link car icons to bargrams



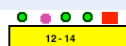
Works for multiple bargrams



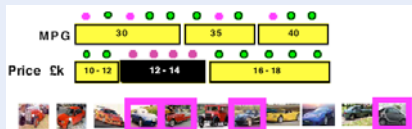
Showing an "ideal" car



Tagging a car for future reference



Interactive selection of a bargram price range



Selecting a second bargram range shows cars satisfying both criteria

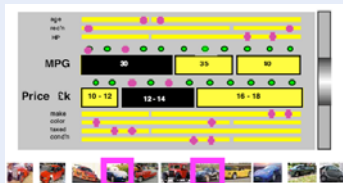


Scrolling bargrams through a window allows display of many bargrams, or use on a smaller device



Handling limited space or many bargrams #2

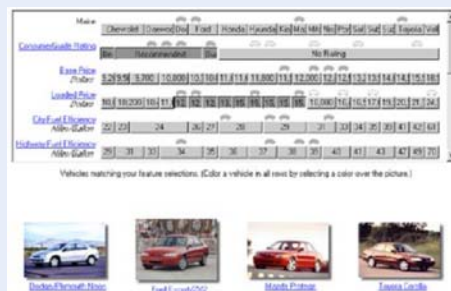
- user selects which bargrams to view



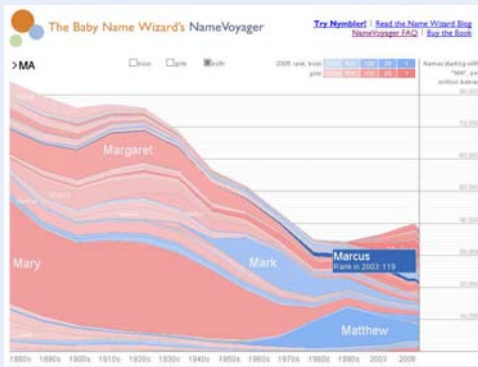
Focusing on a single price range



Providing sensitivity information



Baby Name Wizard Name Voyager



Adding functionality

Supporting comparison

one idea:

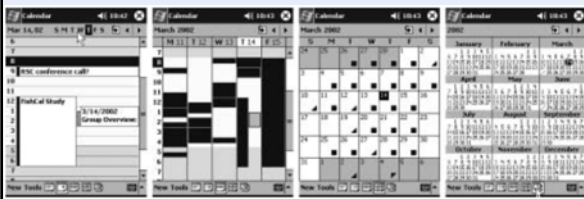
- ways to select up to 20 names, perhaps by dragging each one to a saved names area
- draw a color-coded line graph for each saved name all displayed in the standard time-series 1900-2006

other ideas?

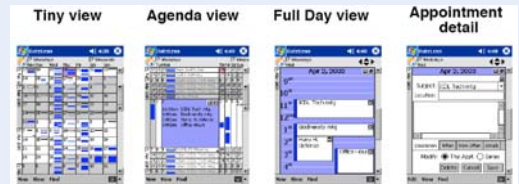
One-stop shopping for prospective parents

- derivations of names, country of origin
- meanings of names
- related names, nicknames, other language forms
- famous people with that name
- more?

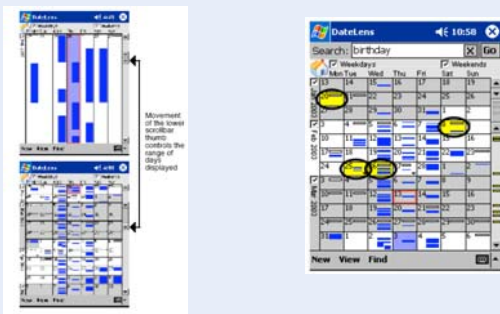
PocketPC calendar tool



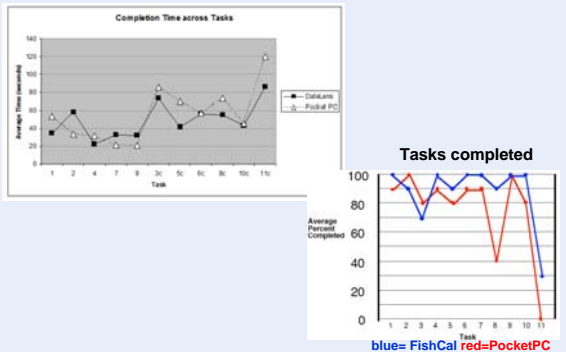
FishCal/DateLens



Scrolling & searching



Evaluation results



Interactive Examples

[U of Maryland Viz4All examples](#)

Elements of Information Visualization



Summary

User-centered design process

- Overview
- Applied to project

Case Studies

- EZChooser
- Baby NameVoyager
- MetroKC
- oSkope
- FishCal/DateLens
- Viz4All

Links

EZChooser

<http://brisa.merl.com:8080/myezchooser/mydatasets.jsp?directory=/showcase>

Baby NameVoyager

<http://www.babynamewizard.com/namevoyager/Inv0105.html>

MetroKC <http://transit.metrokc.gov/>

oSkope <http://oskope.com/>

FishCal/DateLens <http://www.cs.umd.edu/hcil/datelens/>

Viz4All

http://www.cs.umd.edu/class/spring2005/cmssc838s/viz4all/viz4all_a.html