DEPARTMENT OF COMPUTER SCIENCE
UNIVERSITY OF TORONTO

CSC428F/2514F

HUMAN-COMPUTER INTERACTION

Lecture 2

AN EXAMPLE OF USER-CENTRED ITERATIVE DESIGN: TIME-BASED INFORMATION MANAGEMENT

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2.1 User-centred design

An early focus (prior to system design!) on users and tasks

User diversity
- Not to be underestimated
- Not to be overestimated

Understanding (not just identifying, classifying) potential users
- Not just identifying, characterizing

Do this through direct contact with users
- Interviews
- Observations of current work
- Task analysis
- User(s) on design team

User-centred vs. *user-involved* or *user-directed*
Participatory design (Scandinavia), where developers and users are equal partners on design team

See especially Gould paper, BGBG, reprinted in Ch. 2

2.2 Iterative design

Need to prototype, evaluate, revise, evaluate, etc.

Design-->Prototype-->Evaluate
- -->Redesign-->Implement-->Evaluate
- -->Redesign-->Revise implementation-->Evaluate-->etc.

Need tools for rapid prototyping

Evaluation through empirical observation and measurement
- More about this later in the course

2.3 The electronic information management problem

Information overload

Too many filesm too many folders
Too much email (email overload), too many bookmarks
Too much time spent filing, too much time spent finding

Class: Have you experienced this? How?

We'll use this as an example of user-centred iterative design

2.4 User needs assessment

Background: Malone (1983), Conway (1990)

Fitzmaurice, Baecker, and Moore (1994)'s study of computer desktop organization, using interviews and tours of file systems, found:

Semantic hierarchies dominate
These are generally satisfactory, but organizational problems increase as size increases
Some individuals make significant use of time-based organization within a semantic hierarchy

Berlin et al. (1993) design, development, & use of a group email electronic memory, via self-analysis of their group, uncovered interesting differences in filing habits:

Purists (one category) vs. proliferators (multiple categor.'s)
Syntacticists (structural and episodic clues) vs. semanticists (meaning clues)

Scruffies (5 categories, minimize up-front storage time)
vs. neatniks (many categories, minimize retrieval time)
Savers (electronic pack rats) vs. deleters
Content-based filing vs. purpose-based filing

Barreau and Nardi (1995) studies, using interviews and tours of filing systems, discovered:

The prevalence of location-based searching over logical (text-based) searching
The use of three types of information
Ephemeral, e.g., do lists, email (minutes to days)
Working, e.g., work in progress (days to months)
Archived, e.g., past work (months to years)
Need to design for all three types (not just archived)

Silver (1996) study, using interviews, found:

Great variety in styles of email mailbox organization
6 of 8 users have problems retrieving email between once a week and once a month

Whittaker and Sidner (1996) study, using interviews and quantitative mailbox analyses of 20 email users, found:

Email overload perceived to be a problem
Email used for asynchronous communication, task management, and personal archiving
Inbox constitutes on the average 53% of mailbox
Users can be meaningfully differentiated as one of:
No-filers
Spring cleaners
Frequent filers
Need for conversational thread management and automatic semantic clustering

2.5 The first design — Byron Long's TimeStore v. 1

Time-based display of email messages (Fig. 2.1)
- Time runs horizontally
- Email sender runs vertically, organized alphabetically

Messages displayed as dots
- Larger dots indicate multiple messages
- Double clicking on a dot opens the message

Navigation
- Can pan over vertical axis (list of names)
- Can zoom and pan over horizontal axis (time)

Other features
- Access and works with Eudora data base
- Ability to correct incorrect alphabetization of names

2.6 Silver's user study and evaluation

A somewhat enhanced system — TimeStore v. 2
- Multiple mailboxes
- List of all messages from given sender
- Better graphic design

The user study (6 users, 3-8 short sessions of use)
- Users liked the time-based display
- Users disliked the divided list (top — most frequent senders, bottom — everyone else alphabetically)
- Problems with name ordering algorithm
- Problems with messages sent to themselves
- Need for conversation threads
- Desire for better integration with Eudora
- Many interface suggestions

Figure 2.1 The initial TimeStore implementation (Silver, 1996, p. 32)

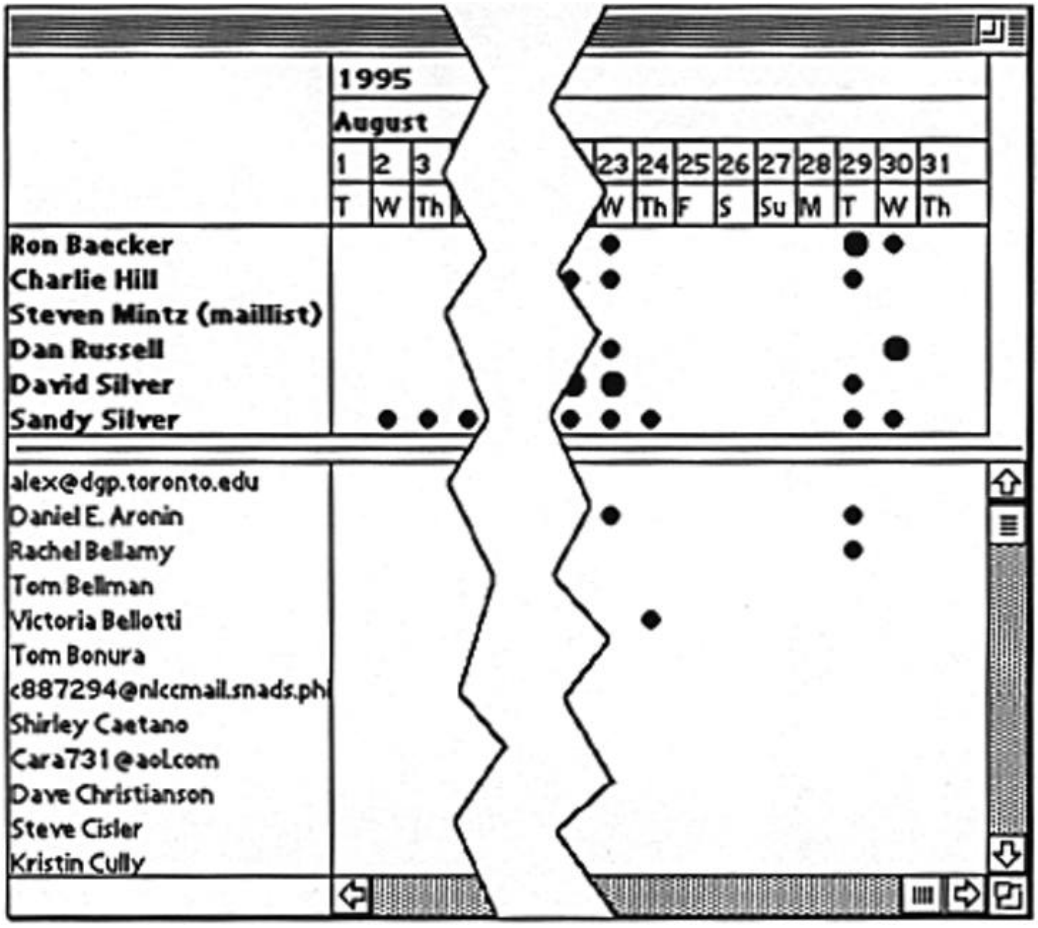

Figure 2.2 Silver's enhanced TimeStore implementation (Silver, 1996, p. 57)

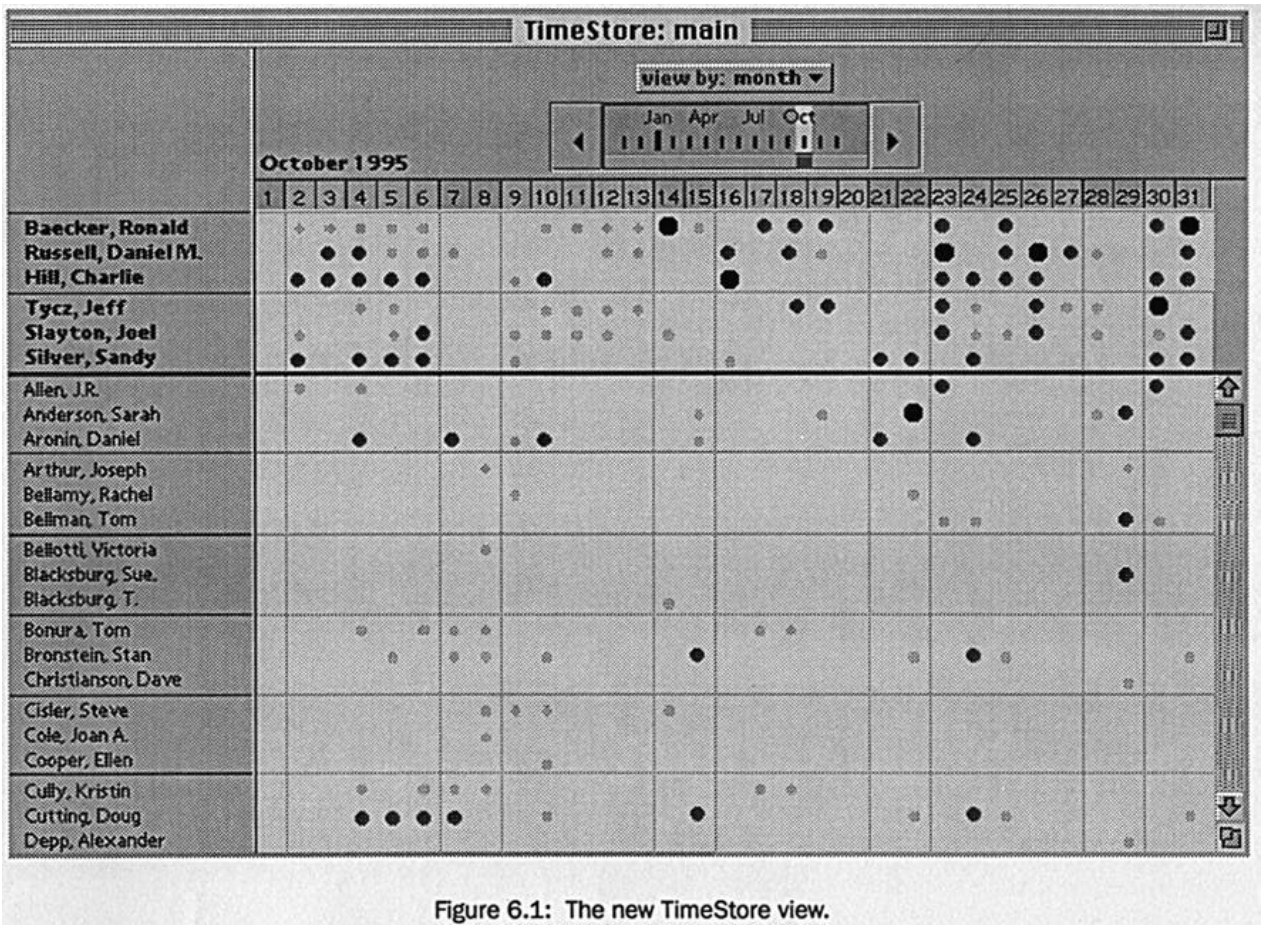

Figure 6.1: The new TimeStore view.

2.7 Yiu's new design and implementation

A completely new implementation (Yiu, 1997) (Fig. 2.2)

Email time-based management
+
Email creation (no more need for Eudora)
+
Task management
+
Calendar management

Figure 2.3 A screen from the 3rd TimeStore implementation (Yiu, 1997)

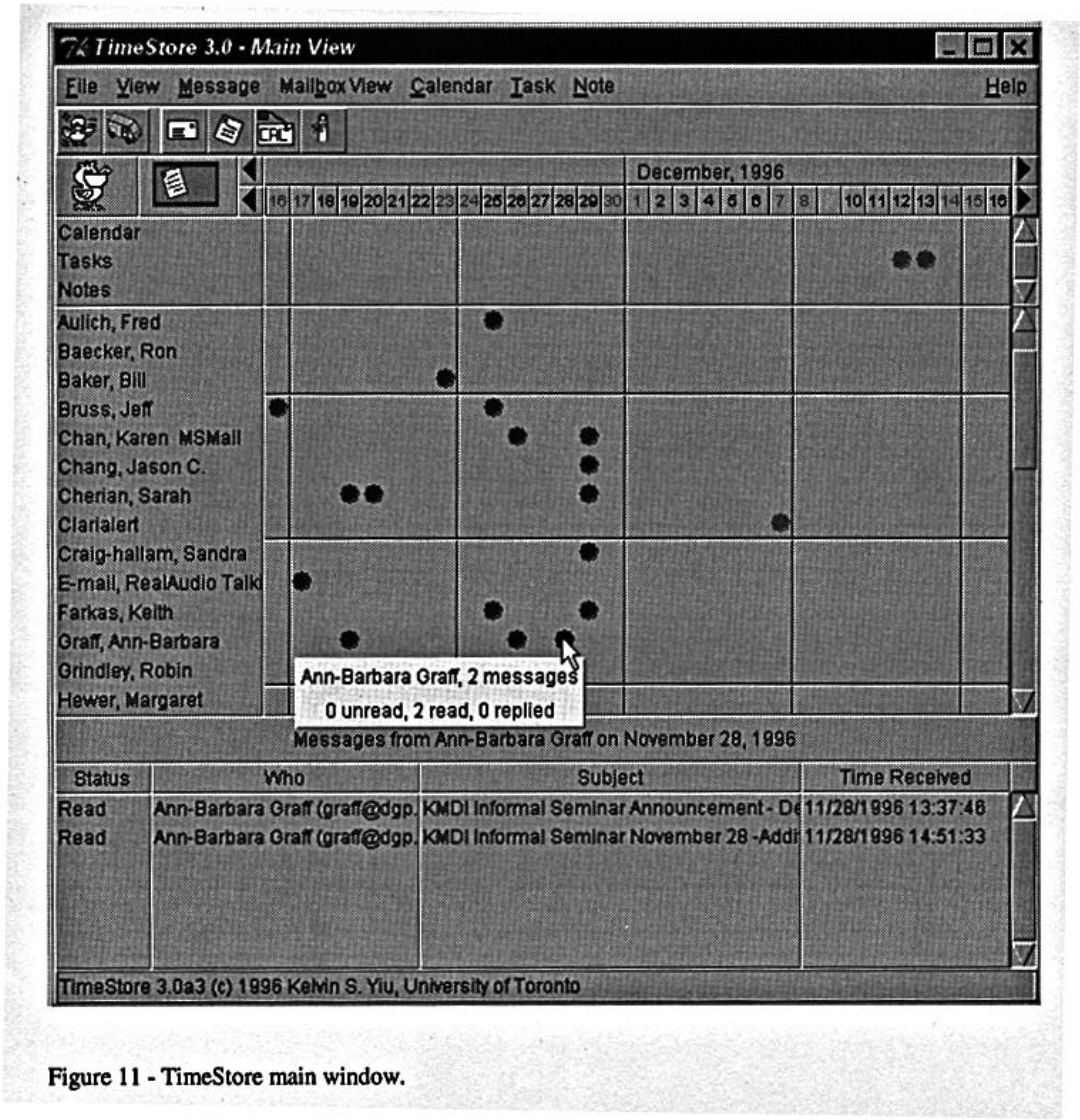

Figure 11 - TimeStore main window.

2.8 A digression on tools

Original systems done in C++, but new version in tcl/tk
- Cross platform high-level scripting language
- API for services, e.g., file I/O, sockets, memory allocation
- Access to C for routines that require performance

Bottom line: Much more rapid development and prototyping of GUI interfaces
- Further discussion of these issues, and discussion of various approaches to interface development tools, in Lectures 12-14

2.9 Yiu's evaluation

5 users, 2-24 short sessions

Interviews, audio-recorded think-aloud sessions, and screen/audio capture by user's computer

Results
- 4 out of 5 liked time-based visualization
  - Ability to see patterns and trends
- Useful associations between messages and tasks
- Difficulties in remembering exact times (no surprise)
- Confusion between send time and receive time
- Problems with outgoing messages
- Problems with sender naming & multiple email addresses
  - Perceived need to organize names

2.10 A role for formal modelling

Time spent:

Establishing file system hierarchy

Filing each item

Retrieving some number of items

Reorganizing file system hierarchy occasionally

We could try to compare total time required for traditional semantic hierarchy and new time-based approach

Given a definition of a “typical” or “average” file system, in one or the other of the 2 approaches, and a filing or retrieval request, we can compute the total time required to carry out the task given:

That an optimal strategy is used
That we know typical times for keystrokes, mouse movements, computer responses, and human thinking times
That we can go from a typical case to the big picture

We'll see how to approach these problems using GOMS and keystroke models in lectures 15-17
We’ll also look at a dramatic example of commercial success with such modeling techniques

2.11 Mental models and an alternate approach

Definition of mental model

Mental model and mental imagery
- The traditional semantic hierarchy
- The TimeStore approach
- The LifeStreams approach (Fig. 2.3)
  - A time-ordered stream of documents
  - Use of stream filters to compute substreams dynamically
  - Unified handling of electronic documents of all types, also ephemeral, working, & archived information

Figure 2.4 A screen from the LifeStreams system (Carriero, et al.,1995)

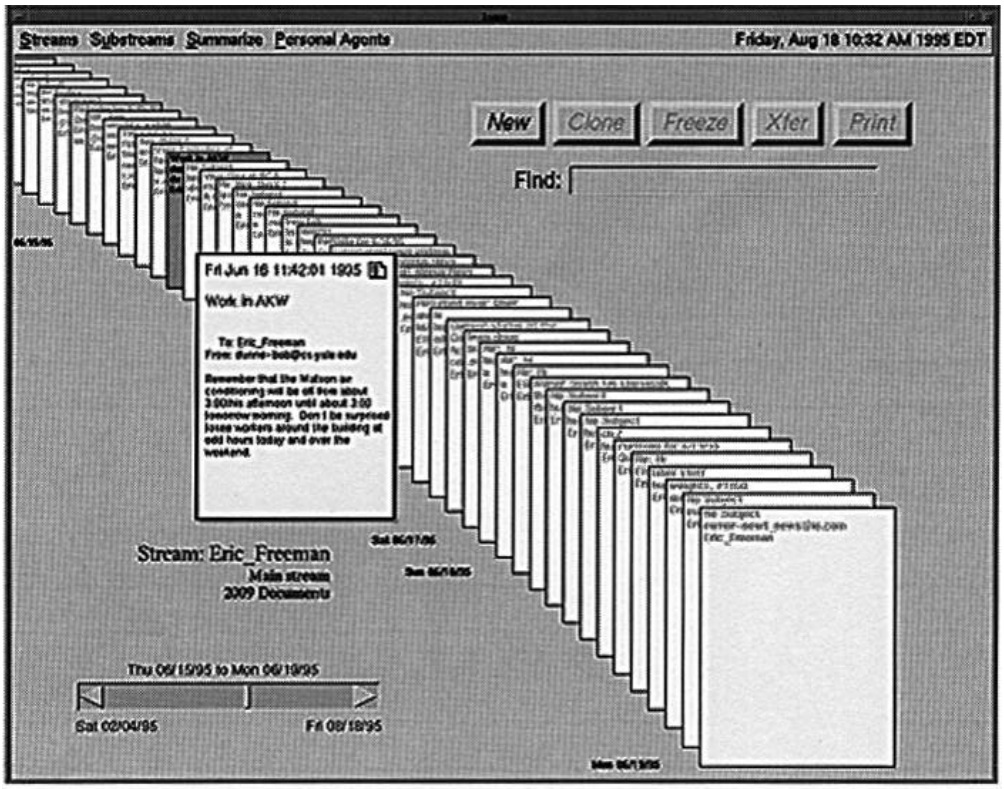

Figure 4 - Lifestreams user interface. Documents are arranged in a "stream" that is organized by time. The slider is used for fast scrolling through the stream. Reproduced from Carriero, Fertig, Freeman and Gelernter [96].

2.12 Information management: from individual to group

Design of a group memory (Berlin et al. 1993)

HCI for groups and organizations to be discussed in Lectures 22-24

2.13 References

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