Sewing the Seams of Sensemaking: A Practical Interface for Tagging and Organizing Search Results

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The Touchstone Sensemaking Diagram

Pirolli and Card 2005, Pirolli and Russell 2011
Need UIs to Stitch Boxes Together (at their seams)
A Neglected Seam: Between Searching and Organizing Search Results
The seam between:

the **saving** of search results during the search **triage** and the subsequent **organizing** of and **thinking** about the saved information,

and the **inter-leaving** of the two.
Saving results itself gets little attention
Saving search results in PubMed

- **Search NCBI databases**
  - Search: PubMed
  - Hint: clicking the "Search" button without any terms listed in the search box will transport you to that database's homepage.

- **Saved Searches**
  - You don't have any saved searches yet.
  - Go and create some saved searches in PubMed or our other databases.

- **My Bibliography**
  - Your bibliography contains no items.
  - Use the "Send to > My Bibliography" menu in PubMed to add citations.
  - Click here to manually create citations.

- **Collections**
  - Favorites: edit, 0 items, Private, Standard
  - My Bibliography: edit, 0 items, Private, Standard
  - Other Citations: edit, 0 items, Private, Standard
  - zebrafish: edit, 6 items, Private, PubMed

- **Recent Activity**
  - Time: 09-Sep-2012
  - Database: PubMed
  - Type: search
  - Term: zebrafish

- **Filters**
  - Filters for: PubMed
  - You do not have any active filters for this database.
  - Add filters for the selected database.

- **Manage Saved Searches**
- **Manage Collections**
- **Manage My Bibliography**
- **Manage Filters**
Usability Problems?

- After relevant docs selected, must scroll to the top of the page to save them.
- Too many steps to make a new collection
- After saving, lose context of earlier query; must reconstruct it
- After reconstruction, doesn’t highlight previously saved queries in search results
- After new docs added to a collection, doesn’t show the older docs
- No support for downstream sensemaking.
A better version
(for saving, but not organizing)
<table>
<thead>
<tr>
<th>Rank</th>
<th>Title</th>
<th>Author</th>
<th>Format</th>
<th>Language</th>
<th>Publisher</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Nanotechnology</td>
<td>Institute of Physics (Great Britain)</td>
<td>eJournal/eMagazine : Document : Periodical</td>
<td>English</td>
<td>[London?] : IOP Pub., 1990-</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Nanotechnology</td>
<td>Rebecca L Johnson</td>
<td>Book : Juvenile audience</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
This design is good for saving ... 

But could it do much more to aid the organizing step in sensemaking
A Design Challenge

• Time-constrained Analysts
• Currently working with paper
• Millions of documents
• Want to search quickly (triage)
• Save the best document quickly now, with some organizing as they go
• Look through and organize them in more detail later
• Currently use dual monitors
Legacy Tool

- Does not show tagged documents while being saved
- Tags are keyboard numbers; cannot assign mnemonics
- Cannot easily arrange or group tagged documents
- Usually print them out and write on them
<table>
<thead>
<tr>
<th>U</th>
<th>P</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Document</td>
<td>Publication</td>
<td>Page</td>
<td>Title</td>
<td>Current</td>
<td>Current X</td>
<td>Retrieval</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 8260784</td>
<td>20120904</td>
<td>21</td>
<td>Indexing and searching JSON objects</td>
<td>707/742</td>
<td>707/791; 707/797; 715/200; 715/326</td>
<td>US 8260784 B2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>US 8255259</td>
<td>20120828</td>
<td>12</td>
<td>Extending constraint satisfaction</td>
<td>705/7.25</td>
<td>705/7.11; 705/7.12</td>
<td>US 8255259 B2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>US 8211342</td>
<td>20120703</td>
<td>17</td>
<td>Processing messages from a mobile</td>
<td>455/423</td>
<td>455/424; 455/425</td>
<td>US 8211342 B2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Small Focus Groups

• Designing a New Tagging Tool
• Showed Potential Designs
• Participants were:
  • Intrigued by Spatial View, Organizing with Piles
  • Emphasized Requirement for Low Effort, Minimal “Fussing”
Mander et al., 1992
Pile Metaphor

Figure 4. Browsing by spreading out a pile. Gesturing sideways with the mouse pointer, or with a finger in the case of a touch screen, causes the pile contents to spread out. Individual items can now be directly manipulated.
Optimal Flow

Drag and drop cards from the list on the left.

Place cards together in groups that make sense.

Give each group a name that feels right to you.
Bae et al 2006
Figure 1: Data Mountain with 100 web pages.

Data Mountain
(Robertson et al.)
TRIST and Sandbox
(Wright, Proulx, 2005,6)
TopicShop
Amento et al., UIST 2000
Initial Pilot

“Organic” layout, allows for overlapping layout, nesting, resizing
(7 participants)
Reactions: 

too much fussing

Back to the prototyping board
The Solution

• Keyboard Letters Create Groups
• Groups *Immediately Visible* and Usable
• Spatial Organizing Available, but with Automated Arranging, *Minimal Fuss*
• Groups *Tightly Coupled* to Search
Revision, Study I

Really linked to search engine, with keyboard tagging
4 views; non-overlapping layouts
(20 participants in the lab)
Abstract: lactic acid-producing bacteria for preserving foodstuffs or animal feed, which can only be conserved for a limited period of time, even under refrigeration. The protective cultures can inhibit the growth of bacteria which are dangerous to the consumer, if the cold chain is interrupted, or if the prescribed...
finding drugs for target

Finding targets for drugs

finding informative biomarkers

finding interaction partners
Abstract: Lactic acid-producing bacteria for preserving foodstuffs or animal feed, which can only be conserved for a limited period of time, even under refrigeration. The protective cultures can inhibit the growth of bacteria which are dangerous to the consumer, if the cold chain is interrupted, or if the prescribed

Description: lactic acid bacteria quantity of 104 to 108 lactic acid bacteria per g or ml or cm2 surface of the food or feedstuff, preferably with a lactic acid bacteria quantity of 105 to 106 lactic acid bacteria per g or ml or cm2 surface. Preferably, during the treatment, a source of carbon, preferably carbohydrates... lactic acid bacteria of the protective cultures according to the invention takes place and above which the lactic acid bacteria can inhibit the growth of toxigenic and/or toxic infectious bacteria is 7°C. The lactic acid bacteria of the protective cultures according to the invention can be obtained

Claims: lactic acid bacteria belonging to the strain Lactococcus lactis subsp. lactis 1526 (DSM 12415).

Title: Methods for manufacturing hydrogen using anaerobic digestion

Abstract: using bacteria or spores includes providing a biomass comprising a hydrogen-producing bacteria and a competing bacteria and treating the biomass with a sufficient amount of a chemical agent for a period of time such that the treatment (i) kills, inhibits or inures substantially all of the competing... competing bacteria and (ii) does not kill or inhibit the hydrogen-producing bacteria or causes the hydrogen-producing bacteria to form spores that are not destroyed during the chemical treatment. The method also includes digesting an
Results (Study I)

• How often would you change tags?

<table>
<thead>
<tr>
<th></th>
<th>Legacy tool</th>
<th>Prototype</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Rarely</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Sometimes</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Frequently/Often</td>
<td>2</td>
<td>10</td>
</tr>
</tbody>
</table>
Results (Study I)

- How many tags would you apply?

<table>
<thead>
<tr>
<th># Tags</th>
<th>Saving results</th>
<th>Organizing results</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2-3</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>4-5</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>6 or more</td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>
Results (Study I)

• How does this compare to the legacy tool?
• 17 / 20 participants indicated 6 (better) or 7 (much better) (out of 7)
Final Design, Study II

Better Search, Column Layout, Improved details
(10 participants for 1 hour on their own schedules)
touch screen

touch screen

Touch screen image setting frame

Number: 07576733
Date published: 2009-08-17
Inventor: Tremaine, L.
Type: Patent

Description: with a touch screen. The monitor 102 may be any of the above-mentioned type of monitors. According to this exemplary embodiment, a monitor 102 lacking touch screen capabilities may have been fitted with a touch screen overlay 104. The touch screen overlay 104 may have dimensions, such that touch screen may come in a variety of different shapes and configurations. The monitor 102, touch screen overlay 104, monitor active area 106, and touch screen active area 108 of FIG. 1 are shown here.

Claims: the touch screen image setting frame; wherein the dimensions of the inner perimeter of the touch screen image setting frame are equal to the dimensions of a touch screen area of the touch screen monitor, and after the adjusting, removing the frame from in front of the... dimensions of a touch screen active area of the touch screen monitor, and after the adjusting, removing the frame from in front of the...
Pat. No., application’s user interface. A Web application exhibits a back-end state (e.g., stored data, runtime data, and logic). The HTML definitions that are used primarily for the application’s user interface must be dynamic to reflect the changing back-end state. The back-end state must be able to be bound to the

Graphical cursor navigation methods

<table>
<thead>
<tr>
<th>NUMBER</th>
<th>DATE PUBLISHED</th>
<th>CLASS</th>
<th>INVENTOR</th>
<th>TYPE</th>
</tr>
</thead>
</table>

Description: using a GUI (on a computer for example) include the use of an input device such as a mouse or a track ball. A movement of the mouse or the track ball results in a corresponding graphical cursor (sometimes called a cursor or a pointer) moving on the graphical user interface. The graphical cursor (or pointer) graphical user interface (GUI) includes navigating a graphical cursor corresponding to an input device onto the button, activating a fence around a border of the button if the navigation occurs via a pre-defined portion of the border and navigating the graphical cursor away from the button via a pre-defined
Results (Study II)

• Behavior:
  • Two completed 2 cases
  • One completed 3 cases
  • Seven completed 1 case
  • Number of groups varied from
    • 1 group with 3 documents to
    • 15 groups with 23 documents in 2 rows
Results (Study II)

• 6/7: works well for my needs
• 6/7: tagging functionality compared to legacy tool
• 6/7: organizing functionality compared to legacy tool
Results (Study II)

- How often would you use this tool?

<table>
<thead>
<tr>
<th></th>
<th>Tagging tool</th>
<th>Organizing tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>For every case</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>For most cases</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>For a few cases</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Never</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>
Not Yet Addressed

• Integration of Annotations
• Supporting Long-Term Categories
• Supporting Collaborative Categories
Applicability Elsewhere?

• Citation Search Tools: YES!
  • Pubmed
  • WorldCat
  • Lexis/Nexis (Proquest)
  • Google Scholar
  • MS Academic Search

• Web Search Engines?
Applicability Elsewhere?

- Information Gathering Tools?
  - Evernote, OneNote
- Web Search Engines?
Conclusions

• The details matter for search UIs!
  • In this case, the seam between saving and organizing search is tricky
• The User-Centered Design Process works
  • Four rounds of design in this case
• Minimizing manual movements is a powerful search design constraint
  • Seems to be a selling point for spoken input too