Data Vis for Empowerment and Inclusion

Sheelagh Carpendale
Professor
Canada Research Chair: Information Visualization
Innovations in Visualization (InnoVis)
Interactive Experiences Lab (ixLab)
School of Computer Science,
Simon Fraser University
British Columbia, Canada
Lessons ...

• Observation is a skill
• Words are not sufficient
• Hard work can lead to new insights
• This is our data!
• Mutual respect is both overt and covert
• Externalization: Empowerment, Engagement, Expression
• Claiming our data heritage
Lessons ...

• Observation is a skill
• Words are not sufficient
  • Hard work can lead to new insights
  • This is our data!
• Mutual respect is both overt and covert
• Externalization: Empowerment, Engagement, Expression
• Claiming our data heritage
Forest Renewal BC
Landscape Dynamics

Harvesting
Succession
Fires

SELES
Lessons ...

• Observation is a skill
• Words are not sufficient
• **Hard work can lead to new insights**
  • This is our data!
• Mutual respect is both overt and covert
• Externalization: Empowerment, Engagement, Expression
• Claiming our data heritage
Information on Tables
Tabletop Territoriality

Personal Territories

Group Territory

Storage Territories

Group 2

pW

pNE
Item orientation as communication
Information analysis is atemporal
Lessons ...

• Observation is more than looking
• Words are not sufficient
• Hard work can lead to new insights
• **This is our data!**
  • Mutual respect is both overt and covert
  • Externalization: Empowerment, Engagement, Expression
• Claiming our data heritage
new elite
those who work with data ...
‘big data’
data society
digital feudalism
data barons

terms: David Karger, MIT
data serfs

terms: David Karger, MIT
Lessons …

• Observation is more than looking
• Words are not sufficient
• Hard work can lead to new insights
• This is our data!

• **Mutual respect is both overt and covert**
• Externalization: Empowerment, Engagement, Expression
• Claiming our data heritage
‘people’ words at CHI
user
participant
person
researcher
designer
<table>
<thead>
<tr>
<th>Role</th>
<th>Male</th>
<th>Female</th>
<th>Unknown</th>
<th>Non-Human</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>User</td>
<td>78</td>
<td></td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Person</td>
<td>89</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Participant</td>
<td>77</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Researcher</td>
<td>73</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Designer</td>
<td>68</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>User</td>
<td>54</td>
<td></td>
<td>15</td>
<td>17</td>
<td>19</td>
</tr>
<tr>
<td>Person</td>
<td>55</td>
<td></td>
<td>17</td>
<td>17</td>
<td>15</td>
</tr>
<tr>
<td>Participant</td>
<td>52</td>
<td></td>
<td>17</td>
<td>17</td>
<td>15</td>
</tr>
<tr>
<td>Researcher</td>
<td>58</td>
<td></td>
<td>17</td>
<td>17</td>
<td>15</td>
</tr>
<tr>
<td>Designer</td>
<td>58</td>
<td></td>
<td>17</td>
<td>17</td>
<td>15</td>
</tr>
</tbody>
</table>

The chart shows the breakdown of roles by gender and other categories.
Lessons ...

• Observation is more than looking
• Words are not sufficient
• Hard work can lead to new insights
• This is our data!
• Mutual respect is both overt and covert
• **Externalization:** Engagement, Empowerment, Expression
• We are all unique
• Claiming our data heritage
Vis on Whiteboards
Vis on Whiteboards
Vis on Whiteboards
John Brosz, Ricky Pusch, Miguel Nacenta, Christophe Hurter, Sheelagh Carpendale
Lessons ...

• Observation is more than looking
• Words are not sufficient
• Hard work can lead to new insights
• This is our data!
• Mutual respect is both overt and covert
• **Externalization: Engagement**, Empowerment, Expression
• Claiming our data heritage
Slicing the Aurora
Lessons ...

• Observation is more than looking
• Words are not sufficient
• Hard work can lead to new insights
• This is our data!
• Mutual respect is both overt and covert
• **Externalization: Engagement, Empowerment**, Expression
• We are all unique
• Claiming our data heritage
empowering people with data
... inspiration
Kindergarten
Frederich Froebel

Constructivism
Jean Piaget

Constructionism
Seymour Papert
constructive visualization
Samuel Huron, Yvonne Jensen, Sheelagh Carpendale
3 Tasks

A- CREATE  B- UPDATE  C- ANNOTATE
Bottom-up and Top-down Procedures

Bottom up 10/12
From data case to higher level of structures

Top down 2/12
From higher level of structures to data cases
Constructive Vis -> VizKit

1. Presenting
2. Authoring
3. Reading
4. Editing
5. Critiquing
6. Conclusion
Lessons …

- Observation is more than looking
- Words are not sufficient
- Hard work can lead to new insights
- This is our data!
- Mutual respect is both overt and covert
- **Externalization: Engagement, Empowerment, Expression**
- Claiming our data heritage
Hadamard’s Book - 100 famous mathematicians and physicists

- creative scientific thought is worked out with ‘visually’
- externalizations of still vaguely formed ideas
- images and diagrams initially described as ‘cloudy’
- not communicating to others,
- For expressing what is still partially formed in their minds.

**USE**

A template
- Easy
- Quick
- Scalable
- dynamic
- **NOT** EXPRESSIVE

**DRAW**

Free form
- Easy
- **NOT** so quick
- **NOT** scalable
- **NOT** dynamic
- EXPRESSIVE

**CODE**

Freedom
- Effort-learned skill
- **NOT** so quick
- Scalable
- Dynamic
- EXPRESSIVE

Bret Victor
Bret Victor’s sentence

“We begin our derivation by disregarding the effect of __________, and inquire into the condition ______________ associated with the interaction of ________ and ________. The theory ________ asserts that __________ must be equal to __________, as indicated by the equation __________________.”
data sketching
### Mean Appropriateness Ratings for 225 Behavior-Situation Combinations

<table>
<thead>
<tr>
<th>Situation</th>
<th>Run</th>
<th>Talk</th>
<th>Kiss</th>
<th>Write</th>
<th>Eat</th>
<th>Sleep</th>
<th>Mumble</th>
<th>Read</th>
<th>Fight</th>
<th>Belch</th>
<th>Argue</th>
<th>Jump</th>
<th>Cry</th>
<th>Laugh</th>
<th>Shout</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class</td>
<td>2.52</td>
<td>6.21</td>
<td>2.10</td>
<td>8.17</td>
<td>4.23</td>
<td>3.60</td>
<td>3.62</td>
<td>7.27</td>
<td>1.21</td>
<td>1.77</td>
<td>5.33</td>
<td>1.79</td>
<td>2.21</td>
<td>6.23</td>
<td>1.94</td>
</tr>
<tr>
<td>Date</td>
<td>5.00</td>
<td>8.56</td>
<td>8.73</td>
<td>3.62</td>
<td>7.79</td>
<td>3.77</td>
<td>3.12</td>
<td>2.88</td>
<td>3.58</td>
<td>2.23</td>
<td>4.50</td>
<td>4.42</td>
<td>3.04</td>
<td>8.00</td>
<td>3.79</td>
</tr>
<tr>
<td>Bus</td>
<td>1.44</td>
<td>8.08</td>
<td>4.27</td>
<td>4.87</td>
<td>5.48</td>
<td>7.04</td>
<td>5.17</td>
<td>7.17</td>
<td>1.52</td>
<td>2.15</td>
<td>4.17</td>
<td>3.12</td>
<td>3.08</td>
<td>7.10</td>
<td>3.00</td>
</tr>
<tr>
<td>Family dinner</td>
<td>2.56</td>
<td>8.52</td>
<td>4.92</td>
<td>2.58</td>
<td>8.44</td>
<td>2.29</td>
<td>2.54</td>
<td>3.96</td>
<td>1.67</td>
<td>2.50</td>
<td>3.25</td>
<td>2.29</td>
<td>3.21</td>
<td>7.13</td>
<td>1.96</td>
</tr>
<tr>
<td>Park</td>
<td>7.94</td>
<td>8.42</td>
<td>7.71</td>
<td>7.00</td>
<td>8.13</td>
<td>5.63</td>
<td>5.40</td>
<td>7.77</td>
<td>3.06</td>
<td>5.00</td>
<td>5.06</td>
<td>7.42</td>
<td>5.21</td>
<td>8.10</td>
<td>6.92</td>
</tr>
<tr>
<td>Church</td>
<td>1.38</td>
<td>3.29</td>
<td>2.38</td>
<td>2.85</td>
<td>1.38</td>
<td>1.77</td>
<td>3.52</td>
<td>3.58</td>
<td>0.62</td>
<td>1.42</td>
<td>1.92</td>
<td>1.71</td>
<td>3.13</td>
<td>2.60</td>
<td>1.33</td>
</tr>
<tr>
<td>Job interview</td>
<td>1.94</td>
<td>8.46</td>
<td>1.08</td>
<td>4.85</td>
<td>1.73</td>
<td>0.75</td>
<td>1.31</td>
<td>2.48</td>
<td>1.04</td>
<td>1.21</td>
<td>1.83</td>
<td>1.48</td>
<td>1.37</td>
<td>5.88</td>
<td>1.65</td>
</tr>
<tr>
<td>Sidewalk</td>
<td>5.58</td>
<td>8.19</td>
<td>4.75</td>
<td>3.38</td>
<td>4.83</td>
<td>1.46</td>
<td>4.96</td>
<td>4.81</td>
<td>1.46</td>
<td>2.81</td>
<td>4.08</td>
<td>3.54</td>
<td>3.71</td>
<td>7.40</td>
<td>4.88</td>
</tr>
<tr>
<td>Movies</td>
<td>2.46</td>
<td>4.98</td>
<td>6.21</td>
<td>2.73</td>
<td>7.48</td>
<td>4.08</td>
<td>4.13</td>
<td>1.73</td>
<td>1.37</td>
<td>2.58</td>
<td>1.71</td>
<td>2.31</td>
<td>7.15</td>
<td>7.94</td>
<td>2.42</td>
</tr>
<tr>
<td>Bar</td>
<td>1.96</td>
<td>8.25</td>
<td>5.17</td>
<td>5.38</td>
<td>7.67</td>
<td>2.90</td>
<td>6.21</td>
<td>4.71</td>
<td>1.90</td>
<td>5.04</td>
<td>4.31</td>
<td>3.75</td>
<td>3.44</td>
<td>8.23</td>
<td>4.13</td>
</tr>
<tr>
<td>Elevator</td>
<td>1.63</td>
<td>7.40</td>
<td>4.79</td>
<td>3.04</td>
<td>5.10</td>
<td>1.31</td>
<td>5.12</td>
<td>4.48</td>
<td>1.58</td>
<td>2.54</td>
<td>2.58</td>
<td>2.12</td>
<td>3.48</td>
<td>6.77</td>
<td>1.73</td>
</tr>
<tr>
<td>Restroom</td>
<td>2.83</td>
<td>7.25</td>
<td>2.81</td>
<td>3.46</td>
<td>2.35</td>
<td>2.83</td>
<td>5.04</td>
<td>4.75</td>
<td>1.77</td>
<td>5.12</td>
<td>3.48</td>
<td>3.65</td>
<td>4.79</td>
<td>5.90</td>
<td>3.52</td>
</tr>
<tr>
<td>Own room</td>
<td>6.15</td>
<td>8.58</td>
<td>8.52</td>
<td>8.29</td>
<td>7.94</td>
<td>8.85</td>
<td>7.67</td>
<td>8.58</td>
<td>4.25</td>
<td>6.81</td>
<td>7.52</td>
<td>6.73</td>
<td>8.00</td>
<td>8.17</td>
<td>6.44</td>
</tr>
<tr>
<td>Dorm lounge</td>
<td>4.40</td>
<td>7.88</td>
<td>6.54</td>
<td>7.73</td>
<td>7.19</td>
<td>6.08</td>
<td>5.50</td>
<td>8.56</td>
<td>2.40</td>
<td>4.00</td>
<td>4.88</td>
<td>4.58</td>
<td>3.88</td>
<td>7.75</td>
<td>3.60</td>
</tr>
<tr>
<td>Football game</td>
<td>4.12</td>
<td>8.08</td>
<td>5.08</td>
<td>4.56</td>
<td>8.04</td>
<td>2.98</td>
<td>5.23</td>
<td>3.69</td>
<td>2.04</td>
<td>3.85</td>
<td>4.98</td>
<td>7.12</td>
<td>4.31</td>
<td>7.90</td>
<td>7.94</td>
</tr>
</tbody>
</table>

Note:
0 = "The behavior is extremely inappropriate in this situation."
9 = "The behavior is extremely appropriate in this situation."
IN OWN ROOM.

WELCOME TO MY ROOM.

SLEEP

8.85

CRY

8.00

KISS xo xo

8.52

xo xo
## Sketching Data

<table>
<thead>
<tr>
<th>A. Individual data points</th>
<th>B. Low level summary</th>
<th>C. Low-level comparison</th>
<th>D. Comparisons and Trends in the dataset</th>
<th>E. Including Extrinsic Information</th>
<th>F. Statements with Analytic Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refer to specific individual data values</td>
<td>Summarize individual rows or columns.</td>
<td>Compare two rows or columns.</td>
<td>Compare 3 or more rows or columns; note trends.</td>
<td>Classify as named type.</td>
<td>Fledgling hypothesis.</td>
</tr>
<tr>
<td>Refer to approximate individual data values.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>Conjecture about reasons for values.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>Make global comparisons.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Jagoda Walny, Samuel Huron, Sheelagh Carpendale
<table>
<thead>
<tr>
<th>Data Report Spectrum</th>
<th>Representation Continuum</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>A B C D1 D2 D3 D4 E1 E2 E3 F</td>
<td>Max</td>
<td>P A X</td>
</tr>
<tr>
<td>P P P P P P P</td>
<td>P</td>
<td>P A X</td>
</tr>
<tr>
<td>V B V C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V V V V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G G G G</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R R R R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D D B L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L L L L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B B B B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B B B B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C B B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D D D D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D D D D</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Aura Pon, J. Ichino, E. Sharlin, D. Eagle
Three performances of *Concordia discors* took place with two different ensembles. The premiere took place at Kino Šiška, Ljubljana, Slovenia, at the International Computer Music Conference on Sept 13, 2012, by Vox Tactum Ensemble.
currently ....
engagement and expression
empowerment and expression
Comparing Bar Chart Authoring with Microsoft Excel and Tangible Tiles

Visualization Stamps (with potatoes)

Stamps: 71 created, 65 used for authoring visualizations; Visualizations: 21 created
Lessons …

• Observation is a skill
• Words are not sufficient
• Hard work can lead to new insights
• This is our data!
• Mutual respect is both overt and covert
• Externalization: Engagement, Empowerment, Expression
• Claiming our data heritage
From Ancient Times ...

- earliest known data recording
- Dordogne, France c. 38,000 BC
- 30,000 years before written language
- thought to be a woman tracking her menses
personal data visualization
Alice Thudt, Uta Hinrichs, Samuel Huron, Sheelagh Carpendale
Constructive Personal Visualization
Life In Clay
Alice Thudt (2017)
lets not get dis-inherited!!!!
Lessons ...

• Observation is a skill
• Words are not sufficient
• Hard work can lead to new insights
• This is our data!
• Mutual respect is both overt and covert
• Externalization: Engagement, Empowerment, Expression
• Claiming our data heritage
Thank You for listening
Data Vis for Empowerment and Inclusion