A Usability Study of a Social Media Prototype for Building Energy Feedback and Operations

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Background and motivation

California Energy Commission PIER project: “Advanced Integrated Systems Technology Development”
- Specific task was to study building performance feedback systems
- Previous phase looked and energy visualization preferences, needs and practices (ACEEE 2010 paper)

Energy behavior in commercial buildings
- Non-technical energy solutions in the workplace not sufficiently explored nor leveraged in policy (Moezzi and Janda 2014)
- Behavioral aspects undervalued in commercial properties (ibid)
- Little research on design aspects of energy display methods (Froehlich et al. 2012)

How can we leverage the power of social media for energy engagement?
**Project overview**

**Objective**
Evaluate opportunities for using a social media application for:
- Encouraging energy-saving behavior in commercial buildings
- Improving communication between operators and occupants

**Research method**
- Develop high-fidelity prototype
- Test with subjects representing typical office occupants (this paper)
- Test with building professionals (see the full report)
Lab testing at UC Berkeley’s XLab

Conducted at UC Berkeley’s Experimental Social Science Laboratory (XLab)

Test procedure

1. Pre-demo background survey
2. Researchers briefly explain application features
3. Subjects review site and complete paper survey
4. Post-demo survey

Conducting test at XLab

Findings to be presented:

1. Personalized energy information (granularity)
2. Energy metric visualization (cost, kWh, etc.)
3. Normative energy information (compare to average user, or individuals)
4. Interest in viewing and sharing personal energy information
5. Using a social media platform for reporting problems, giving and receiving feedback
Options for viewing energy information

- **Granularity:** Three levels of energy information, increasing in granularity from whole building, to floor level, to individual office or workstation
- **Metrics:** Four metrics for individual energy information: cost, power, amount (kWh), and “light bulb equivalent”

Viewing energy information: Granularity

- Clear stated preference for more personalized energy info, at the level of individual workstation or office (65% ranked as most useful)
- Whole building level information ranked last

Please rank these energy charts in terms of their usefulness, from 1 most useful, to 3 least useful.

- **Most useful:**
  - 65% My Energy Charts
  - 29% Group Energy Charts
  - 6% Building Energy Charts

- **Second most:**
  - 28% My Energy Charts
  - 50% Group Energy Charts
  - 23% Building Energy Charts

- **Least useful:**
  - 8% My Energy Charts
  - 21% Group Energy Charts
  - 71% Building Energy Charts
Viewing energy information: Energy metrics

- Strong stated preference for energy visualization by cost (69% ranked as most useful)
- Least interest in familiar units (light bulbs)

Please rank these energy charts in terms of their usefulness, from 1 most useful, to 4 least useful.

<table>
<thead>
<tr>
<th>Most useful</th>
<th>Second</th>
<th>Third</th>
<th>Least useful</th>
</tr>
</thead>
<tbody>
<tr>
<td>69%</td>
<td>31%</td>
<td>35%</td>
<td>19%</td>
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<tr>
<td>16%</td>
<td>32%</td>
<td>37%</td>
<td>60%</td>
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<td>11%</td>
<td>17%</td>
<td>20%</td>
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<td>4%</td>
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</table>

Viewing energy information: Comments

I like that you can monitor your own energy use and so you know how effective you are being in your efforts at using less energy.

...most people (unless they are familiar with the watt and joules or technical terms like that) will not be concerned about pages like "watts used." I think people will be more concerned about the costs of energy and not the amount of energy spent.
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Options for normalizing energy use

“My Energy” showing cost, no comparison

Three options, shown as weekly bar chart
- No comparison
- Compare to average user
- Compare to selected individuals

Comparison with selected individual

Normalizing energy use: Comparison type

- Strong stated preference for comparison to average user
  (79% ranked as first choice)

Please rank these energy charts in terms of their usefulness, from 1 most useful, to 3 least useful.

<table>
<thead>
<tr>
<th>Most useful</th>
<th>Second most</th>
<th>Least useful</th>
</tr>
</thead>
<tbody>
<tr>
<td>79%</td>
<td>17%</td>
<td>3%</td>
</tr>
<tr>
<td>13%</td>
<td>39%</td>
<td>48%</td>
</tr>
<tr>
<td>7%</td>
<td>44%</td>
<td>49%</td>
</tr>
</tbody>
</table>

Compare to Average  Compare to Individuals  No Comparison
Social media features: Sharing energy charts

- 66% likely to share
- 20% Strongly agree
- 46% Agree
- 27% Not sure
- 7% Disagree
- 1% Would not share charts

- 72% think sharing would help save
- 30% Strongly agree
- 42% Agree
- 20% Not sure
- 7% Disagree
- 1% Would not share charts

- 79% want to see charts of others
- 28% Strongly agree
- 51% Agree
- 14% Not sure
- 6% Disagree
- 2% Would not share charts

Normalizing energy use and social aspects: Comments

I liked the comparisons between individual energy use. It made it competitive and like a game, which is a good thing when it comes to energy conservation (a typically dull conversation topic).

I also enjoy that users would be able to set goals and have other people join those goals too. It really creates an environment of peer support.

I think a person versus person feature...could negatively and unfairly single some people out that may need to use more energy for their job than their co-workers.
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Occupant-operator communications: Billboard

- Occupants can post problems, questions and tips
- Operators (and other occupants) can respond to postings
- Subjects asked about likelihood of use, usefulness, and level of interest

![Billboard prototype](image)

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Billboard key findings

- People indicated they would use this to report problems (96%)
- More likely to do so than by phone or email (77%)
- Less interest in sharing energy tips
- Overall 95% rated billboard feature as "very useful" or "useful"

<table>
<thead>
<tr>
<th></th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Not sure</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likely to use this if I had a problem to report</td>
<td>64%</td>
<td>32%</td>
<td>2%</td>
<td>2%</td>
<td></td>
</tr>
<tr>
<td>More likely to report a problem (than phone or email)</td>
<td>47%</td>
<td>30%</td>
<td>16%</td>
<td>7%</td>
<td></td>
</tr>
<tr>
<td>Likely to use this if I had a question</td>
<td>34%</td>
<td>45%</td>
<td>12%</td>
<td>9%</td>
<td></td>
</tr>
<tr>
<td>Likely to share an energy tip with other people</td>
<td>22%</td>
<td>36%</td>
<td>25%</td>
<td>15%</td>
<td>2%</td>
</tr>
</tbody>
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**Post-demo survey: Awareness and incentive**

- **My experience seeing this prototype has made me more aware of energy use in an office environment.**
  - Strongly agree: 12%
  - Agree: 58%
  - No opinion: 20%
  - Disagree: 9%

- **Having such application in my workplace would create an incentive for me to save energy.**
  - Strongly agree: 32%
  - Agree: 57%
  - No opinion: 6%
  - Disagree: 6%

**Insightful comments (in full report)**

**What features do you specifically like?** (126 comments)

- It's a social networking site with a layout and interface similar to Facebook, which I already use and am familiar with...
- I also enjoy friendly competition, and I would definitely be a cheerleader for our individual unit, and set up a competition with other units...

**What features do you specifically dislike?** (122 comments)

- Seeing all problems reported and by whom [are] not really relevant to my day...
- I'd tell Peter Manning to quit whining and put on a sweater!
- While I do think groups are not a bad idea, I do not think employees would go out of their way to try to save money to a well-off company...

**Please list additional features that would be helpful.** (98 comments)

- Connect with local weather notifications such as 'Spare the Air Day.'
Questions?

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Prototype online at: www.cbe.berkeley.edu/prototype

Reports and related papers: www.cbe.berkeley.edu/research/visualizing-info.htm