

# THE DESIGN OF *IMPRINT*: “WALK THE WALK” AND OTHER LESSONS

Zachary Pousman, Hafez Rouzati, Katie Collins, John Stasko

## ***Biography***

Zachary Pousman is a PhD student in Human-Centered Computing at Georgia Tech. He works in the Information Interfaces lab, headed by John Stasko. Zach's research centers around casual information visualization, infovis systems for everyday people dealing with the volumes of information that they generate and encounter. Zach has a Masters of Science in HCI from Georgia Tech and a B.A. in Philosophy from the University of Chicago.

## ***Abstract***

*We introduce Imprint, a casual information visualization system that showcases data extracted from a printer queue. The system filters and aggregates data including layout information, text, and images, and displays interactive visualizations on a large touch-screen display mounted above the physical printers that serve a small community. Imprint's visualizations depict environmental issues, such as energy consumption and paper consumption of the printers, as well as social information, such as popular concepts from the printed matter. Imprint is intended to spark reflection and conversation, and to bring data into discussions about paper usage, “waste,” and extrapolation. The goal is not to explicitly reduce paper, energy, or toner usage, but instead to open some of the very questions that might, for example, cleanly delineate what counts as waste when it comes to the printers as they are being used by the community. We note an emerging list of design strategies that have helped us to explore these issues. The first we term “eating the dog food,” or walking the walk—when a visualization brings up environmental impact data it must also disclose how much environmental impact the system itself produces as it operates. Others may follow, including the use of defamiliarization, and the use of social particulars in visualizations.*

## **1. Introduction**

The modern world is full of traces, ways in which human activity, either individual or aggregate, leaves behind some residue or trace. These traces are often invisible, untracked and unexamined. But like Bowker [2], Star [9], and others who research how infrastructure is understood and made visible, we seek to make these often invisible traces visible for the community. In doing so, we hope to draw a community's attention to the ways that infrastructure shapes its understanding of the world and of itself, and to draw the community into reflection, contemplation, and conversation.

*Imprint* is a system that monitors a printer or group of printers and creates simple interactive visualizations of the datastream that passes to the printer(s). *Imprint* shows casual information visualizations [7] on a large touch screen above the printers that it monitors. *Imprint* visualizations depict either social information, information about which members of the community are printing, and what concepts are popular, in addition to environmental information, information about how much paper, toner, and energy are being used as individuals print their documents.

Our design goals with the system are twofold. First, we seek to create a conversation piece and to foster novel reflections on the datastream of printer traffic. We are not attempting to modify the behavior of members of the community; we do not want to build a system that bullies, badgers, cajoles or shames community members into changing their behaviors (i.e., into printing fewer pages). This kind of intervention, even if it were achievable, might not cause long-lasting behavior change, but instead might cause users to “route around” the *Imprint* monitoring system by, for example, printing more at home. This is exactly why we designed *imprint* to be intentionally vague in its presentations (see figures below). Our second design goal is make *Imprint* provocative enough to elicit suggestions and comments from community members for new visual depictions and visualizations. Our hope is to design the system to be a framework through which community members can ask new and better questions about this data set.

## 2. Related Work

We take inspiration from Gaver *et al.*'s Home Health Horoscope [4] and the general approach to designing for ludic engagement. Ludic engagement is a design strategy for engaging the playful parts of human life, as opposed to targeting the task-centric and analytically solvable parts of human life (which is the implicit focus of much technological intervention) [3]. From here we take inspiration not to “solve” wasted printer pages, and instead to engage a workgroup or community in playful reflection.

We note prior examples of systems that display environmental impacts and traces to occupants of work spaces. Holmes' *7000 oaks and counting* is an ambient display and casual infovis system that reads building automation data to determine a real time carbon footprint of a building [5]. Jeremijenko's *Stump* creates visual tree rings as coversheets instead of the usual coversheet metadata [6]. The coversheets could be stacked to form a stump made from wasted paper.

## 3. System Architecture and Interaction

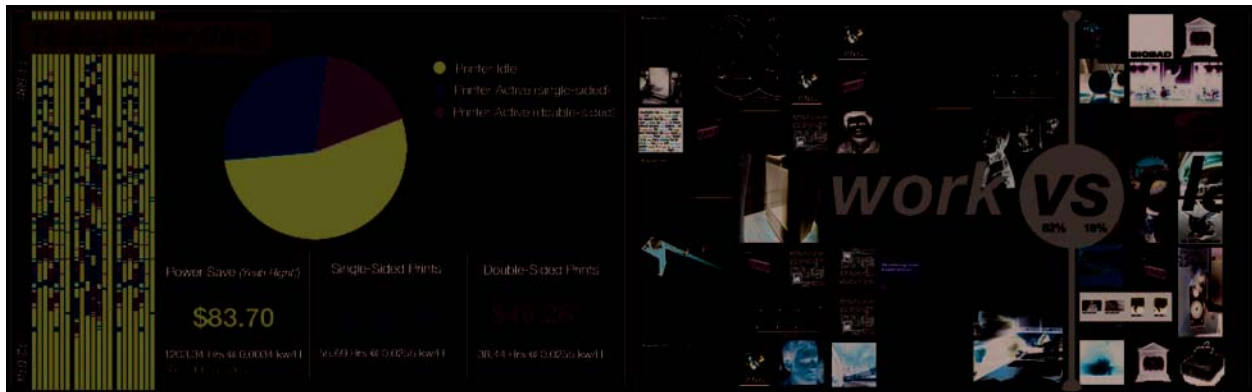
### 3.1 System Details

*Imprint* is built of three main components: a modified print server, a data store, and the visualization front end. *Imprint*'s backend is built on a Mac OS X server, which runs the Common Unix Printing System (CUPS), which has a modified backend to retain print job files. *Imprint* processes print job files and passes them to an Apple Core Data store. The Core Data store serves raw visualization data to a second computer which builds and displays the visualizations. Touch screen input is provided by a Smart Technologies overlay. We log interaction data from *Imprint* in a SQLite database.

### 3.2 User Interactions

We are still constructing the interactive capabilities of *Imprint*. *Imprint* displays simple visualizations in a slideshow presentation, each slide appearing for a period of 30 seconds, before moving to the next slide. In this way, we can show multiple perspectives on the printer data, with individual visualizations focusing on individual aspects of the data. Users may select large next and back buttons to move to different slides.

Users may also filter and query the dataset in each slide by activating a dynamic query slider. Dynamic query sliders allow users to create complicated queries of a dataset with ease, since they are an extension of the normal scroller/slider control found in many applications and systems [8]. The dynamic query slider allows users to modify the date range of the visualization.



**Figure 1a:** The *Timing is Everything* display. Stripmap on the left shows 3 weeks of data of printer activity (idle, one-sided documents, two-sided documents). The bar graph in the center shows aggregate data, with prices. **Figure 1b.** The *Work versus Play* display. An aggregate count of documents that included the word “work” are compared with those that include the word “play.” This ratio is represented by the gray vs bar. Random sub-images from images in work and play documents appear in their respective areas.

## 4. Design Strategies

### 4.1 Walking the Walk

*Imprint* brings up environmental concerns by creating visualizations of energy consumption, paper usage, and toner usage. As such, *Imprint* must be sensitive to these concerns and issues. And it should do so in a public manner, where users (and even passers by) can see how seriously the designers have internalized these concerns. *Imprint* includes a slide view that states how much energy the system itself has required to run. It totals the sum of the energy to power the display, the display computer, and the server. We also calculate the dollar value of this electricity and display that as well. In this way, we are not just talking the talk of environmental impact (and the traces left by our actions), but also walking the walk.

Walking the walk confers three main benefits: it lends credibility to the system and to the designers, it preempts potential questions, and it may be a spark for further reflection. Walking the walk lends credibility to the system because it looks at the same issue (energy consumption) from another perspective inside the same system. Putting our energy consumption out for all to see conveys that we are not embarrassed by it (it is just data), and that, in some sense we are not judging others (or at the very least not judging others more than we judge ourselves). Walking the walk can preempt user questions about the work, since it serves a function of being part of the “full disclosure” of the system. Lastly, the visualization of our own energy consumption can serve as a spark for reflection by users, especially since it can be compared to the core datastream. Users can use the amount of energy used by the system to compare against the total amount of energy used to power the printers themselves.

### 4.2 Defamiliarization

We are exploring with our visualizations some of the notions of defamiliarization [1]. Defamiliarization is a design strategy that appears in much of art, where the normal way of seeing or understanding some topic can be challenged by showing the object or topic from a novel perspective. Removing the printers from their normal everyday role and making the words printed each day the focus of visualizations helps to remove them from the everyday experience

(printing, reading) and to find new ways in which they make sense (as art objects, as part of a community of concepts).

#### **4.3 Sensitivity to social particulars**

Imprint is designed, in its current iteration, for a particular kind of community, and in fact a particular community. It is heavily customized for our own HCI community at Georgia Tech. Visualizations of academic communities have particular attributes that we seek to highlight with our visualizations. One salient one is that members often print the names of other members in the community (in references sections and elsewhere). Another particular we emphasize with our visualizations are implicit or explicit tensions that may be at play in the community. Some researchers at Georgia Tech are more interested in work tasks while others concern themselves with play (there is even a lab group called “Work2Play”). These identities and opposition words also become visible in the visualizations.

### **5. Concluding Thoughts**

We are really just beginning to explore deeply both the topic of environmentalism and the attendant ways that system design must change to accommodate this domain. Our first stake in the ground has been to “walk the walk” by creating a simple visualization that publicly announces the amount of energy used by our system. Our current work is a deployment on our own floor, a floor of an academic research building at Georgia Institute of Technology. Our plan is to measure the effects of the intervention, both in qualitative and quantitative ways, using a mixed methods approach. Our aim is to determine the degree to which members of our workgroup interact with the system, use it as fodder for conversation, and, perhaps, modify their behaviors. By the time of the conference, we may be able to report on preliminary results.

### **6. References**

1. Bell, G., Blythe, M., and Sengers, P. Making by making strange: Defamiliarization and the design of domestic technologies. *ACM Trans. Computer Human Interaction*. 2005 (ToCHI 2005). 149-173.
2. Bowker, G. 1994. Information Mythology: The World As/Of Information. In Bud-Frierman (ed), *Information Acumen: The Understanding and Use of Knowledge in Modern Business*, 231-247.
3. Gaver, W., Bowers, J., Boucher, A., Gellerson, H., Pennington, S., Schmidt, A., Steed, A., Villars, N., and Walker, B. The drift table: designing for ludic engagement. *Proceedings of CHI*, extended abstracts, 2004.
4. Gaver, W. and Sengers, P. Enhancing Ubiquitous Computing with User Interpretation: Field Testing the Home Health Horoscope. *Proceedings of CHI 2007*.
5. Holmes, T. G. Eco-visualization: combining art and technology to reduce energy consumption. 2007. 153-162.
6. Jeremijenko, N. Stump. 1999. Shown at: <http://onetrees.org/stump/index.html>
7. Pousman, Z., Stasko, J., and Mateas, M. Casual Information Visualization: Depictions of Data in Everyday Life. *Proceedings of IEEE Conference on Information Visualization (Infovis 2007)*.
8. Schneiderman, B. Dynamic Queries for Visual Information Seeking. *IEEE Software*. 1994. 70-77.
9. Star, S. L. The Ethnography of Infrastructure. *American Behavioral Scientist*. 1999. 377-391.