How Sustainable We Ourselves Are

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ABSTRACT
This paper describes the results of an on-line survey which received 169 responses from the CHI community. The survey explored the CHI community's attitudes and behaviors towards environmental sustainability as it relates to technology. Although the respondents were likely a self-selecting group, the results are of interest to our community as a kind of pulse taking for the most concerned among us. The majority of the participants reported great concern regarding the issue of environmental sustainability. In addition, the majority of participants support and engage in sustainable practices in relation to technology in their personal lives. Nonetheless, the implementation of sustainable practices into the work of an HCI researcher or practitioner appears to be a challenge. This paper motivates several questions, such as in which specific practices should an HCI practitioner engage to support sustainability and how can such practices be effectively integrated into her or his work?

Author Keywords
Sustainability, Sustainable Interaction Design, Design, HCI and design, Research methodology, Design methodology.

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
Sustainability has emerged as a key area of interest within the CHI community, as evidenced in [2,3,4,5,6,8], for example. Such work indicates a community which has begun to acknowledge that "sustainability can and should be a central focus of the field of human computer interaction" [1,4].

Although efforts within HCI have increasingly centered on sustainability, little is known about the attitudes and behaviors of HCI researchers and practitioners with regard to sustainability. In keeping with current sustainability related work in HCI, we focus primarily on environmental sustainability, rather than other socially motivated issues such as public health and social justice.

Our survey results indicate the following questions are open for our community to solve: What are the attitudes and behaviors of the broader HCI community with respect to sustainability, both personally and professionally? What barriers stand in the way of HCI researchers and practitioners in further adopting sustainable practices and values into their professional lives?

In what follows, we present (i) statistical results from an on-line survey of 169 members of the CHI community, (ii) key findings regarding this group's attitudes and behaviors with respect to sustainability, and (iii) implications for future research and actions based on these findings.

RESEARCH METHOD
An online survey, which included 24 questions, was made available during March and April of 2008 (IRB #08-12859) as part of the Sustainable CHI 2008 initiative. A link to the survey was posted on the CHI 2008 website, specifically on the Sustainable CHI webpage. Requests for participation were also sent to various email lists that are concerned with HCI and/or design. The questions proposed in the survey attempted to determine (i) the participant's general attitude towards environmental sustainability, (ii) whether or not the participant engages in sustainable practices in her or his personal life in relation to technology, and (iii) whether or not the participant incorporates sustainability into her or his professional work as an HCI researcher or practitioner.

The survey was completed by 169 respondents from 17 different countries. The majority of participants indicated that they reside in North America or the European Union. Of the 169 participants, 78 males and 74 females specified their gender in the survey. Of the participants who responded to the question about occupation (N=147), 35% were students, 26% were faculty members, 12% were university staff, and 27% were industry professionals.

The survey results were gathered and further data analysis using cross-tabulation in SPSS was used to reveal significant trends. The correlations between variables were

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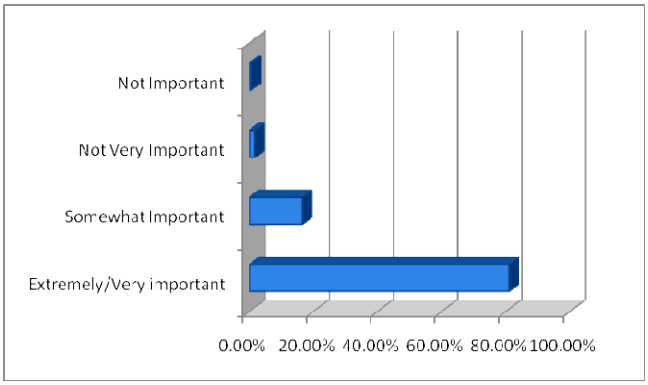

Figure 1. Responses to question: "Compared to other concerns, how important is the issue of environmental sustainability to you?"

calculated using Pearson's Chi Square and Spearman's Rho. Pearson's Chi Square is an appropriate measure for determining if a relationship exists between two categorical variables. Spearman's Rho is an appropriate measure for crossing ordinal level variables. A significant relationship between two variables was acknowledged if the level of significance (p) was less than 0.05 for both the Pearson's Chi Square and Spearman's Rho calculations.

Due to the small sample size, the value of in-depth statistical analysis was limited.

SURVEY RESULTS

Statistical comparisons, using Pearson's Chi Square and Spearman's Rho, were made between the responses of students and non-students, US citizens and non-US citizens, and academics (students, faculty, staff) compared to industry professionals (engineer, designer, marketing specialist, manager/administrator, usability specialist). The comparisons revealed that most of the participants answered in a consistent manner. When comparing the responses of students with non-students, only 2% of the responses revealed significant difference. When comparing the responses of US citizens with citizens of other countries only 3% of the comparisons indicated a significant difference. The comparison of responses of academics and industry professionals revealed that 8% of the comparisons

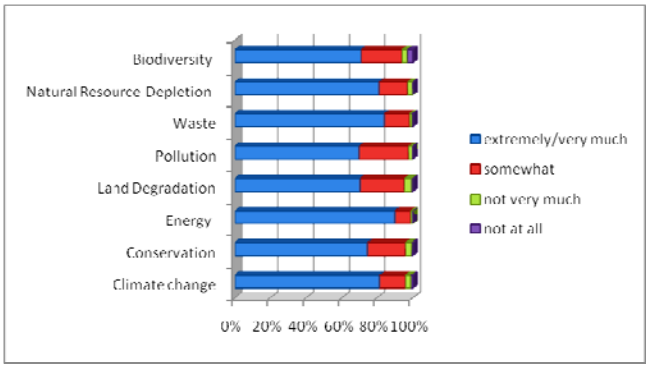

Figure 2. Responses to the question "How concerned are you about the following environmental issues?".

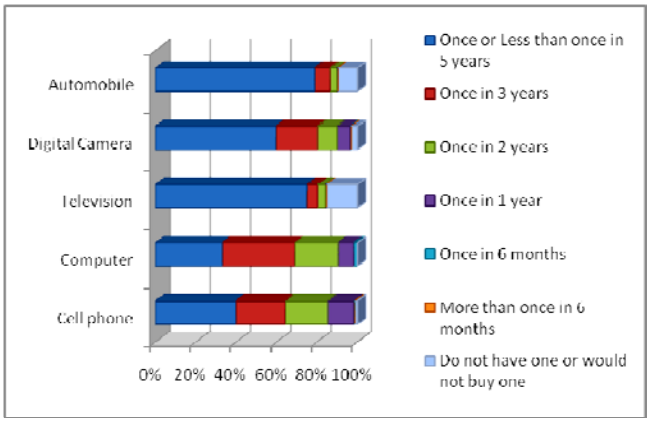

Figure 3. Responses to the question "If money were not an object how often would you prefer to replace your devices?".

indicated a significant difference. Based on the uniformity in responses, we can conclude that the participants, regardless of nationality or occupation, share the same general perspective regarding the issue of sustainability.

Some additional compelling findings are presented below, organized according to sustainable attitudes and behaviors in regard to technology.

Disposition towards Environmental Sustainability

Overall, the participants expressed great concern regarding the issue of environmental sustainability. In the survey, 82% of participants reported that sustainability was "extremely important" or "very important" (see Figure 1). The majority of participants stated that they were "extremely" or "very much" concerned about specific environmental issues (see Figure 2).

The responses of the participants indicated that they desire to engage in sustainable practices in their personal lives. For example, when asked *If money were not an object how often would you prefer to replace* with respect to each of the following objects: *automobile, cell phone, computer, digital camera,* and *television*, a large percentage of

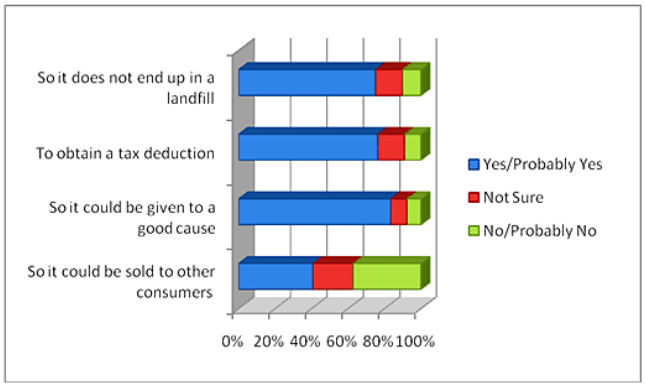

Figure 4. Responses to the question "Would you be willing to pay a small amount towards the cost of remanufacturing your old technology for the following reasons?".

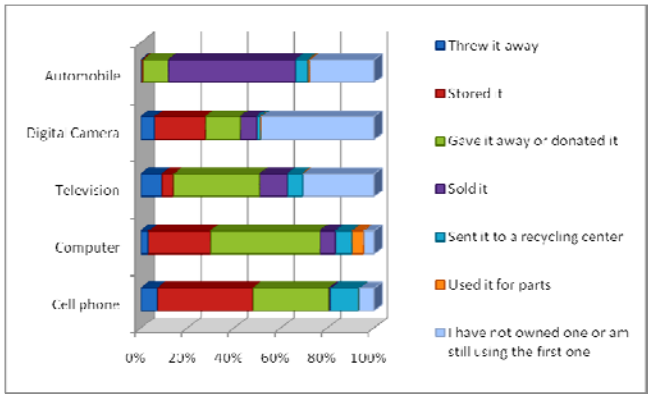

Figure 5. Responses to the question "Indicate what you did with each of the following items when you stopped using it?"

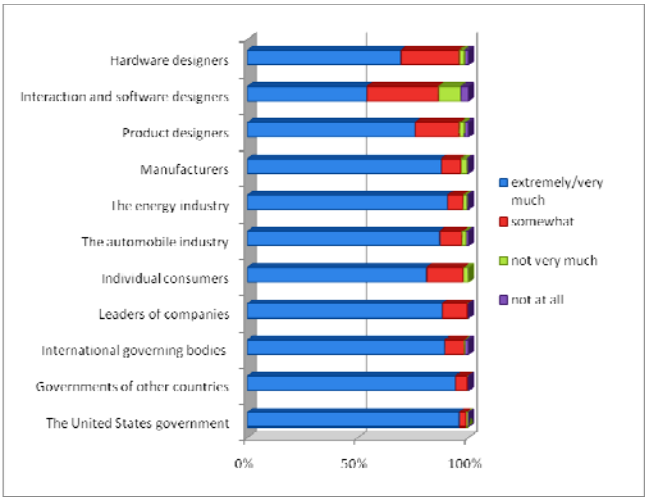

Figure 6. Responses to the question "How accountable should each of the following groups be for environmental issues?"

participants reported that they do not wish to frequently replace any of the items (see Figure 3). Of these items, the tendency was to want to replace computers most frequently.

The responses of the participants show that they are willing to embrace sustainability initiatives from both government and industry. According to the survey results, at least 70% of participants answered "yes" or "probably yes" to the following questions: *"If a computer company offers to take back your old computer and remanufacture it for reuse, but with no financial incentive to you, would you be more likely to buy a computer from that company?"; "Would you be willing to pay a small amount toward the cost of remanufacturing your old technology so it could be given to a good cause (the elderly, children, needy organizations)?"; "Would you be willing to pay a small amount toward the cost of remanufacturing your old technology to obtain a tax deduction?"; "Would you be willing to pay a small amount toward the cost of remanufacturing your old technology so it does not end up in a landfill?"* (see Figure 4).

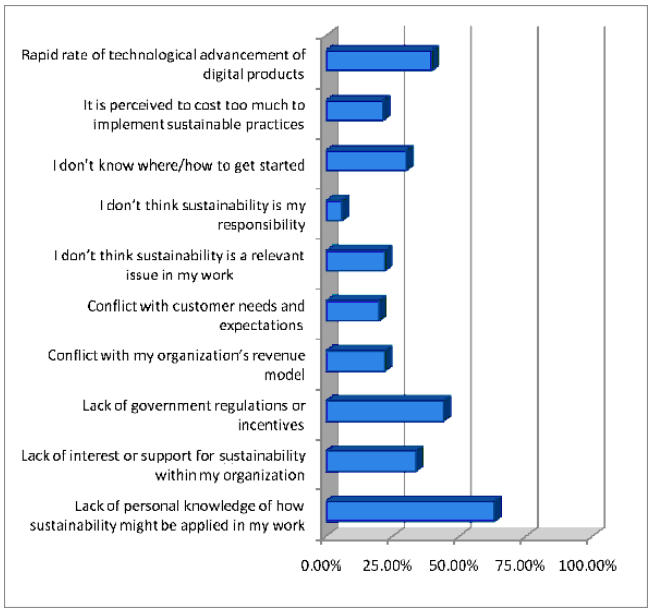

Figure 7. Responses to the question "Which of the following are barriers to your consideration of environmental sustainability in your work?"

Sustainable Practices in Personal Life

Participants reported that they engage in the sustainable practice of increasing the service life of technology when possible. They claim that they do not simply discard unwanted technology, typically. In regard to disposing of unwanted technology, the survey data indicated that each individual participant most likely *"sent it to a recycling center", "gave it away or donated it", "used it for parts", "sold it", "stored it", "have not owned one or is still using the first one"* (see Figure 5).

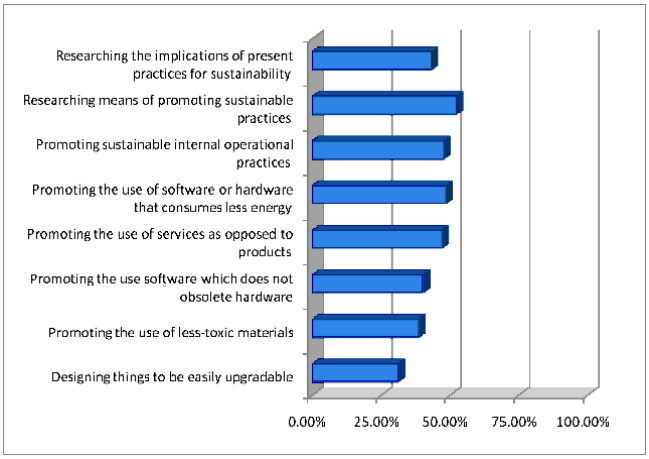

Figure 8. Responses to the question "What are the positive steps that you are taking, or plan to take in the near term, in order to incorporate concerns of environmental sustainability in your work?"

Participants are motivated to purchase "green" products in their personal life. 76% of participants stated that they have bought an item because it is explicitly labeled "green".

KEY FINDINGS

Our analysis of the data indicates that the majority of the participants reported great concern regarding the issue of environmental sustainability. In addition, the majority of participants support and engage in sustainable practices in relation to technology in their personal lives. Nonetheless, the participants indicated that they do not know how to implement sustainable practices in their professional work.

From the open-ended response comments, the participants appear to feel at a loss with respect to implementation of sustainability practices. The feeling of disempowerment is illustrated in the following statements: "*Unsustainability is embedded into our culture. It's massive to try to change that.*"; "*Clients don't hire me with sustainability in mind and expect a different kind of deliverable.*"; "*I work in an old-fashioned industry. They will not change to greener practices unless forced.*".

Participants held interaction designers and software designers as being the least responsible for sustainable practices among the response categories we offered. The data reveals that the percentage of people who hold interaction/software designers as "extremely or very much" accountable is well below the percentages in other categories (i.e. governments, industries) (see Figure 6).

The participants report that they lack personal knowledge of how the concepts of environmental sustainability can be applied to their work (see Figure 7). One participant stated, "*I don't know the current policy; there probably is not one.*".

We asked the participants to indicate which of a number of steps they are taking or would be willing to take to promote sustainability in their practice, and the results are tabulated in Figure 8. As one participant stated, "*It's very hard to know what are REAL gains for sustainability.*".

CONCLUSION

The survey was conducted as a Sustainable CHI 2008 committee initiative. The results of the survey indicate that the participants care a great deal about the issue of sustainability. We acknowledge that the participants volunteered to complete the survey and therefore may not be fully representative of the general CHI community.

The survey results reveal that the participants do not know what specific sustainability practices an HCI researcher or practitioner should incorporate into her or his work. In order to determine which specific sustainable practices are appropriate for the field of HCI, the CHI community should conduct research with members from different fields that implicated in interaction design, such as environmental science, engineering, and industrial design. HCI researchers must then determine how these sustainability guidelines can be incorporated into specific HCI research and design methodologies.

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