Building Dashboard: Using Real-Time Web-Based Utility Usage Feedback to promote Energy Conservation and Education in Residential Halls

Proposal to the MU Information Technology Committee's Interdisciplinary Innovations Fund
June 13, 2008

Purpose: To utilize real-time, high-resolution feedback of electricity consumption in residential halls via web-based Building Dashboard technology in order to educate students about energy usage and energy conservation issues. Building Dashboard technology will function year-round in tracking, analyzing, and displaying utility usage statistics on a dedicated website in real-time. The project will culminate in a month-long energy conservation competition between residential halls on campus, using Building Dashboard technology to track and compare usage statistics.

Project Leaders and Supporters:

Ben Datema, former Sustain Mizzou President; Primary Grant Author. Student in Interdisciplinary Studies with emphasis in Biology, Business, and Environmental Science

Paul Coleman, Managing Engineer—Energy Controls and Chilled Water (Campus Facilities--Energy Management)

Frankie Minor, Director of Residential Life

Jan Weaver, Director of Environmental Studies

Pat Margherio, Sustain Mizzou President. Student in Computer Science

Goals and Objectives

This project intends to

1. Accomplish 15% or greater reduction in energy usage (with accompanying cost savings) by residents of four residential halls on campus compared to a baseline calculated from historical usage statistics.
2. Integrate innovative technology into everyday life in residential halls
3. Serve as experiential education regarding energy usage and energy conservation for involved students, giving them opportunities to learn about a pressing real-world issue outside of the classroom.
4. Bring together multiple campus constituencies in a synergistic, technology-based, interdisciplinary effort.
5. Bring MU to the forefront of sustainability efforts regarding energy usage, and make MU a source of information for possible extension efforts to businesses and other universities who express interest in this type of effort across the state, region, country, and world.

Project Description

Energy usage is a growing issue in modern society, and energy conservation is becoming increasingly important. While Energy Management and other campus departments have done an excellent job of investing in more efficient equipment, little has been done to educate and influence the behavior of end-users. This is particularly true of the student population on campus. This project seeks to address this problem in a fun, creative, innovative, and technologically-savvy way using a technology called Building Dashboard.

Building Dashboard is a web-based application that provides high resolution displays of statistical information regarding resource usage (in this case, electricity consumption). Monitors that track and report energy usage in real time are placed at the utility source of each participating building. These monitors constantly collect data on utility usage within each building, which is then sent to a computer to be interpreted. The final processed information is then sent to an off-site server for storage. This information is displayed in a user-friendly format on a website in the form of meters and graphs that change to illustrate usage in real time. Options are included that display electricity usage over various time periods (today, this week, this month, etc.) and in various unit equivalencies (dollars, euros, carbon dioxide emissions, etc). The competition module is particularly notable for the purposes of this grant, as it provides a competition timeline and constantly updated data regarding present energy usage, percentage reduction over an established usage baseline, rank compared to other competition participants, and other information, all on one user-friendly screen.

The MUITC grant money will be used to pay for the necessary infrastructure to establish and utilize Dashboard technology on campus for one full year (with potential to continue using dashboard if project success warrants). Additional funding will be provided by Residential Life to cover the remaining cost of Building Dashboard implementation, as well as to fund student projects focused on improving the environmental sustainability of residential halls. Energy Management will provide technical support for the project throughout the grant period. The student environmental group Sustain Mizzou will provide an in kind donation of 100 volunteer hours throughout the course of the project for marketing and other project support efforts. There is potential to garner support from multiple other groups on campus, although time restrictions during the proposal submission period has prevented this thus far. Planning and solicitations of support will be ongoing throughout the entire grant cycle, being focused especially in the early planning stage during Summer 2008 (refer to Management Plan below).

Academic units, student groups, and campus departments not named in this proposal will not be restricted from participation in the project, and outreach is ongoing to build the project coalition

Building Dashboard will be installed as soon as possible to begin tracking energy consumption, and a targeted marketing campaign will be initiated to promote the Dashboard website to students in participating buildings. This marketing campaign will include traditional methods such as ads in campus publications, as well as innovative methods such as flash mobs. The goal of this campaign will be to create a 'buzz' of interest around the dashboard website and to promote the overall effort. The campaign will work to progressively build excitement over the course of the semester, with efforts intensifying immediately before and during the competition period.

If funding is awarded, a guiding committee of all grant partners, including MUITC members and other interested parties, will be established to assist with advising and to guide implementation, to ensure that all project goals are met and exceeded, and to find solutions to any problems that may arise.

It is worth noting that the Building Dashboard system is built to be scalable. Once the core technology is established on campus, the system can be expanded in several different ways. Although this proposal focuses on electricity consumption, monitoring options also exist to track water usage, steam heat usage, natural gas consumption, and a variety of other resources. Additional display options are available as well. Future expansion requires relatively little additional cost, and would allow this project to grow enormously in the future, if demonstrated success warrants.

This project is exactly aligned with Educational Technology at Missouri's mission statement, and potential exists for ET@MO to play a key role in the project that this grant would support. An invitation would be extended for ET@MO to provide representation on the guiding committee and to provide input throughout the project. Additionally, the Division of Information Technology could provide valuable technical support and assistance with the Building Dashboard technology, and could also provide representation to the guiding committee to assist with the project from start to finish.

Management Plan

Personnel:

Ben Datema, former Sustain Mizzou President;
Primary project leader. Will initiate and manage project phases, Help gather student support, serve as primary contact person for project

Paul Coleman, Managing Engineer—Energy Controls and Chilled Water (Energy Management)
Technical advisor and Energy Management Liaison

Frankie Minor, Director of Residential Life
Technical Advisor and Residential Life Liaison

Jan Weaver, Director of Environmental Studies
Technical Advisor

Pat Margherio, Sustain Mizzou President
Student liaison; will help garner student support

Jim Kelley, MSA President
Technical Advisor. Will help garner support from students, faculty and staff

Project Schedule:

July 1st: Project Initiated

July 1st-August 22nd: Initial project planning stage. Support will be solicited from additional campus constituencies, the project's guiding committee will be formed, and the grant proposal will be re-evaluated by the guiding committee for improvement and alteration.

Options will be explored to establish which residential halls to include in the project based on specific details provided by Lucid Design Group, Energy Management, and Residential Life. Dashboard system implementation will be initiated, with hopeful completion of implementation before the first day of classes. If this deadline is found to be unrealistic, implementation will be completed as soon as possible during the Fall semester.

August 22nd-November 1: Secondary planning stage. Continue to re-evaluate and refine the project plan. Continue to build support from students, faculty, staff and other interested parties, and to publicize Dashboard website to students in preparation for competition period.

November 1-January 26th: Final planning stage. Finalize preparation for competition period and ensure Dashboard systems are implemented and fully functional.

January: First presentation to MU Information Technology Committee regarding project progress, status, and accomplishments

January 26th-February 23rd: Tentative Energy Conservation Competition Period. Intensive marketing will be utilized to create a 'buzz' about the competition and the website. Students will be encouraged to think of innovative energy conservation ideas and to apply to Residential Life for funding to implement these ideas.

February 23rd: Energy Conservation Competition winning building announced at end of competition. Winners will receive a reward that is yet to be determined.

February 23rd-April: Project wrap-up and assessment. Write final project wrap-up report

April/May: Final presentation to MU Information Technology Committee regarding project progress and results

Project Evaluation Criteria

The project success should be evaluated in an ongoing manner by the guiding committee to ensure that the project is on time, on budget, and meeting interim goals. Specific measures of success may include:

1. Average 15% or greater energy usage reduction in participating buildings during the energy conservation competition stage, with additional demonstrated usage reduction outside of the competition period.
2. Usage statistics: If possible, statistics will be kept on student usage of the Dashboard website throughout the project. This information will be analyzed to evaluate the effectiveness of the Dashboard website as a method of communication.
3. Cost-Benefit Financial Analysis: The final report will include an analysis of the cost of implementation of the Building Dashboard system compared to the monetary savings and educational value associated with this energy conservation program. This analysis will include an estimated payback period for the technology, as well as an analysis of the cost and benefits associated with continuing the project based on the project's demonstrated level of success.
4. Input will be received from all involved parties regarding their assessment of the project's degree of success. This will include feedback on the process and methodology, statement regarding whether or not the project should be continued, and suggestions for future iterations of the project. All feedback received will be forwarded to the MUITC for additional assessment based on the committee's perspective as the primary grant administrator.
5. The accomplishments of this project will be assessed in context of the university's strategic goals, including potential for extension efforts, student recruitment and retention effects, and the impact of the project as a tool for experiential education.

Project Budget

Expenses:

Dashboard System Infrastructure and Implementation (refer to the included product description manual for details on these system components):

Setup and Configuration (20 hours at $145/hr)	$2,900.00
1-year monitoring term of Building Dashboard Remote Information Service for 1 year (4 monitors at $195.00/year each)	$780.00
Building Dashboard Standard Framework	$11,500.00
Electricity Consumption Monitors (3 monitors at $2,500 each[1])	$7,500.00
Competition Module	$3,500.00
How it Works Module	$900.00

Subtotal: $27,080

Funding

MU Information Technology Committee Grant	$25,000.00
Residential Life Sustainability Fund Assistance ** Additional funding for student-initiated projects to improve residential hall sustainability will be provided by a fund from Residential Life totaling $10,000.00. This grant will solicit $2,080 from this fund, with the remaining money left available to be used for this grant or other efforts, dependent upon proposed funding usage.*	$2,080

Subtotal: $27,080

In-Kind Donations

Sustain Mizzou in-kind donation (100 hours of volunteer labor valued at $10.00/hour)	$1,000

Subtotal: $1,000

1:One building monitor is included with the Building Dashboard Standard Framework package, giving the project a total of 4 building monitors