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Office Building Occupants' Response to an Advanced Human-centered, Technology-driven Lighting System

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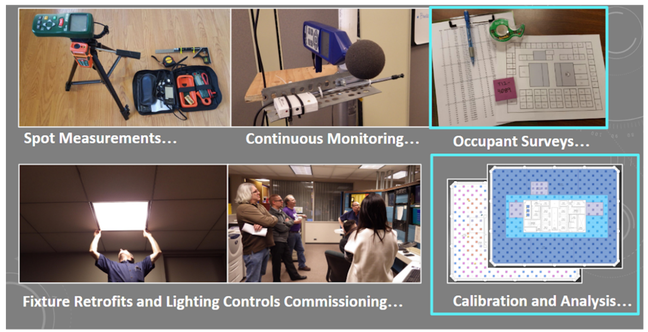
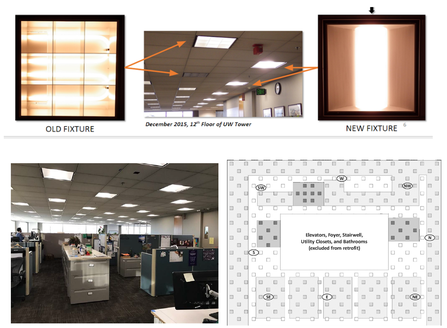
Background

The luminous environment affects how employees perceive their work setting but research on how the lighting commissioning process associates with psychosocial variables relevant to office settings is lacking. This case study was conducted as part of a broader project at the University of Washington to collect qualitative and quantitative data about change management process concerning a lighting retrofit to one floor of a 22-floor administrative building situated in Seattle, Washington, USA.





Lighting Design and Commissioning Process

New fixtures features LED bulb with 8 photometric sensors with daylight harvesting and occupancy detection capabilities. Sensors are equipped with wi-fi-enabled lighting controls that allowed for dynamic operation for individual or user-defined groups of fixtures.

Commissioning occurred over four weeks during working and non-working hours. Occupants provided feedback after the initial setting to reduce the overhead lighting levels, were given individual task lights, and sensitivity of motion detectors changed to avoid frequent shut off. Daylight harvesting was adjusted to reduce temperature gradient across all zones on the floor.

Objective

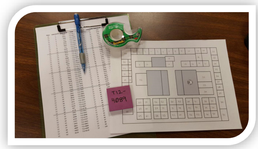
The present case study tests whether three psychosocial variables meaningfully associate with each other, and with office workers' impressions of a recently completed lighting commissioning process.

Specific hypothesis tested include:

H1. Satisfaction with the lighting commissioning process will significantly associate with perceived productivity.
H2. Satisfaction with the lighting commissioning process will significantly associate with perceived controllability.
H3. Satisfaction with the lighting commissioning process will significantly associate with affective organizational commitment.

H4. Perceived productivity will significantly associate with perceived controllability.
H5. Perceived productivity will significantly associate with affective organizational commitment.
H6. Perceived controllability will significantly associate with affective organizational commitment.

Methodology



- Participants were 38 employees working on one floor of the building (6 men, 13 women; 19 individuals chose not to report their gender)
- A questionnaire was administered approximately four months after the initiation of the lighting commissioning process.

Psychosocial Variables	Scale	Questions
Satisfaction with the lighting commissioning process	4 item - 5 point Likert scale 2 item – open ended	• Awareness of timing • Options to communicate lighting preferences • Handling of commissioning process
Perceived productivity	8 item – 5 point Likert scale 1 item-open ended	• Engagement • Efficiency • Motivation for positive atmosphere at work
Perceived controllability	5 item – 7 point Likert scale 1 item – nominal scale	• Self-assessed controllability level • Level of tolerance to changes • Frequency of requesting light level change
Affective organizational commitment	8 item – 7 point Likert scale	• Subscale of the standardized OCS concerning emotions

Results

- 3 of 6 hypothesis supported by correlation analysis
- Satisfaction with the commissioning process did not significantly correlate with the measured psychosocial variables
- Productivity significantly and positively associated with controllability and affective organizational commitment
- Controllability and affective organizational commitment both significantly correlated with the number of perceived productive work hours
- Occupants perceived issues with scheduling, communication, and expectation management were more important compared to lack of controllability

Next Steps

- Occupants' reaction to brightness- and color-tunable task lights installed at employee workstations
- Preliminary analysis shows agreement that light "blend" increased, so did their agreement with (1) overall lighting improvement, (2) productivity, (3) satisfaction, and (4) levels of fatigue improved

Acknowledgment

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