AN APPROACH TO CAPTURE DESIGN AND CONSTRUCTION LESSONS LEARNED FROM FACILITY MANAGERS

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Summary

- The problem
- Post-Occupancy Evaluation
- Research Design
- Data collection
- Results
- Conclusions
- Limitations and future work
What is the problem?

- Incorporating lessons learned from facility managers at the design stage is a rare practice.
- Designers do not fulfill – or do not request - their information needs.
- Making-do in the design stage.
- Waste goes undetected – not measured.
- Systemic problem in the industry.
Potential outcomes

Continuous Improvement
Prevent Mistakes
User Satisfaction
Operational Efficiency
Lessons Learned in the LPDS is an area to be explored

Ballard (2008)
POE focus on technical and functional performance for benchmarking

Technical: thermal; acoustics; visual; air quality; fire safety

Functional: space management; finishes; and human factors
Literature suggests moving from benchmarking to knowledge management
Knowledge Management requires a consistent approach

Acquisition of information

Parameterization of information

Information provided by facility managers

Problems in office buildings

Information storage

Knowledge sharing

Information update

Adapted from Lin and Tserng (2013)
Aim and objectives

**Aim:** To develop a web-based open-source tool that can be used by project teams in the design stage.

**Objectives:**
- Develop a database structure for lessons learned.
- Contextualise the use of information within design teams.
- Assess the impact of information use.
Research Design

• Qualitative approach
• Literature review and interview data
• Inductively deduce information parameters
• Propose a database structure
Data Collection

- Target population: facility managers of office buildings.
- Issues with data privacy.
- Ten interviews with a total of 20 hours of recordings were collected.
- Data was transcribed. The audio recordings were destroyed.
- Transcripts were analyzed and 93 issues emerged.
Results

DISTRIBUTION OF ISSUES PER SYSTEM

- Architecture: 36%
- Plumbing System: 20%
- Electrical System: 12%
- Lighting: 5%
- HVAC: 11%
- Fire System: 3%
- Accessibility: 3%
- Elevators: 7%
- Noise and Environmental Vibrations: 3%

ORIGIN OF PROBLEMS

- Construction: 17%
- Design: 83%
Most issues found had serious impact on end-users.

**Severity of Issues**
- Minor: 18%
- Moderate: 48%
- Serious: 34%

**Impact on Users**
- Minor: 24%
- Serious: 42%
- Moderate: 34%
Architecture, plumbing, electrical, and HVAC present the most serious problems.
# Examples of issues

<table>
<thead>
<tr>
<th>ISSUES</th>
<th>SYSTEM</th>
<th>PARAMETERS</th>
<th>Severity</th>
<th>Impact on users</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insufficient power supply</td>
<td>Architecture</td>
<td>X</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>Problems with vertical movement</td>
<td>Plumbing System</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electrical System</td>
<td>X</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>Single water tank</td>
<td>Emergency System</td>
<td></td>
<td>Mo</td>
<td>S</td>
</tr>
<tr>
<td>Lack of water meters per office</td>
<td>Accessibility</td>
<td></td>
<td>Mi</td>
<td>Mo</td>
</tr>
<tr>
<td>Pipe corrosion</td>
<td>Elevators</td>
<td>X</td>
<td>Mo</td>
<td>Mi</td>
</tr>
<tr>
<td>Vibrations caused by the chiller</td>
<td>Noise and Vibrations</td>
<td></td>
<td>Mo</td>
<td>Mo</td>
</tr>
<tr>
<td>Broken or obstructed foul pipes</td>
<td>Leaking water in concrete tanks</td>
<td>X</td>
<td>Mo</td>
<td>Mo</td>
</tr>
<tr>
<td>Leaking water in concrete tanks</td>
<td>Difficulty to clean sloped curtain wall</td>
<td>X</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>Difficulty to clean sloped curtain wall</td>
<td>Lack of hooks to install equipment to clean the curtain wall</td>
<td>X</td>
<td>Mi</td>
<td>Mi</td>
</tr>
</tbody>
</table>

S: Serious; Mo: Moderate; Mi: Minor
Categories of lessons learned were deduced inductively from data
Database structure
Conclusions

• Facility Managers confirmed that systematic and rigorous capture of indicative post-occupancy evaluation is not an industry practice.

• All buildings have issues in their operation due to problems in design and construction.

• 10 out of 93 issues were present in several projects.

• Architectural system and the plumbing system have more issues.

• Database structure would be the vehicle for systematic data collection within firms, and potentially between firms.
Future work

- Acquisition of information
- Parameterization of information
- Information storage
- Knowledge sharing
- Information update

Information provided by facility managers
Problems in office buildings

Adapted from Lin and Tserng (2013)
Limitations and future work

- Data was collected in office buildings.
- Sample size.
- Build a community committed to knowledge sharing across organizational borders.
- Develop a web-based platform: information retrieval, user feedback.
- Test the platform in live design and construction project.
- Assess the outcomes.
Thank you!

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