The Future of Lighting for Commercial Applications
The future of lighting for commercial applications

Doyle Trankel, PE, CLEP
Engineering Director
• >1,800 Stores in the United States
• 38 Distribution Centers
• Target.com
• 323,000 Team Members
FUTURE OF LIGHTING - LED

• LED Anywhere and everywhere
• LED Benefits:
  • Decrease Energy Usage
  • Decrease Maintenance
• Applications:
  • Interior Illumination
  • Exterior Signage
  • Exterior Parking Lots / Roadways
FUTURE OF LIGHTING - DECISIONS

• New Construction
• Any new construction – you should ask – why not LED?

• Existing Buildings - multiple options depending on:
• How quick ROI? - Energy Rates, Annual burn hours, etc.
• How you will maintain?
FUTURE OF LIGHTING – CONTROLS

• Controls = Accessories to LED

• Digital Lighting Controls:
  • Dimming
  • Occupancy Sensors
  • Integration with Building Controls
TAKE-AWAYS

• Test and Pilot
• Not all LED’s are equal, unknown results without testing

• Understand what you want or need

• You only will get one time to convert to LED, so review all options

• Be prepared to capture Rebates /Incentives
The ‘New Workplace’
Where Green and Productive Meet
2017
“I liked the motivational ones better.”
New Realities Impacting the Workplace

73% of Corporate real estate executives expect the workplace to enhance employee productivity

— Jones Lang LaSalle Study - 2016
New Realities Impacting the Workplace

A study showing improved productivity in an open office

The Open-Office Trap - The New Yorker
www.newyorker.com/business/currency/the-open-office-trap
Jan 7, 2014 - The open office was once considered a team from Hamburg, ... they were damaging to the workers’ attention spans, productivity, creative thinking, and satisfaction. In a 2005 study that looked at organizations ranging from a Midwest ... the number of employees who took sick leave increased space.

Open-plan offices make employees less productive ... - Quartz
qz.com/.../moving-to-open-plan-offices-makes-employees-less-productive ...
May 21, 2013 - Open-plan offices may make some kinds of collaboration easier, but are they ... A study in the Scandinavian Journal of Work, Environment and Health ... improvements yield between a 5% and 15% increase in productivity.

Open-plan offices DON'T boost productivity: Study rubbishes ...
www.dailymail.co.uk/.../open-plan-offices-DONT-boost-productivity ...
Aug 23, 2013 - This undated photo provided by the Kasag Family shows Peter ... Large open-plan offices do not improve staff communication, morale or ...

Open-Plan Offices Create Stress, Lower Productivity | TIME ...
Ideas time.com/2012/09/15/why-the-open-office-is-a-hotbed-of-stress/ ...
Aug 15, 2012 - Research shows that open-plan offices sap motivation and create "cognitive load" ... In a study published in the Journal of Applied Psychology, 40 female clerical workers were subjected to three ... Productivity can increase.

Offices For All Why Open-Office Layouts Are Bad For ...
www.fastcompany.com/.../fast-company-diased/ ...
Nov 4, 2013 - It boosts productivity. ... The open-office movement is like some gigantic experiment in willful delusion. ... Some studies show that employees in open-plan spaces, knowing that they may be overheard or interrupted, have ...

Open-Office Backlash: Seeking Productivity in a Noisy World ...
https://www.americanexpress.com/.../openforum/.../open-office-backlash ...
It's easy to see why open offices, with their high ceilings and open windows, remain about as many
Green and Productive Work Together

**Green**
- Energy / carbon (lighting, heating / cooling, plug load, server rooms)
- Water
- Resources (e.g., green procurement, reduce paper)
- Waste

**Productive**
- Layout (supports tasks / workflow and informal cohesive networks)
- Lighting
- Acoustics
- Visual comfort
- Thermal comfort; IAQ
- Employee amenities
- Health and Work-Life

- Space use efficiency
- Green team initiatives
- Commuting

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Green and Productive Work Together … Amazing!

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## Key Drivers Impacting Employee Productivity

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Productivity – Look at the Components of Productivity

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<td>Accuracy</td>
<td>67%</td>
</tr>
<tr>
<td>Call worker satisfaction</td>
<td>300%</td>
</tr>
<tr>
<td>Sales productivity</td>
<td>20%</td>
</tr>
<tr>
<td>Ability to focus</td>
<td>48%</td>
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<tr>
<td>Memory tasks</td>
<td>10%</td>
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<tr>
<td>Stress (blood pressure and heart rate)</td>
<td>27%</td>
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## Examples

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<th>Improvements</th>
<th>Productivity gains</th>
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<tr>
<td><strong>Improved acoustics</strong></td>
<td>+ 66% memory and 6% productivity savings [1] Banbury SP. and Berry DC. (1998) Disruption of office-related tasks by speech and office noise. British Journal of Psychology 89:3, pp 499-517</td>
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<td>- 27% high blood pressure and heart rate [1] Sykes 2004.</td>
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<td>+ 46 minutes more sleep at night, improved sleep quality, sleep efficiency, fewer sleep disturbances and less daytime dysfunction [1] Chueng I. (2013) Impact of workplace daylight exposure on sleep, physical activity, and quality of life. American Academy of Sleep Medicine 36.</td>
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<td><strong>Layout, comfort, social cohesion</strong></td>
<td>- 6% measured stress of call center operators</td>
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<td>- 28% employee turn-over of call center operators</td>
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San Diego Federal Building – changed from T12s with flickering magnetic ballasts to T8s with electronic ballasts. Daylighting and acoustical changes produced a 3% improvement in office areas and 15% in courthouses, correctional and post office spaces. Valued at $1.3 million in improved productivity and $275,000 in lower energy costs.

California Energy Commission found that students exposed to more daylight performed 7% to 18% better on standardized tests.

Zappos recently re-structured its call centers to address worked productivity issues. While average turnover at typical call centers is 150%, turnover at Zappos is only 39%.

Sound masking can be used to make sure collaboration noise does not travel more than 10 to 15 feet away. Studies report productivity gains of 8% to 38% through the use of such systems.

PG&E study found retail stores with skylights experienced 40% higher sales than those without.
Lighting design = 5% Gain
Daylight = 7 – 18% Gain
### Total Impact

#### 50% Productivity Improvement?

*Seems like a stretch...*

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So let's use 1% (max)
## Compare the Bottom Line

### Energy savings

- **75,000 sq ft**

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<td><strong>Total</strong></td>
<td><strong>$10,600</strong>*</td>
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* 8.8% saving for electricity

### Productivity gain

- **25,000 sq ft**
- **100 employees**
- Payroll: **$7.5M**

How could this be improved?

- Increase daylighting with reflective surfaces
- Convert to color-tuned LEDs
- Provide efficient task lighting

How much improved productivity could be expected?

- Studies say 5% improvement
- G+P conservatively estimates 1% = **$75,000**
Compare the Bottom Line

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The Future of Lighting for Commercial Applications

Chris Dolan
Philips Lighting
October 24, 2017
Philips Lighting

Global player, leading the connected lighting revolution

**Light sources**
- $7.6 billion sales in 2016

**Luminaires**
- 34,250 people employed worldwide in 70+ countries
- 5% of sales invested in R&D

**Connected lighting systems and services**
- 75% of lighting sales is B2B
How lighting can help **reduce OpEx**

<table>
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<th><strong>Lower energy consumption</strong> with LED lighting and smart control systems</th>
<th>(1) Up to 75% savings based on chosen technology, current lighting and use</th>
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<td><strong>Manage and reduce energy</strong> use with proper zoning, dimming, and daylight harvesting</td>
<td>Consistent user experience with maintained light levels anytime of day.</td>
</tr>
<tr>
<td><strong>Simplify maintenance</strong> with light point failure detection.</td>
<td>Remote monitoring allows maintenance issues to be addressed immediately.</td>
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(1): GSA GPG 024 Report August 2015
**How lighting can enhance the experience**

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<th>Design welcoming, inspiring spaces to <strong>make employees and visitors feel comfortable</strong> and welcomed.</th>
<th>Tunable and dynamic lighting can create different experiences to suit the space, the event and task at hand with a simple touch of a button.</th>
</tr>
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<tbody>
<tr>
<td>Let occupant create their own personalized experience to <strong>improve satisfaction and productivity</strong>.</td>
<td>They can change the settings of the lights (and temperature) above their head with their smartphones.</td>
</tr>
<tr>
<td>Use smart lighting to guide people with indoor navigation.</td>
<td><strong>Save time and frustration.</strong> Find a meeting room based on proximity &amp; automatically reserve it.</td>
</tr>
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</table>
### How lighting can help improve operations

| **Accurate count of people** with people counting sensors | **Better space planning and management**
| **Insight into visitor traffic and behavior** |
| **Integrate lighting with other systems**, such as building management, heating, air conditioning, and automatic blinds | **When space is unoccupied, blinds and HVAC can be adjusted for maximum efficiency** |
| **Manage and control multiple sites** from a single central location | **Single dashboard will enable performance comparisons and time savings.** |
Connected lighting

Every light point is connected to an intelligent system that delivers high-quality, reliable illumination and serves as a pathway for information and services . . .

**Connected luminaires**
- Share information on lighting status

**Connected spaces**
- Integrated sensors collect and share data about the space:
  - Occupancy, daylight, activity
- System integrates into buildings' digital ecology to increase efficiencies

**Connected people**
- Location-based services and in-context information delivered via mobile apps
- Delivers enhanced experience for building occupants.
- Allows greater insight into how building is being used
Connected lighting

Wired - Power over Ethernet (PoE)

• Suitable for new construction or deep renovations
• Luminaires powered by low voltage Ethernet cables that also carry data
• Ability to carry high volume of data
• Lower installation costs

Wireless

• Suitable for retrofits or new construction
• Quick and easy upgrade of existing facilities
• Hassle free installation with few, simple components
• Uses existing infrastructure
Data
Granular data at your fingertips

A bird’s-eye view
Oversee global operations from a single point

See more
An advanced dashboard visualizes data — delivering insights at a glance

Make it actionable
Sensors deliver granular data about space usage, allowing you to make changes and optimize your space and operations
The Edge

One of the most cost optimized offices in the world

Amsterdam, the Netherlands
The Edge
Amsterdam, the Netherlands
Technology enabling cost reduction

<table>
<thead>
<tr>
<th>Deloitte building</th>
<th>Allocated ft²</th>
<th>Employees</th>
<th>ft²/FTE</th>
<th>Cost/employee</th>
<th>Savings USD/year</th>
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<tr>
<td>Chrystal Tower (Previous Deloitte premises)</td>
<td>263,700</td>
<td>1600</td>
<td>165</td>
<td>$4,674</td>
<td>-</td>
</tr>
<tr>
<td>The Edge Nov 2014</td>
<td>236,800</td>
<td>1740</td>
<td>135</td>
<td>$5,344</td>
<td>$ -1m</td>
</tr>
<tr>
<td>The Edge Sept 2016</td>
<td>236,800</td>
<td>2900</td>
<td>82</td>
<td>$3,212</td>
<td>$4.2m comparable cost/year</td>
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Thank you for your attention

http://www.philips.com/smartbuildings