

The Future of Lighting for Commercial Applications





The future of lighting for commercial applications

*Doyle Trankel, PE, CLEP
Engineering Director*



TARGET

- >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



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WWW.ANDERTOONS.COM

“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

study showing improved productivity in open office



Web News Videos Images More Search tools

About 11,800,000 results (0.44 seconds)

The Open-Office Trap - The New Yorker

www.newyorker.com/business/currency/the-open-office-trap

Jan 7, 2014 - The open office was originally conceived by 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 apace.

Open-plan offices make employees less productive ... - Quartz

qz.com/.../moving-to-open-plan-offices-makes-employees-less-productiv...

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-St...

Aug 23, 2013 - This undated photo provided by the Kassig 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/2012/08/15/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 › Dialed

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 ...

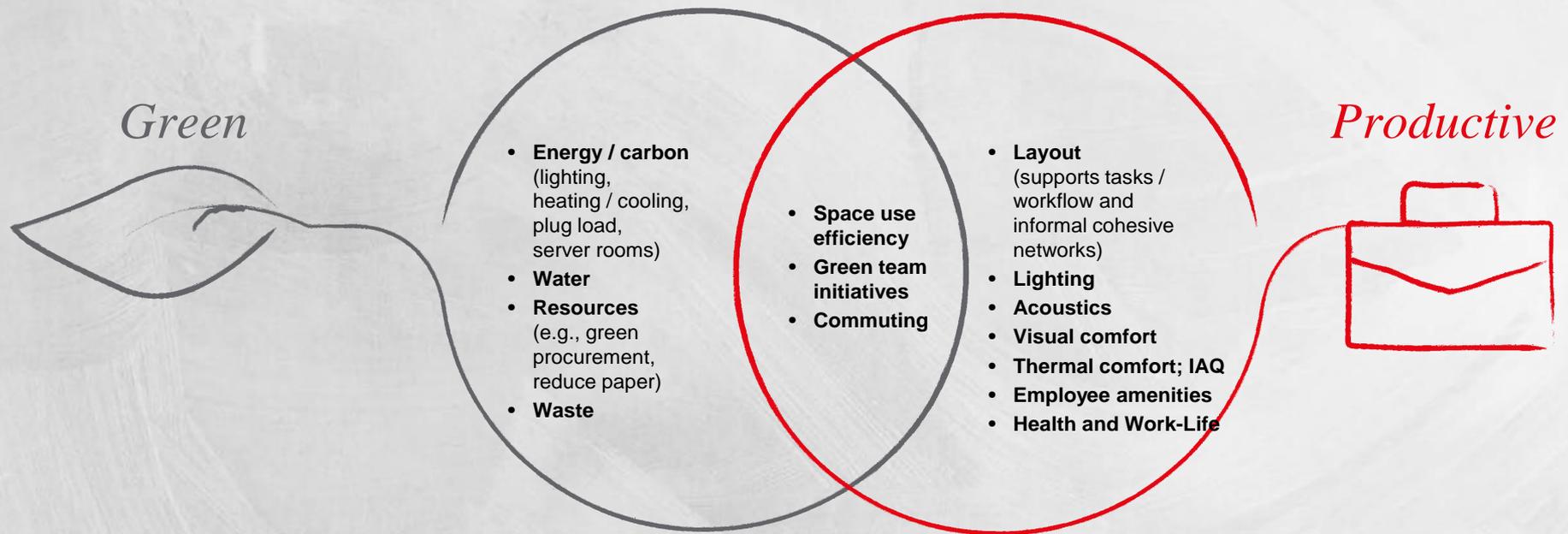
Open-Office Backlash: Seeking Productivity in a Noisy World ...

<https://www.americanexpress.com/.../openforum/.../open-office-backlash...>

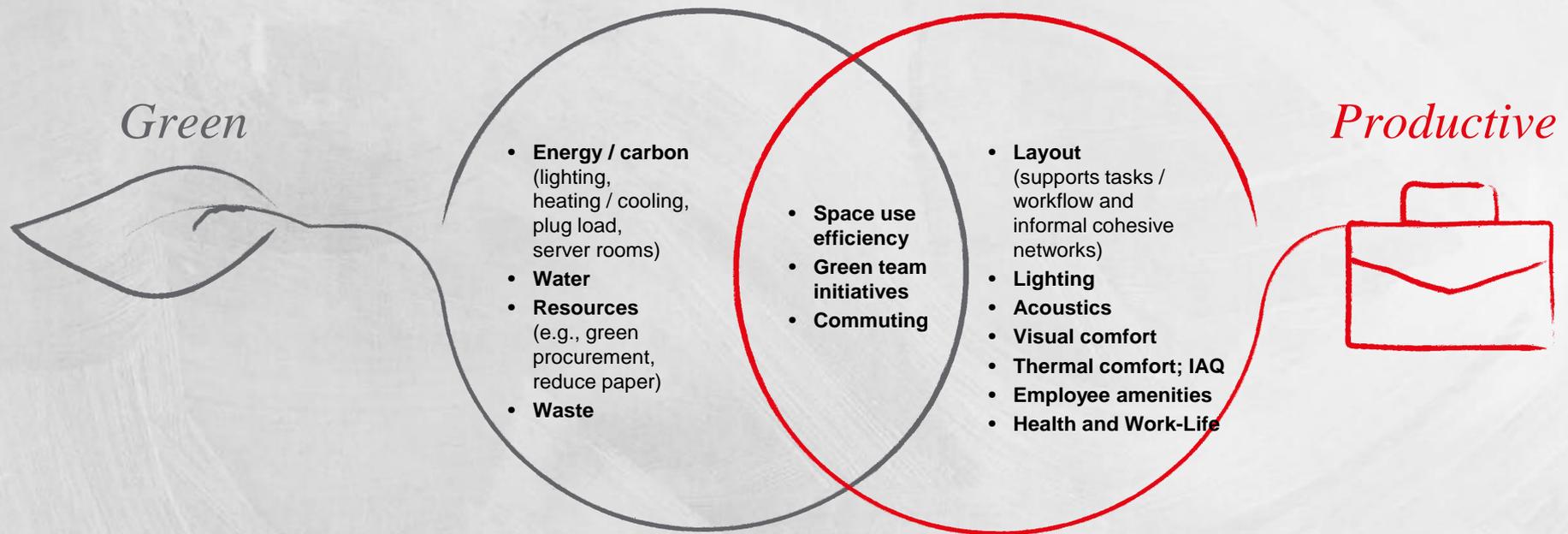
It's open season on open offices, with experts and employees grinning about its many



Green and Productive Work Together



Green and Productive Work Together ... Amazing!



Key Drivers Impacting Employee Productivity



	Productivity
Improved acoustics	+ 6 – 300%
Improved lighting, day lighting and views	+ 5 – 18%
Improved thermal comfort and ventilation	+ 5%
Reduced stress from commuting	+ 11.5 working days/FTE/year
Improved ergonomics and privacy	+ 6%
Layout, comfort, social cohesion	+ 30%

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Productivity – Look at the Components of Productivity



	Improvement
Accuracy	67%
Call worker satisfaction	300%
Sales productivity	20%
Ability to focus	48%
Memory tasks	10%
Stress (blood pressure and heart rate)	27%

Improvements	Productivity gains
Improved acoustics	<ul style="list-style-type: none"> + 66% memory and 6% productivity savings 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 + 67% accuracy Banbury SP. and Berry DC. (2005) Office noise and employee concentration: identifying causes of disruption and potential improvements. Ergonomics 48:1, pp 25-37 + 48% ability to focus on tasks Sykes, D. M. (2004) How Acoustics Affect Workers' Performance In Offices and Open Areas. Retrieved February 1, 2009, from Office Sound Masking Solutions, by Speech Privacy Systems: www.speechprivacysystems.com/files/Productivity.pdf - 27% high blood pressure and heart rate Sykes 2004.
Improved lighting	<ul style="list-style-type: none"> + 2% productivity Hedge, A., Sims, W. and Becker, F. (1995) Effects of lensed-indirect and parabolic lighting on the Satisfaction – Visual Health and Productivity of Office Workers. Ergonomics, 38:2, pp. 260-280.
Daylighting and views	<ul style="list-style-type: none"> - 6.5% sick leave Elzeyadi I. (2011) Daylighting-Bias and Biophilia: Quantifying the Impact of Daylighting on Occupant Health. Available: http://www.usgbc.org/sites/default/files/OR10_Daylighting%20Bias%20and%20Biophilia.pdf Last accessed 5 August 2014 + 7-12% faster processing of calls in call center and better overall performance Heschong Mahone Group (2003) Windows and Offices: a Study of Worker Performance and the Indoor Environment (Technical Report) for California Energy Commission, 2003, pp 2-4. Available: http://www.energy.ca.gov/2003publications/CEC-500-2003-082/CEC-500-2003-082-A-09. PDF Last accessed 12 August 2014 + 15% more time focused on primary task (programming) versus chatting on the phone or to one another Heschong Mahone Group (2003) Windows and Offices: a Study of Worker Performance and the Indoor Environment (Technical Report) for California Energy Commission, 2003, pp 2-4. Available: http://www.energy.ca.gov/2003publications/CEC-500-2003-082/CEC-500-2003-082-A-09. PDF Last accessed 12 August 2014 + 46 minutes more sleep at night, improved sleep quality, sleep efficiency, fewer sleep disturbances and less daytime dysfunction Chueng I. (2013) Impact of workplace daylight exposure on sleep, physical activity, and quality of life. American Academy of Sleep Medicine 36.
Improved IAQ	<ul style="list-style-type: none"> + 10% units of output (typing speed) A meta-analysis of 24 studies – including 6 office studies Wargorcki P. (ed.) Seppänen O. (ed.) Andersson J. Boerstra A. Clements-Croome D. Fitzner K. Hanssen SO. (2006) REHVA Guidebook: Indoor Climate and Productivity In Offices - 35% short term sick leave and + \$400 per employee Milton DK. Glencross PM. and Walters MD. (2000) Risk of Sick Leave Associated with Outdoor Air Supply Rate, Humidification, and Occupant Complaints. Indoor Air 10, pp 212-221. Available: http://www.e-co.uk.com/Recirc-Milton2000.pdf Last accessed 5 August 2014.
Improved thermal comfort	<ul style="list-style-type: none"> + 4 to 6% logical thinking performance Lan L. Wargocki P. Wyon DP. Lian Z. (2011) Effects of thermal discomfort in an office on perceived air quality, SBS symptoms, physiological responses, and human performance. Indoor Air 21:5, pp 376-90
Layout, comfort, social cohesion	<ul style="list-style-type: none"> - 6% measured stress of call center operators - 28% employee turn-over of call center operators + \$15 million savings per year in Bank of America call center operations Waber B. (2013) People Analytics: How Social Sensing Technology Will Transform Business and What It Tells Us about the Future of Work Financial Times Press, Chapter 3.

Does It Really Work?



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



*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

How could this be improved?	Savings
Reduce hours of lighting and HVAC (<i>no cost</i>)	\$4,500
Lighting controls (<i>2 - 4 yr. payback</i>)	\$2,800
Server room features / management (<i>low - to no cost</i>)	\$3,300
Total	\$10,600*

* 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**

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Thank you

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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



Luminaires



Connected lighting systems and services

\$7.6

billion sales
in 2016

34,250

people employed
worldwide in 70+ countries

5%

of sales invested
in R&D

75%

of lighting sales is
B2B

How lighting can help **reduce OpEx**

Lower energy consumption with LED lighting and smart control systems

(1) Up to 75% savings based on chosen technology, current lighting and use

Manage and reduce energy use with proper zoning, dimming, and daylight harvesting

Consistent user experience with maintained light levels anytime of day.

Simplify maintenance with light point failure detection.

Remote monitoring allows maintenance issues to be addressed immediately.

(1): GSA GPG 024 Report August 2015
<https://www.gsa.gov/governmentwide-initiatives/sustainability/gpg-program/published-findings/lighting/led-fixtures-with-integrated-controls>



How lighting can **enhance the experience**

Design welcoming, inspiring spaces to **make employees and visitors feel comfortable** and welcomed.

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.

Let occupant create their own personalized experience to **improve satisfaction and productivity.**

They can change the settings of the lights (and temperature) above their head with their smartphones

Use smart lighting to guide people with indoor navigation

Save time and frustration. Find a meeting room based on proximity & automatically reserve it.



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 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



Deloitte building	Allocated ft2	Employees	ft2/FTE	Cost/employee	Savings USD/year
Chrystal Tower (Previous Deloitte premises)	263,700	1600	165	\$ 4,674	-
The Edge Nov 2014	236,800	1740	135	\$ 5,344	\$ -1m
The Edge Sept 2016	236,800	2900	82	\$ 3,212	\$ 4.2m comparable cost/year

Thank you for
your attention

<http://www.philips.com/smartbuildings>



