



Illuminating Employee ROI

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Casting a light on office productivity: How lighting triggers higher yields

Lighting in a space is often treated as an “add-on” part of the design with architects or building owners coming to a lighting consultant after the blueprints are all but printed. This approach assumes that lighting is just a matter of picking out fixtures. However, lighting designers know lighting is so much more.

In fact, lighting should be the foundation of a design. Incorporating the lighting into the early steps of a project ensures the final product delivers on the architect’s vision and the needs of the building owner/corporate tenants.

As soon as there is enough light to walk without falling, most people tend to think the first goal of lighting is accomplished. If they think about lighting any further, it’s about pretty fixtures, rather than the quality of light they put out.

The lighting in a space has two main jobs: optimizing the functionality of the space and creating atmosphere for the room.

When the lighting is done right, the design is mostly invisible. However, people unconsciously react to the lighting—people follow the path the lighting directs them on without even realizing they are doing it. They feel more comfortable and will be healthier. They are more productive in their work.





Lighting has a huge impact on productivity

Lighting can have a huge impact on people's mood, cognitive function as well as their overall health. Each of these aspects can have a significant impact on their work productivity.

What is the value of productivity?

How valuable is the investment in employee productivity? It's worth a lot. Many LED companies advertise energy savings as a reason to switch to LEDs. The impact on productivity is way higher than these energy savings.

Commercial real estate firm JLL developed a famous formula to quantify the value of productivity improvements: the 3/30/300 rule.

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Actual figures will vary across locations; in general, organizational expenses (per square foot, per year) break down like this:

- \$3 for utilities
- \$30 for rent/mortgage
- \$300 for payroll

According to the US Energy Information Administration, the average commercial building is a little more than 15,000 square feet. Using the 3/30/300 proportions, annual spending for a business in an average building should roughly break down to \$45,000 on utilities, \$450,000 on rent and \$4,500,000 on employees (the total adds up to \$4,995,000).

- Reducing utility costs by 50 percent saves this company \$22,500 annually
- Improving space utilization by 10 percent and they save \$45,000
- Increasing employee productivity by five percent and the company saves \$225,000

A small change in the employee category can have a huge impact on a company's bottom line. This factor is why everything in the office environment should contribute towards the goal of user productivity.

How lighting enhances productivity

Whether an office is productive or not tends to result from a combination of several variables, including company culture and physical factors in the office design. Lighting is a key ingredient in this cocktail and it can help perpetuate a vicious cycle or a virtuous cycle around productivity.

The positive results from good lighting are significant:

- Elevated mood
- Improved cognitive function
- Overall better health

Studies have shown that poor quality lighting has the opposite impact on people.

Lighting elevates our moods

Lighting is a powerful lever in manipulating our moods. This claim makes intuitive sense if you compare your emotional state on a bright sunny day versus a dark rainy day. It's easier to feel light and cheerful under sunlight, while it's natural to feel a little gloomy in the overcast scenario.

The research bears this conclusion out, with study after study finding that dim and lower CCT lighting depressed mood and brighter and higher CCT lighting enhances people's moods.¹

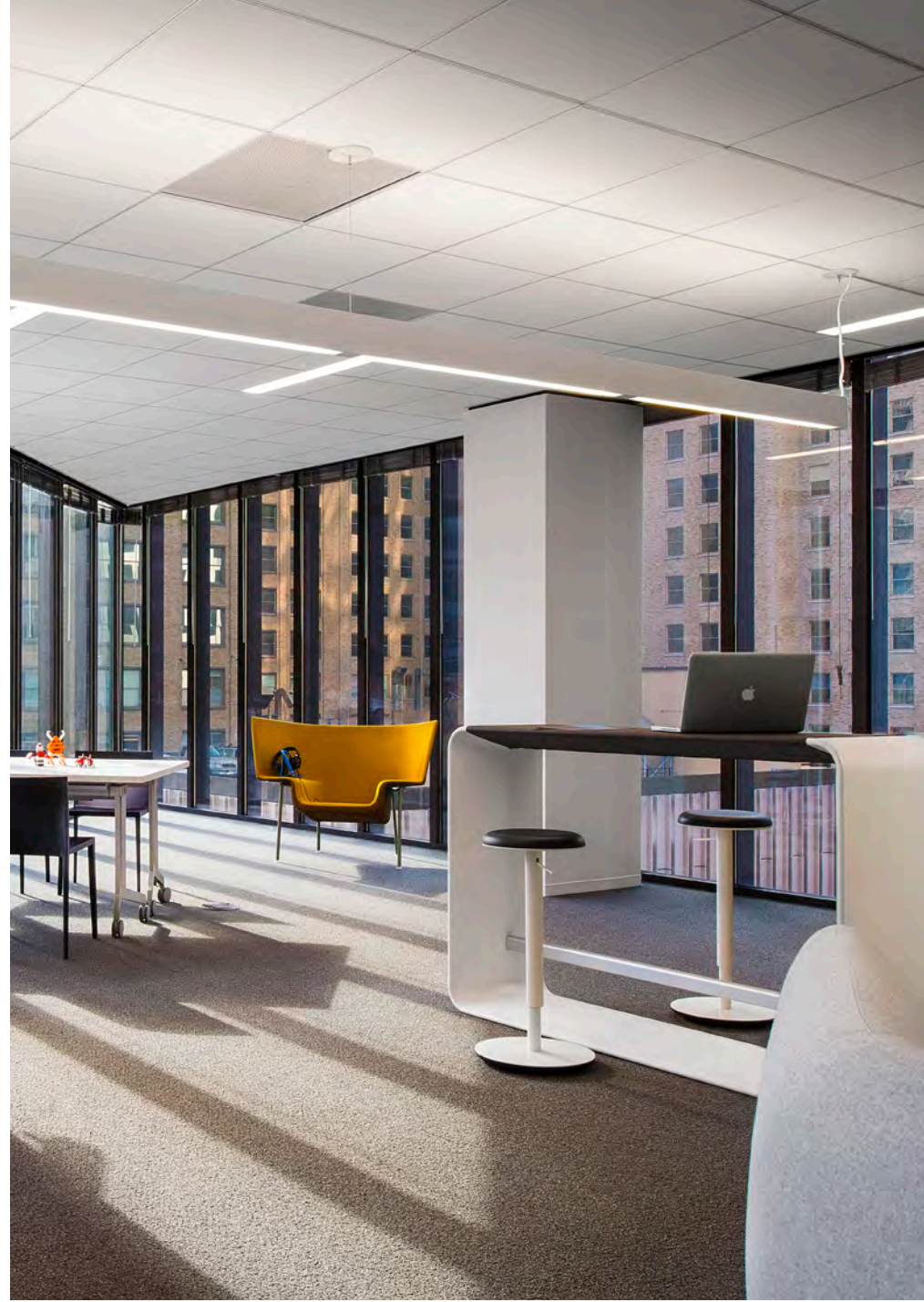
Lighting improves cognitive function

Light is a basic building block of our environment, so it is no wonder that it has profound impacts on our ability to function in the world. One study actually found that the brain makes "fewer connections" when working in dim lighting conditions, resulting in "diminished learning and memory performance. In other words, dim lights are producing dimwits."²

¹Hawes, B. K., Brunyé, T. T., Mahoney, C. R., Sullivan, J. M., & Aail, C. D. (2012). Effects of four workplace lighting technologies on perception, cognition and affective state. *International Journal of Industrial Ergonomics*, 42(1), 122-128. doi:10.1016/j.ergon.2011.09.004

²Soler, J.E., Robison, A.J., Núñez, A.A., Yan, L. (2018) Light Modulates hippocampal function and spatial learning in a Diurnal Rodent Species: a study using male Nile Grass Rat (*Arvicanthis niloticus*), *Hippocampus*, 28(3), pp. 189 – 200. DOI: 10.1002/hipo.22822

³Beaven, M.C. & Ekstrom, J. (2013) A Comparison of Blue Light and Caffeine Effects on Cognitive Function and Alertness in Humans, *Plos One*, <https://doi.org/10.1371/journal.pone.0076707>.





Another study found one-hour of exposure to blue light delivered higher levels of alertness and cognitive function than a cup of coffee (240 mg of caffeine).³ Even more interesting, when test subjects were given a decision-making task with distractions around them, caffeine reduced their overall accuracy, while blue light significantly improved it.

Additionally, while a stimulant like caffeine's effects are fairly immediate, light's effects can linger longer. A study found that exposure to blue light improved alertness and working memory the following day.⁴

Lighting delivers better health outcomes

It's important to get the light just right in an office for maximal productivity. Too little light, too much light or poor-quality light all cause health problems. These can range from eye strain to headaches and migraines to disrupted sleep patterns.

Since we often spend most of our awake time indoors at work, offices are the perfect places for human-centric lighting solutions. In addition to delivering general light to see, workplace lighting affects employee alertness, mood, focus, sleep-wake pattern and overall health. The research bears this out:

Rensselaer Polytechnic Institute's Lighting Research Center conducted a study of human-centric lighting in five government office buildings across the United States. The three-year study found employees working under human-centric lighting

⁴Scheuermaier K., Münch M., Ronda J.M., and Duffy J.F. (2018) Improved cognitive morning performance in healthy older adults following blue-enriched light exposure on the previous evening. *Behavior Brain Research*, 348(1), pp. 267 – 275. <https://doi.org/10.1016/j.bbr.2018.04.021>.

⁵Figueiro, M.G., Steverson, B., Heerwagen, J., Kampschroer, K., Hunter, Gonzales, C.M.K., Plitnick B., Rea, M.S. (2017) The impact of daytime light exposures on sleep and mood in office workers, *Sleep Health*, 3(3), pp. 204 – 215, <https://doi.org/10.1016/j.sleh.2017.03.005>.

“experienced better sleep and lower levels of depression and stress,” than those who didn’t. They were also able to fall asleep more quickly at bedtime and experienced better-quality sleep.⁵

It’s not exactly news that healthier employees can work harder and smarter than unhealthy ones. Study after study has demonstrated this effect.

How to light offices for productivity

Facilitating peak productivity among employees requires the “right” light, which is a blend of several lighting variables:

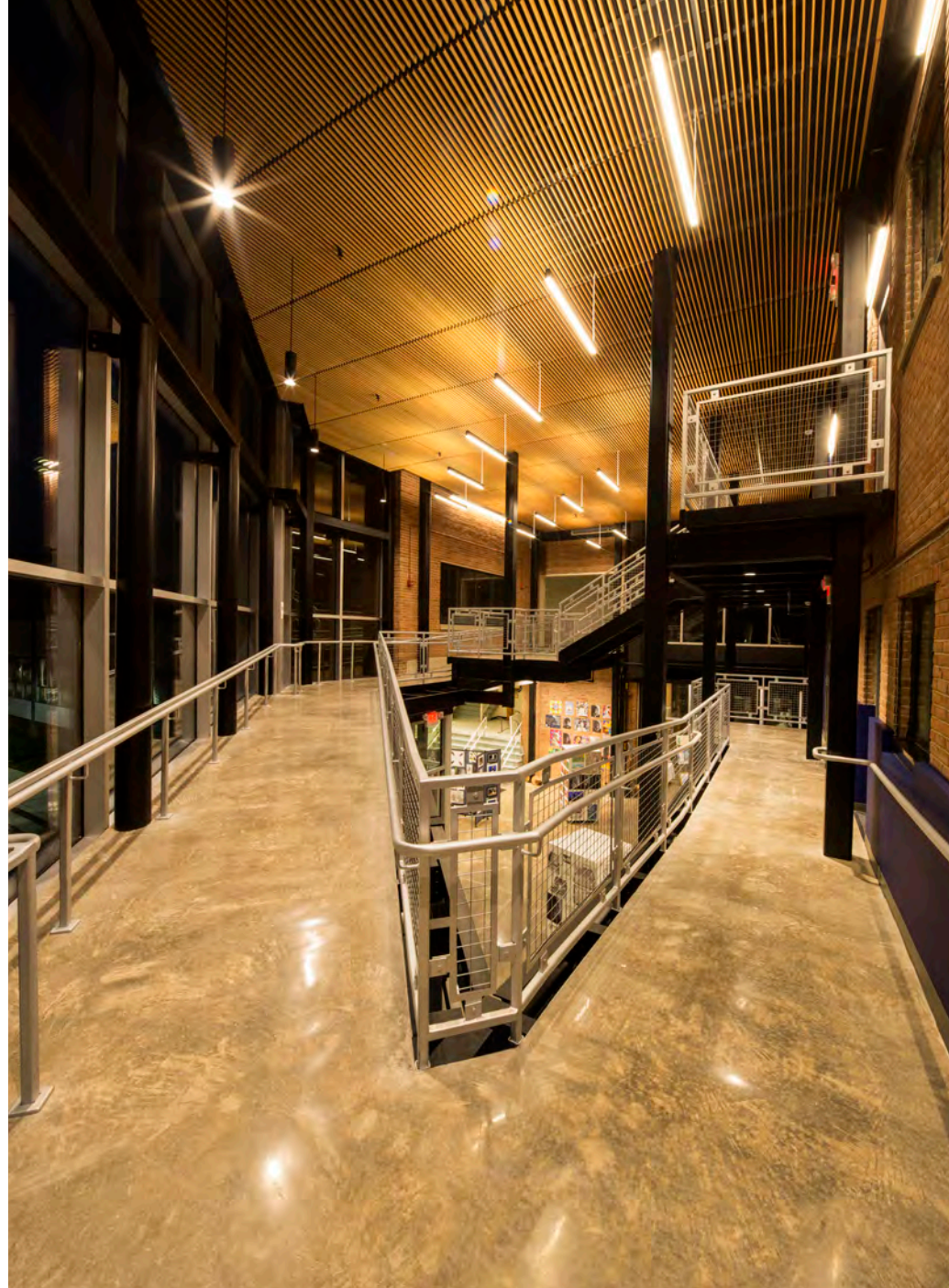
- The right intensity and brightness,
- At the right temperature,
- At the right time of day,
- In the right concentrations and locations in the office.

Lighting for humans

Light is the link between our bodies and the solar day. We evolved under the sun for millions of years and are closely attuned to the daily light/dark cycle of the sun. This is our circadian rhythm and it governs our wake/sleep cycle.

Modern LED and control technology allows lighting to complement the sun’s natural light cycles and enhance human health and wellness. This human-centric lighting delivers lighting that mimics the sun’s natural brightness and color temperature throughout the day.

Light temperature has a significant impact on humans, especially light on the blue end of the spectrum. Blue light activates our ganglion cells—light-sensitive cells in our eyes. These cells are a key lever in our





biological clocks, passing information on to the brain about when to release “sleep hormone” melatonin.

Warm light stimulates production of melatonin and prepares us for rest, while blue light suppresses melatonin secretion, making us feel more alert and cognitively sharper. Following the sun, blue light syncs our internal clocks with the outside world.

Blue light stimulates wakefulness and alertness, which is ideal for early in the workday, but not for the end of the day. A general lighting schedule for an office open from 9 a.m. – 5 p.m. might look something like this:

Time of day	9 a.m. – 11 a.m.	11 a.m. – 1 p.m.	1 p.m. – 2 p.m.	2 p.m. – 5 p.m.
CCT	6,500K light	3,000 – 4,000K light	6,500K light	3,000 – 4,000K light

Starting the office lighting with cool light in the morning and warming up towards lunch maximizes morning productivity. Resetting the cycle with a blast of blue light after lunch combats the mid-afternoon slump and warmer light at the end of the day prepares employees to sleep at night.

Lighting in layers

When developing the lighting for a room, it’s critical to know what the space will be used for. If the room has a defined purpose, it’ll be easier to design a lighting plan for it.

Once you have zeroed in on the purpose of the room, the next step is to determine what kind of task lighting you need to best support the room’s function. Task lighting can range from the specialty lamps over a dentist chair, to under shelf/cabinet lighting, adjustable desk lamps,



as well as certain ceiling-mounted downlights. Whatever the light used, it should be adjustable by individual users and provide adequate light to accomplish the task and proper contrast levels.

Next, add the ambient lighting. These lights provide general illumination and lights up the architecture. Indirect light fixtures are an ideal choice for ambient lighting—they put a soft wash of light on the walls and ceiling, so the room doesn't look like a cave.

The third layer, if necessary, is decorative and accent lighting to accentuate architectural features and add a touch of pizzazz to the room.

Lighting in layers is the architectural equivalent of dressing in layers for cold weather: If all you have is a big coat, then you can't do much to modulate the temperature if you feel too warm, but with layers, you can add and remove layers as necessary. Likewise, with lighting, if you only have a big light source in the ceiling, you can't adjust much, but with several lights, you can adjust individual task lights and the ambient light levels as needed.

Controlling light

Lighting and controls go together like peanut butter and jelly. Users appreciate being able to adjust their environments around them and human-centric lighting systems rely on controls to change the lighting throughout the day.

While it's important to give users the ability to control their own lighting, there must be a balance, so the carefully designed human-centric lighting system isn't overridden by the building users.

A good way to manage controls for offices is to leverage presets (especially useful with a white-tuned system). With presets, users can choose from a range of color temperatures and intensities for different purposes to temporarily override the system.

For example, a brainstorming meeting may work better under a “focus” preset that features high CCT (e.g. 6500k) and high illuminance (e.g. 500 to 1000 lx). A more confrontational meeting—such as a contract negotiation—would do better with a “calm” preset that had low CCT (e.g. 2700k) and low illuminance (200 to 300 lx).

Aside from presets, it’s also good practice to put dimmers on the lights. If not all of them, then at least the individual task lighting.

Lighting is a foundational, but often overlooked, element to any office. It has the power to boost employee productivity, raise morale and improve employee health.

New technologies have made it possible to not only control how bright the lights are in your office building, but also how those lights can impact the moods, focus, productivity, health, energy levels and mindset of your employees. Never before has light had such far-reaching impacts. Through LED lighting and white-tuning technologies, you can, in effect, control the productivity or morale of employees.

About Amerlux

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