

## Designers Lighting Forum

### Value Driven Innovation: Targeting Equity

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March 20,2024



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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.



## Learning Objectives

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At the end of this course, participants will be able to:

1. Visually hyposensitive individuals' concerns may include difficulty focusing on tasks. True or False?
2. Visually hypersensitive individual's: concerns include environmental aesthetics, personal appearance and seeking respite. True or False?
3. In addition to neurodiversity, name three causes of sensory stimulus disorders.
4. Why are veterans "potentially vulnerable patient populations...at risk of receiving lower-quality medical care or for having worse medical outcomes"?
5. Basic understanding of lighting application requirements including illuminance and color appearance (CCT), comfort concerns such as glare, flicker, and energy constraints such as lumens/watt.



# From Diversity to Equity

DOE L Prize 2023

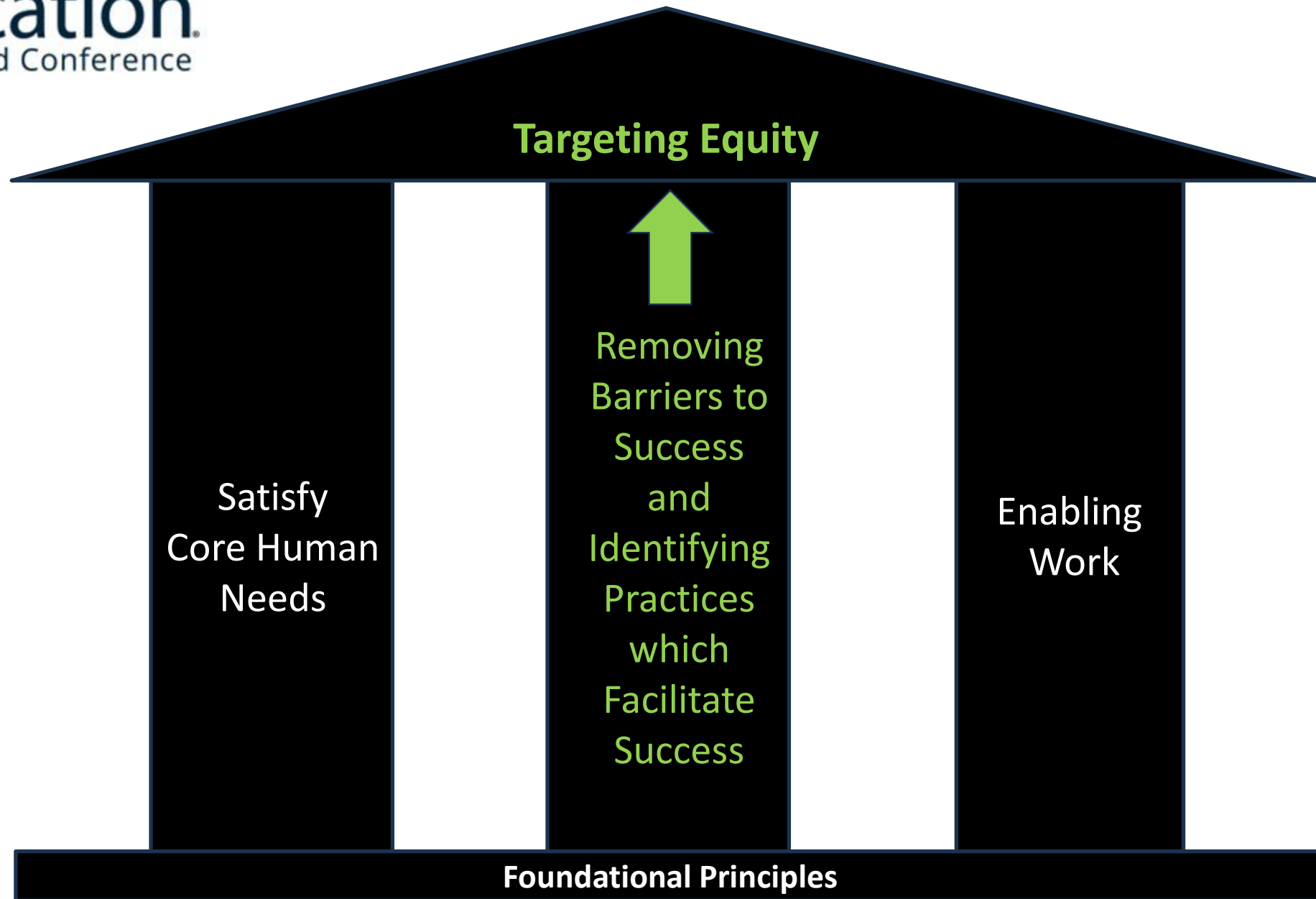
LightFair 2018

DOE Innovative Office 2015

The Dress 2015

NIH Inspiration 2014





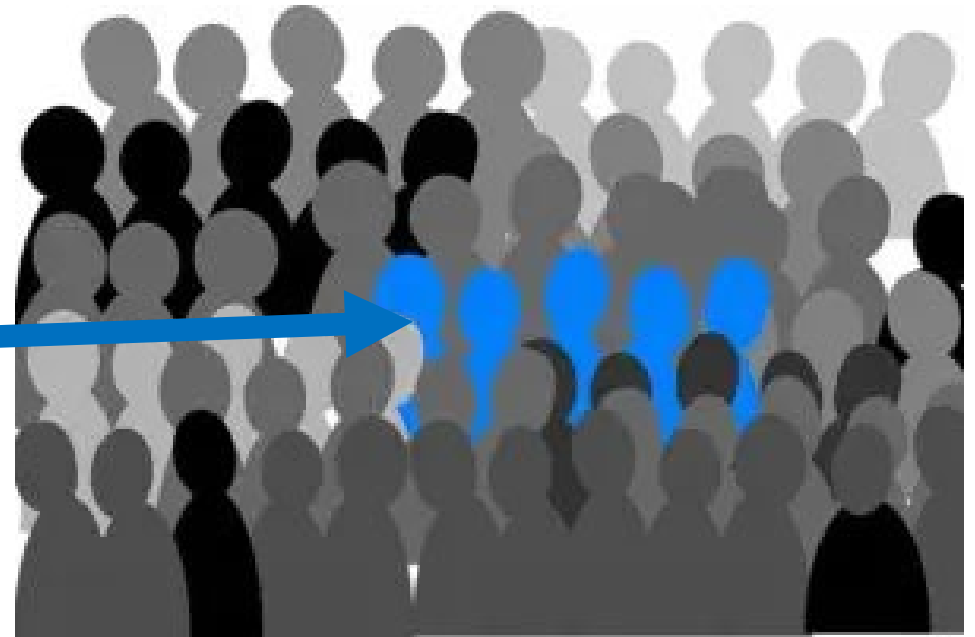
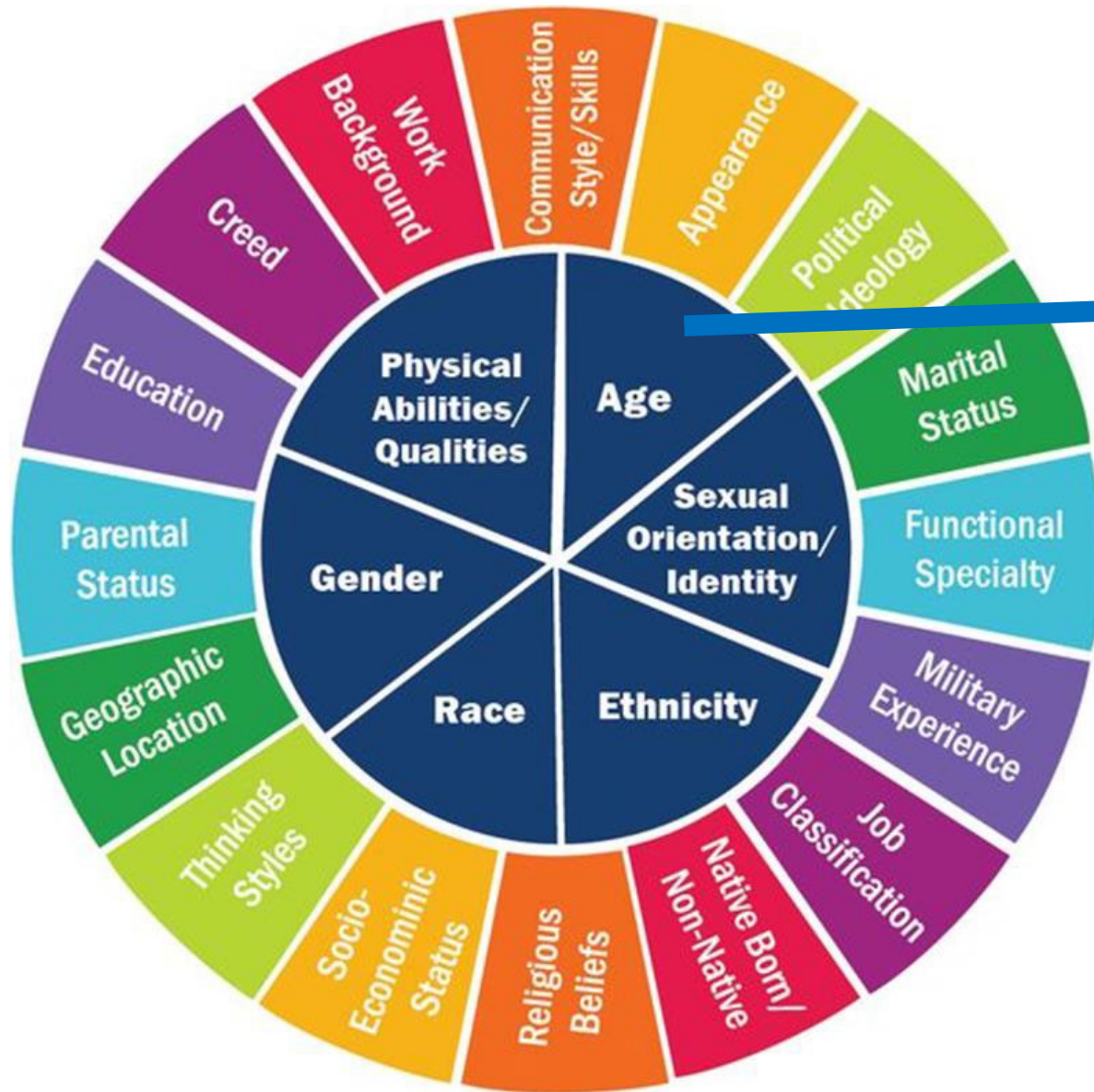


## Return to work?

Office environmental conditions, specifically *lighting and the lack of flexible, accessible lighting controls, contribute to workplace inequity and impede employee performance.*



# Diversity in the Workplace 2014-2024



**5 Generations in the workplace in 2024**

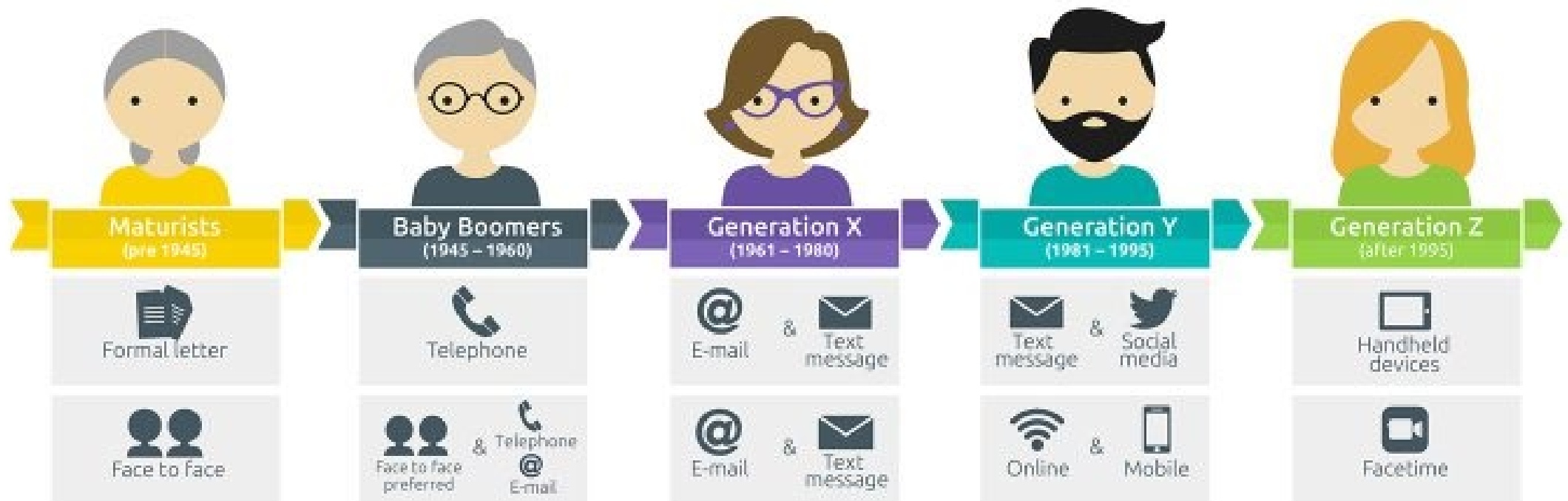




# ONE POLICY

## FIVE GENERATIONS

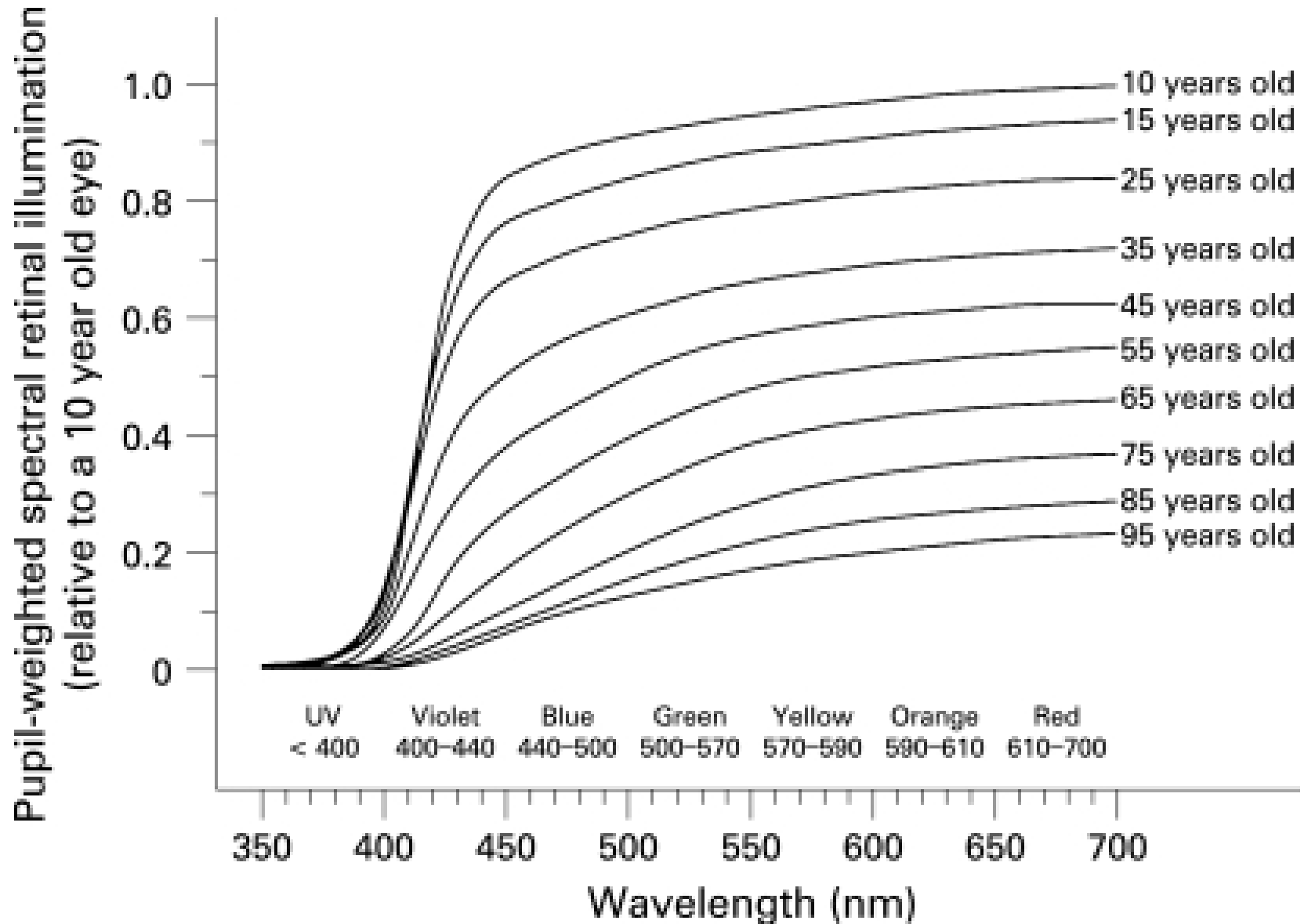
Five generations will be working side-by-side in 2020.  
Here we look at the most effective ways to communicate a data privacy policy with each.





## Diversity of Response to Light at Night

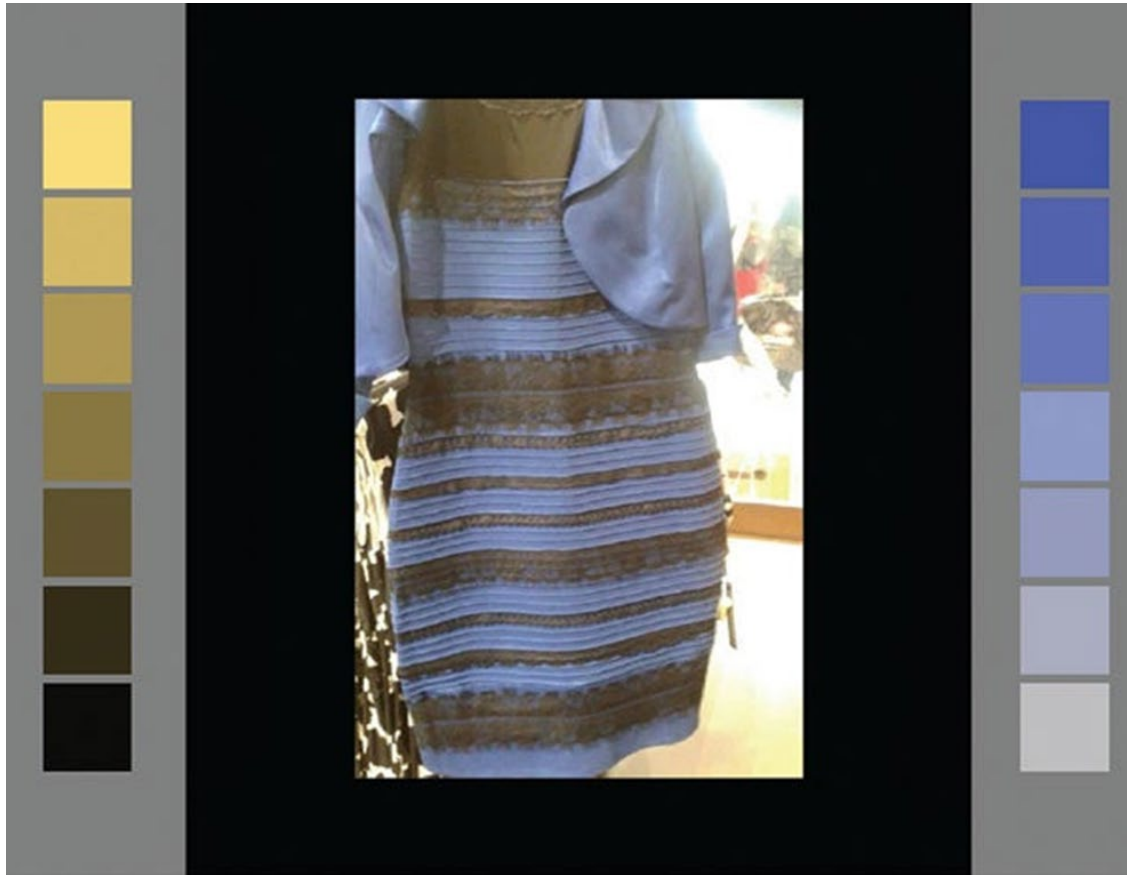
Interindividual differences in light sensitivity may explain differential vulnerability to circadian disruption and subsequent impact on human health.



[High sensitivity and interindividual variability in the response of the human circadian system to evening light \(pnas.org\)](https://www.pnas.org)



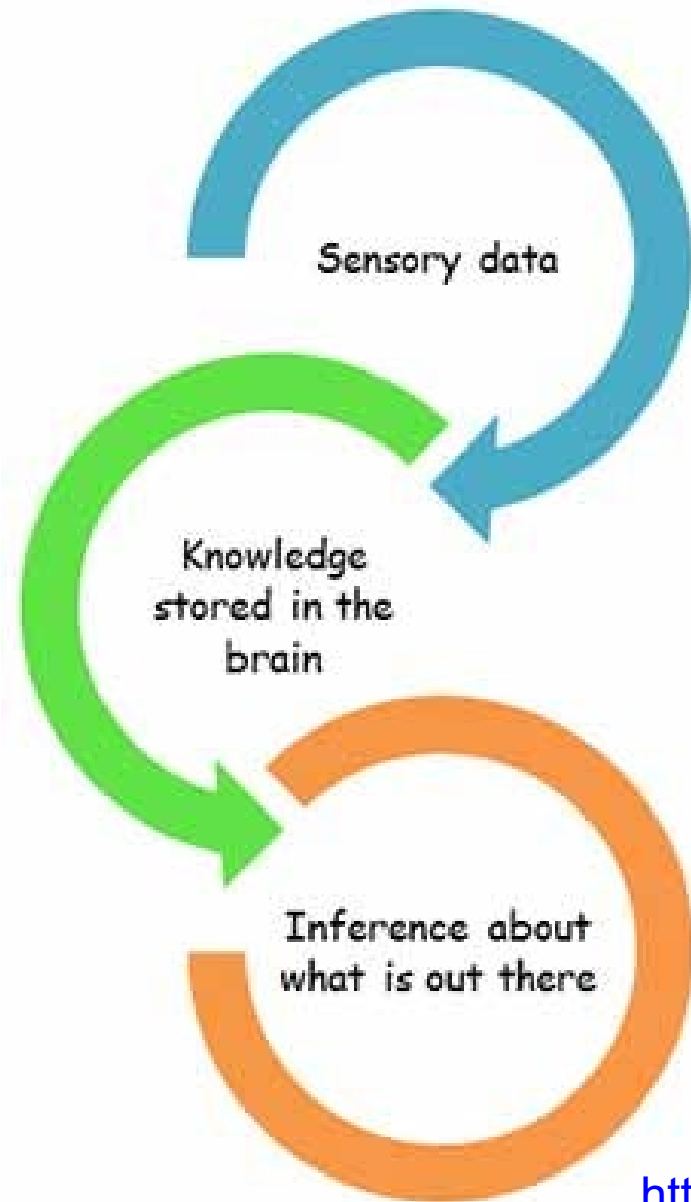
# Diversity of Visual Response to Visual Stimulus.



- Actual dress was blue with black lace
- Internet images of the dress were variously perceived as blue with black lace and white with gold lace
- Current Biology published in 2015 a study with 1,400 participants viewing **images** of the dress.
- 57% saw blue black, 30% saw white gold, 11% saw blue brown and 2% saw “other”



# Top-Down Visual Processing



- One study indicated that people who see the blue-black combination experienced more “top-down modulation of visual processing” activity in the part of the brain that makes “tentative object hypothesis” based on previous experience and knowledge when there is insufficient information provided by sensory input available.
- **The key to this puzzle is not the color but the illuminance.** The white balance setting on the camera which took the photo was not correctly set.
- **The differences do not arise with respect to hue or saturation but are mainly due to the perceived differences in lightness.** In this case not enough illuminance means not enough information for the brain to make a good guess.



# Mystery Solved

- In this photograph, the white wedding dress, dark curtains, visible skin tones and body shadows help us accurately judge the amount of ambient light in the room.
- In recent years, consideration of visual stimulus diversity has reshaped the practice of vision science.

[Is That Dress White and Gold or Blue and Black? - The New York Times \(nytimes.com\)](https://www.nytimes.com)







[Epigenetics: The Science of Change - PMC \(nih.gov\)](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1392256/)  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1392256/>

# Sensory Stimulus Processing

- **Neutral Responsiveness:** Individuals with little or no difficulty processing sensory stimuli.
- **Hyposensitive** individuals have abnormally decreased sensitivity to sensory input.
- **Hypersensitive** individuals have abnormally increased sensitivity to sensory input. They may be overwhelmed by environmental stimuli that are acceptable to individuals with neutral responsiveness.

## Visual Stimulus Sensitivity

Visual Stimulus Sensitivity	Lighting Condition	Workplace Concerns
Neutral Responsiveness	L-Prize requirements for illumination and comfort met	Environmental aesthetic appearance, comfort, task-based performance, and personal appearance
Hyposensitivity	High Stimulus Lighting. Vividness prioritized	Difficulty focusing on tasks
Hypersensitivity	Low Stimulus Lighting preferred.	Seek respite Environmental aesthetics and personal appearance

# There is no “standard observer”

Preference (P)		Vividness (V)		Fidelity (F)	
P1	$R_f \geq 78$	V1	$R_g \geq 118$	F1	$R_f \geq 95$
	$R_g \geq 95$		$R_{cs,hl} \geq 15\%$		
	$-1\% \leq R_{cs,hl} \leq 15\%$				
P2	$R_f \geq 75$	V2	$R_g \geq 110$	F2	$R_f \geq 90$
	$R_g \geq 92$		$R_{cs,hl} \geq 6\%$		$R_{thl} \geq 90$
	$-7\% \leq R_{cs,hl} \leq 19\%$				
P3	$R_f \geq 70$	V3	$R_g \geq 100$	F3	$R_f \geq 85$
	$R_g \geq 89$		$R_{cs,hl} \geq 0\%$		$R_{thl} \geq 85$
	$-12\% \leq R_{cs,hl} \leq 23\%$				

TM 30 provides a set of three “recommended specifications” based on **design intent Preference, Fidelity and Vividness and Priority Level** so that you can make informed decisions when the inevitable tradeoffs need to be made during the design process effecting **Pleasantness, Naturalness and Acceptability**

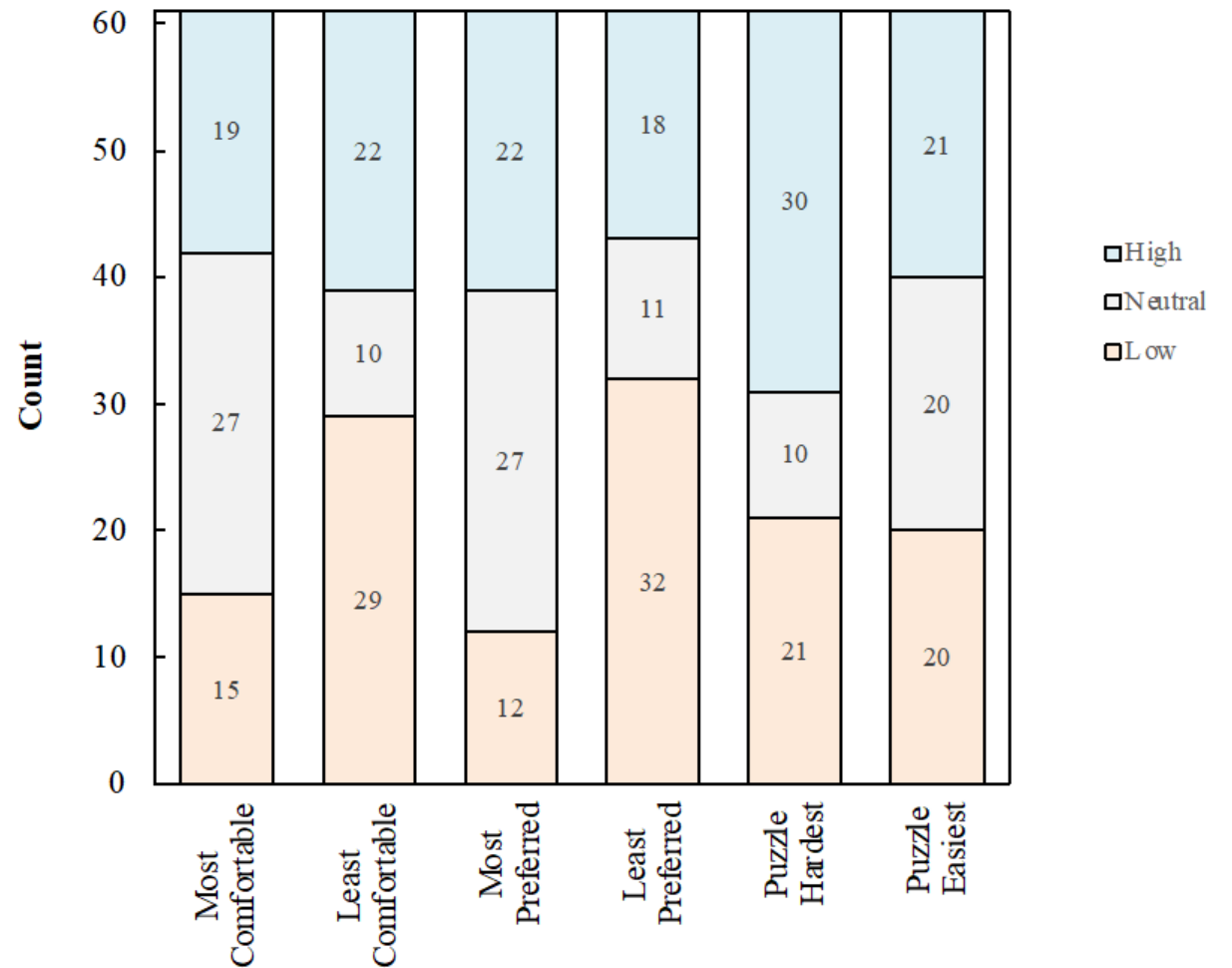
Kudos to the IES Color Committee and my thanks to Tony Esposito without whom this research would not have been completed.





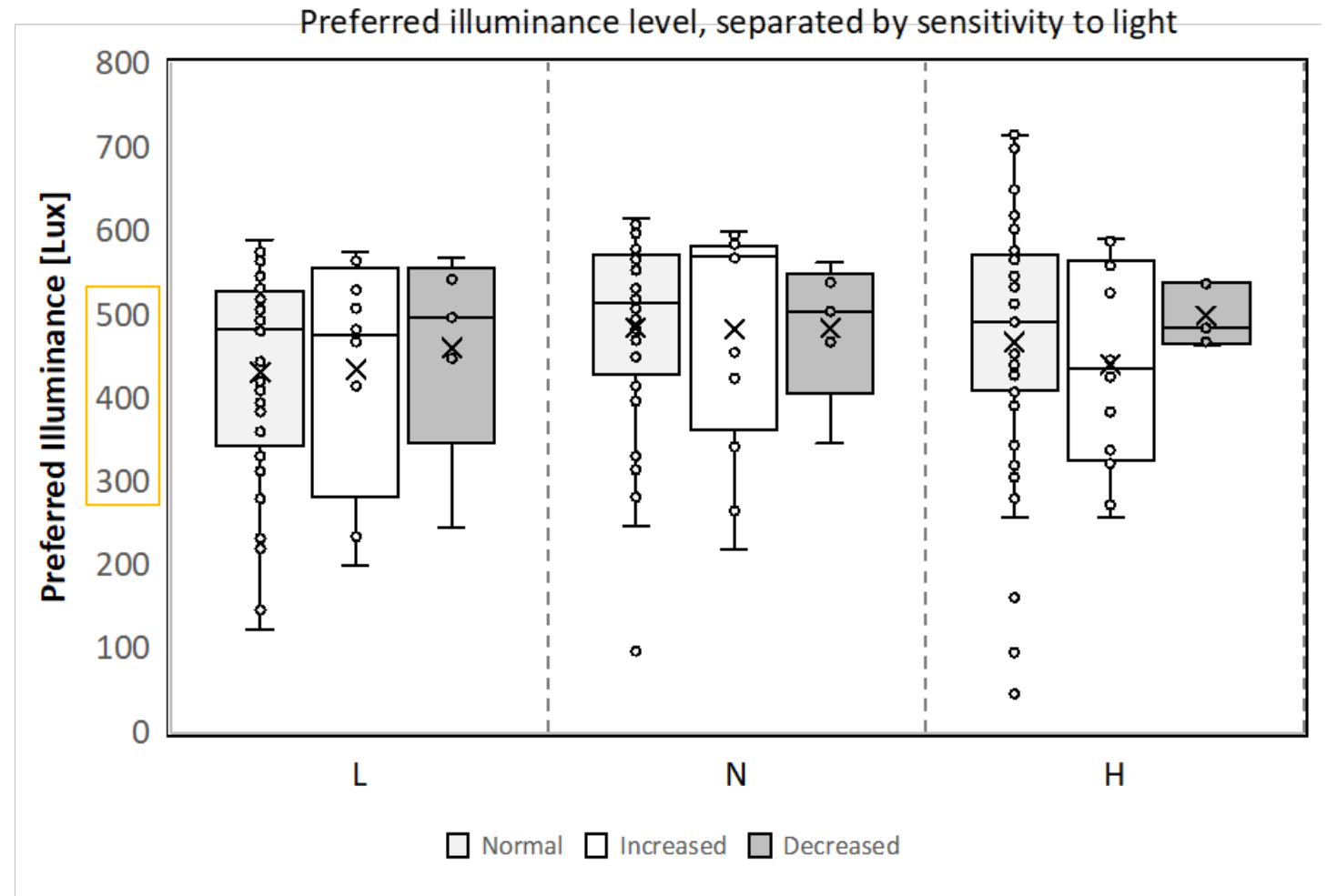
I followed the TM30 approach and defined for the L-Prize DEIA research develop three “recommended specifications” based on **Neutral Stimulus, Low Stimulus and High Stimulus** lighting to be evaluated based on **personal preference, performance, and visual comfort**.

My hope is that this approach can assist the design professionals to make informed decisions when the inevitable tradeoffs need to be made during the design process effecting comfort and enabling performance and facilitating success.



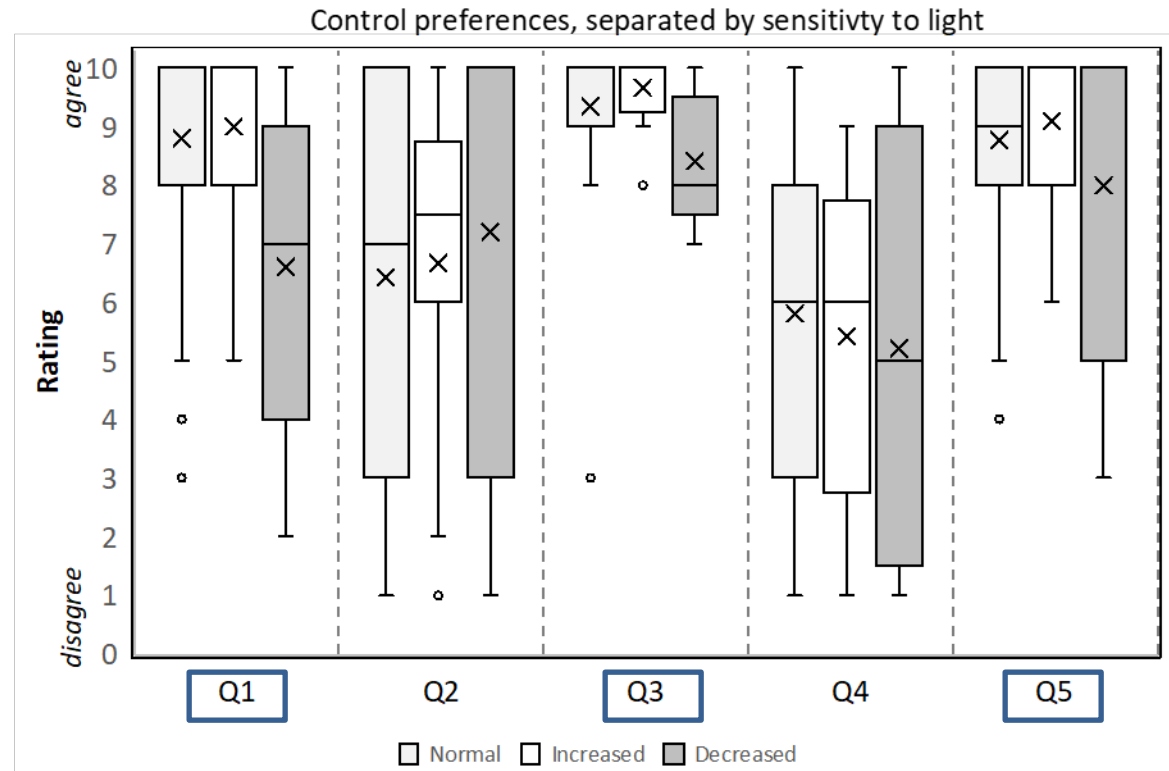
## Preferred Illuminance

The statistically significant finding here is that the range of illuminance preferences strongly suggests the need for personal control of task illuminance



# Control Preferences Q1&Q3

Statistically relevant insights regarding control preferences indicate a strong preference for personal control of both color appearance (CCT) illumination (intensity)

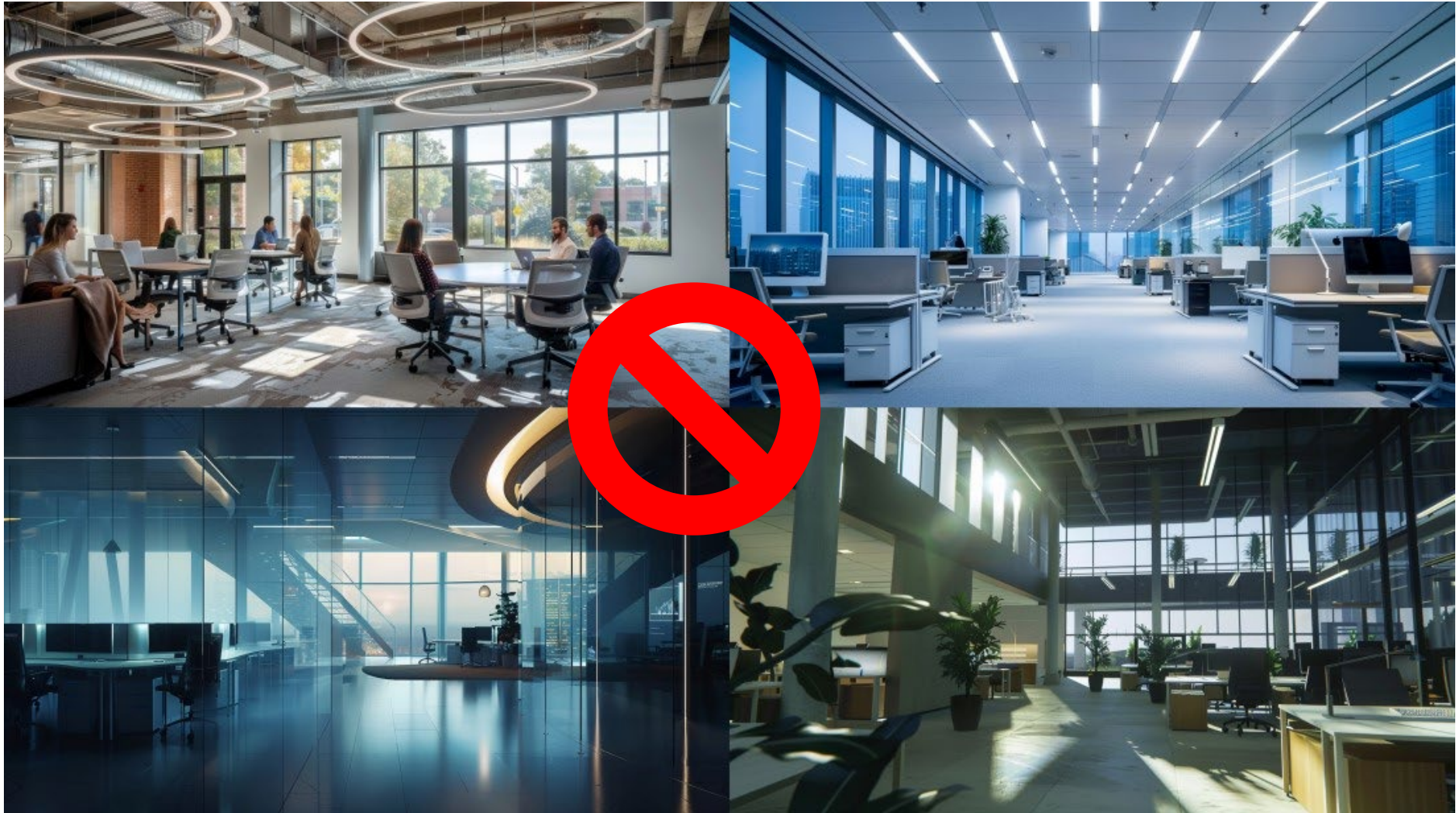


Question	Text
Q1	For my personal workspace, I would like the ability to control the color temperature of the light.
Q2	Rather than control the color temperature in my personal workspace, I would prefer a change in color temperature to happen automatically.
Q3	For my personal workspace, I would like the ability to control the intensity of the light.
Q4	Rather than control the color temperature in my personal workspace, I would prefer a change in intensity to happen automatically.
Q5	Overall, having control of the lighting in my personal workspace is important to me:

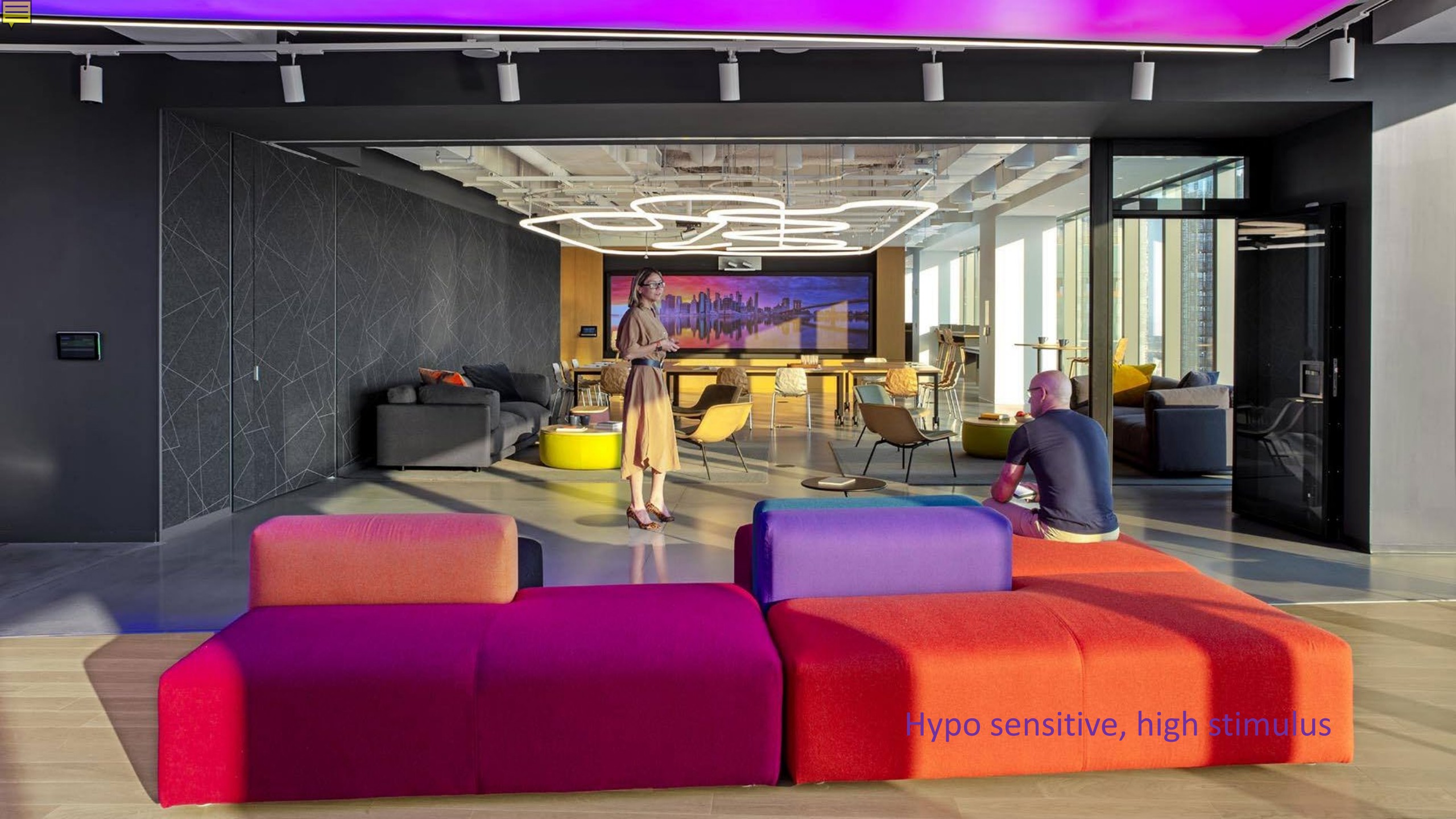
# Quality of Light: Removing Barriers to Success

Primary Challenges	
Glare	Direct/Indirect Overhead Daylight Management: View of source and direct/indirect glare
Contrast	User control of directionality of lighting Can be used by some to support focus on a paper task. Contrast can be problematic, particularly with digital tasks
Distraction	View of overhead ambient lighting in adjacent spaces, particularly change of state









Hypo sensitive, high stimulus



Hypo sensitive, high stimulus





Hypersensitive Low stimulus



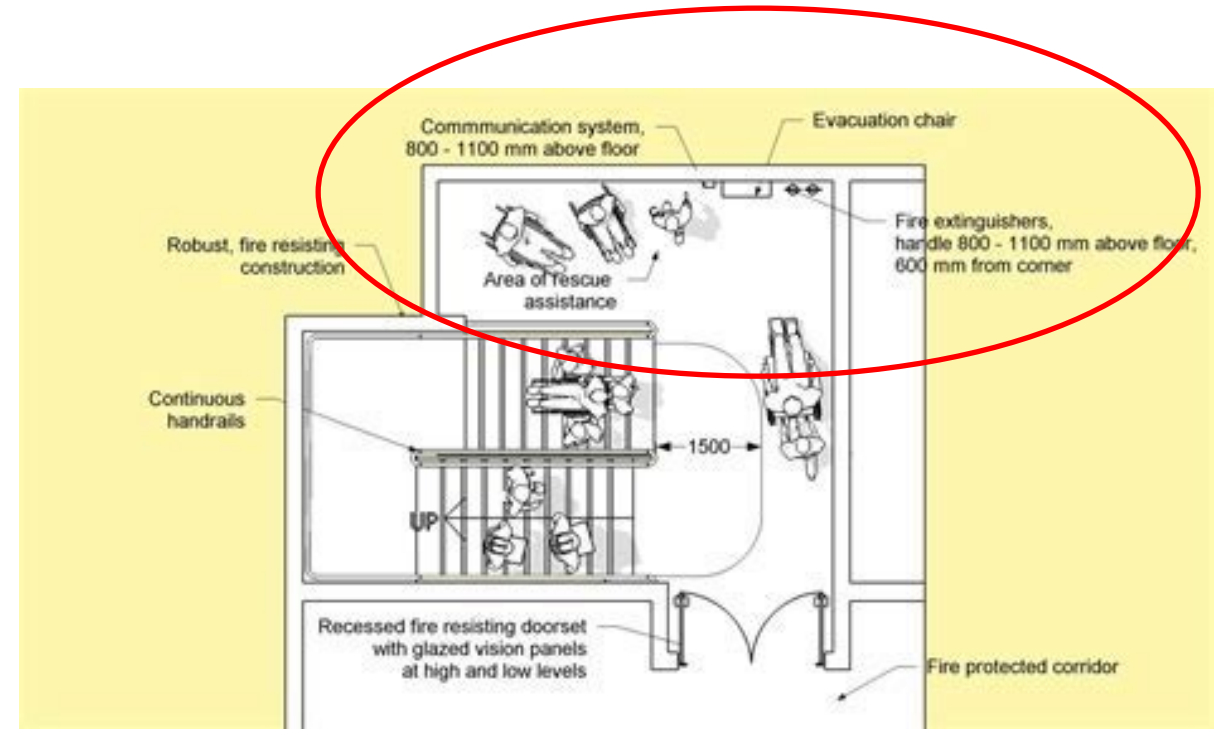


Hypersensitive Low Stimulus



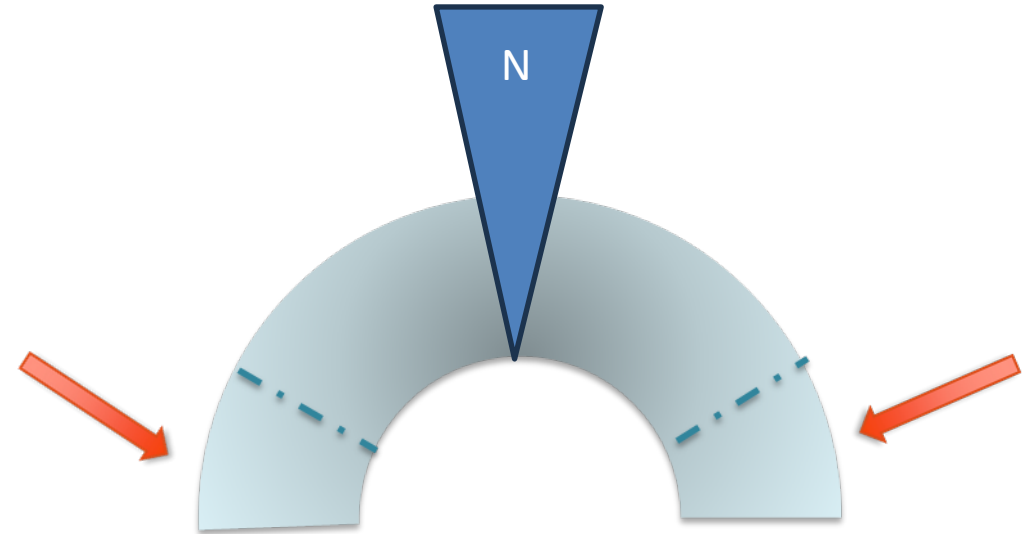
# Emergency Path of Egress

- Currently there are no ADA lighting requirements for Emergency Lighting other than the use of annunciators (audible) and braille (tactile) to assist those with hearing and/ or visual disabilities.
- There are areas designated as areas of refuge and assisted rescue primarily intended for mobility challenged and wheelchair use.



## Beyond the “Norm”

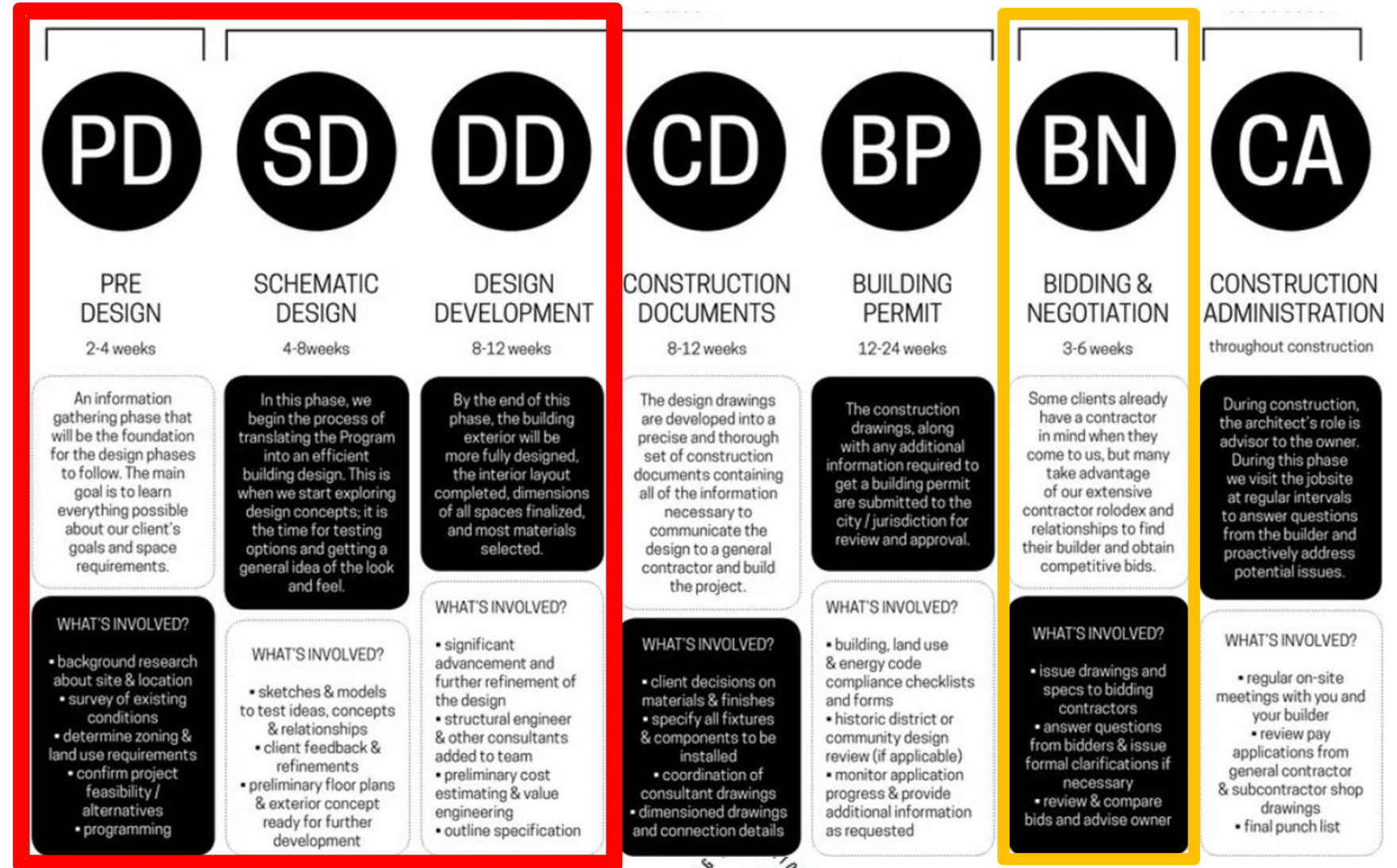
“Importantly, a company, architect, designer, manager or business leader, motivated to create inclusive spaces for all individuals in an office environment, must concern themselves not with an imagined “average” person, but instead with the nuance of individual differences and preferences.” –Tony Esposito



Design to the edges and you enable all

# Advocate Early and Often

Need to educate the teams so that they understand the **scope of work, the costs, challenges, benefits, impact on the organization (HR, facility managers, finance, etc.)** identify synergies with other project priorities... such as energy savings, adaptive environments. **Clear the path of “obstacles to adoption”**

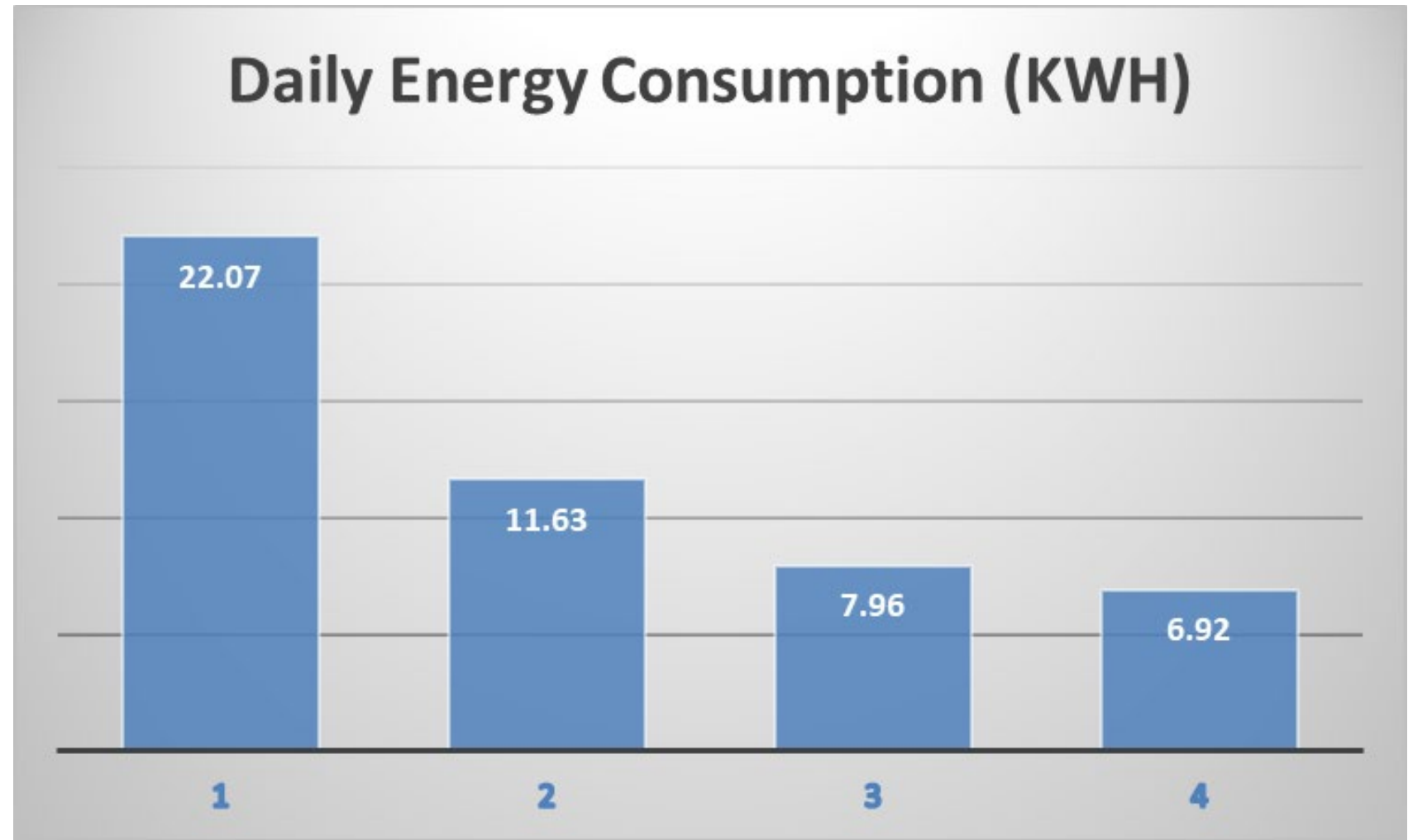


**Eliminating obstacles to Adoption:**

There is a mistaken belief that providing flexibility jeopardizes Energy Savings.

There is no energy savings penalty for providing options.

The layered lighting system provides additional energy savings opportunities and satisfies supports people and activities.



1: Baseline: T8;

2: LED only;

3. LED/Task;

4: LED/Task/Sensor

The fourth item LED/Task/Sensor represents the pilot installation resulting in 70% energy savings



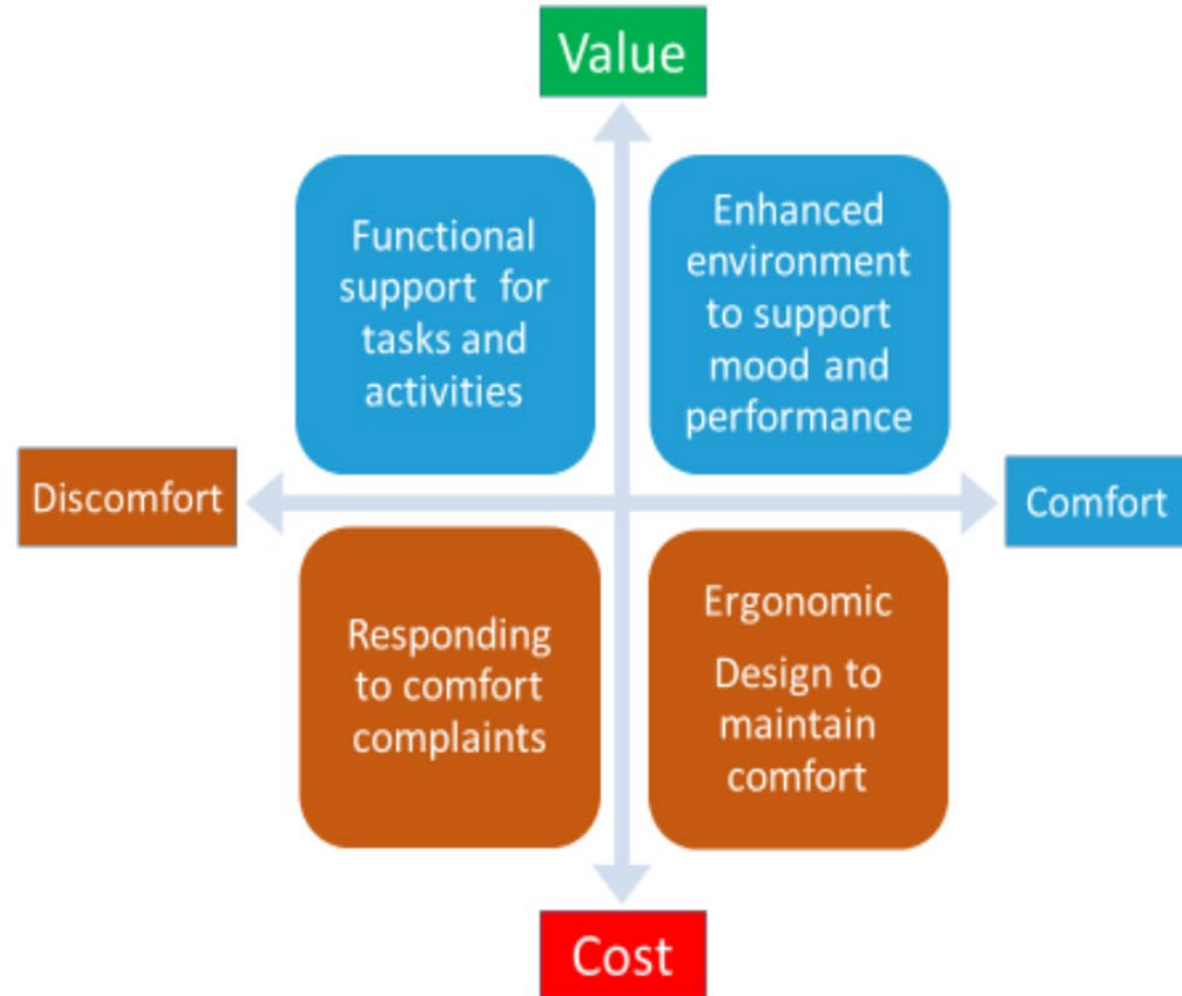


## Cost vs Value

Studies show that Enhanced Lighting appraisal in offices has led to:

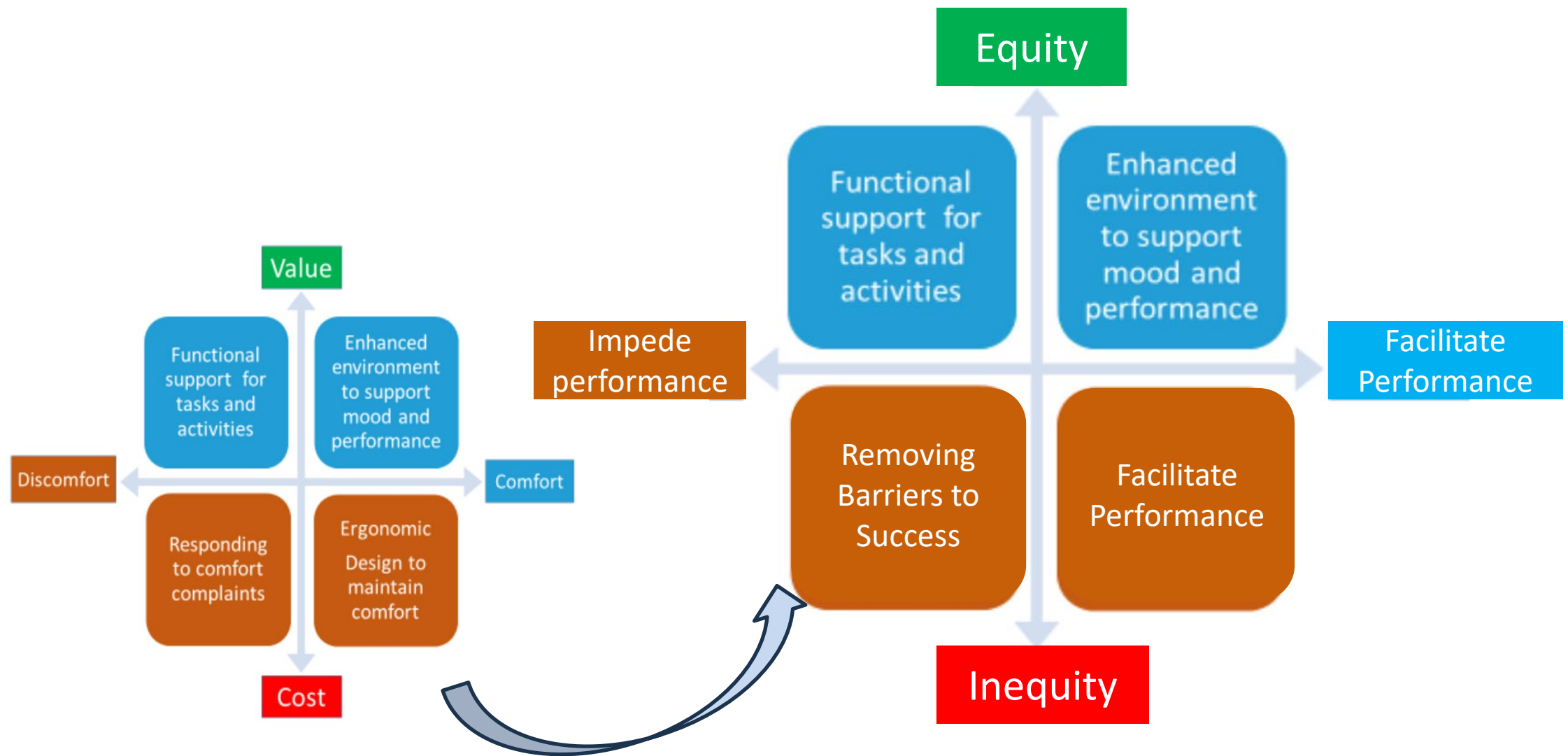
- 8% increase in job satisfaction
- 5% decrease in the intent to turnover
- 13% reduction in absenteeism
- Increase in organizational commitment
- Improvement on the overall environmental satisfaction

Research led by Jennifer Veitch, National Research Council of Canada and current president of the CIE



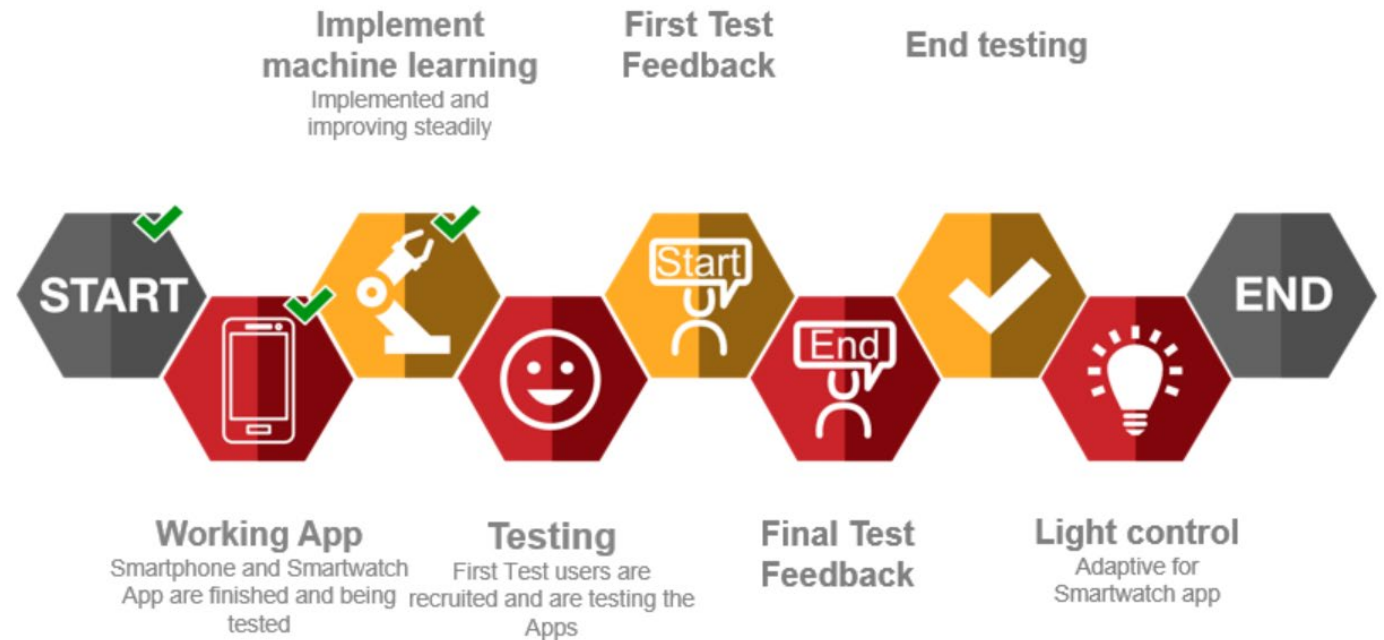
**But is it equity? Maybe, But not unless you ask the question and take a proactive approach**





## Synergies with other Building Management Projects

- Lighting Infrastructure supports other enabling Technologies and facilitates adaptive environments
- Generates data to guide building management
- Data driven verification
- Smarter, more accurate personalization of control behaviors through machine learning



# Equity is not synonymous with Justice

## **Equity is a thing that *you have***

Equity recognizes that people have different needs and different barriers due to various factors such as race, gender, or socioeconomic status...or response to sensory stimulus.

## **Justice is a thing that *you do***

Justice requires action and ensures that all people are treated fairly and with respect, and that the systems that create and maintain inequities are changed. **Justice is the long-term goal of equity.**

<sup>1</sup> “Addressing Imbalance,” by Tony Ruth for the [2019 Design in Tech Report](#).



The  
strongest  
indicator of  
your health  
outcome is  
your zip  
code



Photo credit: CC0 Public Domain  
Research reference : [DOI: 10.1038/s44220-023-00135-8](https://doi.org/10.1038/s44220-023-00135-8)

## Justice 40

**Visual stimulus hypo- or hypersensitivity may be caused by**

- Neurological diversity
- Vitamin D deficiency
- Migraines
- Functional vision problems including refractive errors (cornea)
- A side effect of medications, or brain injury.

Recent research documenting the combined incidence of these causes, specifically related to neurodiversity within the federal workforce, *and failure to deliver appropriate public health care in underserved communities highlights the urgency of developing strategic plans to eliminate any barriers to success faced by underserved employees.*



#3,4



Department  
of Veterans  
Affairs 2024  
Agency  
Equity  
Action Plan

## Justice 40

Strategies to address systemic barriers to achieving equitable healthcare outcomes:

- expand healthcare procurement supporting group purchasing to controls costs
- improve representative data collection
- use evidence-based decision making to improve overall health, well-being and trust.



# Justice = Action

## Justice in the corporate world

- **Reducing barriers** faced by minority owned businesses in underserved communities to participate competitively in commercial channels, while setting achievable goals for expanding distribution in underserved communities.
- **Offer a superior low-cost, rebate ready lighting solution accessible for budget constrained projects** such as schools, healthcare facilities, public housing.\*
- **Partner with unions to provide installer training** to ensure successful installation and user satisfaction, including being able to adapt to space use and configuration changes with minimal disruption to occupants.
- **Partner with IFMA to offer facility manager training** to tailor lighting installations to deliver the varied lighting preferences requirements which support workplace diversity and ensures workplace equity throughout the "installed life" of the product.



## **1. Business opportunities for underserved communities**

## **2. Well paying Employment opportunities for those in underserved communities**

## **3. Support neglected infrastructure in underserved communities**

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# Justice = Action

## Justice in the corporate world

- **Partner with IFMA to offer facility manager training** to tailor lighting installations to deliver the varied lighting preferences requirements which support workplace diversity and ensures workplace equity throughout the "installed life" of the product.
- **Contribute to professional training in HBCUs** and support lighting projects meeting Justice 40 criteria.
- **Partner to improve access to quality healthcare** in underserved communities for those struggling with stimulus sensitivity disorders. **Partnerships to provide “pop up” healthcare similar to past collaborations with the Veterans Administration**
- **Advocate for fair treatment and respect in the workplace** (office, schools, healthcare) through marketing campaigns.



**Now Is The Time!**

