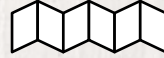


# Build a deck of LUX Cards!

## 1. Instruction leaflet (p.2 - 3)

Print pages 2 and 3 on one page, double sided. Cut along the outline and fold in zigzag pattern.



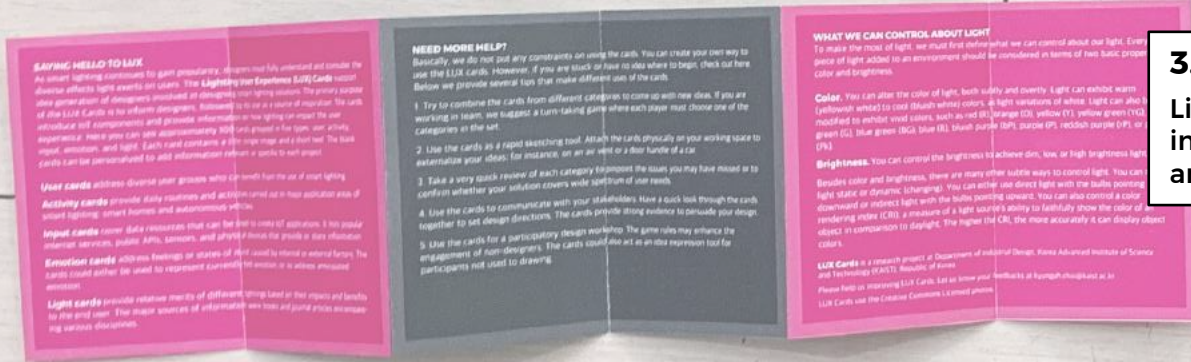
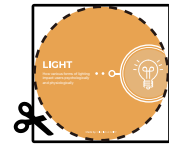
## 2. User, Activity, Input, and Emotion cards

User (pp 4-35), Activity (pp 36-91), Input (pp 92-137), and Emotion (pp 138-171) cards are RECTANGULAR in shape. Print these pages double sided and cut out each card.



## 3. Light cards

Light (pp 172-213) cards are CIRCULAR in shape. Print these pages double sided and cut along the circular outline.



# LUX cards

Lighting User  
Experience (LUX) Cards



Made by. Color Lab at KAIST

## User



Diverse user groups who can benefit from the use of smart lighting

### Card List

Adolescent	Married
Baby	Novice
Child	Older person
Disabled	Parent
Expert	Pet
Man	Pregnant
Married	Single
Multi-person	Woman

## Activity



Daily routines and activities that may be performed out in smart homes and autonomous vehicles

### Card List

Accident	Music listening
Break	Night driving
Business trip	Online communication
Car wash	Photograph
Cooking	Playing an instrument
Crafting	Radio listening
Dinner	Reading
Drowsing	Scenic drive
Electronic devices	Sleep
Housework	Social interaction
Information acquisition	Studying and working
Long drive	Sunny day driving
Meal	TV watching
Morning awakening	

## Input



Data resources that can be applied to generate IoT solutions

### Card List

Activity tracker	Position sensor
Air detector	Posture sensor
Beacon	Schedule
Biosensor	Smart furniture
Camera	Smart speaker
Light sensor	Social media data
Location data	Sound sensor
Mail/Message	Temperature/Humidity sensor
Motion sensor	Traffic Info
News	Weather data
Parking Info	Weight sensor

## Emotion



Feelings or states of mind caused by internal or external factors

### Card List

Afraid	Guilty
Angry	Happy
Anxious	Interested
Bored	Lonely
Disgusted	Quiet
Enthusiastic	Relaxed
Excited	Sad
Frustrated	Surprised

## Light



Relative merits of different lightings based on their impacts and benefits to the end user

### Card List

Alert/Focused	Legibility
Awakening	Liveliness
Baby	Productivity
Children	Refreshing
Classy	Relax
Cool	Sleep disorder
Depression	Sound sleep
Drowsiness	Splendid
Elderly	Tension
Eyestrain	Tranquil
Futuristic	Warm
Learning	

## SAYING HELLO TO LUX

As smart lighting continues to gain popularity, designers must fully understand and consider the diverse effects that light exerts on users. **Lighting User Experience (LUX)** Cards support designers' innovation of human-centered smart lighting solutions. LUX Cards are primarily meant to inform designers and, secondly, to use as a source of inspiration. The cards introduce IoT components and provide information on the extent to which lighting can impact the user experience. Here, you can see approximately 100 cards grouped into five categories: user, activity, input, emotion, and light.

Each card contains a title, single image, and a brief caption communicating relevant information. The blank cards can be personalized to add relevant or specific information to each project.

**User cards** address diverse user groups who can benefit from the use of smart lighting.

**Activity cards** provide daily routines and activities that may be performed out in major application areas of smart lighting: smart homes and autonomous vehicles.

**Input cards** cover data resources that can be applied to generate IoT solutions; these cards lists popular internet services, public application program interfaces (APIs), sensors, and physical devices that provide or store information.

**Emotion cards** address feelings or states of mind caused by internal or external factors. The cards could be used either to represent current emotions or to address anticipated emotions.

**Light cards** identify the relative merits of different lightings based on their impacts and benefits to the end user.

## NEED MORE HELP?

Basically, we do not constrain use of the cards. You can create your own way to use LUX cards. However, if you are stuck or have no idea where to begin, we provide several tips for various uses of the cards.

1. Try combining the cards from different categories to create new ideas. If you work with a team, we suggest a turn-based game where each player must choose one category in the set. In the game, the players take turns drawing a card from their own deck, until the group selects a meaningful combination of cards from the categories to generate new ideas.
2. Use the cards as a rapid sketching tool. Physically attach the cards to your workspace to externalize your ideas—on an air vent or a car door handle, for instance. The output platform may be a board, a scale model, or a real-world space.
3. Quickly review each category to pinpoint the issues you may have missed and to confirm that your solution covers a wide spectrum of user needs.
4. Use the cards to communicate with your stakeholders, and have a quick look through the cards together to set design directions. The cards provide strong evidence to support your design.
5. Use the cards for a participatory design workshop; the game rules may help engage non-designers. The cards could also act as an idea expressive tool for participants not used to drawing.

## WHAT WE CAN CONTROL ABOUT LIGHT

To make the most of light, we must first define what about our light we can control. Two basic properties of every piece of light in an environment should be considered: color and brightness.

**Color.** You can subtly or overtly alter light's color. Light can exhibit warm (yellowish-white) to cool (bluish-white) colors as variations of white. Light can also be controlled to exhibit vivid colors, such as red (R), orange (O), yellow (Y), yellow green (YG), green (G), blue green (BG), blue (B), bluish purple (bP), purple (P), reddish purple (rP), or pink (Pk).

**Brightness.** You can control brightness to achieve dimly, moderately, or highly bright light.

Besides color and brightness, there are many subtle ways to control light. You can make light static or dynamic (changing). You can also use direct light with bulbs pointing downward or indirect light with bulbs pointing upward. You can also use a color rendering index (CRI) to control a light source's ability to faithfully show an object's color in comparison to daylight. The higher the CRI, the more accurately it can display object colors.

**LUX Cards** is a research project at Department of Industrial Design, Korea Advanced Institute of Science and Technology (KAIST), Republic of Korea. Please help us improving LUX Cards. Let us know your feedbacks at [kyungah.choi@kaist.ac.kr](mailto:kyungah.choi@kaist.ac.kr). LUX Cards use the Creative Commons licensed photos.



**USER**

**Married**

A person having a wife or husband

# USER

Diverse user groups who can benefit from the use of smart lighting





**USER**

# **Single**

An unmarried person who does not  
have a child

# USER

Diverse user groups who can benefit from the use of smart lighting





**USER**

# **Teenager**

A transition period from childhood to  
adulthood



# USER

Diverse user groups who can benefit from the use of smart lighting





**USER**

**Child**

Kindergarten and young elementary  
school students

# USER

Diverse user groups who can benefit from the use of smart lighting





**USER**

**Baby**

A very young child who needs care

# USER

Diverse user groups who can benefit from the use of smart lighting





**USER**

# **Parent**

A father or mother having children

# USER

Diverse user groups who can benefit from the use of smart lighting





**USER**

# **Older person**

Elderly aged over 70 years old



# USER

Diverse user groups who can benefit from the use of smart lighting





**USER**

# **Disabled**

A person who has a physical or mental  
impairment

# USER

Diverse user groups who can benefit from the use of smart lighting





**USER**

# **Pregnant**

A woman having a baby

# USER

Diverse user groups who can benefit from the use of smart lighting





**USER**

**Man**

An adult human male

# USER

Diverse user groups who can benefit from the use of smart lighting





**USER**

**Woman**

An adult human female



# USER

Diverse user groups who can benefit from the use of smart lighting





**USER**

## **Novice**

A person new to or inexperienced  
with something

# USER

Diverse user groups who can benefit from the use of smart lighting





**USER**

# **Expert**

A person who is very skilled at doing something

# USER

Diverse user groups who can benefit from the use of smart lighting





**USER**

# **Multi-person**

More than one person

# USER

Diverse user groups who can benefit from the use of smart lighting





**USER**

**Pet**

A companion animal that  
you take care of



# USER

Diverse user groups who can benefit from the use of smart lighting



**USER**

---

# USER

Diverse user groups who can benefit from the use of smart lighting





ACTIVITY

## Cooking

Preparing and cooking dishes for  
yourself or for others

# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





ACTIVITY

## Meal

Eating breakfast or lunch

# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





ACTIVITY

# Dinner

Eating dinner at dining table



# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





ACTIVITY

# Morning awakening

Wake up and dress up

# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





ACTIVITY

## Housework

Cleaning, laundry, ironing, and washing dishes

# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





ACTIVITY

# Crafting

Gardening or sewing crafts

# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





ACTIVITY

# Studying and working

Focusing on studying or working



# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





ACTIVITY

## Electronic devices

Using smartphones, laptops or other  
electronic devices

# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





## ACTIVITY

# Playing an instrument

Playing a musical instrument

# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





ACTIVITY

# Reading

Reading a novel

# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





ACTIVITY

## Break

Having a cup of tea or coffee



# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





ACTIVITY

## TV watching

Watching TV and movies

# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





## ACTIVITY

# Social interaction

Socializing, face-to-face communication, and phone conversation

# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





ACTIVITY

# Music listening

Listening to music through speakers  
and headphones

# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





ACTIVITY

## Sleep

Sleeping or a short napping



# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





ACTIVITY

# Radio listening

Listening to a radio station

# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





ACTIVITY

## Sunny day driving

Driving on a road on a beautiful  
sunny day

# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





ACTIVITY

## Scenic drive

Beautiful drive with stunning scenery

# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





ACTIVITY

## **Business trip**

Going on a business trip



# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





ACTIVITY

## Car wash

Washing a car by hand

# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





ACTIVITY

# Long drive

Driving long distances alone

# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





ACTIVITY

# Night driving

Nighttime driving in the dark

# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





ACTIVITY

## **Drowsing**

Being half asleep or dozing intermittently



# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





ACTIVITY

# Accident

Having a car accident

# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





## ACTIVITY

# Information acquisition

Visual attention and information  
acquisition

# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





ACTIVITY

# Photograph

Taking pictures with a camera

# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





## ACTIVITY

# Online communication

Communicating via social media or  
text message



# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles



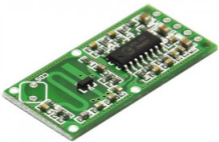
## ACTIVITY

---

# ACTIVITY

Daily routines and activities that may be performed out in smart homes and autonomous vehicles





**INPUT**

## **Motion sensor**

Detects motion and movement in  
an area

# INPUT

Data resources that can be applied to generate IoT solutions





**INPUT**

## **Sound sensor**

Detects a sound's intensity in an environment

# INPUT

Data resources that can be applied to generate IoT solutions





**INPUT**

## **Temperature/Humidity sensor**

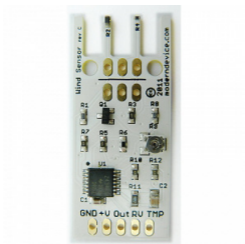
Measures the temperature and moisture of something



# INPUT

Data resources that can be applied to generate IoT solutions





**INPUT**

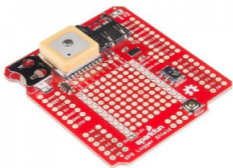
# **Air detector**

Monitors the presence of air pollution  
in an area

# INPUT

Data resources that can be applied to generate IoT solutions





**INPUT**

## **Position sensor**

Detects an object's position and movement

# INPUT

Data resources that can be applied to generate IoT solutions





**INPUT**

## **Posture sensor**

Detects users' body posture and movement

# INPUT

Data resources that can be applied to generate IoT solutions





**INPUT**

# **Weight sensor**

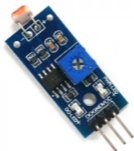
Measures weight of objects



# INPUT

Data resources that can be applied to generate IoT solutions





**INPUT**

## **Light sensor**

Detects and measures ambient light  
in an environment

# INPUT

Data resources that can be applied to generate IoT solutions





INPUT

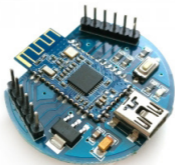
# Biosensor

Captures users' biological signal

# INPUT

Data resources that can be applied to generate IoT solutions





**INPUT**

# **Beacon**

Communicates with other devices  
and retrieves location information

# INPUT

Data resources that can be applied to generate IoT solutions





INPUT

## Traffic Info

Information on road traffic in real-time



# INPUT

Data resources that can be applied to generate IoT solutions





**INPUT**

# **Parking Info**

Parking data such as occupancy and duration

# INPUT

Data resources that can be applied to generate IoT solutions





**INPUT**

## **Camera**

A video feed from a public webcam  
or surveillance camera

# INPUT

Data resources that can be applied to generate IoT solutions





**INPUT**

## **Weather data**

Weather information and forecast  
from weather stations

# INPUT

Data resources that can be applied to generate IoT solutions





**INPUT**

## **Location data**

Information on something's time and location



# INPUT

Data resources that can be applied to generate IoT solutions





INPUT

## News

Data from news providers like breaking news

# INPUT

Data resources that can be applied to generate IoT solutions





**INPUT**

## **Alarm**

Time-related events such as alarms or reminders

# INPUT

Data resources that can be applied to generate IoT solutions





## INPUT

# Social media data

Data from different social media sources such as Twitter, Instagram, and Flickr

# INPUT

Data resources that can be applied to generate IoT solutions





**INPUT**

## **Activity tracker**

Tracks physical activity such as exercise, heartbeat, and sleep patterns



# INPUT

Data resources that can be applied to generate IoT solutions





**INPUT**

## **Smart furniture**

Furniture with networking capability  
beyond its analogue function

# INPUT

Data resources that can be applied to generate IoT solutions





**INPUT**

## **Smart speaker**

Voice command device with an integrated virtual assistant

# INPUT

Data resources that can be applied to generate IoT solutions





**INPUT**

# **Mail/Message**

Data from delivered mail or messages

# INPUT

Data resources that can be applied to generate IoT solutions



**INPUT**

---



# INPUT

Data resources that can be applied to generate IoT solutions





EMOTION

**Excited**

Being in a state of excitement

# EMOTION

Feelings or states of mind caused by internal or external factors





EMOTION

**Interested**

Having an interest in something

# EMOTION

Feelings or states of mind caused by internal or external factors





EMOTION

## Enthusiastic

Feeling of energetic interest in a particular subject or activity

# EMOTION

Feelings or states of mind caused by internal or external factors





EMOTION

**Happy**

Feeling or showing pleasure or contentment



# EMOTION

Feelings or states of mind caused by internal or external factors





EMOTION

**Relaxed**

Free from tension and anxiety

# EMOTION

Feelings or states of mind caused by internal or external factors





EMOTION

**Quiet**

Without much activity, disturbance,  
or excitement

# EMOTION

Feelings or states of mind caused by internal or external factors





EMOTION

**Bored**

Feeling unhappy because something  
is not interesting

# EMOTION

Feelings or states of mind caused by internal or external factors





EMOTION

**Sad**

Feeling or showing sorrow or unhappiness



# EMOTION

Feelings or states of mind caused by internal or external factors





EMOTION

**Guilty**

Guilt for doing something wrong

# EMOTION

Feelings or states of mind caused by internal or external factors





EMOTION

# Lonely

Sad because one has no friends or  
company

# EMOTION

Feelings or states of mind caused by internal or external factors





EMOTION

## **Frustrated**

Annoyance resulting from an inability  
to change or achieve something

# EMOTION

Feelings or states of mind caused by internal or external factors





EMOTION

## **Anxious**

Worry, nervousness, or unease  
about something with an uncertain  
outcome



# EMOTION

Feelings or states of mind caused by internal or external factors





EMOTION

# Disgusted

Feeling or expressing revulsion or  
strong disapproval

# EMOTION

Feelings or states of mind caused by internal or external factors





EMOTION

**Angry**

Feeling or showing strong annoyance, displeasure, or hostility

# EMOTION

Feelings or states of mind caused by internal or external factors





EMOTION

**Afraid**

Feeling fear or anxiety

# EMOTION

Feelings or states of mind caused by internal or external factors





EMOTION

# Surprised

Sudden feeling through unexpectedness



# EMOTION

Feelings or states of mind caused by internal or external factors



**EMOTION**

---

# EMOTION

Feelings or states of mind caused by internal or external factors





**LIGHT**

## **Relax**

Create relaxing, cozy, and soft ambience by setting the light to:

**Color :** Warm, Y, O

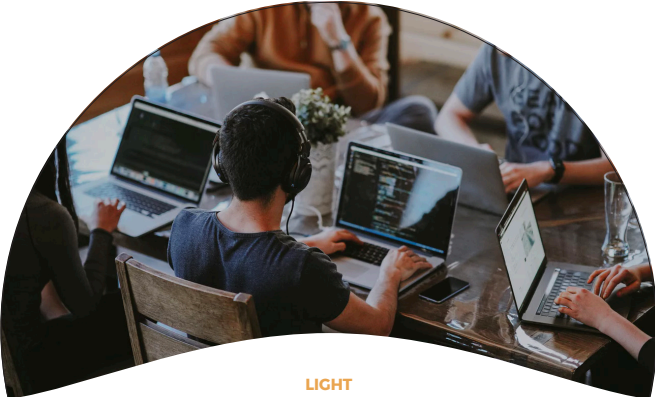
**Brightness :** Low to Medium

**Others :** Indirect light,  
Slow tempo light

# LIGHT

Relative merits of  
different lightings  
based on their impacts  
and benefits to the end user





**LIGHT**

## **Alert/Focused**

Keep users alert and stay focused by setting the light to:

**Color** : Cool, White

**Brightness** : Medium to High

# LIGHT

Relative merits of  
different lightings  
based on their impacts  
and benefits to the end user





**LIGHT**

## **Tension**

Create an atmosphere of tension by setting the light to:

**Color:** R, rP, B

**Brightness:** Dim

**Others:** Fast tempo light



# LIGHT

Relative merits of  
different lightings  
based on their impacts  
and benefits to the end user





**LIGHT**

## **Depression**

Improve mood and help relieve depression  
by setting the light to:

**Color** : Cool, White

**Brightness** : Medium to High

# LIGHT

Relative merits of  
different lightings  
based on their impacts  
and benefits to the end user





**LIGHT**

## **Sleep disorder**

Inappropriate light at night reduces sleep quality. Do NOT use:

**Color :** B, Cool

**Brightness :** High

**Others :** Direct light

# LIGHT

Relative merits of  
different lightings  
based on their impacts  
and benefits to the end user





**LIGHT**

## **Sound sleep**

Help people sleep better at night by setting the light to:

**Color :** Warm, Y, O

**Brightness :** Dim to Low

**Others :** Indirect light

# LIGHT

Relative merits of  
different lightings  
based on their impacts  
and benefits to the end user





**LIGHT**

## **Eyestrain**

Light could induce eyestrain. Do NOT use too much of:

**Brightness** : High

**Others** : Direct light



# LIGHT

Relative merits of  
different lightings  
based on their impacts  
and benefits to the end user





**LIGHT**

## **Drowsiness**

Light may cause extreme daytime sleepiness. Do NOT use too much of:

**Color :** Warm, Y, O

**Brightness :** Dim to Low

# LIGHT

Relative merits of  
different lightings  
based on their impacts  
and benefits to the end user





**LIGHT**

## **Learning**

These lights could enhance students' concentration and learning,

**Color :** Cool, White

**Brightness :** Medium to High

# LIGHT

Relative merits of  
different lightings  
based on their impacts  
and benefits to the end user





**LIGHT**

## **Productivity**

Increase productivity in a workplace by setting the light to:

**Color** : Cool, White

**Brightness** : Medium to High

# LIGHT

Relative merits of  
different lightings  
based on their impacts  
and benefits to the end user





**LIGHT**

## **Legibility**

Help users distinguish fine visual details by setting the light to:

**Color** : White

**Brightness** : High

**Others** : Direct light



# LIGHT

Relative merits of  
different lightings  
based on their impacts  
and benefits to the end user





**LIGHT**

## **Futuristic**

Create a futuristic atmosphere by setting the light to:

**Color:** BC, B, P, rP

**Others:** High color rendering

# LIGHT

Relative merits of  
different lightings  
based on their impacts  
and benefits to the end user





**LIGHT**

## **Classy**

Create a luxurious and classy atmosphere  
by setting the light to:

**Color** : Warm

**Others** : Low color rendering

# LIGHT

Relative merits of  
different lightings  
based on their impacts  
and benefits to the end user





**LIGHT**

## **Liveliness**

Increase liveliness and vigor by setting the light to:

**Color** : Warm

**Brightness** : High

**Others** : High color rendering,  
Middle tempo light

# LIGHT

Relative merits of  
different lightings  
based on their impacts  
and benefits to the end user





**LIGHT**

## **Tranquil**

Create a calm and tranquil ambience by setting the light to:

**Color :** G

**Brightness :** Medium

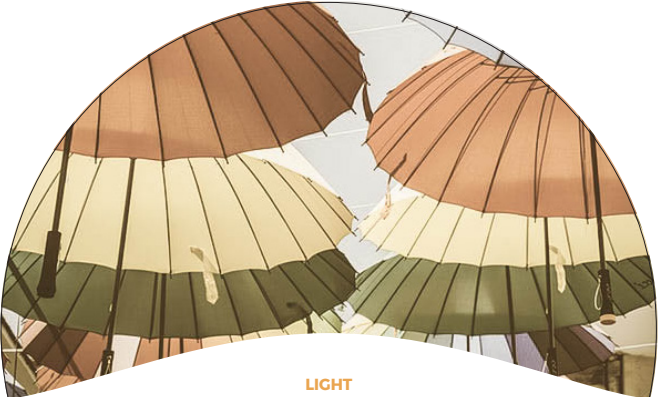
**Others :** Low color rendering



# LIGHT

Relative merits of  
different lightings  
based on their impacts  
and benefits to the end user





**LIGHT**

## **Splendid**

Create a splendid and flamboyant ambience by setting the light to:

**Color:** R, O, Y

**Brightness:** Low to Medium

# LIGHT

Relative merits of  
different lightings  
based on their impacts  
and benefits to the end user





**LIGHT**

## **Refreshing**

Create a clear and refreshing atmosphere  
by setting the light to:

**Color** : White, C

**Brightness** : Medium to High

# LIGHT

Relative merits of  
different lightings  
based on their impacts  
and benefits to the end user





**LIGHT**

## **Elderly**

Elderly users prefer the light in:

**Color** : Warm

**Brightness** : High

# LIGHT

Relative merits of  
different lightings  
based on their impacts  
and benefits to the end user





**LIGHT**

## **Children**

Help children calm down by setting the light to:

**Color :** Warm, O

**Others :** Slow tempo light



# LIGHT

Relative merits of  
different lightings  
based on their impacts  
and benefits to the end user





**LIGHT**

## **Baby**

Help babies feel comfortable by setting the light to:

**Color** : Warm, O

**Brightness** : Low to Medium

# LIGHT

Relative merits of  
different lightings  
based on their impacts  
and benefits to the end user





**LIGHT**

## **Awakening**

Help drowsy people stay awake by setting  
the light to:

**Color :** Cool, White

**Brightness :** Medium to High

# LIGHT

Relative merits of  
different lightings  
based on their impacts  
and benefits to the end user





LIGHT

## Warm

Make people feel warmer by setting the light to:

**Color :** Warm, Y, O

# LIGHT

Relative merits of  
different lightings  
based on their impacts  
and benefits to the end user





LIGHT

**Cool**

Make people feel cooler by setting the  
light to:

**Color:** Cool, B



# LIGHT

Relative merits of  
different lightings  
based on their impacts  
and benefits to the end user



**LIGHT**

---

**Color :**  
**Brightness :**  
**Others :**

# LIGHT

Relative merits of  
different lightings  
based on their impacts  
and benefits to the end user

