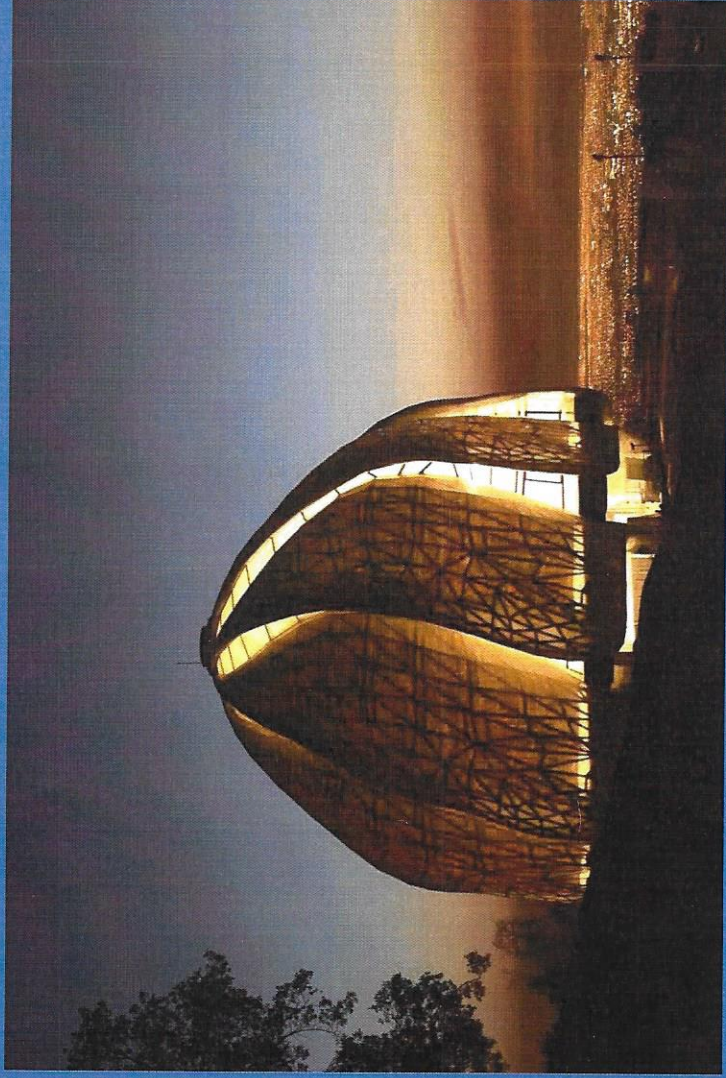


How can Artificial Lighting Improve Architecture?



By: Miran Burhan Sharey

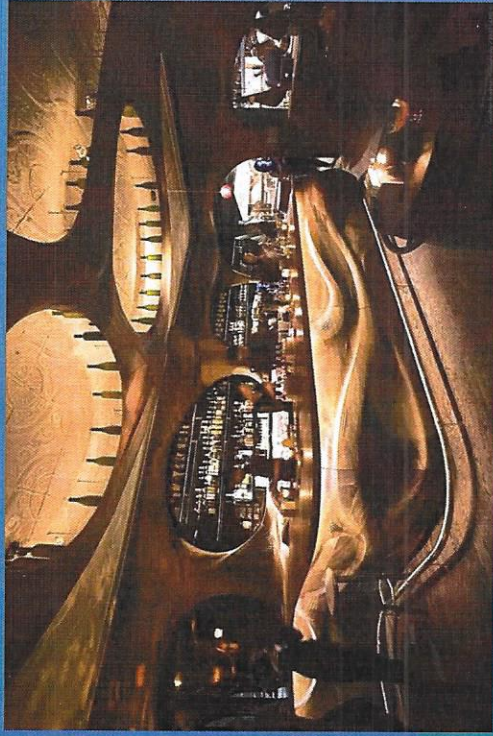
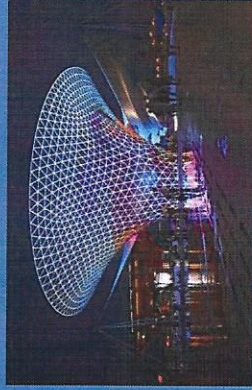
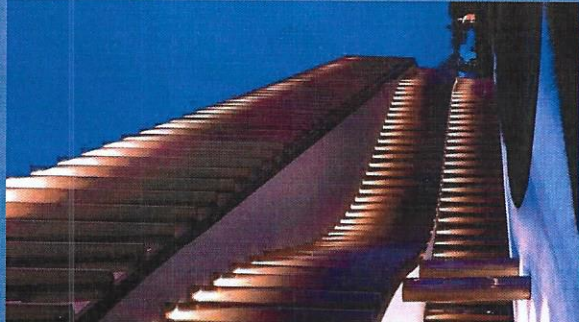
Handwritten signature in blue ink, likely reading "Miran Burhan Sharey".

ARTIFICIAL LIGHTING:

Artificial lighting greatly affects the way we perceive and realize spaces—it has always been used as an efficient element to accentuate certain aspects of architecture, create contrast, craft the desired atmosphere, and most importantly, illuminate!

Our ancestors of architects successfully and creatively employed natural light in their interest, leaving us with great examples including Rome's Pantheon and Athen's Parthenon, while architects created masterpieces with natural light likewise, such as Tadao Ando's Studio of Light and Church of Light. Artificial lighting can, as well, be a powerful tool in architectural design!

Since it is more controllable, artificial lighting can take both the aesthetics and functionality of architecture to a whole new level. It can be customized to fit the exact needs of a space, strongly defining its geometry and pointing out its materials and textures.



Objective of this Research:

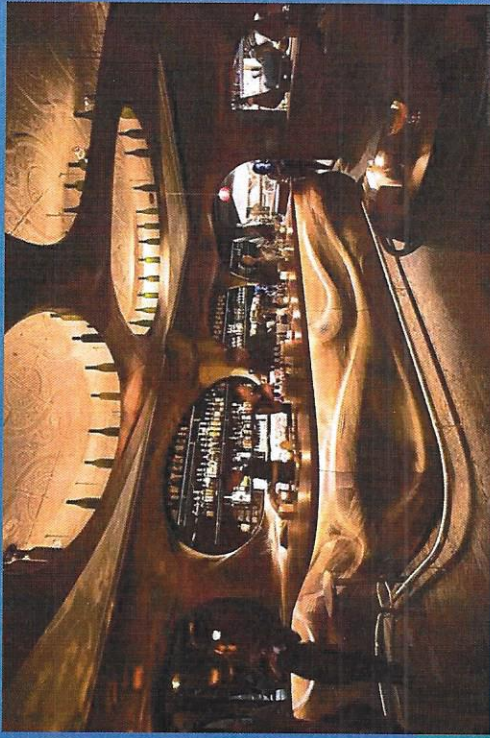
Artificial lighting design is an integral part of the building design process. However, little or no emphasis is usually placed on its importance in the initial design process, as lighting is often understood as merely the idea of illuminating spaces.

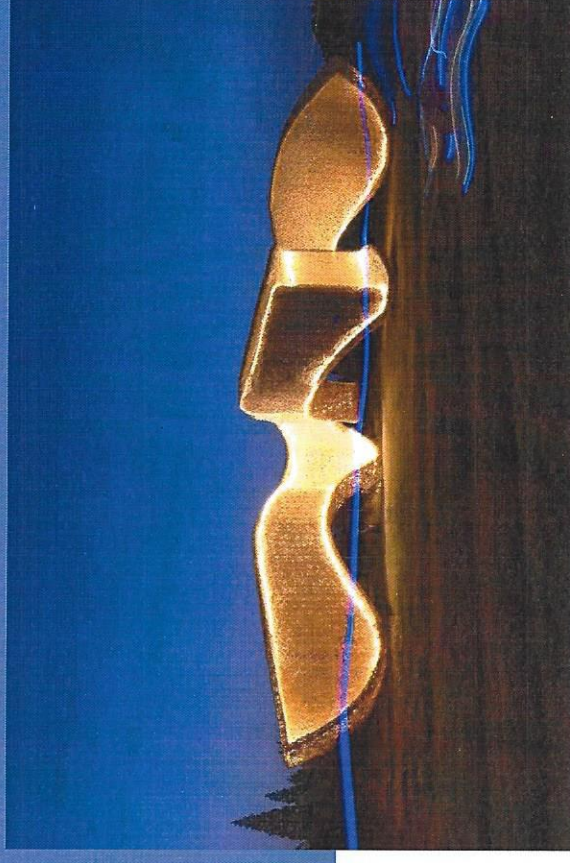
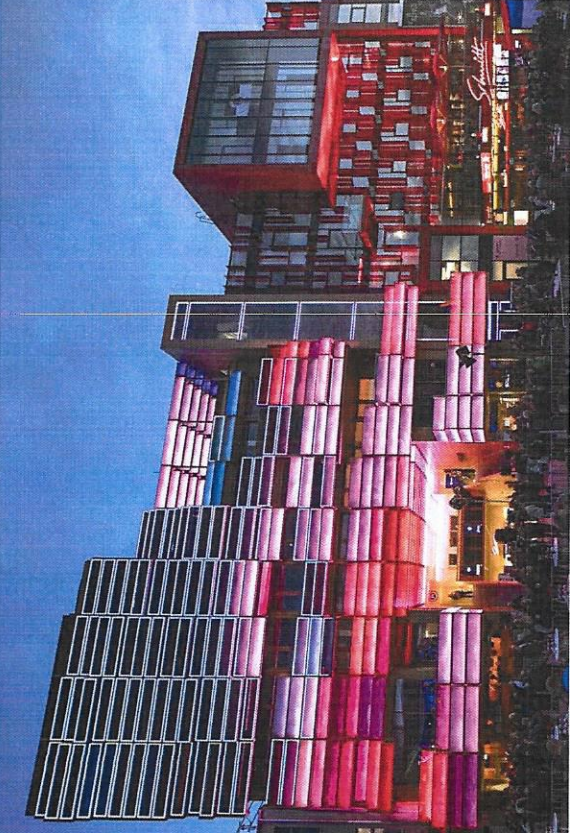
This paper investigated the evolved variety of roles artificial lighting plays in architectural designs in the context of psychology and communication.

Data was compiled from existing knowledge on artificial lighting techniques, tools and practices to develop a literature for better understanding of the greater capabilities of artificial lighting within the urban context.

The research focused mainly on the use of artificial lighting in the 21st century, in a bid to capture the diverse roles artificial lighting plays in the built environment in recent times.

The study is a qualitative research that relied strictly on data from secondary sources.



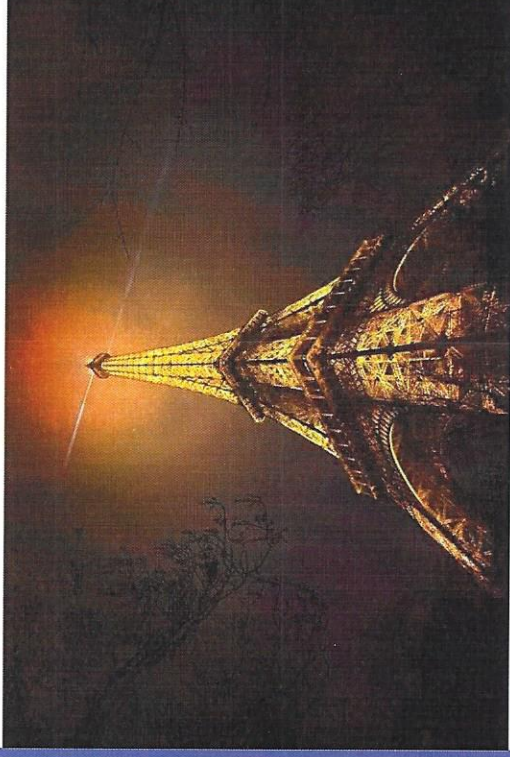


Artificial Lighting Design Effects

What is artificial lighting?

The Importance Of Artificial Light In Architecture

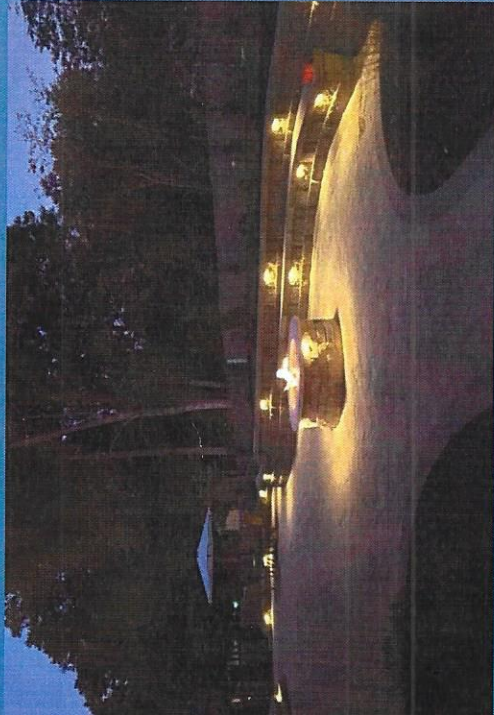
- The term artificial lighting refers to any man-made light emitted from sources including fire, gaslight, and electric lamps. However, in the modern-day, artificial lighting mostly refers to light emitted from electric lamps. These lamps or lighting devices typically comprise a light-emitting element within an outer container transmitting this light.
- Artificial light is controllable—it can be increased, decreased, directed, focused, and colored. There are multiple light sources, the choice depends on the function of the space and the needed quality of light.



- Artificial light replaces natural light during the night, or in areas where natural light does not reach.
- It is a powerful element in both interior and exterior design.
- The type and quality of artificial light can affect the moods and health of the users of a space.

The Role of Artificial Lighting in Architectural Design

1. Sources of light
2. Lighting design
3. Effects of artificial lighting on visual comfort and energy consumption
4. Effects of artificial lighting on emotion
5. Effects of ambient lighting on approach motivation
6. Architectural lighting in workspaces
7. Architectural lighting and its implications on the urban landscape



1. Sources of light

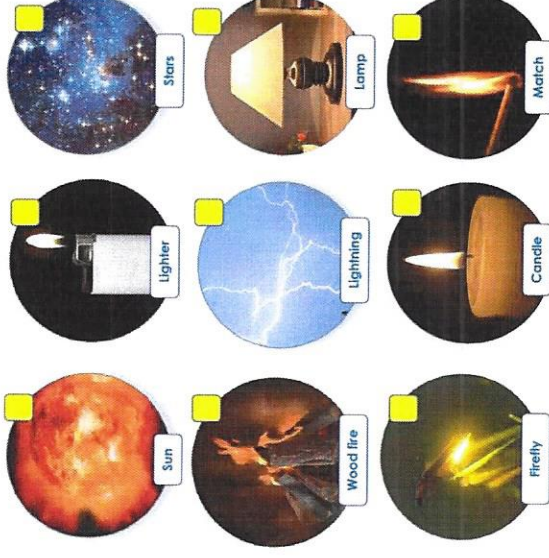
Sources of light The origin of light can be traced back to the beginning of the events that led to the creation of the world as recorded in the bible. The holy book records that in the beginning when God created heaven and earth, the earth was completely filled with blackness and was without form and void.

However, with the statement “let there be light” God commanded light to appear in the mist of the darkness which He later separated from the light.

He named the light day and the darkness night. He then made two lights, the sun and the moon. The sun which is the greater light was created to appear and provide light on earth during the day, whereas the moon which is the lesser light was made to appear to provide the needed light at night.

Homework # 6
"Sources of light"

1. Write an **N** Next to the natural light source and an **A** next to the artificial light source.



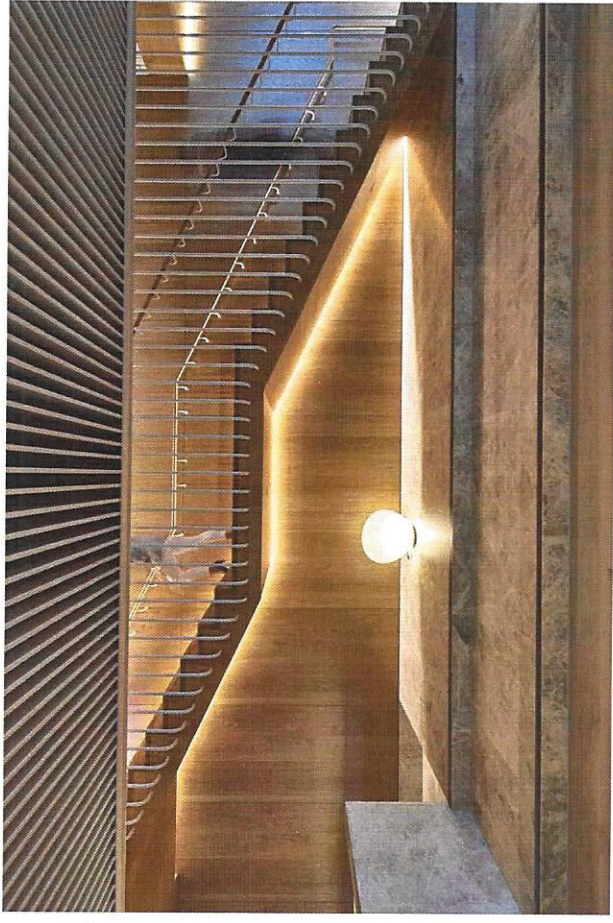
LIVEWORKSHEETS

2. Lighting design

Man uses his eyesight to navigate himself about the built and natural environment, therefore the role of lighting and the proper design of it cannot be overlooked as a design tool, particularly as 80% of information to man comes visually.

Light does not only serve for vision and navigation, it also influences our wellbeing and our mood greatly.

The effective application of lighting depends upon a definition of light that captures the full range of wavelengths to which the human retina is sensitive. Therefore, lighting should be designed to seamlessly produce appropriate brightness for a space, as well as to save energy costs.

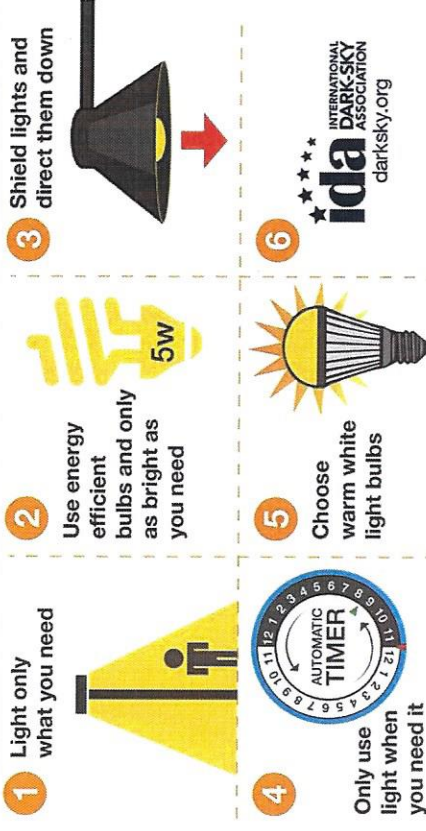


3. Effects of artificial lighting on visual comfort and energy consumption

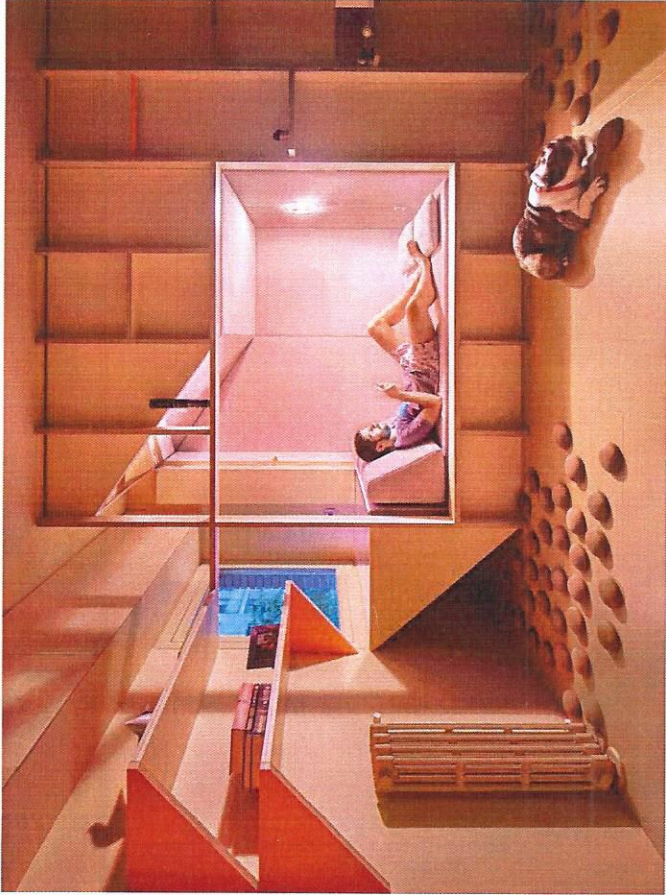
Sources of light The origin of light can be traced back to the beginning of the events that led to the creation of the world as recorded in the bible. The holy book records that in the beginning when God created heaven and earth, the earth was completely filled with blackness and was without form and void.

However, with the statement “let there be light” God commanded light to appear in the mist of the darkness which He later separated from the light.

He named the light day and the darkness night. He then made two lights, the sun and the moon. The sun which is the greater light was created to appear and provide light on earth during the day, whereas the moon which is the lesser light was made to appear to provide the needed light at night.



4. Effects of artificial lighting on emotion



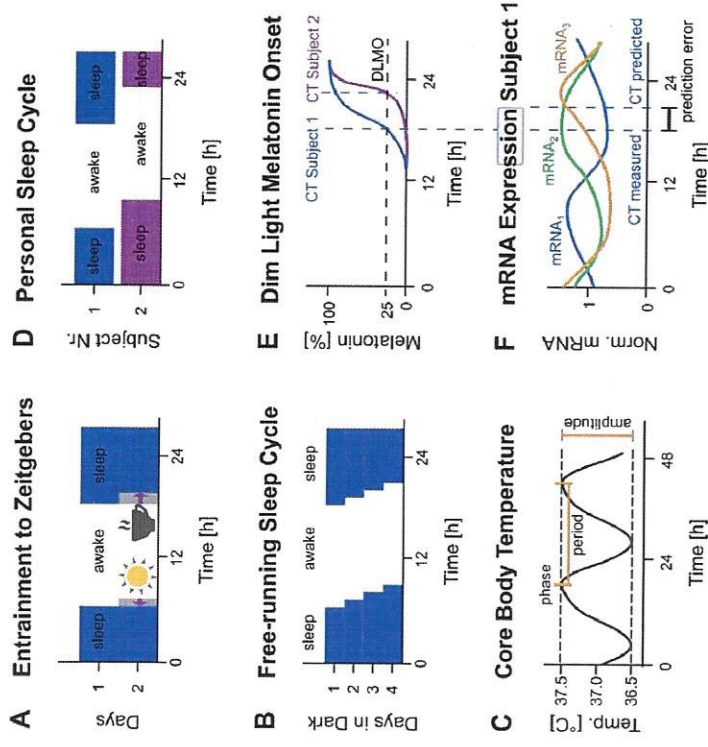
Effects of artificial lighting on emotion Artificial lighting is an important consideration in the wellbeing of users of a particular space as it affects mood, emotion and mental alertness. It can also support and affect circadian rhythms and influence peoples physiological and psychological states [14]. Therefore, artificial lighting methods are usually adopted for the purpose of creating varying kinds of environments or inducing certain emotional states. It is a powerful tool of passive communication. Examples of this can be seen in spaces like theatres, stadiums or plays where certain emotional states are evoked from the audience. Artificial lighting plays a key role in this regard.

5. Effects of ambient lighting on approach motivation

Lighting has a long lasting effect on individuals and how they relate with others and as such should be correctly utilized in order to maximize its effects in this regard.

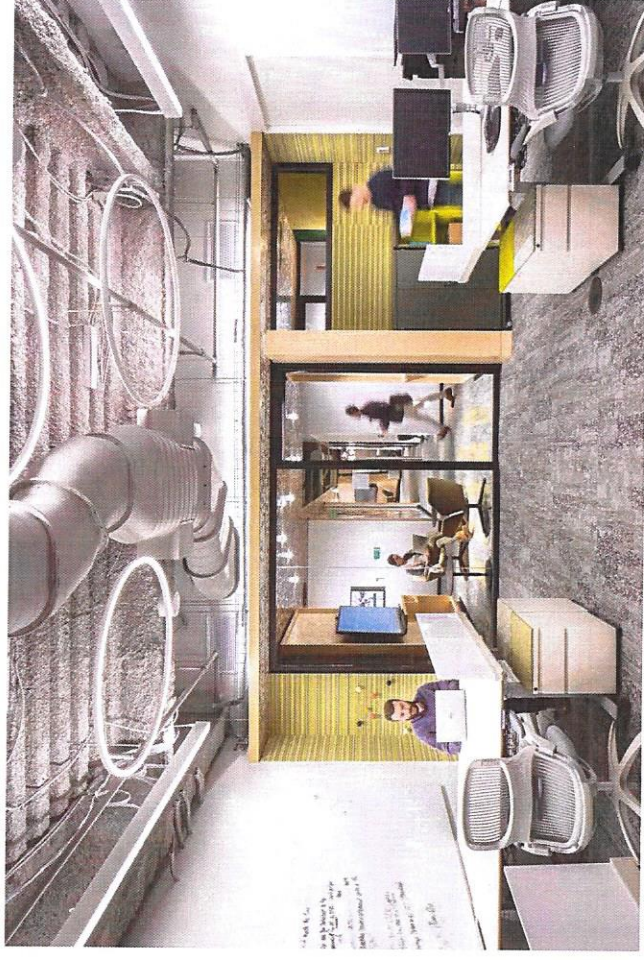
A research on the effects of ambient lighting, discovered that people reported less approach motivation in a dark room as against a bright room. The study investigated the influence of lighting over the psychological motivation of users to enter or engage with a certain space.

As a result of the impression that a dark space is more likely to lack an activity, the study posited that darker environments are more likely to lower approach motivation as against brighter atmospheres. Some other studies also revealed similar findings.



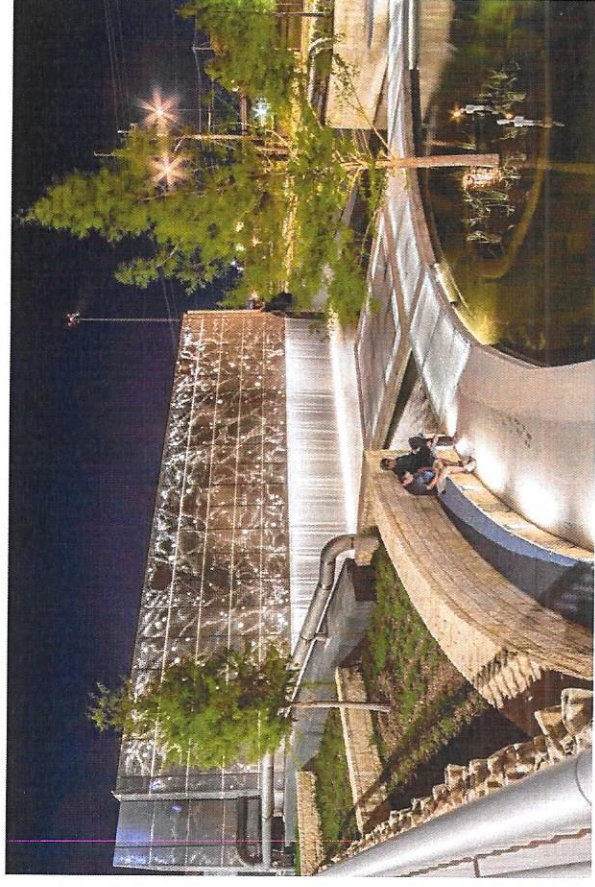
6. Architectural lighting in workspaces

In a research on the application of artificial lighting in office spaces [14] conducted a study on how artificial lighting is used as a tool for non-verbal communication within the building envelope. The author noted that intelligent lighting solutions help to increase peoples sense of wellbeing to create identity and at the same time cut energy costs. The researcher also advanced that lighting spaces that can be adjusted to the personal preference of users by variable colour temperature and quantity of light, increase employee satisfaction and create identity. High quality product design that maximises illumination, aesthetics and reduce maintenance costs also play a role in this.

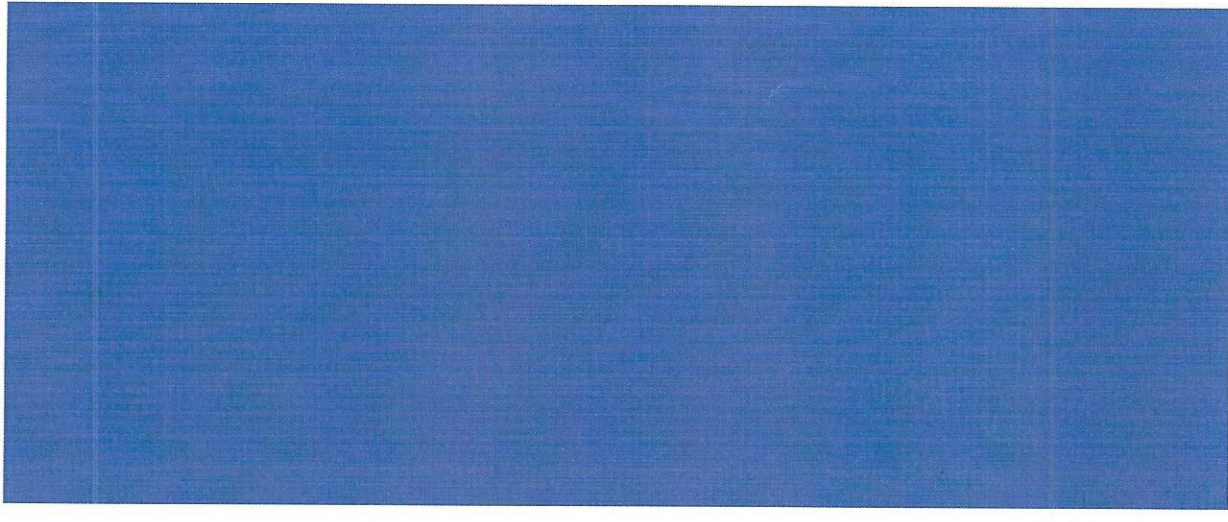


7. Architectural lighting and its implications on the urban landscape

Looking outside the building envelope briefly, artificial lighting also provides a wide array of uses and possibilities. One of the applications of lighting in the urban scape include security control as lit spaces naturally invoke openness and serve as a passive deterrent to criminal activity. It also highlights a more defined cityscape and helps to drastically reduce the rate of accidents through guidance and navigation.



Examples of Projects That Used Artificial Lighting



1. The Winton Gallery at The Science Museum | Zaha Hadid

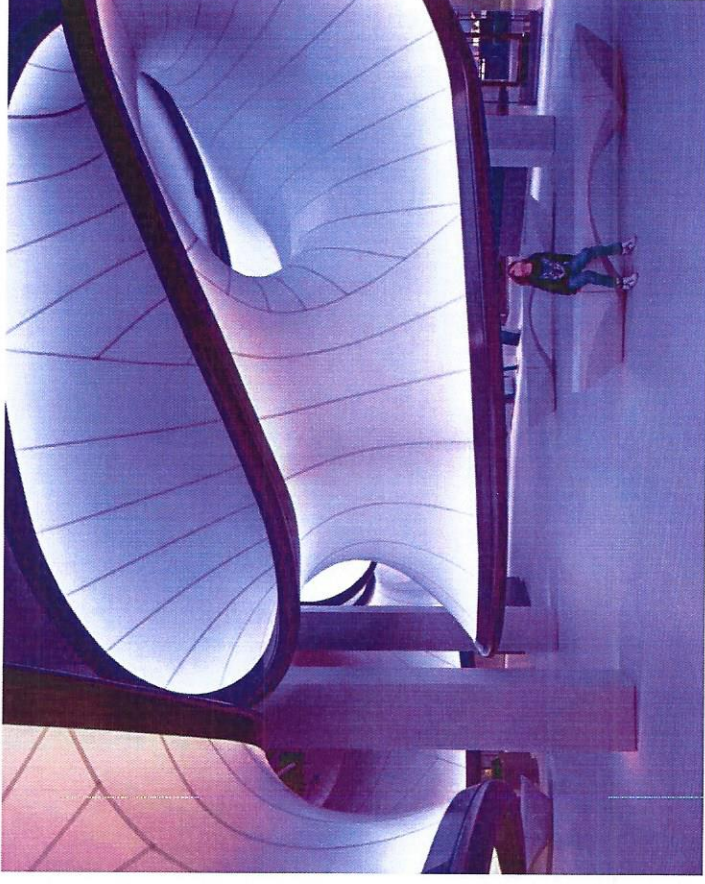
The British museum's theme focuses on the scientific and technological advances of mankind.

The design of the mathematics gallery by Zaha Hadid is an artistic representation of mathematics itself—the gallery is inspired by the airflow of a moving airplane as it represents a calculated air tunnel caused by the movement of an airplane. The 'breathing environment' of the gallery goes back to the impressive artificial lighting design by Arup.

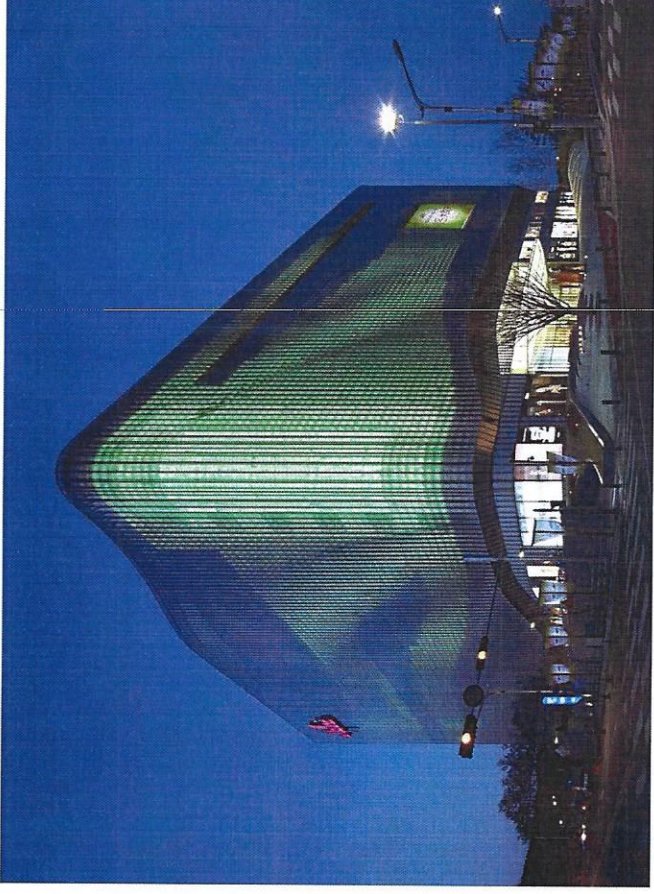


Examples of Projects That Used Artificial Lighting

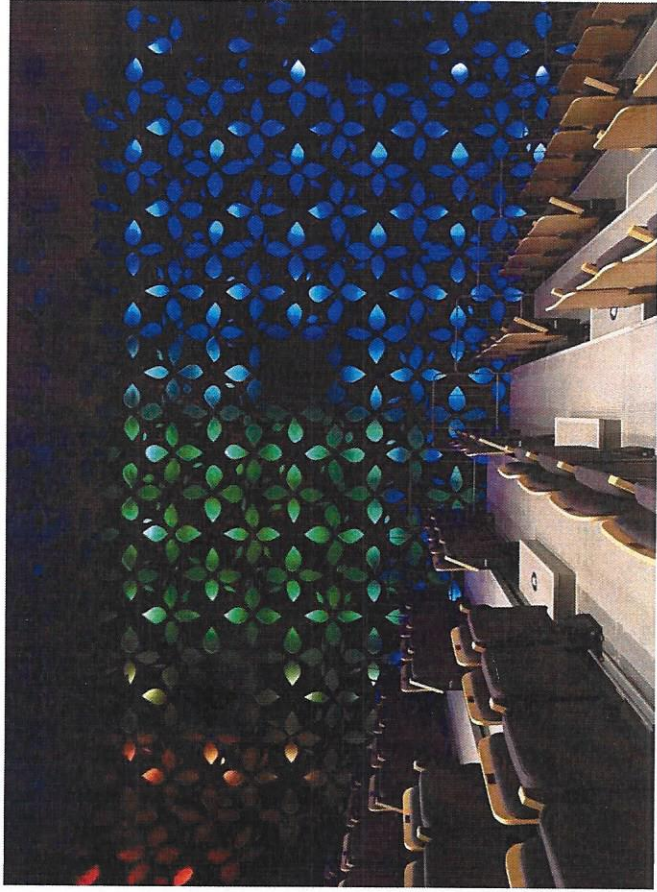
The British engineering company designed a mix of blue and purple light that conveys the atmosphere of an airplane and draws the visitors' attention to the details of the design. According to the jury, the lighting plan is 'stunning and almost more interesting than the exhibit itself.' It was granted an Award of Merit.



2. The Moiré Effect of Galleria Centercity | UNStudio

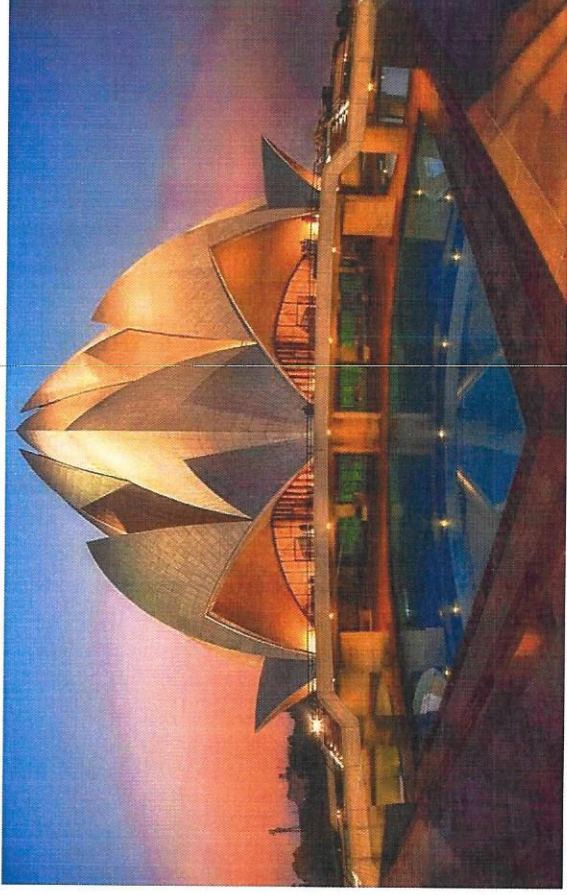


This department store in Cheonan, South Korea designed by the Amsterdam-based [UNStudio](#) is one of their remarkable works. The magic lies in the buildings' facade that comprises two thin layers of lamellas that create the so-called moiré effect. The effect is created because the two identical and transparent layers are superposed above each other and slightly rotated from one another.



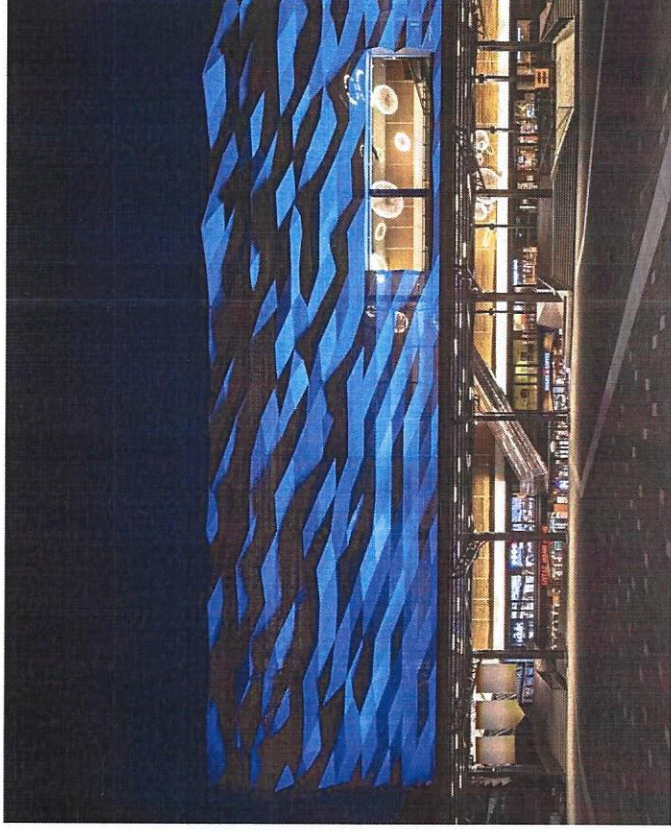
To increase the dynamism of the facade the designers included special artificial lighting within the facade, the changeable lighting makes the building an interactive one as it changes its appearance all the time. Artificial lighting is a prominent feature in the interiors of Galleria Centercity as well.

3. Baha'i Temple of South America | Hariri Pontarini Architects



The long-awaited Baha'i Temple in Santiago, Chile opened almost a hundred years after the Baha'i faith first arrived in Chile in 1919. The temple is designed by the Canadian architect Siamak Hariri and it took fourteen years to be realized. Artificial light is a significant element in the Baha'i Temple—the translucent petals of the dome that is shaped like a giant flower allow the temple to glow up at night because of the artificial lighting emitting from the inside. The jury granted the lighting designer firm Limari Lighting Design the Award of Excellence for this project. Artificial light is integrated into the interiors cleverly, as well, to create a soft and warm atmosphere.

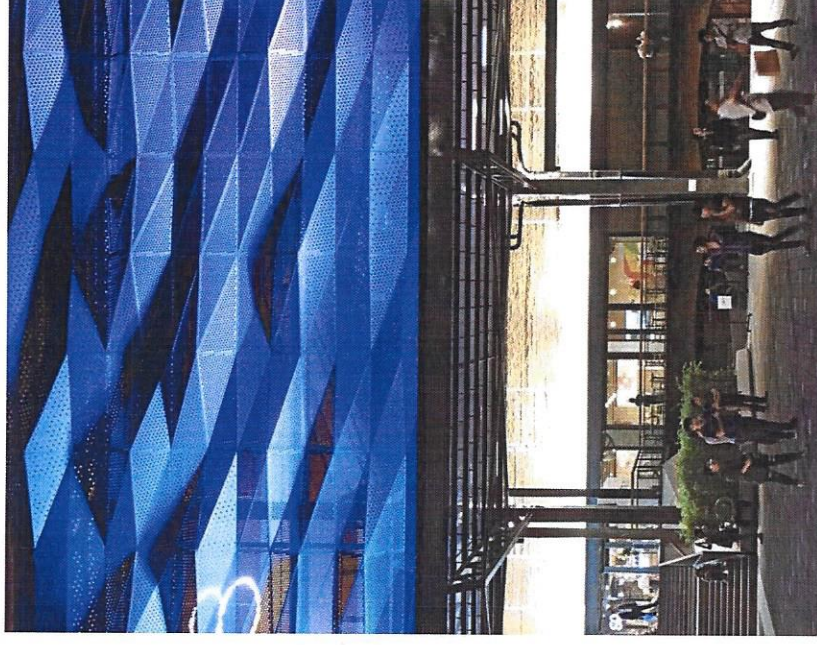
4. The Street Ratchada | Architectkidd



Trying to introduce public and urban features in a newly developing neighborhood in Bangkok, [Architectkidd](#) designed new exterior and semi interior spaces by renovating an old building to be The Street Ratchada. The building's facade interacts with the open plaza and the interior retails.

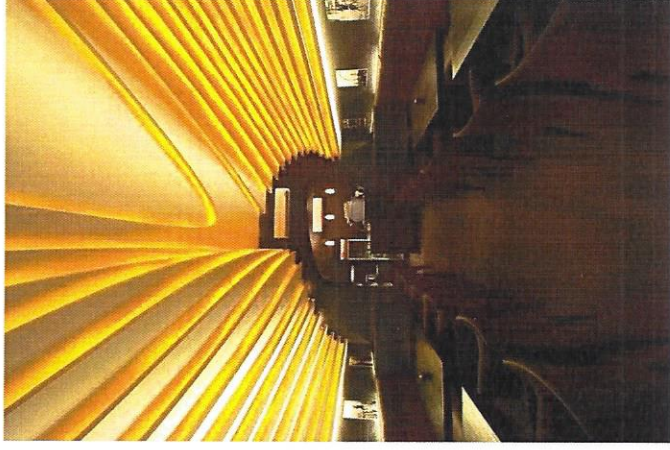
The unique material of the facade gets dematerialized during the night giving a surreal effect because of the artificial lighting incorporated into it.

With this project, Architectkidd attempts to break through common expectations of what might be considered a purely commercial large-scale building type and to inject a diversity of urban and architectural scales into a rapidly developing area of Bangkok.



5. M Coffee | Hooman Balazadeh

M Coffee in Tehran, Iran is designed by the Iranian firm Hooman Balazadeh. The designers wanted to avoid visual clutter and reach a calming and softened atmosphere, hence they chose two materials of two colors. The sweeping ceiling is generated from two curves that deform into each other from which artificial light is recessed.



Hidden lighting devices are incorporated into the coffee house to achieve the desired atmosphere with mitigating glare and harshness. There is an incredible sense of calmness to this space, yet it is also subconsciously exceedingly strong and vibrant.

CONCLUSION

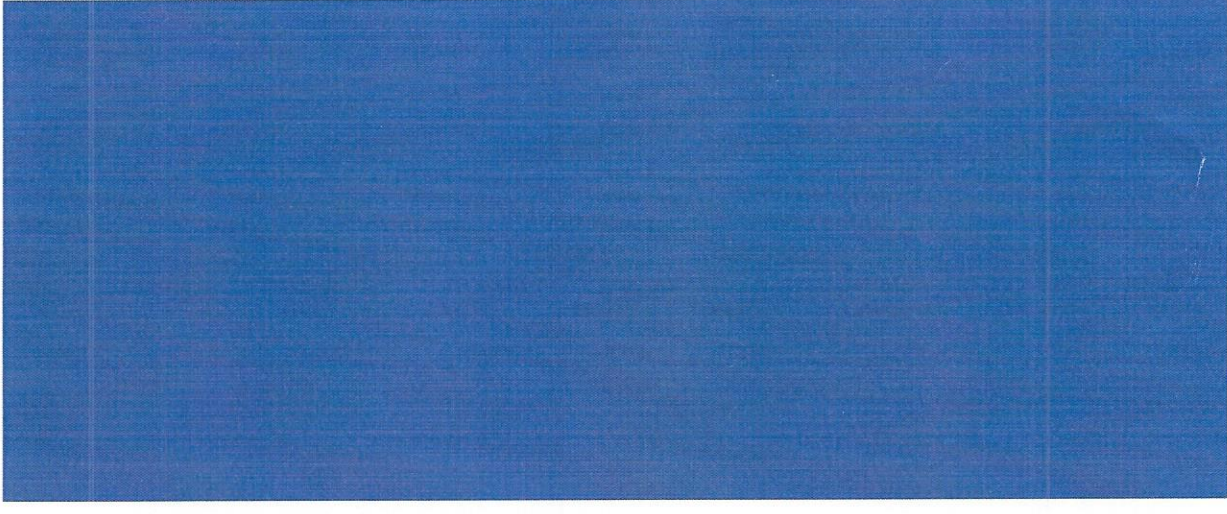
- Artificial lighting has evolved beyond spatial illumination over the years to become a tool for passive non-verbal communication that can evoke emotion and affect people psychologically.

- It is recommended that architects should take advantage of the numerous potentials artificial lighting presents to explore more possible ways of using illumination to enhance users' comfort, experience and satisfaction in the development of the built environment.

- Artificial lighting design is an integral part of the design process.

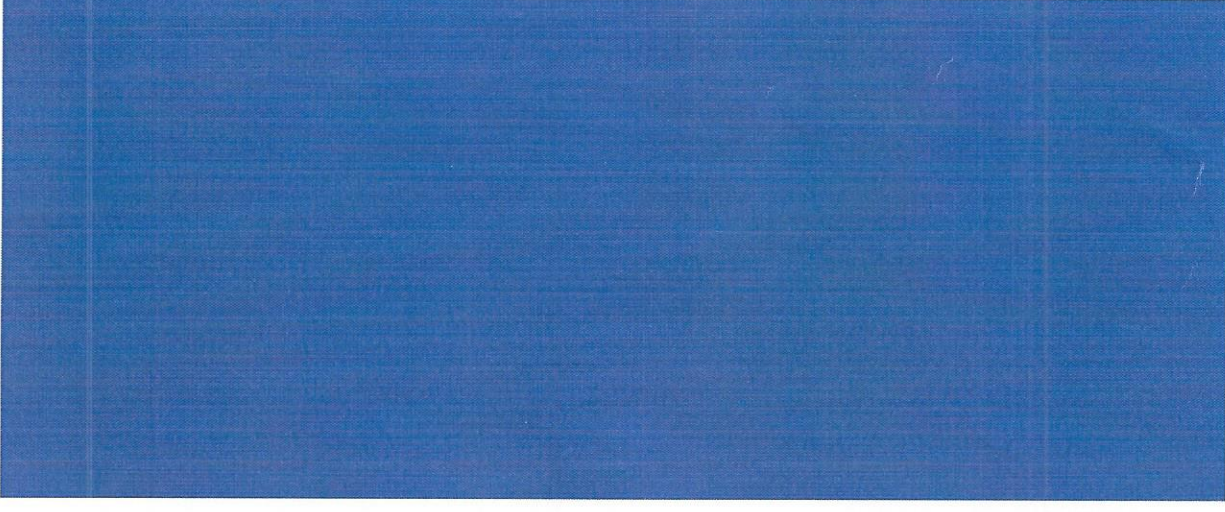
Therefore, planning for it should be introduced early in the design stage to avoid incurring unnecessary cost and time wasting associated with late decision making in the construction industry.

- This study has compiled and analyzed in one place, various literature that showcased the evolving role of artificial lighting as a tool for non-verbal communication in specific areas of the built environment. The study's contribution is that it has provided a new platform that sheds more light on the potential applications of artificial lighting as a tool for human, non-verbal communication in the architectural profession.



- The paper is also a reference material for architectural professionals, scholars and students to better and more conveniently understand the new roles of artificial lighting in architectural designs and how they can be practically applied in the field to enhance users experience and evoke certain emotions in people, as intended by designers.
- In addition, the study establishes a new scientific base for further research on the topic. The study was conducted as a literature review. This implies that, only secondary data were collected, analyzed and presented.
- This did not allow for new discoveries to be made, but rather provided a systematic information on existing knowledge for better understand. Further studies could examine users experience and satisfaction with various lighting types, as well as the effectiveness of different kinds of lighting in meeting designers' intentions and users' specific needs. Such studies will involve the collection of raw primary field data that may likely lead to new discoveries towards possible improvement in the design of artificial lighting fittings and fixtures. Similar literature review studies can also be conducted using wider scope for the literature search, as the authors recognize that the literature search scope utilized for this research constitutes a limitation for the study. Such investigation can extend beyond how artificial lighting was used before the 21st century.

ANY QUESTIONS?



Prepared by:

MIRAN BURHAN SHAREY

©2022

