

“Natural Light: Promoting wellness in adaptation and reuse.”

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Project 02: Literature Review.

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Chapter Two

Literature Review

2.0. Introduction.

A literature review is an in-depth research project focusing on multiple sources with a specific interest in a topic. The approach to this project is to provide adequate information by reading published literature and critically dissecting the information provided. The gathering of multiple sources, such as books, eBooks, official documentation, archives, theses, articles, and internet sites, and critically analysed the information. The aim of this chapter is to critically review the literature relating to the topic *title "Natural Light: Promoting Wellness in Adaptation and Reuse"*. In chapter two, the intention is to discuss thematic literature while reviewing and separating it into 4 sections.

Section one will assess the contribution of literature regarding history and culture to natural light and wellness. In section two, a platform is created for the next theme, the principles of natural light and wellness. Section three of this review will focus on the exploration of lighting technology. Finally, I will conclude this review in section four.

2.1. The History and Culture of Natural Light and Wellness.

While researching, it is evident that authors have made a phenomenal contribution to the education surrounding the topic of natural light and wellness. Through decades and centuries of work, it is evident that this information is valued globally. To provide a clear understanding of the history and culture of natural light and wellness, it is vital to critically analyse the literature relating to the topic by separating the sources into both seminal and supporting sections.

2.1.1. Seminal Works.

Understanding global history and culture is a major factor in natural light and wellness, as it differs from country to country, decade to decade. The ancient Greeks would use solarium to embrace daylight while absorbing all its health benefits. This was until 2007

scientists Thursfeild and R vd Ven proved that light receptors in the human eye influence the body's biorhythm within their design (*Design principles for natural lighting, P Thursfield and R vd Ven 2022.*)

Mary Guzowski states in 2018 that each structure has various geographic locations, climates, and programs (*The art of architectural daylighting, 2018, Mary Guzowski*). Interestingly, the modern masters of light Alvar Aalto, Louis Kahn, and Luis Barragan continue to hold great influence for architects and designers.

2.1.2. Supporting Works.

The supporting works regarding natural light and wellness draw on the seminal studies found. Peter Tregenza and David Loe discuss the theme of natural light and wellness as a modern topic in 2014, and today's society is understanding to both physical and mental health. Though research isn't available to back this theory, a great example of a sophisticated design using natural light is evident in the "cathedral of Hagia Sophia in Istanbul, Turkey 537 AD". (*The design of lighting second edition, 2014, Peter Tregenza & David Loe*).

The designer Derek Philips in 2000 details that the Romans demonstrated the earliest architecture of natural light incorporation. Their interior and exterior incorporated natural light throughout, this provided shade to combat heat while trailing light through the space. The old medieval English dwellings were often dominated by a communal hall, and the natural light was restricted by wooden shutters and translucent materials such as parchments and linen oils. In the Renaissance era, Italy introduced symmetrical facades. This paid very little attention to the interior space behind the window, their courtyards were placed at the back, with vertical windows facades, allowing maximum infiltration. In Philips work a valuable example is "*The Queen's House Greenwich, Inigo Jones*" in the seventeenth century, and is an excellent example of a top-lit internal room. The eighteenth century reduced the harsh contrast between the bright interior and exterior, and improved window detailing (*Lighting Modern Buildings, 2000, Derek Philips*).

2.2. The Design Principles of Natural Light and Wellness.

To determine if a structure succeeds, it is necessary to acknowledge the design principles of natural light and wellness. As seen on the Internet article *“Well Certified – The leading credential for creating healthier buildings and organizations,” Well Certified levels and requirements, 2023, Eric Rosenkranz. (Article).*

their design principles portray multiple layers while also promoting light and wellness. When considering the design principles, it is important to offer details regarding the key principles and how they function. These values are described in seminal works and further analysed in the supporting works.

Louis Kahn, Architect *“Artificial light is a tiny static moment in light and is the light of the night, and never can equal the nuances of mood created by the time of the day and the wonder of the seasons.”*

2.2.1. Seminal Works.

The seminal works connect the key principles of designing with natural light and wellness, while the supporting works 2.2.2 provide extra information backing up with analysed literature. The public is naturally attracted to sunlight, from landscape atmosphere to health benefits. The attraction is inevitable.

D.C. Pritchard and the FCIBSE indicated in the study *“interior lighting design sixth edition, may 1986, D.C. Pritchard, BSc C.Eng., MIEE., FCIBSE,”* that 82% of American citizens and 74% of Europeans resign in urban settings, while a study conducted by the U.S. Environmental Protection Agency found that the average American citizen spends on average 87% of their day indoors.

The importance of the trio of natural light, fresh air and nature is vital to both the mental and physical health of an individual (*Design principles for natural lighting, P Thursfield and R vd Ven 2022*). Sage Russel in their 2012 work *“the architecture of light - second edition, 2012, Sage Russell,”* mentions that daylight as a critical source, and if wrongly used in a design, it is detrimental to the finished product.

The main purpose and function of lighting is to benefit the user. In the past decade, studies have found artificial lighting is less effective than natural light. Some key purposes and functions are as follows:

- Light for health and wellbeing.
- Physical comfort.
- Biological health.
- Psychosocial wellbeing.

2.2.2. Supporting Works.

The research gathered provided an insight into natural light functionality, Sage Russell *“the architecture of light – second edition, 2012, sage Russell”* spoke of two types of daylight: functional and accenting. Functional daylight introduces light into a space to serve the task at hand and provide spatial awareness, while daylight accenting is a dramatic approach to natural light, hoping to present visual interest.

When passive, solar, and bioclimatic designs are paired with natural light, it can reduce energy consumption, aid the environment, and enhance an individual’s wellbeing. A very important problem in Ireland is SAD (seasonal affective disorder), which affects numerous people globally. This is sought to be from the lack of sunlight from September through to April. A study found that SAD affects less individuals if natural light can be incorporated into their working life (*Lighting Modern Buildings, 2000, Derek Philips*). It is seen that many electrical companies try to imitate natural light (*the Architecture of Light, 2012, Sage Russell*). The supporting works are vital to my research, as the information is too valuable to disregard.

2.3. Exploration of Lighting Technology.

The literature of lighting technology is vital when surveying a building's effectiveness. Both the humanistic method and scientific method are applied in structures, but both have an importance in the communication of light. The method of research varies for both methods, and the outcomes rely heavily on accuracy. Focusing on the seminal studies will attain the fundamentals, while supporting works will help in the researched theme.

2.3.1. Seminal Works.

The research of lighting technologies provided important seminal information to aid in the literature reviews present and future. Admir Jukanovic explores the idea that natural light has both quantitative and qualitative dimensions, while being tangible and measurable with their book "diffusers (*architectural lighting design - a practical guide, 2018, Admir Jukanovic*". The movements of the luminous sun can be precisely measured using scientific methods using standardized lux levels, foot-candles, and daylight factors. The daylight reflectors are an essential technology to disperse light throughout a space, for example a lampshade. The use of multiple materials and finishes, for example polished, textured and matte, all reflect a different textured light. The shape of a reflector is also vital, as it positions light differently and emits various wide to narrow rays. Unlike reflectors, a diffuser can be divided into three categories: opal diffusers, satin diffusers, stretched membrane diffusers and micro prism diffusers (*Admir Jukanovic, architectural lighting design - a practical guide, 2018*).

D.C. Pritchard found in their "D.C. Pritchard, *Lighting sixth edition, 1999*," study, that the National Physical Laboratory UK proved that the maximum illuminance is approximately 35000 lux and occurs annually in July at noon. While the average exterior illuminance is approximately 5000 lux. "Alan Lewis - *the mathematization of daylighting, 2017*", suggests that daylight is unsuitable to balance daylight and solar control. The importance of this approach has been introduced as energy performance. Finally, the research found that Alexander Trotter and P.J. Waldram were connected through "Alan Lewis's - *mathematization of daylighting 2017*", Trotter created the daylight factor in 1895, and P.J. Waldram used Trotter's photometer to establish the science behind measuring daylight.

2.3.2. Supporting Works.

The supporting works are flooded with information that would thrive in future research and is adequately stored. Natural light is a vital component of producing light into the atmosphere naturally, without electricity and fossil fuels. If you rely on natural light in a building, you will need sufficient daylight availability and an electric false lighting. The *CIBSE "Interior lighting design sixth edition, May 1986, D.C. Pritchard, BSc C.Eng., MIEE., FCIBSE"* recommends a minimum of 500 lux within an office space, while in a modern educational space a minimum of 3% is seen at the least advantaged positions. If a building is designed to integrate natural light, it will gain many architectural advantages. If a structure has an average daylight factor of 2%-5%, there is considerable scope for energy efficiency. While research states that if a building is below 2% energy efficiency, it is minimal, and electric lighting will permanently be necessary (*Interior lighting design sixth edition, May 1986, D.C. Pritchard, BSc C.Eng., MIEE., FCIBSE*).

2.5. Conclusion.

This literature review used both seminal and supporting works through four sections. The seminal data collected in my topic title "*natural light: promoting wellness in adaptation and reuse,*" was gathered and dissected, and will remain a valuable gauge of information for my research to come.

It is important to reference the various literature found while researching for this review, which is impressive, as it allows generations of knowledge to grow further. There are multiple sources of information across various platforms, such as libraries, the Internet, and businesses. These all helped me in my critical review of "*Natural Light: Promoting Wellness in adaptation and Reuse.*" The research connects the importance of natural light in architectural structures and the importance natural light plays in an individual's wellness within a space. When researching the thematic sections, a sequence of information was created to provide more knowledge to the world's database. In conclusion, the review of literature regarding my topic has provided numerous assets of knowledge for interesting discussions to come.

2.6. Bibliography:

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