

HUMAN-CENTERED DESIGN & PSYCHOLOGY IN ARCHITECTURE

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Abstract- Human-centred design is often conflated with user-centred design – another philosophy focused on ensuring a product or service's end users are the focus of a design approach. Designing learning spaces based on the insights from neuroscience research for architecture can have a significant positive impact on students' academic performance, emotional well-being, and physical health. What would spaces look like if architects designed buildings based on the emotions, healing and happiness of the user? Hospitals that help with patient recovery, schools that encourage creativity, work environments that make you more focused. Awareness surrounding the built environment's impact on occupants' well-being has increased after the pandemic. As a result, a substantial increase in the demand for a design that prioritizes humans, such as Biophilic Design, has been observed. Biophilic Design can enhance the quality of interior workspaces, where employees can work, collaborate, socialize, and restore. Architecture and interior design should move beyond simply meeting functional user needs and instead adopt a human-centered approach that prioritizes people's emotions, well-being, healing, happiness, and cognitive performance. Incorporating insights from neuroscience and approaches such as Biophilic Design can create environments that improve learning outcomes, health, recovery, creativity, focus, and overall quality of life. The growing awareness of the built environment's impact on well-being especially after the pandemic has increased demand for such human-centered design strategies.

Key Words: Human-centred design, Biophilic, Neuroscience, Architecture, and Environment.

1. INTRODUCTION

Human-Centered Design & Psychology is one of the most relevant and impactful directions in architectural research today. Applying human-centric design principles to our buildings and structures can have a wide range of benefits for both their occupants and the environment.

From air quality and noise pollution to the functional layout of land, transport and accessibility, the built environment has a significant impact on human health and wellbeing.

Because of this, more needs to be done to create residential, industrial and commercial structures that support the needs

of individuals and communities. To achieve this, the occupants and end users of infrastructure need to be considered throughout the entire building lifecycle, from planning and design through to construction and operation. Human-centred design is a solution-based framework that puts real people at the centre of each of the design phases of a product's development and considers the human perspective at every stage.

The idea for HCD is often traced back to a Stanford University design study in 1958, when Professor John E. Arnold first suggested that engineering design should be human-centred. Human-centric design tends to reflect humanity as a whole, while user-centred thinking is more concerned with the specific people most likely to utilise a product or service.

How Human-Centered Design works in architecture?

Human-centered design (HCD) begins with a deceptively simple question: How will real people experience this place, hour by hour, year after year? Henry Dreyfuss' seminal *The Measure of Man and Woman* translates that question into data anthropometrics, reach envelopes, ranges of motion and reminds us that the human body is the first dimension of architecture. When it comes to architecture, human-centred design isn't just a trend – this approach is key to optimizing relationships between people and buildings. Through applying these principles, designers can map out structures and projects that are simultaneously practical, ecological and beneficial for society.

1.1 CHARACTERISTICS OF HUMAN-CENTRIC ARCHITECTURE

1. The health and wellbeing of inhabitants

The physical and mental wellbeing of residents must be prioritised throughout the design process. This is realised through architectural features like ample natural lighting, good air quality and building comfortable, functional spaces that improve the quality of their daily lives.

2. Universal design and accessibility

It's also important to ensure that these spaces are designed to be accessible for all people within a community. This promotes inclusion without barriers and means that there's no need for adaptation or special design due to factors like age, ability or circumstance.

3. Closeness to nature

Connection with nature is important and incorporating green elements into these designs is key. It's vital for the inhabitants as it impacts their health, and is also crucial for creating eco-friendly spaces within the built environment. For example, by including elements like water features, green space and other biophilic design principles, you can enhance the user experience for all.

4. Sustainability and eco-friendly designs

Energy-positive and carbon-neutral designs tend to be favored characteristics of the HCD process. Sustainable materials and green initiatives are also preferred, as these impact the wellbeing of both people and the planet.

5. Social interaction and inclusion

Building spaces that encourage social interaction can help to foster a sense of community. This in turn helps to promote the wellbeing of those in the local area. These spaces should meet the needs of a diverse range of people, becoming yet another inclusive part of our environment.

6. Culture and identity

Human-centric architecture also acknowledges the importance of local culture and identity. These spaces must reflect and respect the unique identities, beliefs and traditions of those who live there.

7. Technological integration

Lastly, incorporating new technologies, such as sensor systems often seen in smart buildings, can enhance the comfort, convenience and energy efficiency of new designs. These tools can also be adapted to meet the changing needs of residents in real-time.

that individuals create can alter their minds and capacity for thought, emotion, and behavior. That being said, how much does the built environment affect individuals' behavior and well-being? In particular, how does the body and the brain respond to the built environment?

While many people often assess buildings mainly in terms of their functional utility, physical comfort, economic value, symbolic importance, or aesthetic appeal, architecture actually serves a far deeper role in human life. Finnish architect Juhani Pallasmaa argues that the significance of buildings goes beyond these material and superficial aspects. Rather than just offering physical protection and facilitating various activities, buildings also play a vital role in housing our mental lives, our thoughts, memories, desires, and dreams. Pallasmaa describes buildings as important extensions of ourselves, both individually and collectively. They act as mediators between our consciousness and the world around us, helping to "internalize the world and externalize the mind". According to his view, architecture is not just a physical structure; it is also a manifestation of our mental space, which in turn is influenced by the architecture around us.

Understanding how spaces impact individuals' brain structure and behavior has been a core research point for architects and environmental psychologists. Architects consider a design's impact on residents while mapping out the structure (e.g., adequate lighting). They can strategically design spaces to enhance creativity, cognition, concentration, and memory. As Fred Gage stated, "Changes in the environment change the brain, and therefore they change our behavior. In planning the environments in which we live, architectural design changes our brain and our behavior"

The Brazilian Academy of Neuroscience and Architecture was founded by architects Gabi Sartori and Priscilla Bencke, passionate about neuroscience and architecture. A partnership that started through trips and specialization courses in the area. The objective is to train professionals, disseminate knowledge, develop studies, integrate multiple areas in a systemic view of space, behaviour and well-being. There you can find several courses divided into specific modules such as sound or aromas, or also a more complete training.

Perkins&Will has existed since 1935 and has branches in several cities around the world, including Brazil. It works in projects such as corporate, commercial and hospital environments with a focus on humanity and sustainability.

2. NEURO ARCHITECTURE

Designing efficient environments based not only on technical parameters of legislation, ergonomics and environmental comfort, but also on subjective indices such as emotion, happiness and well-being.

Human minds can include aspects of physical and cultural environments, which means that the kind of environments



Figure 1: Bambu atmosfera residential building by perkins&will



Figure 2: Amazon spheres seattle usa

2.1 How the Brain Perceives Our Surroundings: From Ambiguity to a Clear Image

The brain adapts to the visual perception of surroundings through a variety of processes. Whenever the individual is presented with a visual image, the human brain reacts with a wave of activity. This reaction begins when the light hits the eye’s retina, which creates a message. The brain then processes this image but sometimes establishes sensations that over-ride the initial visual input if deemed improbable. The impact of architectural spaces on one’s brain can be understood through the neurological basis of perception.

“Architecture of Memory” focuses on maximizing autonomy and reducing anxiety through sensory cues and intuitive design which can also help patients suffering from memory loss, dementia. Research and dementia care guidelines consistently demonstrate that thoughtful design can lower agitation, improve sleep, support healthy eating, and even reduce the risk of infection.

Light has a direct impact on circadian rhythms. Bright, natural-feeling light during the day can improve sleep patterns, lift mood, and reduce sun downing behaviours. In the evenings, low-glare, warm lighting helps minimize confusion and supports restful nights.

Studies have demonstrated that providing residents with access to secure gardens and outdoor walking paths can reduce agitation levels and enhance their everyday engagement.

3. BIOPHILIC WORKSPACES

It incorporates natural elements such as abundant daylight, indoor plants, and organic materials can boost productivity by up to 6–15% and increase feelings of well-being. These designs facilitate emotional recovery by reducing cortisol levels, improving cognitive function, and lowering work-related anxiety and stress.

Restorative environments, as defined by von Lindern et al. (2017), are those that exert little pressure on the individual’s physiological and psychological resources. These environments allow for the restoration of cognitive emotional and functional resources and capacities that may have been compromised by stress or daily demands.

Natural environments can capture an individual’s involuntary attention, facilitating the recovery of mental fatigue, attentional resources, and cognitive capacities, as well as boosting affective–emotional benefits. Biophilic design offers opportunities to increase exposure to nature during work, and aspects such as maximizing natural lighting in offices and including components like water and plants can benefit workers’ cognitive, emotional.

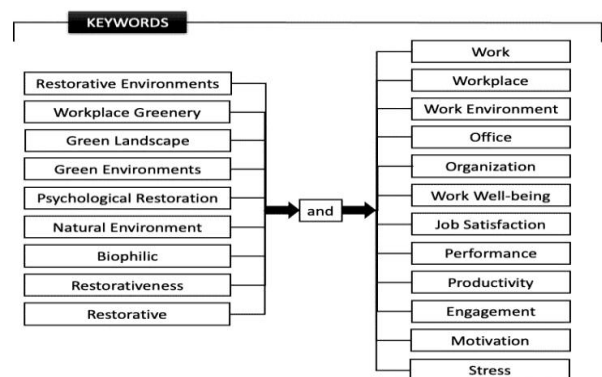


Figure 3: Relation between nature based solutions and workplaces

Employers in the post-pandemic era focus on developing optimal workplace design approaches that will attract employees back to their workplaces. The main purpose of the workplace has changed due to the “Working from Home” phenomenon. The workplace has shifted from being a space for work completion only to becoming a space for interaction and collaboration. The employees’ return to the office is driven by their need to access particular zones and work materials that exist only at their workplace, as a means to enhance their performance, and to facilitate social connections with co-workers.

3.1 The relevance level of Biophilic design in rating systems

Recently, there has been a rise in the use of green building rating systems such as Leadership in Energy and Environmental Design (LEED), BREEAM, the WELL Building Standard, and the Living Building Challenge (LBC). These systems seek to offer a positive impact on the built environment through the acknowledgment of biophilic elements.

In the recent version of LEED V4, Biophilic design was directly addressed in the innovation (ID) section of the LEED rating system. Biophilic design strategies are included in several Indoor Environmental Quality (EQ) and Materials Resources (MR) credits.

Examples: The new JLL offices in London were designed by Tetris Design and Build to create a flexible workspace that promotes collaboration. This includes spaces with innovation that mainly focus on improving employee well-being with minimal impact on the environment. Elements such as adequate natural light and biophilic design concepts are integrated into the office design. The workplace aim is to obtain WELL Platinum, SKA Gold, and BREEAM Excellent buildings certifications. The office space consists of two zones associated with individual work, five zones for group work, and six zones associated with different types of restoration along with the reception area,

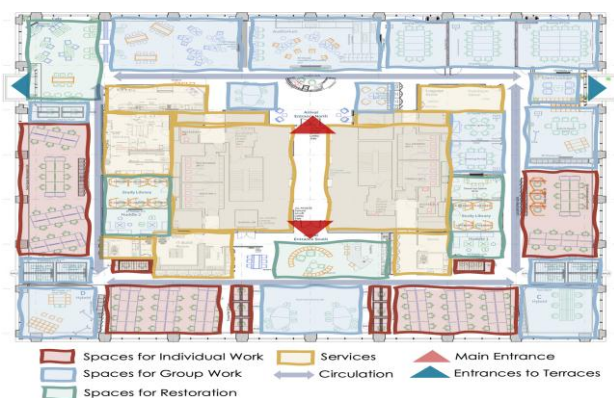


Figure 4: Circulation and connectivity between spaces

Throughout the open work area, big operable facades with louvers diffuse daylight (P6) and connect employees with natural systems (P7). The use of planter boxes on the storage cabinets enhances the visual connection with nature as well as the non-visual connection (P1, P2). Further, it contributes to thermal and airflow variability (P4). Warm, earthy colours also enhance the visual connection (P1). Pods that are partially covered with symbols enhance the Biomorphic forms and patterns (P8). The strategic configuration of individual workspaces along hallways contributes to the complexity and order (P10) by presenting directional clarity, as noted in Figure a. The open work areas are located next to windows, thus stimulating curiosity and providing an outdoor view as well. This strategy enhances the sense of mystery (P13) and Peril (P14). The refuge (P12) is emphasized in the individual focus pods. The pods provide a hiding spot from open areas while being accessible, as shown in Figure 5 b.

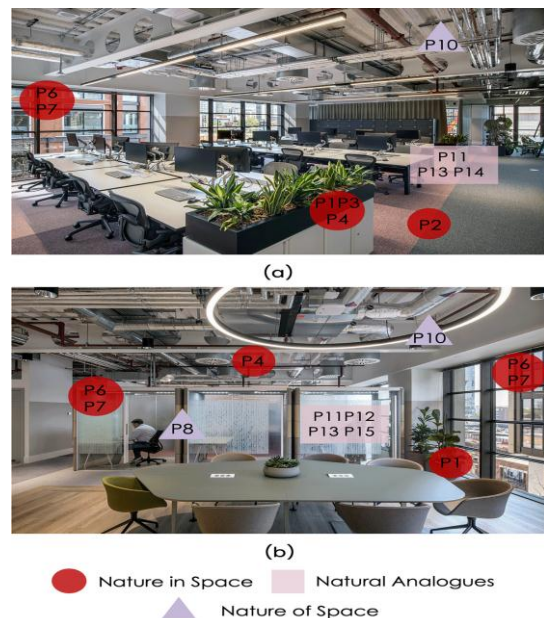


Figure 5: Amalgamation of nature and space

4. CONCLUSIONS

Architecture shapes how we live, learn, work, and thrive. And yet architects often find themselves constrained by convention, or tradition, or driven by aesthetics alone. Those can create a disconnect between architectural vision and human experience. People-Centered Architecture presents a transformative framework to bridge this gap. By putting people at the center of architectural design, the built environment can better serve residents long into the future. Adopting this methodology can take into account the needs of groups previously underrepresented in the built environment, from younger generations who want more of a voice to an ageing population with evolving needs. What’s more, these spaces can be made more sustainable and help

foster connected communities. The biophilic design integration occurs by implementing different biophilic patterns throughout the workplace zones. The study applied photographic documentation to record the biophilic patterns present in the zones of the analysed workplaces by using the matrix developed in this research.

The study concludes that human-centered design principles, supported by neuroscience research and Biophilic Design strategies, can positively influence occupants' psychological, emotional, and physical well-being. By designing spaces around human experiences rather than purely functional requirements, architects can create healthier, more productive, and more restorative environments for learning, healthcare, and work.

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