

Embodied experience of architecture: Research on the role of body in design process

Erfan Fallahian

Master of Architecture, Art University of Isfahan
Erfan.Fallahian.S@Gmail.com

Abstract:

Throughout history, various perspectives regarding the body have shaped architectural designs. These perspectives have shifted from viewing the body as a structure to considering it as a machine and beyond. The focal point of the current research is the consideration of the lived body, which is central idea of Merleau-Ponty's philosophy. According to this viewpoint, the process of human existence and perception is corporeal. In other words, humans perceive and embody things in space through their bodies, and their existence is fundamentally tied to this embodiment. Thus, the body can be considered the existential center of space, a space that emerges from architectural design. By considering their lived experience and the user's lived-world, the architect, brings a space to the forefront. This space is imbued with cultural, political, social, economic forces, etc., internalized through the design process. Lived experience, in fact, creates a bond between the experiencer and the experienced through the body. The present research aims to explore the role of the body in the design process. The findings of the research indicate that the architectural design process is an embodied process, where the designer provides the user with environmental conditions through their connection with the user's body. Additionally, the architectural design becomes a place where the user interacts with the designer through multisensory experience, thus architectural design effects a form of art conveying messages.

Keywords: Body, Lived Experience, Design Process, Space

1. Introduction:

It has been customary to take the meaning of the term "body" for granted, as if the body is not a significant subject for intellectual curiosity. Indeed, since Aristotle referred to humans as "rational animals," the distinguishing feature of human nature was attributed to the power of reason/logos, effectively excluding the body from metaphysical considerations (Mohseni, 2021). Even until Descartes' time, the body was largely marginalized in philosophical discourse. Descartes believed that humans were composed of two distinct substances: the extended substance, which is the body, and the thinking substance, which is the mind. The connection between these two substances occurs through the pineal gland. According to him, there is no other connection or relationship between the body and the mind (ibid). However, the relationship between the human body, the perception of created space, and the creation of spatial mechanics is an ancient concept in the history of architecture that can be studied in various historical and cultural contexts. Essentially, the art of each civilization is initially assessed in relation to the dimensions of human existence (Akbari & Nirumand, 2019).

Throughout history, architects and architectural theorists have approached the human body in various ways when formulating architectural proposals or theories. In many of these paradigms, the human body primarily serves as a source for dimensions which rooted in diverse intellectual frameworks (Vermeersch, 2013). Many architects have neglected the role of experiential or emotional aspects of architecture, which involve interactions between the body and the built environment. The human-centered aesthetics of architecture, ranging from interpreting the body as a reason for shelter, to the body as a rationale for boundaries, or the body as a representation of form, have shifted throughout history. The human, as a natural element and a part of the forms, can be described as the fundamental criterion for measuring itself in our world. Therefore, it serves as a medium through which society has represented the constructed environment since ancient times. The body has always maintained an evasive, if not ambiguous, relationship with the built environment, despite a long history of supposed naturalness that Western culture's architectural representations of humanity depict (Fortkamp, 2005).

Therefore, it can be argued that the body is the origin of architecture; the relationship between space and the body is the source of spatial perception and understanding, and the desire for existential spatiality. Surely, due to the irreplaceable role of the body in many architectural creations, it is unimaginable for the mind alone to be the carrier of architecture (Palasma, 2016). The existence of every individual encompasses both the body and their perception. Bodily perception is a mental aspect accompanied by focus and awareness of inner experiences and emotions. It is shaped by bodily movement in the environment and imparts meaning to that environment. This process leads to the audience's recognition of their surroundings. Moreover, this perception can influence the extent of an individual's connection and understanding of their environment. Space is recognized and given meaning through the presence of humans, and thus, bodily perception and the spatial realm are inseparable. Consequently, addressing the body, bodily perceptions, and awareness within the realm of architecture is essential and requires attention. Disregarding these aspects is tantamount to turning a blind eye to the reality buried beneath the rationalistic weight, ignoring the sensory-bodily aspects (Sayyad et al., 2019).

The present research aims to investigate and elucidate the relationship of the human embodied experience in the design process, within the field of architecture, utilizing the descriptive-analytical research method and information collection through library sources, while examining various interpretations of the human body.

2. The Body and Corporeality:

The nature of the body has perpetually been a subject of contention among philosophers and thinkers. In his book "The Body Social," Anthony Synnott alludes to the diverse interpretations of the body by various thinkers and the significant paradigm shifts that have occurred over centuries. These interpretations encompass a broad spectrum, ranging from viewing the body as a "tomb for the soul" to a "self," and from a "sacred entity" to a "machine." Plato considered the body as a tomb, while Saint Paul deemed it the temple of the Holy Spirit, Descartes labeled it a machine, and Sartre introduced it as the "self" (Synnott, 2002). Lexically, the term "body" in some dictionaries, including the Oxford and Larousse dictionaries, refers to a living organism, a physical structure, a physique, a form, and the physical and material component of any being, especially in terms of anatomy. Corresponding terms to the body, such as soul, spirit, mind, and psyche, denote entities that are independent of the body, depending on the definition of human truth and their existential levels in various worldviews, and have been defined with similar or different valuations (Monshizadeh, 2022).

From the inception of life as an individual, humans gauge and structure the world based on their bodies: the world opens up before them and closes behind them (Kurbjeweit, 2020: 33). Johnson (2002) asserts, "What things mean to us and how they mean, is a result of the kind of bodies we have" (Johnson, 2002). We perceive the world, objects, others, and ourselves through our bodies. The body is the origin of every meaning. As Merleau-Ponty suggests, our bodies are the source of every expression as they provide a space for meanings. According to Merleau-Ponty, the body chooses to reside in space and is not independent of it; thus, by dwelling in space, we create a meaning of space based on our perceptual capacity, rooted in our bodies. The body's experience is the source of spatial expression (Mahdalickova, 2009).

Among phenomenologists, Merleau-Ponty, more than anyone else, introduces us to the concept of "corporeality." In Merleau-Ponty's perspective, humans exist in the world, comprehend it, merge with it, and gain assurance of their presence through it. We will be present in the world with our bodies, and not only is the body the source of our understanding of the world, but it is also recognized as an agent in demarcating personal from public domains. Perhaps the fundamental role of architecture throughout history has been to provide a stage for cultural communication to articulate intellectual and emotional narratives, embodied (corporeal) awareness, and reveal spaces harmonious with valuable human actions (Sayyad et al., 2019). In fact, the process of users connecting with buildings occurs through corporeal conditions (Johnson, 2002), and structures are not abstract or trivial constructs, but rather extensions and secure vessels for our bodies, memory, identity, and mind. Therefore, architecture emerges from our internal confrontations, experiences, memories, and expectations (Palasma, 2016).

3. The Body and Architecture in Historical Evolution:

Antony Vidler divides the discussion of the body and architecture in a historical context into three stages: 1. Building as a body, 2. Buildings that manifest bodily states or, more importantly, mental states based on bodily sensations, 3. The environment as a whole possessing bodily or at least organic characteristics (Li et al., 2019). These stages can be categorized into three main paradigms, namely: 1. Classical Body, 2. Modern Body, 3. Postmodern Body (Scribner, 1997).

3-1. Classical Body:

The pervasive symmetry of ancient architecture was a response to the primal form of the human body. The body is an indivisible possession that enables access to reality, now understood as a visual awareness through the polarization of "external body materials." Despite our prevailing rational biases, the body and the world are inseparably and mysteriously intertwined. The world possesses meaning in its immediacy of perception, and its appearance is shaped by the representation of our body's image upon it (Perez Gomez, 1986).

Classical architectural theories, from Vitruvius to Alberti, considered the ideal human body as the primary figure for designing buildings. In fact, the proportional system proposed in Vitruvius's ten books forms the foundation for designing buildings in the classical era (Scribner, 1997). In this paradigm, human forms are not only represented in buildings but the building itself is also conceived as a body (Ibid). (Figure 1)

The human body, from an anthropological standpoint, served as a norm, a starting point, and a unit of measurement through which ancient humans approached their environment, nature, and the cosmos. The conventional body, as depicted in Leonardo da Vinci's famous diagram (Figure 2), represents a complete microcosm with numerical order reflecting the dimensions and inner components of the whole. It embodies the same underlying harmony that resides within the macrocosm (Vermeersch, 2013). (Figure 3)

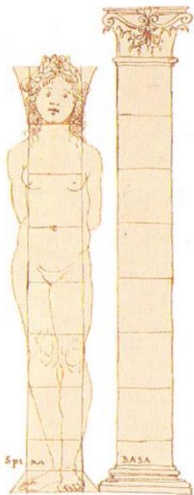


Figure 1: Comparison of a Corinthian Column with the Human Body (Fortkamp, 2005)

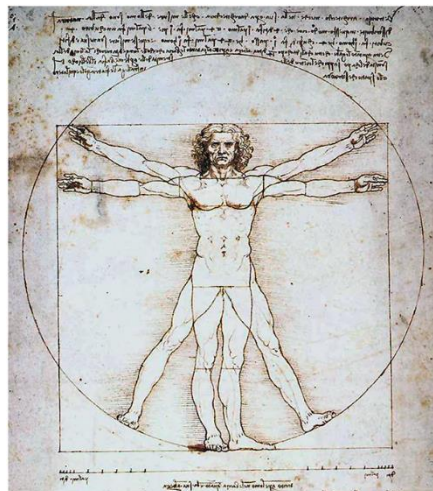


Figure 2: The Vitruvian Man, by Leonardo da Vinci (Fortkamp, 2005)

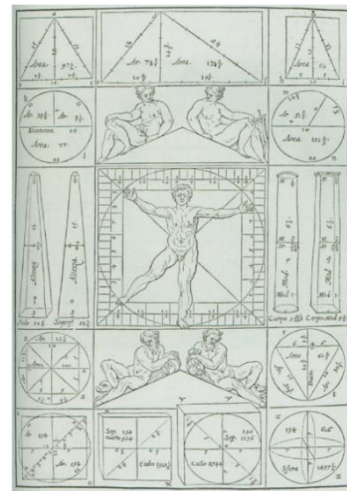
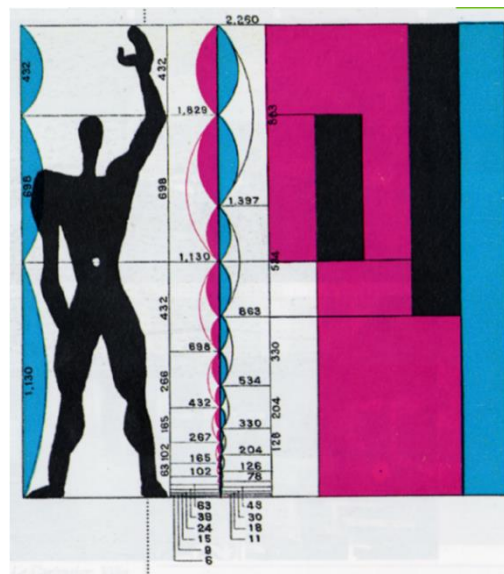


Figure 3: Utilizing the Proportions of Vitruvian Man in Architectural Design (Vermeersch, 2013)

3-2. Modern Body:

Under the modern paradigm, the body was conceptualized as a machine composed of various parts working together. The different body parts were seen as distinct elements connected to a unified form, creating a mechanical body. The machine-like house for living, as proposed by Le Corbusier, exemplifies this paradigm (Scribner, 1997).

From the 17th century onward, with the emergence of Descartes and other philosophers, along with astronomical advancements by Galileo and Copernicus, the human was no longer the center of the universe (Scribner, 1997). The influence of the body as a proportional system continued into the 20th century. In 1942, Le Corbusier developed the Modulor scale (Figure 4), a proportional system for buildings largely based on the golden ratio (Fortkamp, 2005). His attempt aimed to revive the Vitruvian human and establish a newer, more fundamental and balanced method of embodying proportions and sensations (Monshizadeh, 2022).



As previously mentioned, due to the paradigms presented during the postmodern era, we are now witnessing various interpretations of the body. Research conducted by Loke & Robertson (2011) has explored some of these interpretations, which have been extracted from a broad spectrum of literature and fields, and are summarized in Table (1) below.

Table 1: Different definitions of body in post-modern paradigm (Loke & Robertson, 2011)

<p>The body as anatomy and physiology</p>	<p>The body is a collection of interrelated anatomical and physiological systems that give rise to specific capabilities and impose physical constraints. These systems include, for instance, the skeletal, muscular, respiratory, circulatory, nervous, and digestive systems, among others. Digital technologies have the potential to interface with many of these bodily systems, thereby offering novel behaviors and shaping our daily experiences.</p>
<p>The body as an expression tool</p>	<p>The body continually expresses our state of being and becoming. The body, being observable and material, is a manifestation of existence, serving as a conduit for embodiment, while also constituting a mode of interaction with the world. The field of dance emphasizes qualities of aesthetic cognition, embodiment, and transformative corporeality.</p>
<p>The body a source of knowledge</p>	<p>The concept of embodied thinking or bodily engagement in contemporary studies of cognition and in practical design has garnered significant attention. Knowledge and meaning can be constructed through bodily experience, and the foundation for studying motor activities such as yoga, Pilates, and Capoeira lies in understanding how individuals learn and cognize through bodily experiences.</p>
<p>The physical body</p>	<p>The physical nature of the body and its capacity for skillful interaction constitute fundamental aspects of some recent approaches to designing interactive systems. The notion of an active physical body is prevalent in interactive applications, aimed at enhancing physical prowess for entertainment, play, health, and common physical fitness.</p>
<p>The body as a lived experience</p>	<p>The body serves as a tool of perception, encompassing both sensory perceptions of the external world and the internal states of the body itself. Kinesthetic awareness constitutes a fundamental perception, while self-awareness within movement encapsulates consciousness of the body's actions.</p>
<p>The social and cultural body</p>	<p>While phenomenology places direct and lived experience at the forefront of its analysis of existence, Merleau-Ponty indicates that our actions within the patterns of interaction systems with others acquire significance in their social and cultural dimension.</p>

4. Body, Architecture, and Lived Experience:

As explored, historical examination of the body reveals at least three modes of existence where architecture and the body intersect:

The conception of a "universal harmony" that determines the proportions of all bodies, including the human body, which has been a persistent idea throughout history. An allegorical notion that "building is a body" signifies that we visually depict our empathetic inner process as a composite of forms. Rather than experiencing the world like a structure, we "experience through the window of a structure" and effectively turn architecture into a tool through which we can experience the world in new ways beyond the biological limitations of the body (Hale, 2017).

The concept of experience holds a fundamental position in the phenomenological approach, and phenomenology is a system defined by examining the structure of experience. In the German language, there are two words for "experience": *Erfahrung* and *Erlebnis*. *Erfahrung* generally refers to experience, such as personal experience. *Erlebnis* translates to "lived experience," signifying an immediate and present experience of something, an experience where unity is established between the experiencer and the experienced, between the world and the known. Essentially, lived experience stands in contrast to *Erfahrung*, which represents second-hand experience mediated through acquisition and has implications in the natural sciences, whereas in the humanities and the arts, experience of the *Erlebnis* type, direct and flowing, is relevant (Van Manen, 1977). It can be said that "lived experience" takes place through the "lived space"; lived space, or lifeworld, is a situation where human lived experiences are shaped, and this concept differs from geographical place, as it is shaped, firstly, by the mutual influence a specific place has on an individual's sense of being there, and secondly, by the individual's sense of being there that imbues meaning into that place. In other words, the unique experience is constructed through the qualitative significance of its lifeworld (Ibid). Thus, in significant architectural experiences, space, matter, and time blend together in a unified dimension, penetrating our awareness. We recognize ourselves through this space, this place, this moment, and these dimensions that have become the constituents of our being. Architecture acts as an intermediary and harmony between us and the surrounding world (Hall et al., 2020).

Our experience of space, prior to being mental and rational, is embodied experience. The phenomenological approach indicates that we can access the concept of space through direct sensory contact (kurbjeweit, 2020). Pallasma describes this embodied experience as follows: 'Every significant architectural experience is a multisensory one. The quality of material, space, and scale is measured by the eye, ear, nose, skin, tongue, skeleton, and muscles' (Pallasma, 2000).

In fact, as illustrated in Figure (5), an observer can be situated within an architectural space and experience the inner space from within (rather than in front of the observer). [This experience is internally articulated through the seven senses as proposed by Pallasma]. Furthermore, through movement within the space, the sense of place gives rise to the creation of a tangible concept, allowing the identification of previous points from different areas. Thus, it generates high-level panoramic views within the framework of a space (Mousavian et al., 2019). Similarly, humans, when encountering architectural space, do not come empty-handed without any prior perception or assumptions. Rather, they enter buildings carrying a baggage of lived social experiences and are influenced by economic, political, and cultural forces. All these lived components will influence how they perceive space, shaping both the manner and quality of their perception (Seyyed et al., 2019).

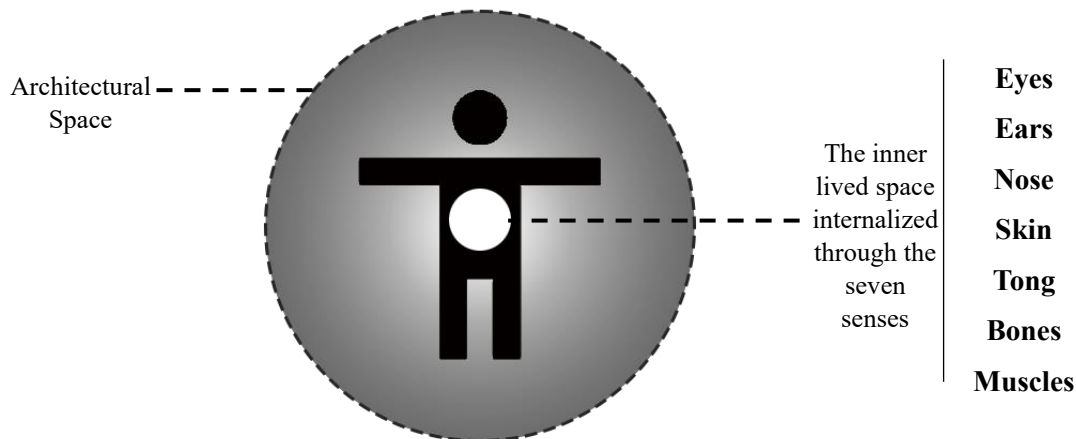


Figure 5: Diagrams of lived experience through architectural space (by author)

5. Architectural Design Process:

An architect constructs a building within their own body. Displacements, balance, distance, and scale are subconsciously felt through the body, similar to tensions in the muscular system and the states of the body and internal organs. When the effect interacts with the observer's body, the acquired experience reflects the creator's unique sensations. Consequently, architecture establishes a direct connection from the architect's body to the recipient's body (Hall et al., 2020). In fact, this process, through the inner design process and through this process's embodiment, connects the architect to the recipient.

Regarding the design process (especially in architectural design), it can be stated that space is increasingly considered as a locus for design, and the design space is often a mental, personal, and abstract space where design ideas are generated and nurtured (Van Amstel et al., 2017). Researchers have always pursued the elucidation of a systematic pattern in the design process. However, many aspects of systems [in systemic perspective, various phenomena can be perceived as systems with a common structure] have been neglected in these patterns, leading to their fragmentation (Goodini, 2020).

The mechanism of the design process, as an incredibly intricate mental activity, is not clearly defined. Furthermore, designers' experiences indicate that the formation and birth of design concepts happen mostly in the unconscious mind. Simultaneously, a designer can analyze the subject and site conceptually through rational thought and then provide them with a unified structure through creative thought. Indeed, the designer's thoughtful perspective on the design's site and creative interpretation of the design subject lead to the formation of design concepts. Considering the significant influence a designer can have on determining and understanding the other two elements, their role in shaping the design concept is more crucial. Architecture, therefore, crystallizes the designer's perspective on the world of existence (Mandegari et al., 2011).

Unlike the static representation of the body dictated by Vitruvian human, the animate body emphasizes experiential and phenomenological qualities (Spurr, 2009: 323). In this regard, research conducted by Negintaji et al. (2017) proposes a model for employing phenomenology in the design process: (Figure 6).

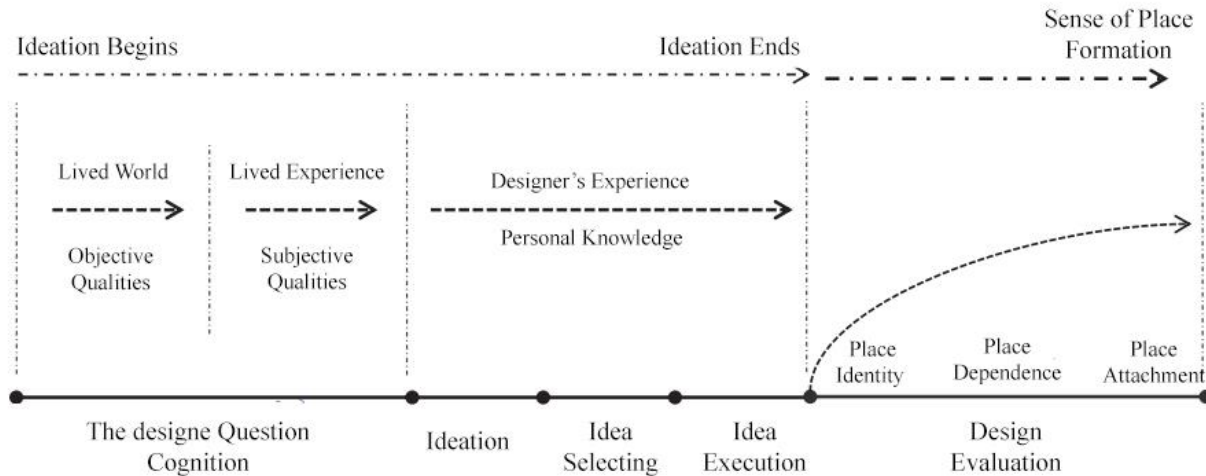


Figure 6: Phenomenology in different levels of design process (Negintaji, 2017)

According to Figure (6), the design process can be divided into three parts: understanding, ideation, and presentation [or evaluation] (Bastani et al., 2018). In the understanding phase at the beginning of the design process, the designer needs to first understand the particular characteristics of the context. This can be processed by accepting the bio-world nexus with the socio-cultural realm, coupled with lived experiences. In the subsequent phase, during design decision-making, the designer's personal knowledge plays an active role, which has been acquired through a phenomenological approach to their lived experiences. Finally, after the design process and execution of the design, according to specific criteria, the design's success in responding to users' lived experiences can be evaluated (Negintaji et al., 2017). This evaluation will essentially be an evaluation of the created space throughout the design process, which has been designed based on the architect's lived experiences for specific users.

6. Space, Architecture, and the Body:

Space, as a product of the design process, is one of the fundamental concepts in architecture. Architects and thinkers in the realm of architecture have presented various interpretations of this concept throughout history. What gains greater acceptance among experts is a definition of space that encompasses both the human element and the surrounding environment. In this definition, space is considered a result of the interaction between humans and their surrounding environment or the interaction between subjectivity and objectivity (Sohangir & Nasir Salami, 2014). Creating a desirable architectural space is the outcome of disciplined and precise thinking. It adheres to specific principles and techniques that bear fruit after numerous trials (Ibid).

Initially, space carries the concept of conscious perception of the environment and then shaping it, with or without cognition, by humans themselves. Human efforts, primarily contingent on individuals' presence in space, transform public space from a pre-existing physical state outside of humans and into an active interactive entity through establishing communicative fields. Through social relationships, humans confer form, function, and social significance onto space (Casey, 2012). According to Merleau-Ponty, space is existence, and spatiality is a form of being. Hence, humans are fundamentally connected to space (Mahdalickova, 2009). Through bodily perception, we gain cognition of objects and the world. We experience our being in the world. The sense of being in the world as embodied entities necessitates a sense of being in space. Our existence in the world is spatial because our physical body is spatial, stretched into space and possessing spatial dimensions. The image of the body, which constitutes the structure of all experiences, is an image of a 'spatial body' (Lefebvre, 1991).

Architecture must uncover the nuances of bodily experience to create spaces tailored for actual life. After all, the activities we engage in, whether it be a dinner party or a murder, are complex and diverse. (Spurr, 2009). In essence, the architect acts as a conductor orchestrating the space in harmony for function and aesthetics through synchronized senses. How the human body engages with space is of paramount importance. As the human body moves, sees, smells, touches, hears, and even tastes within a space, architecture comes alive (Spence, 2020).

7. Conclusion:

According to the investigation conducted in this study, as previously discussed, the human experience intertwines with existence through embodiment and incarnation, enabling their existence in the world. The architectural design process, considering this fact, becomes an embodied process that facilitates the connection between the architect's body and the user's engagement with space.

According to Figure (7), in the understanding phase of the design process, the designer examines the design context, which is essentially a biosocial realm. In this process, the designer actively engages with understanding all social, political, cultural, natural, artificial, and other forces. This process is a mental one, through which the designer perceives it through their body. Additionally, in this phase, the designer needs to identify and explore the user's lived experience, who will use the design product. This itself establishes a mental connection between the user's body and the architect's body, and the designer abstracts this stage in the next phase (ideation) to progress towards the design.

In the subsequent phase, the designer endeavors to formulate a design using the cognitive information acquired in the understanding phase. This is achieved through the designer's personal knowledge, which results from an embodied experience in the world. This multisensory experience, facilitated by the eyes, ears, nose, skin, language, skeleton, and muscles, is internalized in the designer's mind. In this stage, not only does the body unconsciously play a role in this process, but the designer's design philosophy and conceptualization of the body also consciously contribute, incorporating the body into this process. Thus, the design finds its way into the realm of tangibility (Figure 7).

Ultimately, the culmination of this process is realized in the constructed architectural space. This space is essentially a fusion of the user's lived experience and the designer's creation, giving rise to a tangible entity. In this space, the designer can convey a message or an idea nurtured in their mind throughout the design process to the audience. The space becomes an artistic creation that not only provides a living environment for the user but also communicates the designer's message to the audience. Through their embodied and multisensory experience, the user perceives and comprehends this message.

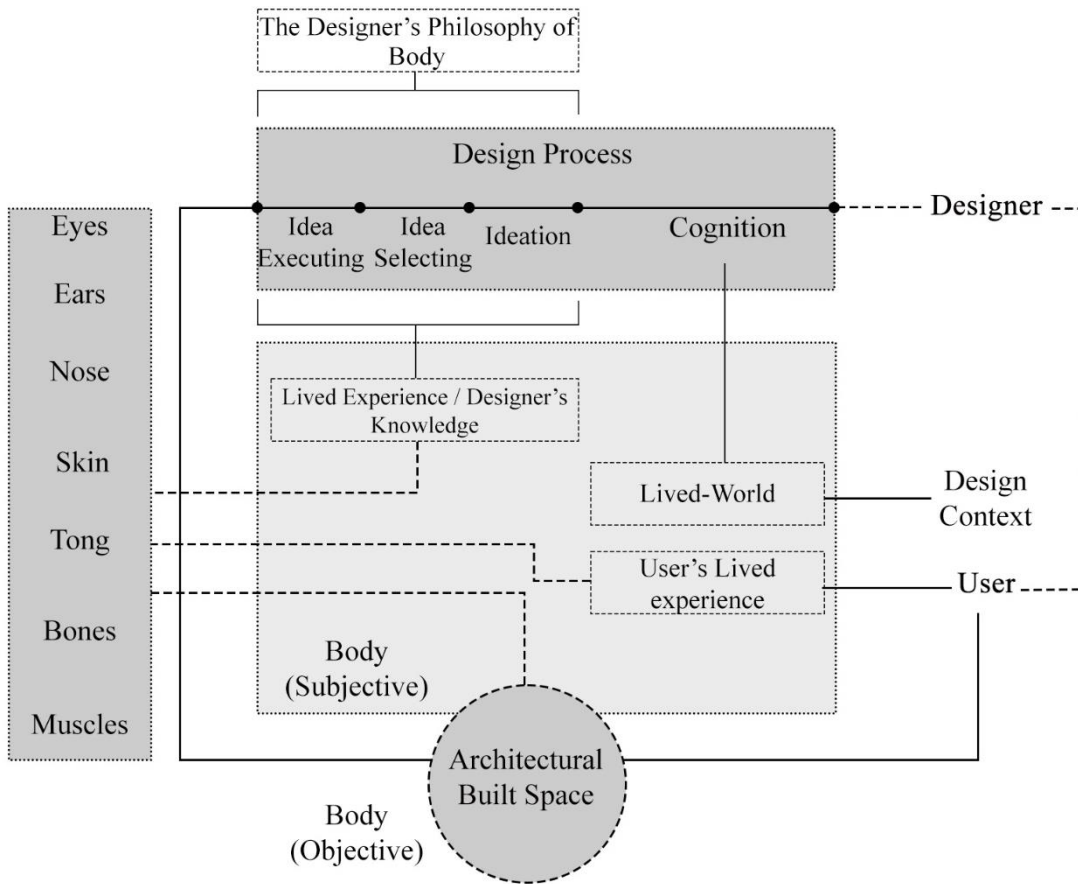


Figure 7: Embodied connection of user and designer through design process (by author)

References:

1. Akbari, A., & Niroomand Shishavan, M. (2019). The Position of Embodied Experience from the Perspective of the Philosophy of the Body in the Process of Designing and Creating Place. *Philosophical Researches*, 13(26), 25-52.
2. Pallasmaa, J. (2016). *The Embodied Imagination: Imagination and Imagination in Architecture* (A. Akbari, Trans.). Tehran: Parham Naghshe.
3. Sohangir, S., & Nasir Salami, M. R. (2014). Patterns of Creating Space in Architecture Based on Postmodern Theoretical Paradigms. *Bagh Nazar*, 11(28), 65-78.
4. Siyad, A. H., Ghorbpoor, A., & Delshad, M. (2019). Spatiality and Embodied Awareness: Reinterpreting the Concept of Space in Architectural Experience (Case Study: Tehran Museum of Contemporary Art). *Bagh Nazar*, 16(75), 71-82.
5. Goudini, J. (2021). Presenting a Holistic Definition of the Architectural Design Process. *Bagh Nazar*, 17(91), 29-40.
6. Mohseni, A. (2021). Bringing the Body Back to Interior Design. *Journal of Interior Architecture*, 1(1), 96-105.
7. Mahmoudi, A. S., & Bastani, M. (2018). Methods of Generating Ideas and Concepts in Architectural Design Process. *Fine Arts - Architecture and Urbanism*, 23(1), 5-18.
8. Monshizadeh, A. (2022). The Evolution of the Concept of Body in Architecture: From Organicism to Phenomenal Body. *Safhe*, 32(1), 5-20.
9. Mosavian, S., Aminzadeh Goharrizi, B., & Shahcheraqi, A. (2019). Explaining the Conceptual Model of Effective Components in Shaping Architectural Experience. *Architectural Thought*, 3(6), 59-75.
10. Negin Tajy, S., Ansari, M., & Pourmand, H. A. (2017). Explaining the Relationship between Human and Place in the Architectural Design Process with a Phenomenological Approach. *Fine Arts - Architecture and Urbanism*, 22(4), 71-80.
11. Hall, S. J., Pallasmaa, J., & Perstgårdm, A. (2018). *Questions of Perception: Phenomenology of Architecture* (M. Nikfetrat, S. Mirgol Langroudi, & E. Bitaraf, Trans.). Tehran: Ketab-e Fekr-e No.
12. Mahdalickova, E. (2009). New Experiences Of The Body Through Space. *Implications Philosophiques*, 1-2.
13. Spurr, S. (2009). Drawing the Body in Architecture. *Architectural Theory Review*, 14(3), 322-332.
14. Spence, C. (2020). Senses of Place: Architectural Design for the Multisensory Mind. *Cognitive Research: Principles and Implications*, 5(1), 46.
15. Pallasmaa, J. (2000). Hapticity and Time. *Architectural Review*, 207(1), 78-84.
16. Henri, L. (1991). *The Production of Space*. Massachusetts: Blackwell.

17. Kurbjeweit, J. A. U. (2021). Moving (in) Space: The Role of the Body in Architectural Experience (Doctoral dissertation).
18. Johnson, M. (2002). Architecture and the Embodied Mind. *OASE Journal for Architecture*, 58, 75-93.
19. Perez-Gomez, A. (1986). The Renovation of the Body: John Hejduk & the Cultural Relevance of Theoretical Projects. *AA Files*, (13), 26-29.
20. Synnott, A. (2002). *The Body Social*. Routledge.
21. Vermeersch, P. W. (2013). *Less Vision, More Senses: Towards a More Multisensory Design Approach in Architecture*. Katholieke Universiteit Leuven.
22. Fortkamp, S. A. (2005). *Body. Emotion. Architecture. A Phenomenological Reinterpretation* (Doctoral dissertation, University of Cincinnati).
23. Scribner, S. A. (1997). *Lived Body Architecture: An Argument for Lived Bodies in Architecture and an Exploration of Women's Lived Bodies in Society*.
24. Hale, J. (2016). *Merleau-Ponty for Architects*. Routledge.
25. Van Manen, M. (2016). *Researching Lived Experience: Human Science for an Action Sensitive Pedagogy*. Routledge.
26. Van Amstel, F. M., Hartmann, T., van der Voort, M. C., & Dewulf, G. P. (2016). The Social Production of Design Space. *Design Studies*, 46, 199-225.
27. Casey, E. S. (2009). *Remembering: A Phenomenological Study*. Indiana University Press.
28. Loke, L., & Robertson, T. (2011, November). The Lived Body in Design: Mapping the Terrain. In *Proceedings of the 23rd Australian Computer-Human Interaction Conference* (pp. 181-184).
29. Li, L., Zhang, Q., & He, M. (2019, December). Research on Body and Architecture. In *IOP Conference Series: Materials Science and Engineering* (Vol. 690, No. 1, p. 012017). IOP Publishing.