

## 論文の内容の要旨

論文題目 DESIGN STRATEGIES AND THE QUESTION OF INHABITABILITY IN ARCHITECTURE

(デザイン戦略と建築の居住性の問題について)

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Throughout history, the relevance of the theme of inhabitability has pervaded the architectural discourse. Since Vitruvius, many attempted to develop a framework to tackle it by involving the human perspective into the design process. Scholars repeatedly underlined the importance of formal design elements in relation to the human body – such as scale and proportion – articulating that the presence of essential mathematical harmonies is perceived instinctively by people, and is emotionally fulfilling. However, history also shows that this human-centered framework fluctuated in being the focal point of architectural design: other matters at times were more prominent, like stylistic representation, aesthetic, functionalism, rationality, among others.

At the beginning of the 20th century, in particular, distinguished architects theorized about the humanization of architecture. With an approach which drew on analytical observation in combination with scientific reasoning, they attempted to explain the links between nature, space and human biology. Frank Lloyd Wright, Geoffrey Scott, Alvar Aalto, and Richard Neutra, for example, had resolute discourses on the importance of considering humanitarian and psychological aspects when designing, as well as to reestablish the relationship with nature.

Meanwhile, civilization witnessed surprising consequences from the interaction with the built environment. Significant outcomes happened at the end of the nineteenth century with the sanitation crisis, followed by the energy crisis and the outbreak of Sick Building Syndrom<sup>e</sup> in the 1970s. Over time, multitudes of

studies evidenced the crucial effects the environment has over our physical and psychological health. Many of the public health disturbances, including obesity, depression, violence, and social inequities, were linked to the built environment. Furthermore, overpopulated cities have caused an escalation of problems such as smaller enclosed spaces, lack of sufficient natural elements and real estate bubbles. This goes without mentioning the impact of climate change, greenhouse gas emissions and the decrease of earth's natural resources.

The green building rating systems that emerged in the 1990s were a response to the problems related to construction and sustainability. In general, they focus on evaluating the performance of buildings within a sustainability framework. These systems have multiplied over the years, and, by promoting measures that were sometimes complex and costly to apply in the past, are responsible for transforming the construction industry. In consequence, they also managed to improve the general building standards and raised the status of buildings.

Yet, the green building movement brought about a backlash: it evidenced that besides sustainability, a framework which ensures the inhabitability of buildings is of utter importance and urgently needed. Hence that highly rated buildings in sustainability standards do not necessarily account for buildings which are good for its inhabitants. This issue has been raised by many, especially in consideration of the lack of knowledge over practical strategies to achieve more human-centred designs.

Parallely, recent developments in the sciences are changing the entire body of human knowledge. Developments, especially those determined by technological advancements, have forced major fields of study to go through a radical restructuring of agenda. And, within this scenario, many studies from different fields are contributing towards a human-centred framework for architectural design, either directly and indirectly. Experimental research in neuroscience, cognitive science, psychology and physiology, for example, are producing unprecedented empirical evidence on how inhabitable space is according to the practical strategies used in a building's formal design. Through newly existing technologies and traditional analytical tools, researchers are able to measure our behavioral, cognitive, and emotional reactions, as well as physiological markers and brain activity in relation to our surrounding environment.

This surrounding environment informs us about who and where we are, what we need, and if we are safe and well. It is not a coincidence that we prefer environments that impact us positively: we, as human beings, have a strong connection to the space around us. This connection - termed inhabitability in this thesis - happens especially in places that we are in for long hours. It involves our conscious and unconscious embodied cognition - our mental constructs and performance on various tasks - and has a direct effect on our physical and emotional wellbeing. The findings on the physical foundations of this connection are already being employed for decades in areas such as marketing and in the entertainment industry. In the field of architecture, practical findings have been generally applied to the design of specialized healthcare facilities.

Architects (in general) are far behind in the engagement to understand how a person's body and mind truly experiences and reacts to the spaces being designed by them. The reason for this delay might be that, despite established facts, many architects accept the romantic approach to the profession, believing it to be based on intuition and creativity, where artistry sensibilities should not be limited or controlled. Or, due to the fact that there is still no appropriate theoretical and practical framework in architecture which objectively tackles the influence of design strategies on users.

Therefore, it is essential to explore and integrate the outcomes of the growing empirical knowledge from other influential fields of studies into architecture in order to improve/promote inhabitability. Studies in human health and cognition together with the theory of architecture may start to provide the foundations for involving such issues with design strategies towards a more human-centred approach to architecture.

An integrative model, where relevant findings within this new body of knowledge are merged, could benefit architects in obtaining practical knowledge into more human-centred design practices. Additionally, it has the potential to guide future scientific research. To consider the substantial amount of existing data on human/space behavior and incorporate it in the design of the built space is an important step which will assist in our constant design challenges. With so many great achievements and developments taking place, and with all the available database and data-driven intelligence, we as professionals should not be intimidated to explore new ways of promoting inhabitability within our designs.

Inhabitability in architecture concerns not only spaces which are fit to be occupied/lived in, but spaces that are centered on humans and which positively affect what we think, feel and do. This thesis bases itself on the precedent that by acknowledging how the human brain assimilates the awareness and affection for environments, it is possible to intentionally design a more human-centred architecture. This human-centricity entails our conscious experience through our actions and uses of a built environment, like how well a building performs towards providing its occupants with physical well-being for everyday tasks such as working, studying, cooking, relaxing, sleeping, etc. And it also entails our subconscious experience, like how well a built environment performs towards promoting psychological well-being.

This research engaged in an investigation of studies in architecture and from relevant scientific research in various fields in order to identify, within this broader body of knowledge, relevant data that can be utilized for successful design outcomes. Based on available literature and in scientific data, the research explored the correlation and integration of concepts and findings, and summarized them into a framework composed of practical strategies which could have a direct impact on the design process and building outcomes. This methodology proposes to integrate diverse fields of study and to eliminate the disconnection among current scientific-based research and its practical application in architecture. Likewise, it aims to help inform, instigate and legitimize designers, clients and all stakeholders involved in the design process into considering the effectiveness of built spaces.

It is critical to understand the weight of design decisions on buildings' occupants. What kind of design strategies in schools enhance children's focus and the ability to learn? What kind of design strategies in workplaces can make workers more productive? What kind of design strategies in hospitals could lead patients to faster recovery time? These are questions that need to be addressed. This thesis does not intend to answer them categorically, but to provide a general framework for promoting overall well-being in built environments.

Since inhabitability is defined by conscious and unconscious experiences in space, a thorough interdisciplinary research on the history and findings on the theme is necessary in order to identify what type of features an inhabitable space possesses. The resulting data should enable the establishment of a framework to promote inhabitability, aiming at providing a base for analysis and a model that contributes to the design process and assist architects in ensuring their design decisions.

First, it was important to detect the occurrence and relevance of the theme throughout the history of architecture. Therefore, a literature review was conducted with the intention to gain information on the evolution of the theme along time, and insights on how architects have objectively approached the

human/space behavior relation. Following in the contextualization of the theme, the supporting role of the sciences to the human-centred approach to architectural design was analyzed. The emergence of interdisciplinary fields linked to human/space behavior was investigated, and their role as providing evidence for a human-centred approach to architecture was established.

Subsequently, a method for approaching inhabitability within a design framework was proposed. First, a review was conducted on scientific studies developed in the field of architecture and in the sciences which identify relevant design strategies towards spatial inhabitability. The procedure was to first locate and analyze as many existing research related to human/space behavior – and the neuroscience/architecture relation – currently available. Then, identify within that body of knowledge findings which could lead to parameters based on practical design strategies to be utilized for enhancing the human/space behavior relation in built environments.

Finally, after parameters for inhabitability were established, there was a need to verify their validity. Two types of case study analysis were proposed to assist in the validation: one based on cross-examination of buildings submitted into popular voting against the inhabitability parameters, and another based on cross-examination of renowned buildings. Both analyses were developed by a matrix-points based correlation. The intention was for the results to demonstrate compatibility between the inhabitability parameters and the design strategies used in the featured buildings.

This proposed framework created a solid base for architects to reach their design goals, being capable of assuring the wellness and the enhancement of cognitive processes of the occupants of buildings they design. It should also inspire professionals to enrich their repertoire, reevaluate their responsibilities, and design more meaningful and sustainable environments.

Architects need to be reminded that people experience space through an ensemble of stimuli of their biological senses. Furthermore, architectural designs need to respond to new challenges and opportunities presented by a range of social, environmental, technological and economic motivators. As architecture cannot be judged by its formal constructability, its accomplishment of programmatic requirements or its performance in terms of technical parameters – since these issues are fundamental – architects must strive to enrich their conceptualizations by understanding and articulating the experience built environments can provide to its occupants.

As a response to this prominent issue, the translation of scientific findings on human/space behaviour into a design framework aims at providing architects with practical strategies that support physical/mental health and wellbeing. The possibility to merge knowledge from different disciplines and explore it in new design approaches is a necessity for the development of architecture and an excitement prognosis for professionals. The more information about human/space behavior, the better the design can become. The objective is not to prescribe a solution or justify a style, but rather inform on the possibilities and outcomes, and put the emphasis on the experience of design. By drawing upon a range of sources, and emphasizing the far-reaching implications of new neuroscientific discoveries and models, this thesis intends to bring insights and clarity over findings that are fast becoming accepted in architecture.

Finally, this research entails the exploration of more systematic methodologies in architectural design, which has been sought by many. Systematization does not infer in lack of creativeness or standardization of design. In fact, it is the opposite: designers can benefit from an objective methodology which provides opportunities to focus on the development of original and innovative solutions within a reliable framework to enhance user's wellbeing.