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Do intelligent Buildings (IBs) Promote Well-Being? Identify the Key Influential Factors and Shortcomings

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Abstract: *Physiological comfort and health is something that could be explained scientifically, by referring to certain physical conditions of architecture that match the needs of comfort and health. Well-being must be thought of not as provided to or obtained by individuals, but as socially constructed and constituted within the political and cultural context. But sometimes the building design may not create a better indoor comfort and one of the reasons is that we lack of an interdisciplinary study and the cross-disciplines knowledge frame from the physical climate, architectural design, organization environment, as well as social and cultural background of the users. IBs should respond to the needs of their occupants and society, be functional and sustainable, and promote wellbeing of the people (Clements-Croome 2013).*

Keywords: *Well-being; physiological comfort; physical conditions; IBs*

INTRODUCTION

The question of how wellbeing should be defined (or spelt) still remains largely unresolved, which, has given rise to blurred and overly broad definitions of wellbeing' (Forgeard, Jayawickreme, Kern, 2011; Seligman 2011, p. 81). As interest in the measurement of wellbeing grows, there is a greater necessity to be clear about what is being measured, and how the resulting data should be interpreted, in order to undertake a fair and valid assessment. In essence, stable wellbeing is when individuals have the psychological, social and physical resources they need to meet a particular psychological, social and/or physical challenge. When individuals have more challenges than resources, the see-saw dips, along with their wellbeing, and vice-versa. In this essay, first of all we try to define well-being in the context of building then analysis how much smart houses affect well-being.

Definition of well-being in the context of building:

We spend upwards of 90% of our lives within buildings, yet we know much more about the effects of ambient environmental conditions on human health than we do about how buildings affect our health. Built environment is having a potential effect on the occupants' physical and psychological health, well-being and performance. Building is not only a machine for living, it also a shelter to flee away, a place to settle down soul and first of all, it should be an inhabit environment where people can gain physical and mental health, relaxation and freedom.

In the late 1980s, the World Health Organization identified the concept of healthy building: Free of hazardous material and capable of promoting health and comfort of occupants throughout its entire life cycle, meeting the social needs and upgrading productivity (Barton and Grant 2008). Over the past 20 years, the association between built environment and health, well-being and performance has attracted increasing research interest in building scientific area. But to the authors' knowledge, the mechanism how built environment impacts people's health and wellbeing is far from discovered. Until recently, there is little information available in the literature about the association between health risk factors and built environment and how they are interacting. There is nothing more important than our health and well-being. 'Health' is usually defined as 'the body is under normal conditions without disease'. However, human has the social characteristics as well as the physical characteristics. The Preamble to the Constitution of World Health Organization gave a definition of health as 'Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity' (WHO, 1948).

1-1.The historical background to wellbeing research:

Knowing the historical background to the study of wellbeing is necessary to the definition of wellbeing. Two approaches emerged: the hedonic tradition, which accentuated constructs such as happiness, positive affect, low negative affect, and satisfaction with life (e.g., Bradburn, 1969; Diener, 1984; Kahneman, Diener, & Schwarz, 1999; Lyubomirsky & Lepper, 1999); and the eudaimonic tradition, which highlighted positive psychological functioning and human development (e.g., Rogers, 1961; Ryff, 1989; Waterman, 1993). However, despite the differences in approach, most researchers now believe that wellbeing is a multi-dimensional construct (e.g., Diener, 2009; Michaelson, Abdallah, 2009; Steuer, Thompson, & Marks, 2009; Stiglitz, Sen, & Fitoussi 2009). Consequently, the diversity of dimensions has created a ,confusing and contradictory research base' (Pollard and Lee, 2003, p. 2).

Definition of Wellbeing

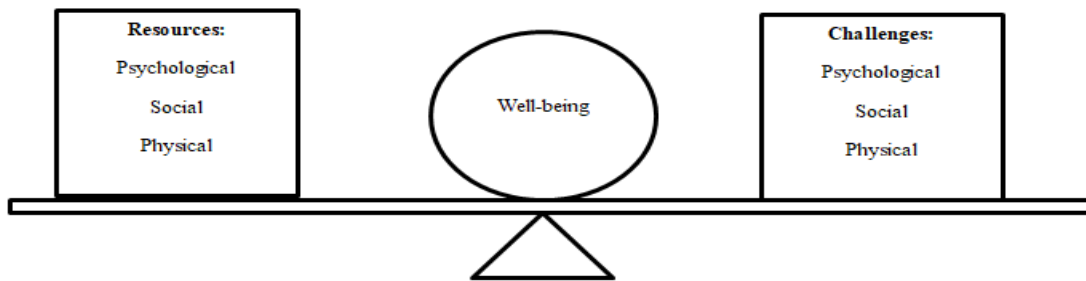


Figure 1: Definition of Wellbeing

Types/ categories of well-being in building:

Sustainability must be defined to include meeting human physical, emotional and social needs. Well-being is multidimensional and context-specific, and must be approached in a way that preserves cultural diversity and societal autonomy while meeting universal human needs. Researchers have found that well-being and life satisfaction is subjectively experienced as a shrinking gap between aspirations and actual achievements; thus growth may contribute to perceptions of reduced well-being if it increases aspirations without satisfying them. We know today that people's well-being does not depend only on genetics or their interactions with each other, but also on their physical environments.

Home environments can affect three primary areas of their well-being. These three areas include:

- Physical health
- Social and emotional functioning
- Cognitive development

Each of the three areas of well-being—physical, social and emotional, and cognitive—are important. Success in all of the areas is necessary in order to say that, overall, a person is faring well.

Physical health: Most people understand what physical health means. Physically-healthy people are free from diseases, such as asthma or chronic colds, and they are neither overweight nor underweight. They are also safe from accidents, injuries, and poisoning. Adequate nutrition, sleep, exercise, and preventive health care all contribute to a person’s healthy physical functioning.

social and emotional functioning: Social and emotional functioning refers to people’s relationships with others, social skills, and feelings about themselves. Demonstrate the good character values and mental health that allow them to work towards their goals and be hopeful about their future, and connection with nature and beauty.

Cognitive development: Cognitive development describes person’s abilities to mature in ways that allow them to learn and solve problems, make good decisions.

Influential factors affecting well-being:

The elements of well-being will vary from person to person, place to place, and culture to culture. This highlights the importance of essential freedoms and capabilities, which allow individuals and communities to put into place the elements of well-being in ways which work for their lives and environments.

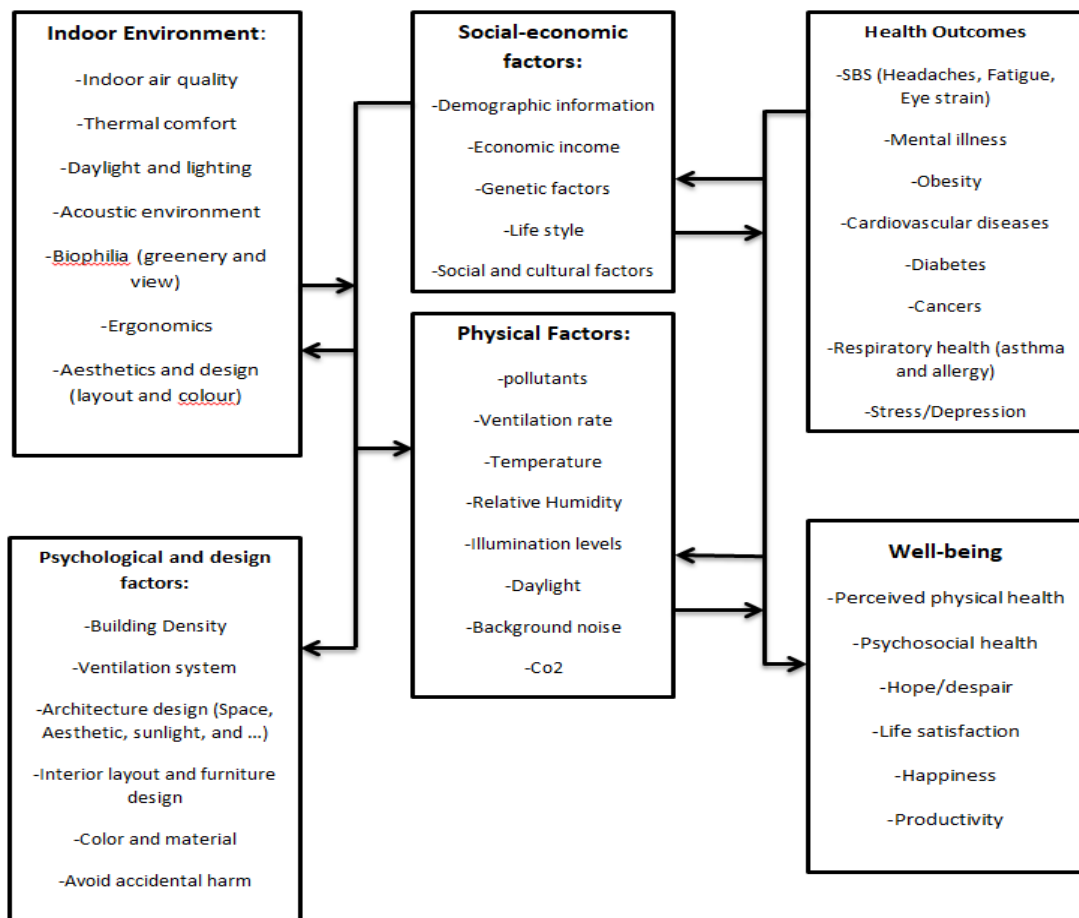


Figure 2: Model of building environment and well-being: (Clements-Croome and Wang)

Housing characteristics affect people both directly and indirectly. For example, housing quality can directly affect person’s well-being, such as when the paint in an older home causes blood-lead poisoning. In contrast, the cost of housing affects people indirectly, not directly. In combination with a family’s income and other necessary expenses, the affordability and availability of housing determines the range of housing and neighborhood characteristics to which a family has access.

Analysis of the level of well-being in IBS:

In recent years, the notion of intelligent buildings (IBs) has become increasingly popular due to their potentials for deploying design initiatives and emerging technologies towards maximized occupants’ comfort and well-being with sustainable design. Several recent studies endeavored to define IBs, identify their core attributes and set platforms for analyzing their effectiveness (Clements-Croome 2018). Concerning one of the most recent representation of IBs, six main KPIs are defined (Ghaffarianhoseini 2016):KPI-1) Smartness and Technology Awareness, KPI-2) Economics and Cost Efficiency to give high value, KPI-3) Personal and Social Sensitivity and, KPI-4) Environmental Responsiveness.KPI-5) Health &Well-Being and, KPI-6) Urban-Scale Responsiveness.

Table 1: Physical well-being factors in IBs

positive factors:	negative factors:
Environmental friendliness: (sustainable design for energy and water conservation, effective waste disposal, zero pollution and using material and resources)	The most smart homes are depicted as sterile and neutral spaces (the domestic environment is simply the “taken for granted”)
Safety and security measures: fire, earthquake, disaster and structural damage/ Space utilize and flexibility/ Improving health and sanitation	Automating and optimizing the importance of domestic life of enrichment activities: boosting physical fitness make people lazier, about being unable to control or maintain
Support the elderly and people with chronic illness and disable people living along home independence	
Positive effect of air flow and lighting (Natural lighting, ventilation and spaciousness physical comfort)	
Alongside automation provide useful information to users about various aspects of household functioning: room temperature, appliance conditions and energy usage	

Table 2: Social and emotional well-being factors in IBs

positive factors:
Reduction costs (lower health care, minimization of the energy consumption and its operating costs)
negative factors:
Users must interact or interface with technologies: computer software plays the role of an intelligent agent
Automating and optimizing the creativity and teaching social value: reduce opportunities to teach children how not to be wasteful
Neglecting the complex understanding of homes and different preferences as well as emotional associations
Personal privacy and security: Loss of control, reliability, privacy: being reluctant to introduce seeing

technologies into their home, others can monitor
Data information communication: Removing any active user involvement by automating functions
Having fixed and stable needs- Strictly limited to chain of functions
Developing data: making specific, repetitive and relatively predictable routines and schedules. Ranging from a one-off input of preferences for the domestic environment:” set and forget”
Technology is coming to dominate people
Entirely reliant of technology

Conclusions

Health and wellbeing are more complex on the mental and perceptual levels than it can be predicted only based on the results of measurable building performance parameters (Bluyssen et al, 2011). There are still many knowledge gaps concerning human real demands and the designed indoor built environments such as comprehensive understandings of how various factors affecting health and wellbeing, what are the biases existing between human real demands and building performance. However, existing datasets are still limited to identify all related factors and quantify the influencing relations to truly achieve sustainable indoor built environment in different typologies of intelligent buildings. Obviously, there is a demand to gather sophisticated information on occupants’ perception and behavior as well as various building performance related aspects such as energy efficiency levels, the role of smart materials, and potentials of smart technologies. This demand is seen globally but localization is required to adequately address socio-economic and cultural differences

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