

## **How the sensory experience of buildings can contribute to wellbeing and productivity**

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### **Abstract**

Buildings should have productive environments that contribute to occupant wellbeing. An important aspect of this is how the user experiences the building through the full range of their senses. This paper reviews the current understanding of wellbeing and productivity as reported in published papers to examine how they relate to comfort and sensory design. It explores the idea that comfort is just one aspect of wellbeing and productivity. Designing for wellbeing and productivity gives a greater range of possible design solutions than designing for comfort alone.

Keywords: Sensory design, wellbeing, productivity, comfort, buildings

### **Introduction**

It is proposed that wellbeing and productivity are better terms to describe the personal and organisational success of a building's environment than comfort. Environments which are thermally uncomfortable can contribute to our sense of wellbeing, just as saunas, plunge pools and Christmas markets currently do. The science of wellbeing has developed to the stage where its constituent components have been identified. It is possible to understand thermally uncomfortable but desirable situations in terms of the aspects of wellbeing that they provide. This understanding of wellbeing offers alternative design solutions than comfort alone.

Sensory design can be divided between the *technical* that removes discomfort and the *artistic* that provides positive experiences, for instance the dentist and the chef. A different approach to problems based on wellbeing bridges this division. This approach is based more on human psychology than physiology and therefore a wider range of sensory stimulus can be explored in the search for a solution. This requires an appreciation of all the senses and their interplay.

This paper first considers wellbeing and its different constituents. This is then put in the context of the thermal environment and the differences between it and thermal comfort are highlighted. The similarities and differences between wellbeing and productivity are then discussed. This leads to an analysis of how the built environment can improve aspects of these, it is argued that for this the whole sphere of the sensory environment can be put to use. From an improved understanding of wellbeing and productivity new design opportunities emerge; these can be facilitated by a sensory design approach. The implications and limitations of these approaches are discussed.

### **Wellbeing**

Wellbeing provides a perspective of health that looks at the full spectrum of fitness for life rather than the traditional dichotomy of sick or healthy, mind or body (Davies, 2011). There is a spectrum of mental health ranging from mental disorder, through languishing to moderate mental health and finally flourishing; this suggests that it is not only the sick that can be helped nor the healthy that can work (Huppert, 2009). Work by the Department for Health and Pensions recommended the replacement of the sick note with the fit note, this describes the nature of a person's health in more detail and allows the matching of work tasks more closely with a

person's capabilities (Black, 2008). Table 1 summarises different descriptions of wellbeing from the literature; many focus on positive mental wellbeing or positive psychology as this is a major driver of current research.

**Table 1: a summary of wellbeing descriptions.**

Maslow (1959) (Basic human needs)	Huppert and So (2011)	ESS (Huppert et al., 2009) feeling (having, being)	ESS functional (doing)	Juniper et al. (2010)
Physiological, Safety, Belonging, Esteem, Self actualisation, Cognition, Understanding, Aesthetic.	Competence, Emotional stability, Engagement, Meaning, Optimism, Positive emotion, Positive relationships, Resilience, Self esteem, Vitality.	Personal: Satisfaction, Positive affect, Negative affect, Optimism, Self esteem.  Interpersonal: Belonging, Social support, Social recognition, Societal progress.	Personal: Autonomy, Competence, Interest in learning, Goal orientation, Sense of purpose, Resilience.  Interpersonal: Social engagement, Caring, Altruism.	Advancement Home work interfaces, Job, Organizational, Physical (e.g. diet), Psychological (e.g. stress), Relationships, Workload, Facilities (e.g. break rooms).

One aspect of these descriptions is the connection between the physical and mental components of wellbeing. There is evidence that the more positive a person's outlook on life the better their physical health will be in terms of life expectancy, recovery from cardiovascular stress and level of immune response (Huppert, 2009). Maslow (1959) conceived a hierarchy of basic human needs where the physical factors of physiology and safety were prioritised over the social and mindful factors such as esteem and self actualisation. Recent research looking at the core components of wellbeing focus only on positive mental health as a separable issue partly because it has been overlooked in comparison with physical health and mental disorder (Huppert, 2009, Huppert and So, 2011). Interviews with police offices and support staff found that individuals viewed physical factors (such as the job's impact on diet) as an important component of their wellbeing (Juniper et al., 2010). Overall there is some relation between physical and mental factors, the prioritisation of one over the other will depend upon the degree of dysfunction in either.

Huppert and So (2011) measure the positive wellbeing of countries, Juniper et al. (2010) measure the wellbeing of a police constabulary while Maslow (1959) was interested in the wellbeing of the individual. Deciphering the important unit of study of wellbeing is important when planning measurement and intervention. It rests on the the degree to which the group's wellbeing matters to the individual and vice versa. Maslow's view of wellbeing was individualistic in its nature, other people matter only insofar as they contributed to the individuals sense of belonging and self esteem. However other studies show that organisational traits such as organisation performance, workload and relationships are important to people's perception of their wellbeing (Juniper et al., 2010) and there are correlations between individuals wellbeing and national statistics such as levels of education, wealth, inequality and welfare provision (Huppert and So, 2011). None of these different scales of understanding gives a complete revealing of the nature of wellbeing, they are constructed independent from each other and so one can use whichever is more appropriate to the task at hand.

Returning to the individual scale, hedonic and eudaimonic wellbeing have been suggested to be two aspects of positive human psychology (Anderson and French, 2010). Hedonic wellbeing is also referred to as subjective wellbeing, it is about the pursuit of sensation, pleasure and enjoyment. Eudaimonic is more centred on the concept of a life well lived and the fulfilling of human potentials. This suggests that momentary pleasures can be sacrificed for longer terms goals such as autonomy, competence and relatedness (Anderson and French, 2010). The model of wellbeing described in the ESS wellbeing module associates hedonic wellbeing with feeling, having and being and eudaimonic wellbeing with functioning and doing (Huppert, 2009) but this can more simply be stated as people needing challenges and the stress that these entail as much as they need the highs and pleasures of hedonistic release; the feast is meaningless without the famine.

### **Wellbeing and the thermal environment**

Comfort in the thermal environment has been viewed as a problem of heat balance (Fanger, 1970). Alternative theories of adaptive comfort challenge this viewpoint and acknowledge that agency plays a role in comfort because people choose what to wear, where to sit and how to adapt their behaviour to the conditions (Nicol and Humphreys, 2009). In the context of wellbeing comfort, as heat balance, provides physiological comfort, safety, physical wellbeing and an absence of negative affect, while adaptive comfort provides additional aspects of wellbeing such as social engagement, autonomy and altruism (Anderson and French, 2010).

Thermal comfort is defined by (ASHRAE, 2009) as “that condition of mind that expresses satisfaction with the thermal environment”, it follows that comfort is the state reached once satisfaction has been achieved, it is experienced at homeostasis, after the removal of all dissatisfiers when nothing more is desired. Alternative wordings for thermal comfort describe it as “the subjective indifference to the thermal environment” (IUPS Commission for thermal biology quoted in Cabanac (2006)). This definition of comfort is not exciting, stimulating or pleasurable of itself although its achievement might have been. Looked at in terms of comfort the thermal environment is never more than a background for everything else, it will never be part of the action.

An ‘uncomfortable’ thermal environment can provide aspects of wellbeing that are overlooked by existing comfort models. Heschong (1979) recounts many instances where the thermal environment has provided pleasure and delight outside the normal range of temperatures, such as Finnish saunas and plunge pools. Analysis of a Christmas market using the ESS Wellbeing model shows how it provides a rich range of social and interpersonal aspects of wellbeing as well as providing the pleasure associated with small areas of heat, in an otherwise cold environment (Anderson and French, 2010). These insights suggest the thermal environment can be used to enable wellbeing even when it is ‘uncomfortable’ and just as in the work of Anderson and French (2010) the models of positive psychology reviewed here could provide a framework for its analysis and development.

These insights provide, not just a new way of using the thermal environment, but also an alternative way to make uncomfortable environments habitable. Our current approach is to condition them using energy intensive HVAC systems. This approach is a relatively new one but it is already deeply ingrained in our socio-technological systems and it has strongly influenced the perception of the thermal environment and its engineering solution (Chappells and Shove, 2005). Before this the cold was made habitable by drawing on aspects of it that promote wellbeing; for example the Christmas market uses light and local sources of heat to make a cold environment habitable and improve wellbeing (Anderson and French, 2010). Perhaps we can even consider Christmas and other winter festivals in the light of the humanity and wellbeing they bring into a harsh thermal environment. In summary by broadening our perspective, from comfort to wellbeing, new ways of dealing with uncomfortable conditions can be developed.

## **Wellbeing and productivity**

Wellbeing as a description of a health spectrum is deeply related to productivity (Black, 2008). The purpose of this approach is to look at the full spectrum of health and therefore allow someone to be classified in terms of their capability to do a given task. This is especially relevant to modern afflictions such as diabetes and obesity, it allows individuals who were previously classed as too sick to work to be re-classified in terms of the types of work they were fit for. In this sense using wellbeing as a measure of general health can greatly improve the productivity of individuals.

The relationship between positive wellbeing and productivity is more complex. Activation of the left prefrontal cortex is associated with positive emotions and spontaneous strategy setting whereas the right is associated with negative emotions, error detection and checking (Huppert, 2009). Productivity is reported to be a function of intrinsic ability, motivation and opportunity (Clements-Croome, 2004). A job that has meaning and a sense of purpose makes people more productive and requires less monetary reward to motivate them (Ariely et al., 2008). The ability to make measurable progress in meaningful work has been found to be crucial to motivation levels especially in creative work (Amabile and Kramer, 2011). These directly link to aspects of wellbeing such as sense of purpose, esteem, social recognition and meaning. This evidence suggests that a person with high eudaimonic wellbeing matched to the right job, that gives them a sense of meaning, will be highly productive and not only this, their productivity can contribute to their sense of wellbeing.

However it should not be forgotten that wellbeing and productivity are different, one is the performance of the individual while the other is the performance of the organisation. When these are aligned it is self evident that improvements in wellbeing will result in improvements in productivity. Should this not be the case either the organisation's or the people's goals must change (e.g. by a broader power base, branding or education). It is possible that there is a role for the building in this relationship, in their design they may be able to communicate simple core values that are important to individuals and organisations alike, such as trust, creativity and autonomy.

## **Sensory design and the human experience**

Sensory design acknowledges the role of the total sensory experience in influencing our attitudes and behaviours (Lehman, 2011, Pallasmaa, 2005). However the current technical building approach treats only a limited number of senses and these from an intervention, single sense based approach (commonly engineering design is split between mechanical (HVAC), electrical, public health, lighting and acoustics, this division is as much based on the type of technology used as the sense that is served). However senses are multi modal; on a practical level design for one sense can have an unexpected effect on the other, such as double glazing that produces an office that is too quiet (ASHRAE, 2011) and at a deeper level, perception in one sense can conceptually prime a person and affect their perception of another sense (Krishna and Morrin, 2008, Stevenson and Oaten, 2008). This multi modal response can enhance the human experience for example incongruent sensory information, such as a sofa that looks hard but feels soft, can evoke surprise, inquisitiveness and pleasure (Ludden et al., 2007) and aromas can be used to encourage people to gamble more (Hirsch, 1995). These sources are representative of the disjointed mixture of prose, technical design guidance and highly specific psychological investigations that guide understanding of the sensory experience.

The removal of discomfort and the addition of positive experiences is a simplified way of viewing much of sensory design. Dentists remove pain and displeasure from our mouths, while chefs put delight in, meanwhile the medical preparations of chewing gum and mouthwash have given mouths the feeling of freshness (Fischman, 1997, Sgan-Cohen, 2005). The smell of smoke has slowly been cleared from workplaces by social pressure and scientific evidence and now companies specialise in providing air fresheners and other aromas to offices (Ambius, 2011).

Science and technique may appear to focus on the removal of discomfort while art provides delight but the relationship is subtle and more complicated. The rise of highly technical chefs such as Hester Blumenthal, the advent of electronic music and television highlight that the relationship between science, art, technique and delight are complex and vary from setting to setting (Jütte, 2005, Pallasmaa, 2005).

It is interesting to juxtapose the sensory experience in an office versus a shop. The former is designed to be neutral while the latter is designed with a strong human focus. The store experience has been used to improve brand and to increase unplanned purchases (Turley and Milliman, 2000). Design for branding involves consideration for who will use the building, what their expectations are and what range of physical variables can support the beliefs and emotional reactions they are seeking (Kotler, 1973). So, for example, a discount store will have bright lights and bold colours (Saucier, 2001). Retail design has shown adept understanding and manipulation of the attitudes, perceptions and facilitating conditions required for a given behaviour by understanding the human experience of buildings. This may be because shopping is viewed more as a leisure activity and an experience than a functional requirement. When a building is designed just to be functional it is possible to reduce sensory design into its components and thence remove distraction, malfunction and annoyance but when a building is an experience, like a theatre, a church or a shop then it is more important to think of all the senses together.

### **Implications for design**

Changes in human understanding and technology have removed much pain from the world and opened up new avenues of creative endeavour; they have changed the way the perception of the world is understood and also our approach to the senses, to comfort and to wellbeing (Pallasmaa, 2005). It has affected the way notions of comfort and wellbeing are articulated and operationalized (Chappells, 2010). The primary purpose of a building is to keep the elements out and for achieving this comfort is a very useful concept but it confines us to a view of the sensory environment as a distraction from the task at hand that should be minimised. Wellbeing and productivity are more comprehensive terms than comfort. They offer broader scope to understand the relationship between the building and its inhabitants and hence a wider spectrum of design possibilities and outcomes.

There are times, such as in a Christmas market, when keeping the elements out is not so important and may be prohibitively expensive. The built environment can instead be designed to increase productivity or improve aspects of wellbeing that were previously overlooked. The environment will no longer be comfortable in a traditional sense but maybe pleasurable and contribute to wellbeing.

Any buildings and its systems can be designed with wellbeing in mind even when it is not its primary purpose. The science of wellbeing provides a perspective for designing different sensory interventions. Some buildings already consider this but many don't, interesting examples are the KI Building in Tokyo where varying aromas added to the ventilation system encourage natural cycles of work and rest (Takenoya, 2006) or Google's Zurich offices that have dark and quiet aquarium rooms for employees to rest in (Bbc, 2008).

Building design can be used to align personal and organisational goals and thereby improve productivity and wellbeing. As part of a management and relocation strategy the Association of Accounting Technicians (AAT) hired brand experts who fed into the interior design of the building. The branding exercise helped AAT "understand our strengths...[and] gave us a vision for the future" (17-7, 2011) it included many aspects of the building design including colour scheme, furniture design and layout (Corpra, 2011). Accounts suggest that this has produced a more enthused staff because they have better appreciation of the purpose of their work.

Sensory design can also more directly affect behaviour such as poisonous animals using bright colours to warn potential predators off. In the modern world an unpleasant smell is added to natural gas to make a passive leak detection. In retail certain scents affect people's perception of time making them stay longer in stores (Turley and Milliman, 2000). More useful to office environments might be the finding that people who have previously handled hot drinks perceive people as more friendly and trustworthy (Williams and Bargh, 2008).

## **Discussion**

An underlying assumption to this current interest in wellbeing and productivity is that people are neither well enough nor productive enough and that they don't have the means or the inclination to improve. These issues need to be tackled one by one and provide insights into where the limits of this approach may lie.

An increase in productivity either results in more product or less input. On a personal and an organisational level the preference is to opt for more product so that overheads are reduced and income maximised. However on the global scale less input is the preferred outcome so that the burden on resources is reduced. These two outcomes are in conflict, without this being resolved the utility of productivity increases is unclear.

Poor wellbeing is not necessarily bad. In the right context it is a driver for positive change. It may also have more practical uses as demonstrated by the potential link between negative emotions and a propensity to error check. In addition medicalising wellbeing, and treating it as an individual's problem rather than societies, ignores the political aspects of wellbeing. An extreme example is thinking that in a nation with high inequality, poor education and poor welfare it is appropriate to improve an individual's wellbeing by providing them with an interesting and stimulating office environment. There is a need to better understand the relation between different causes of poor wellbeing and the trade-offs between say having a meaningless job, a stimulating office environment and no opportunities in life. The form of that understanding is important, there is a time in problem solving that science must give way to morality (Richard, 2005, Rittel and Webber, 1973, Lazarus, 2010).

The study of the science of wellbeing assumes that people need to be told what wellbeing is and how to achieve it but most people intrinsically understand that wellbeing is fundamentally important and aim to continuously improve their own throughout their lives. One aspect of this understanding is that it can be used to communicate the value of other people's wellbeing and therefore justify the cost of building improvements that contribute to wellbeing. However this leads to a commoditisation of wellbeing, which in this author's opinion may be useful but shows a thorough misunderstanding of the value of wellbeing. A more nuanced outcome is a wider understanding of wellbeing, for the individual and society at large, that recognises routes to wellbeing improvement that were previously undervalued and overlooked.

In general this burgeoning area of positive psychology raises the possibility of wellbeing becoming a technical issue. Treating pleasure, sense of purpose and aesthetics as a technical engineering problem might seem to threaten the role of the architect as the conduit of human experience. This though would be ignoring the long history and complex relationship of art and science, aesthetics and technology. There are many ways that these insights can be used, for instance, Oseland and Burton (2012) use it to justify the expense of wellbeing measures that before had been seen as beyond functional requirements and Anderson and French (2010) show how it has been used to understand trade-offs between the excessive provision of comfort and undervalued necessity of pleasure and delight. The OED defines an engineer as someone that "*influences human affairs according to scientific or technical principles*" (Oup, 2011); the science of psychology opens up new possibilities for engineering. An improved understanding of the interaction between human and environment offers a chance to add increased depth to building design and make better buildings.

## **Conclusions**

Wellbeing, productivity and the sensory experience are more fundamental and universal concepts concerning the relationship between buildings and occupants than comfort, the thermal environment and the soundscape. Understanding these concepts can offer alternative approaches to familiar problems chiefly:

- Traditional ideas of comfort may not be necessary if alternative aspects of wellbeing can be achieved;
- The fundamentals of wellbeing can be considered in design, leading to buildings that improve the mental health of their occupants;
- Buildings can be used to transmit the brand and values of their organisation leading to better motivated individuals with improved wellbeing;
- Understanding of the building experience and sensory design can be used to influence people's behaviour by changing how they perceive the world.

These approaches require that the building environment engineer becomes more of a psychologist and less of a technologist, it suggest a move from understanding how the building affects our physiology to an appreciation of human psychology. This human centred perspective may be complemented by a fuller understanding of the sensory experience. However wellbeing is not wholly a technical issue it will always have deeply personal and moral perspectives and these should not be overlooked.

## **Acknowledgements**

This paper would not have been possible without the financial support of the Institute of Technology for a Sustainable Built Environment (TSBE), University of Reading, the Engineering and Physical Science Research Centre (EPSRC) Doctoral Training Scheme and Buro Happold.

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