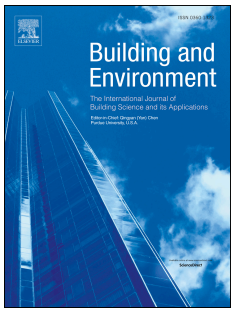
Accepted Manuscript



An open acceptance model for indoor environmental quality (IEQ)

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PII: S0360-1323(18)30374-3

DOI: 10.1016/j.buildenv.2018.06.031

Reference: BAE 5533

To appear in: *Building and Environment*

Received Date: 12 March 2018

Revised Date: 12 June 2018

Accepted Date: 13 June 2018

Please cite this article as: Wong LT, Mui KW, Tsang TW, An open acceptance model for indoor environmental quality (IEQ), *Building and Environment* (2018), doi: 10.1016/j.buildenv.2018.06.031.

An open acceptance model for indoor environmental quality (IEQ)

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Abstract

Indoor environmental quality (IEQ) acceptance prediction is crucial to sustainable building development. A simple yet comprehensive IEQ modelling strategy that can genuinely reflect occupant's responses to environmental conditions is necessary. This study proposes an open acceptance model that uses frequency distribution functions of occupant's responses towards IEQ parameters to assess IEQ. The proposed model is not only flexible enough to encapsulate a diverse range of descriptive model parameters but also feasible for openly available IEQ acceptance data, offering the flexibility to add data incrementally to allow easy model updating as and when a new set of observations arrives, this model can be a solution to the existing problems and limitations encountered in IEQ modelling.

Keywords

Indoor environmental quality (IEQ); Open acceptance model; Thermal comfort; Indoor air quality; Visual comfort; Aural comfort

Introduction

Modern people stay indoor most of the time. Indoor environmental quality (IEQ) has become a major concern for sustainable development as it affects occupant's health and well-being [1–2]. Studies on linkage between IEQ and occupant's comfort, health and productivity can be found in the literature [3–10]. Some research discuss the relationship between IEQ and one particular parameter [11–14], some look at the effects of multiple parameters on the overall IEQ [15–20]. It has been found that maintaining an acceptable indoor environment through controlling a range of IEQ parameters could provide positive effects on one's well-being [20–23], but the relationship between them are complex [24]. Contributions of these parameters to the occupant's overall acceptance are non-uniform in different indoor environments, i.e. one IEQ parameter dominate over another [25–27]. For instant, study showed that aural comfort is the most important contributors to the overall IEQ acceptance in learning environment, while thermal comfort is more important in workplace [28–29]. IEQ acceptance is intricate and shall be addressed at the design stage and throughout the lifecycle of the building to protect the willingness of occupants [24,30] and IEQ acceptance models therefore are important and useful for building designers and facility management when making decisions regarding the building performance.

Models for predicting occupant's responses towards individual IEQ parameters as well as overall IEQ acceptance have been proposed. IEQ could be expressed by various physical parameters [16,21]. Overall IEQ expressed by four major IEQ aspects, namely thermal