Investigation of A New Simulation Procedure for Speech Intelligibility In Open-Plan Offices.
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Abstract

Open-plan offices are a popular office layout, due to the efficient use of floor space. However, to employees open-plan offices normally appear to be less beneficial. Complains about noise from phone calls or discussions from colleagues are very common. But not only annoyance is a negative consequence of bad acoustical conditions, also work performance and productivity decrease steadily with increasing number of office users. Therefore it is essential for the acoustic planners to consider all major sources of noise in the planning stage to gain the best possible user experience.

The current measurement standard for evaluating office rooms ISO 3382-3 is difficult to apply due to given limitations and conditions. In addition, it generalizes results using a limited number of measurement points and linear regression for the calculation of single number values, which are used for rating the examined office. There is no systematic model available for comprehensive acoustical analysis or advanced optimization in the planning stage. Therefore, this thesis investigates a new evaluation method. The main focus lies on speech intelligibility, represented by the Speech Transmission Index (STI), since speech sounds possess the highest potential to disturb office users.

In the new method investigated, each office user is considered to be a source as well as a receiver. Therefore, the idea of a Source-Receiver-Matrix is pursued. Thereby it is possible to gain information on every single source and receiver relation, as well as a comprehensive overview on the overall acoustics in the room. A color scheme, which categorizes the STI results regarding the expected working conditions, enables a direct evaluation. Three hypothesis were tested with data gained from three generic simulation models. Firstly, it showed that the shape of the ground plot has significant influence on the overall acoustic quality achieved. Secondly, there are workplace groups, which have significantly different noise exposures. Thirdly, with the new model, the effectiveness of modifications of interior design with regards to acoustical performance can be judged and ranked on statistical basis, which is exemplified. The new method supplies concise analytics based on comprehensive modelling, which leads to better understanding of acoustics in the open-plan office.

Keywords: open-plan office, acoustics, ISO 3382-3, simulation, speech transmission index, source-receiver-matrix, comprehensive model, statistics