

OCCUPANT SATISFACTION IN NON-WELL AND WELL CERTIFIED OFFICE BUILDINGS

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Introduction

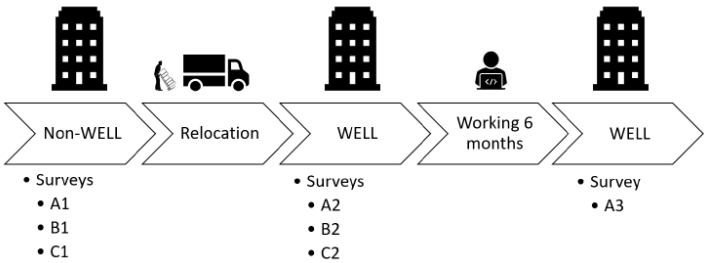
People spend around 90% of their time indoors in developed countries. This means longer exposure to indoor conditions with 2 to 5 times more polluted air than outdoors. There are certain links between air pollutant level in workplace environment and occupant satisfaction. Workers' health, well-being, and cognitive performances are also related.

In a company, 90% of operating cost is salaries and benefits of workers, while only 1% of operating costs is energy. Losing the productivity of workers is therefore a costly issue. With increasing concerns of occupant health and productivity, there is a recent shift in the prioritization of human health in Green building industry. The healthy building certification WELL promotes health-based building design and operation.

Conventional buildings are constructed with traditional methods. Whereas, green buildings aim to reduce the environmental impact by decreasing energy, water consumption and environmental disturbances. The new paradigm: WELL certification gives no points for the conservation of energy and water, and adapts a holistic approach to support occupant health: both physically and mentally. There are 10 concepts to support occupant health and well-being: air, water, nourishment, light, movement, thermal comfort, sound, materials, mind and community. This study is the first ever study to examine WELL-certified buildings. Three cohorts relocated into WELL-certified buildings are surveyed for their satisfaction levels with different parameters.

Methodology

The study is based on online surveys which are anonymous and take 15 minutes. Data is collected from non-WELL and WELL-certified buildings of three companies (A, B and C). The aim is to get the satisfaction of occupants with the aforementioned parameters before and after relocation into WELL-certified buildings. Environmental parameters are thermal comfort, air quality, lighting and acoustics. Non-environmental parameters include furnishings, privacy, interaction maintenance etc. The satisfaction scores are collected with 7-point Likert scale: ranging from very dissatisfied (-3) to very satisfied (3) votes. The productivity levels and sick building syndrome (SBS) symptoms are also surveyed.



The newcomers in the WELL-certified buildings are filtered out to get more consistent cohorts, allowing a better before-after comparison. Data analysis is done in R Studio software. For statistical analysis, Shapiro-Wilk test for normality is used. After confirming that the data is non-normally distributed and categorical, the statistical significances of mean differences of before and after scores are checked using Wilcoxon rank sum and Spearman's correlation tests.

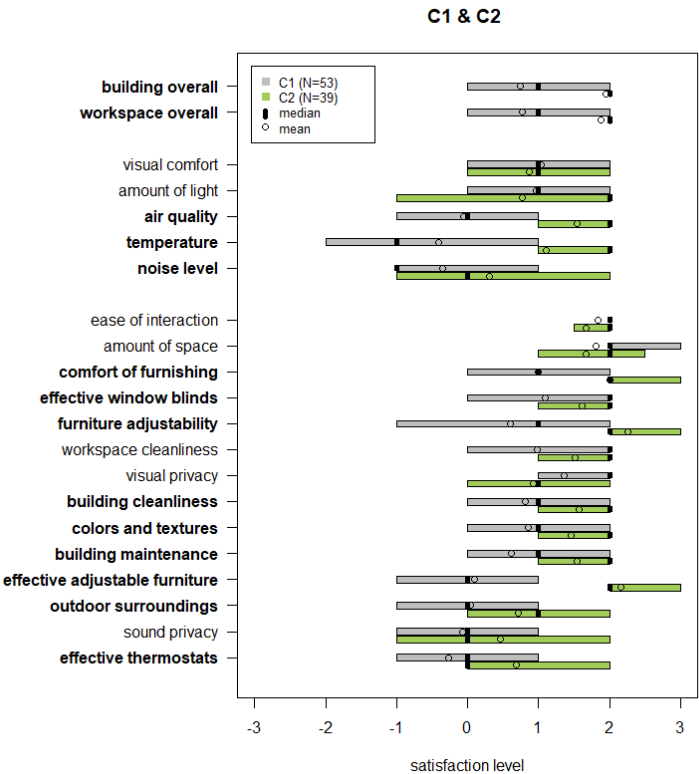
Case ID	Certification	Employees (N)	All votes (N)	Non-newcomers (N)	RR (%)
A1	BREEAM	400	202	202	51
A2	WELL	400	203	185	46
A3	WELL	400	253	201	50
B1	BREEAM	240	81	81	34
B2	WELL	240	81	74	31
C1	Conventional	70	53	53	76
C2	WELL	70	39	39	56

Results

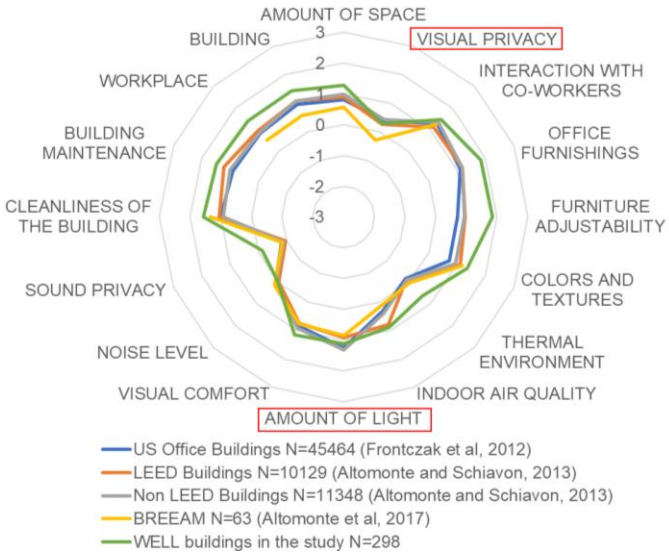
case ID	temperature (%)			air quality (%)			noise level (%)			amount of light (%)			visual comfort (%)		
	-1 to 3	0 to 3	1 to 3	-1 to 3	0 to 3	1 to 3	-1 to 3	0 to 3	1 to 3	-1 to 3	0 to 3	1 to 3	-1 to 3	0 to 3	1 to 3
A1	84	64	50	89	70	53	60	30	21	94	84	70	97	89	64
A2	97	78	62	91	80	63	79	53	42	92	83	72	95	89	72
A3	90	71	53	94	86	69	71	48	37	89	67	54	93	83	66
B1	87	73	57	88	77	56	76	59	49	97	91	85	95	86	67
B2	90	63	49	93	74	58	85	61	47	97	77	69	96	85	73
C1	71	39	30	84	59	34	96	81	41	92	77	64	98	90	65
C2	90	85	80	96	93	80	87	59	44	97	64	54	98	77	64

The survey results are compared with 80% satisfaction goal in standards ASHRAE 62.1 and EN 15251. Three scenarios for positive answer intervals are checked for environmental parameters. Noise level is found as the main problem both in non-WELL and WELL buildings, but there is a tendency to be improved after relocation.

The satisfaction levels before and after WELL are also shown in boxplots. The biggest improvements are seen when the company is relocated from a conventional building to a WELL-certified building. Different than the transition from BREEAM certified buildings as in Company A and B; in Company C environmental parameters air quality, temperature and noise level satisfaction means improved significantly with relocation.



The mean satisfaction scores of three WELL buildings are compared with existing data in literature for various green certifications and conventional buildings. Except for the amount of light and visual privacy, WELL buildings have better scores. Sound privacy is better but still problematic. Noise level is similar with other datasets, not improved.



Conclusion

Occupants satisfaction on environmental and non-environmental factors tend to improve after relocation into a WELL-certified building. This positive effect is more evident when the relocation is from a conventional building. Noise level, sound and visual privacies are still problematic despite improvements after relocation. No significant difference in self-reported productivity is found. This is the first ever study to examine WELL-certified buildings, additional research with physical measurements would be beneficial.