Advances in acoustic design for open plan offices

Jack Harvie-Clark

@JackH_C
Workplaces have been failing people

• 57% of people say workplaces enable productive work

• ‘Noise levels’ most common challenge
  • average satisfaction of 34%
  • nearly half of workplaces < 30% satisfaction

https://www.leesmanindex.com/250k/

Organisations are not getting what they should from their corporate workplaces. This is the finding from research across 250,000+ employees in 2,000+ workplaces.
From challenges to solutions

Quiet?

Monotonous?

Varied?

Vibrant?
Designing for acoustic satisfaction

Room acoustic response

Acoustic satisfaction

People, personal tolerance, culture

Activities, adjacencies, in-situ environment

@JackH_C
Room acoustic response

Implications for design

Contrasting Open Plan Office Design Implications from Emerging French, German and Finnish Standards F Larrieu, J Harvie-Clark, ICSV24, 2017
ISO 3382-3 indicators

Distraction distance predicts perceived disturbance by noise

Distraction distance and perceived disturbance by noise—An analysis of 21 open-plan offices
Designing for acoustic satisfaction

Room acoustic response

Acoustic satisfaction

People, personal tolerance, culture

Activities, adjacencies, in-situ environment
Different types of space activity

- Call centre
- Collaborative work
- Individual work
- Combining activities

https://www.iso.org/standard/74237.html
Implications for design

Figure 1 – examples of measured variations of screens in an open plan office

How ISO 3382-3 acoustic parameter values are affected by furniture, barriers and sound absorption in a typical open plan office, R Wenmaekers N Van Hout, ICA 2019
Variety of acoustic needs

Acoustic description of the room is necessary but not sufficient

Source: http://tskgroup.co.uk/news-knowledge-resources/activity-based-working

https://www.apexacoustics.co.uk/new-method-for-acoustic-design-of-open-plan-offices/

@JackH_C
New acoustic design method

ISO/DIS 22955:2019[E]

Table 6 – Potential $D_{A3}$ ratings between different types of spaces [4]

<table>
<thead>
<tr>
<th>Source / receiver space type</th>
<th>Informal meetings (open plan)</th>
<th>Outside of the room communication (phone)</th>
<th>Collaborative</th>
<th>Non-collaborative</th>
<th>Focussed phone</th>
<th>Focussed individual work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social and welfare</td>
<td>15</td>
<td>15</td>
<td>18</td>
<td>24</td>
<td>27</td>
<td>32</td>
</tr>
<tr>
<td>Informal meetings (open plan)</td>
<td>15</td>
<td>12</td>
<td>15</td>
<td>21</td>
<td>24</td>
<td>29</td>
</tr>
<tr>
<td>Outside of the room communication (phone)</td>
<td></td>
<td>12</td>
<td>18</td>
<td>21</td>
<td>21</td>
<td>29</td>
</tr>
<tr>
<td>Collaborative</td>
<td></td>
<td></td>
<td>18</td>
<td>21</td>
<td>21</td>
<td>26</td>
</tr>
<tr>
<td>Non-collaborative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Focussed phone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>21</td>
<td>26</td>
</tr>
</tbody>
</table>

https://www.apexacoustics.co.uk/new-method-for-acoustic-design-of-open-plan-offices/

@JackH_C
Evaluating in-situ environment

- Point of view video
- Point of hearing audition

The APEAL Method
Apex Acoustics, 2020
Designing for acoustic satisfaction

- Room acoustic response
- Acoustic satisfaction
- People, personal tolerance, culture
- Activities, adjacencies, in-situ environment
Questionnaire: effect of noise on comfort

- ISO 22955 Annexe

Effect of noise on comfort in open-plan offices: application of an assessment questionnaire
N Perrin Jegen, P Chevret, Ergonomics, 2017
How do people cope?

- Avoidance strategies most common
- Approach strategies most effective
- ISO 22955 Annexe on etiquette

How office workers cope with distraction by sounds in the open plan office
S Steps et al, ICA 2019
Noise cancelling headphones

Influence of active-noise-cancelling headphones on cognitive performance and employee satisfaction
B J Muller, A Liebl, N Martin, ICA 2019

@JackH_C
Personal Office Preferences

Figure 1 Mean ratings (and standard deviation) of office designs and practices

Figure 2 Mean rating of office preferences by current primary workspace

Case study: Transformation from “Traditional”...
... to activity-based working

- Lighting – 23 % improvement
- Thermal – 39 % improvement
- Acoustic – 21 % improvement
Case study: addressing noise problems

• Room acoustic measures
• In-situ measurements
• Noise comfort questionnaire
Case study: addressing noise problems

Normalised Liveliness score, P1
- Quiet
- Tranquil
- Lively
- Turbulent

Normalised Liveliness score, P4
- Quiet
- Tranquil
- Lively
- Turbulent

@JackH_C
Post Covid office acoustic challenges

• Lower occupancy

• More VC

• Changing nature of the office
Facebook Reality Labs

Creating the future of personal and shared reality

At Facebook Reality Labs, our mission is to give people the tools to feel connected anytime, anywhere.

https://research.fb.com/category/augmented-reality-virtual-reality
Spatial information currently lost in VC
Designing for acoustic satisfaction

Cross-disciplinary problem!
The questions that you ask!

Jack Harvie-Clark

jhc@apexacoustics.co.uk

www.apexacoustics.co.uk/acoustics-open-plan-offices/

@JackH_C