White Paper

Solving the problem of poor-quality audio in professional video conferencing

Increase your teams' productivity and professional presentation

Sound Insul8ion

Acoustics controlled

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Executive Summary

The monumental shift we have experienced since the beginning of the lockdown in March 2020 has catapulted us into a new high-tech reality. One that none of us were prepared for and many have found extremely challenging.

We are experiencing an unprecedented change in how we communicate and we have no way of knowing what the long-term consequences will be.

While video conferencing apps have enabled us to work remotely, the 'technical problems' being experienced during virtual meetings are having a detrimental affect on our mental well-being and are impacting our professional reputations.

With some referring to it as a 'work-from-home revolution', even if all restrictions on social distancing are lifted, whether part or full-time, many will continue the practice.

There is no turning back.

So how do we move forward safely and securely, without risking our health or our businesses?

In this report we will look at how the current situation is affecting us professionally and personally, and demonstrate how proven, low-tech, low-cost solutions can be used to mitigate the high-tech problems we are experiencing.

Poor quality conference presentations impact negatively on professional reputation

Whether meeting for 10 minutes, an hour or for a whole day, clear communication is obviously imperative. Not only is it important for the communication of information, it also makes a statement about a company's level of professionalism.

In face-to-face meetings great care is taken to achieve this professional persona. Conference rooms are designed to present the corporate image as successful and trustworthy. The space is physically comfortable and often incorporates elements of soundproofing to prevent distracting reverberation and increase privacy.

Such attention to detail is not just for the corporate image or the benefit of visitors, it also plays a crucial role in the support of employees, by providing them with the best possible environment in which to excel.

With the sudden and unprecedented lockdown in March 2020, employees who are used to working in such carefully planned environments, were thrown into a chaos for which few would have been prepared.

Practically overnight people have had to adjust and turn their homes into offices. Working in spare bedrooms, tight spaces and at kitchen tables with applications that most had never heard of before and which, in a home environment, were untested.

The challenges of working remotely via conferencing apps like Zoom, Microsoft Teams, Skype and Google Hangouts have taken many by surprise. Individuals seasoned in holding professional meetings or giving well-structured presentations have unexpectedly discovered that their efforts are being seriously undermined by 'technical issues'.

For many the results have been personally frustrating and professionally humiliating.

Poor quality audio, that is muffled, 'dirty' or difficult to hear is not only disheartening for the speaker, but can also seriously diminish the corporate image. It's just not the quality stakeholders expect from an organisation.

Poor audio decreases comprehension and confidence

Many studies have shown that, although visual presentation is important, it is the audio quality that carries the most weight.

A 2007 review of 26 studies conducted by Petr Slovak at Masaryk University, found that, ***whereas video with audio was preferred over audio-alone, improved audio quality was more important to the test subjects than improved video***.*[1]*

Poor speech transmission, distracting background noises and excessive reverberation result in participants having to strain to hear the pertinent points, and risks key elements literally being 'lost in translation'.

Additionally, this straining to hear causes frustration and makes it harder for the listener to concentrate on the points being discussed, which leads to the communication of the ideas being significantly marred.

"***...unwanted levels of ambient noise, often caused by an excessively reverberant environment, can cause difficulties with communication as well as with concentration at work***." *[2]*

For the speaker the results are far more personal with the potential to seriously impair self-confidence. Unintelligible audio leads to constant interruptions from those unable to hear or understand what is being said. Even a speaker, who does not usually have a problem with performance, will be thrown.

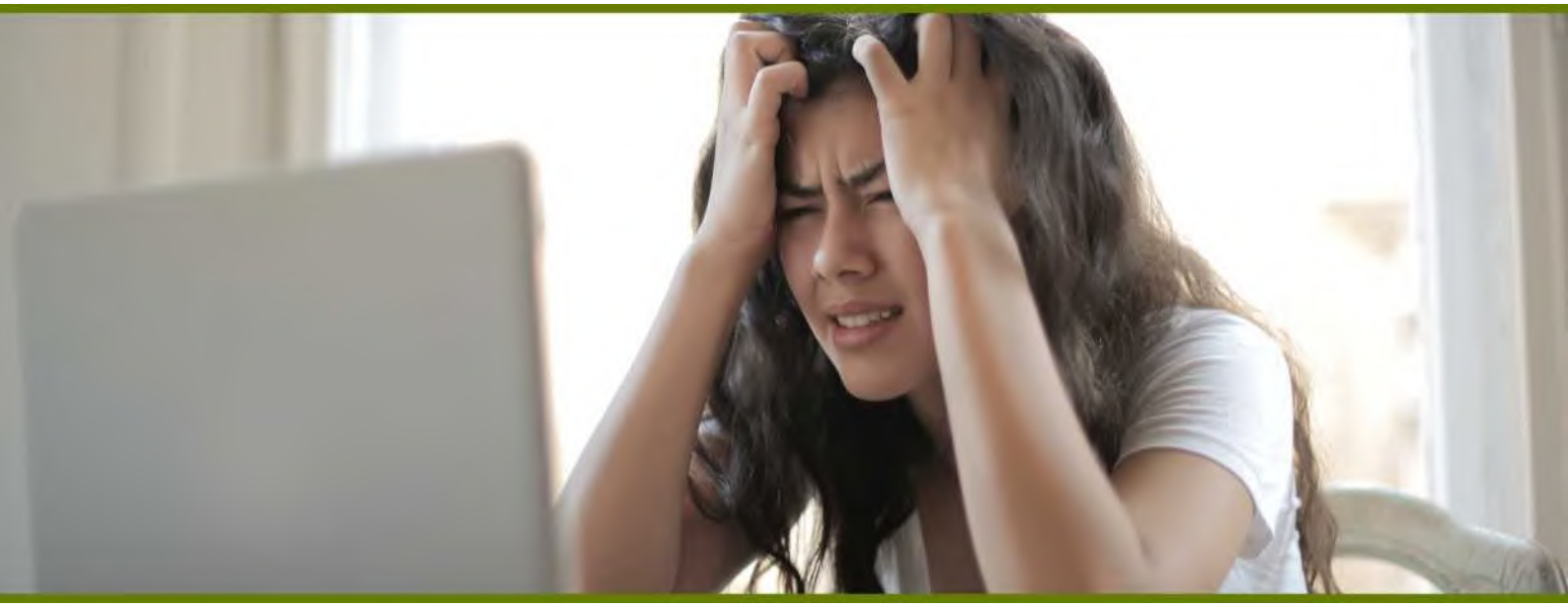
Although often attributed to faults with the technology being used, rather than the speaker, this is of little comfort. Regardless of where the blame lies, the result is the same: communication is greatly reduced, and all participants, especially the speaker, are left annoyed and disappointed by the experience.

As we are less than a year into this 'new normal', we are yet to see the long-term health consequences of this quantum leap. However, past studies and current experiences suggest that, unless we take steps to protect ourselves, the personal toll on our health and well-being could be significant.

Increased cognitive load causes reduced concentration and increases fatigue

From both a business and personal health perspective, it is important to understand the impact of the increase on 'cognitive load' required to communicate through video and audio technology.

Literally overnight we have pushed our brains to work in ways in which they are not accustomed. And already, just seven months into this new paradigm, we are beginning to see the negative results.



Increased cognitive load leads to fatigue

In a National Geographic article in April this year, just one month into the pandemic, Julia Sklar writes, "***The unprecedented explosion of their use [video conferencing apps] in response to the pandemic has launched an unofficial social experiment, showing at a population scale what's always been true: virtual interactions can be extremely hard on the brain***." *[3]*

The results of this '*unofficial social experiment*' now has a name; Zoom Fatigue.

Experienced by users of all conferencing apps, not just Zoom, the implications of ignoring this new dilemma could have serious and long-term consequences, not just for your business' productivity, but also the individual health and well-being of employees.

So, what is Cognitive Load, and why is remote conferencing increasing it?

Cognitive Load – taxing our brains to the limit

Since the introduction of digital technologies in the early 1990's, and its rapid, all-encompassing use, two fields of study have become more important;

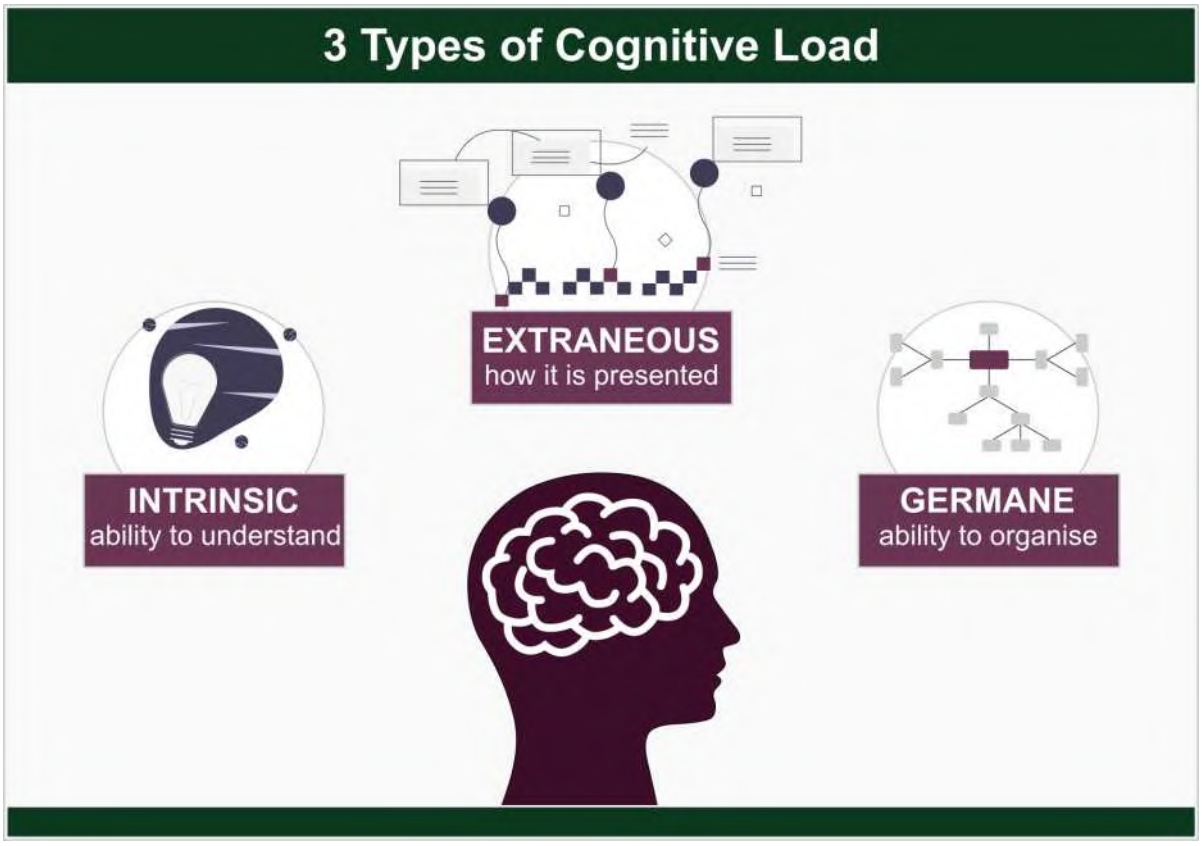
- Psychoacoustics, the study of the perception of sound, and,
- Cyberpsychology, a developing field studying the psychological phenomena associated with emerging technology.

Both fields have demonstrated a negative impact on cognitive load.

Developed at the end of the 1980's, Cognitive Load Theory (CLT) refers to the amount of working memory resources we have available.

The theory differentiates cognitive load into three types;

1. Intrinsic – the effort required to understand a specific topic
2. Extraneous – how the information is presented to us, and
3. Germane – our ability to organise and remember the information



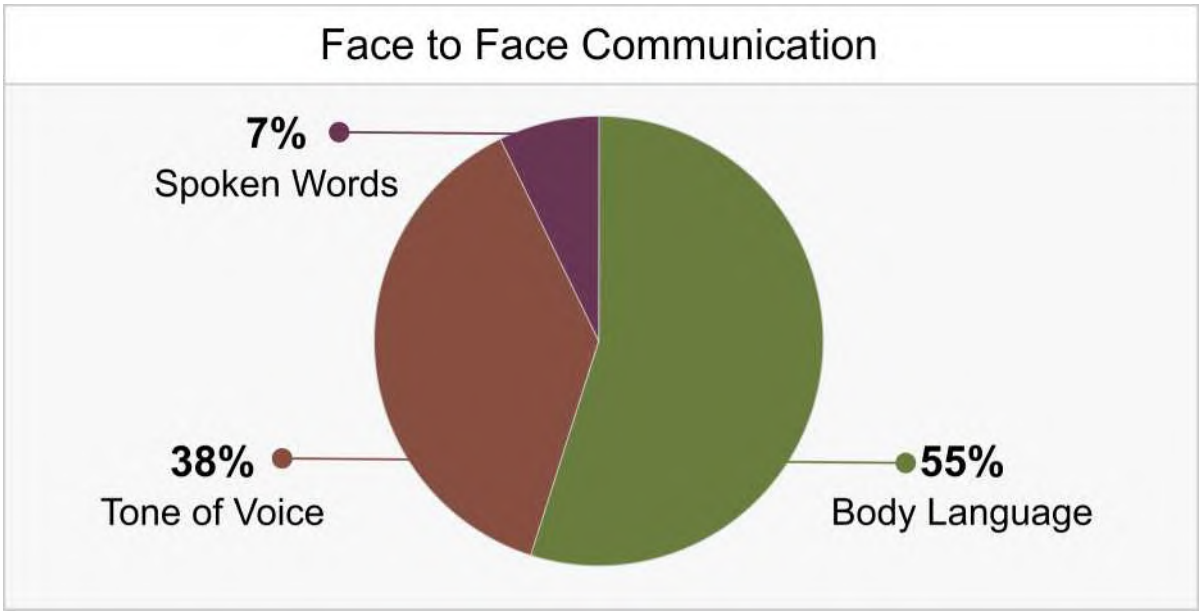
In face-to-face meetings, in a professional setting, each of these types of cognitive load can be expected to be reasonably balanced;

- An intrinsic understanding is expected as all participants are professionals within the same field,
- the extraneous component is determined by the speaker's ability to deliver a coherent and logical presentation of the information, and,
- the germane aspect is a function of the listeners ability to understand, organise and remember the information being presented, which is determined by both the intrinsic and extraneous components.

However, in face-to-face meetings we do not just rely on the spoken word. Instead our brains process information using a sophisticated collaboration of verbal and nonverbal cues. Cues which may not be readily available to us during remote interactions.

In video conferencing, all aspects of verbal and nonverbal communication are compromised

In a standard face-to-face encounter, it is believed that approximately, "***55% of communication is body language, 38% is the tone of voice, and 7% is the actual words spoken***." *[4]*



When communicating remotely however, each of these aspects become compromised;

- Visually, participants are represented in a small area with only their head and shoulders being visible. The ability of our brains to interpret body language becomes significantly reduced.
- Add to this poor-quality audio and the 38% of tone of voice is hampered, and
- with an audio marred by excessive reverberation, or echo,
  even the 7% of actual words spoken can become a challenge to listen to.

As our brains work to compensate for this loss of visual and audio cues, the compounded cognitive load is eventually experienced as increased fatigue and decreased concentration.

The result is that meetings become less productive and participants can be left drained and exhausted.

"Compared with their face-to-face counterparts, computer-mediated teams viewed their discussions as more confusing and less satisfying, spent more time devising decisions, and felt less content with their outcomes." *[5]*

The problem is greatly exacerbated when poor video and, particularly substandard audio, is transmitted.

Accepting that remote conferencing is here to stay, what can be done to improve the situation? How do we mitigate the unintended consequences before harm to both your reputation and your staff's well-being is done?

Current technological solutions can be distracting, ineffective and potentially malicious

One day, probably in the not-to-distant future, holographic communication, whereby real-time 3D representations of colleagues in remote locations can be transmitted, will become a reality. But until that day, the only way we can mitigate the lack of visual cues in remote conferencing is to sit further away from the camera.

By letting the viewer see the entire upper body while talking, they will have access to more of our nonverbal body language gestures. Thereby reducing cognitive load.

Audio transmission, however, is something that can be handled now.

There are currently three common solutions offered for dealing with excessive background noises and reverberation; headsets, the mute function on the conferencing app and downloading a noise cancelling app. However, each of these have their flaws.

Headsets

Headsets make it easier to interpret what someone is saying. However, while they may be acceptable during personal conferencing, in call centres or during online game play, they do not lend themselves to a professional persona.

Mute Function

The mute function on the conferencing app is often recommended. But it is only useful in preventing noise being transmitted from the location of someone who isn't speaking.

Muting the audio while you are not speaking simply stops noises from your environment being transmitted, thereby nullifying your in-app presence. If you are the speaker, then obviously the mute button cannot be used.

Noise Cancelling App

Of these three options, only a noise cancelling app promises to reduce the amount of reverberation being received. However, the risk of downloading an app onto machines with access to your company's files and network can be a significant security risk.

The solution is, in fact, far simpler. You could call it low-tech, or even no-tech, but this passive solution works not by adding more technology but by controlling the environment.

Before we look at how this solution can greatly improve the audio quality of video conferencing, let's first examine why it happens to start with.

Understanding the problem with audio

Reverberant sound dies away with time as the sound energy is absorbed following multiple interactions with surfaces within a room. This is called Reverberation Time, or RT.

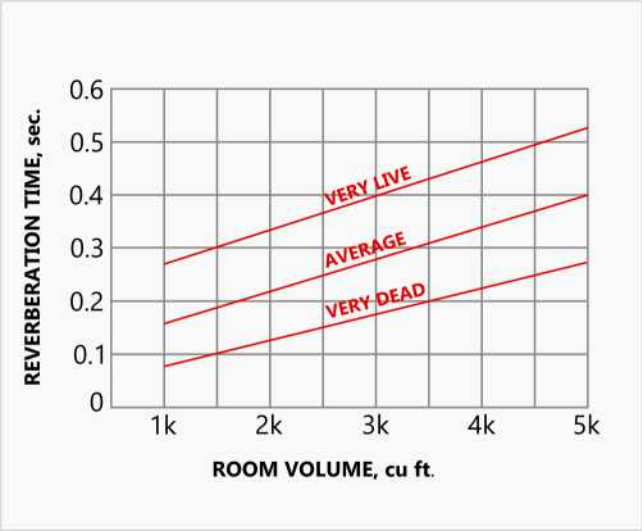
When the energy interacts with soft surfaces much of it is absorbed, resulting in a short RT, otherwise known as acoustically 'dead'.

However, when it hits hard surfaces it bounces off and creates an echo. The room is then considered to be acoustically 'live'.

In large acoustically live spaces with a very long RT, like caverns or cathedrals, you are able to experience the echo created when you speak. However, that is not the case in small spaces with a long RT, such as a kitchen with cabinets and a hard floor.

In these situations, the speaker does not hear the echo. They may experience a tinny quality to their voice, but not the full impact of reverberation.

The problem arises when a voice in an acoustically live location is transmitted via microphone.

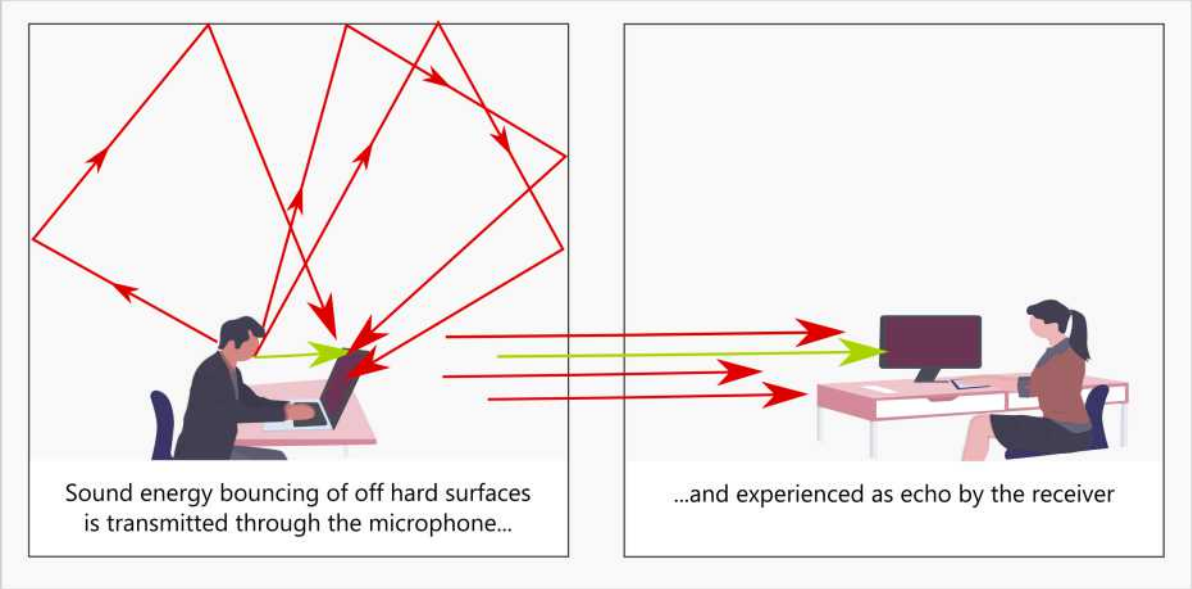


Suggested Reverberation Times for Control Rooms (Fierstein, 1979) [6]

When you speak in the direction of your laptop or phone, some of the sound energy from your voice reaches the microphone. While the rest radiates out and reflects off of all of the surfaces in your surrounding area.

These reflected waves, along with all the other background noises in your environment, are then also picked up by the microphone and transmitted.

The result, for the listener, is an audio full of background noises, echoes, pops and static.



Baffles - old-tech, no-tech, but an effective solution

An acoustic baffle is a device used to mitigate noise pollution and reduce reverberation.

They are used in many situations, including; walls in public spaces, like schools and swimming pools, and along major roads in the form of barriers to reduce the exposure to noise of the residents in the immediate vicinity.

Well-designed meeting rooms often incorporate acoustic panels and suspended ceilings to help absorb sound. This both reduces echo and increases privacy. It also makes the room *feel* different.

Well-designed meeting rooms have acoustic control built into the design

Rooms which are acoustically dead have a ‘cocooned’ ambiance. Speech is experienced as clear without a great deal of extraneous interference and the inhabitants experience a tangible separation from the outside environment.

Such spaces provide an environment that encourages concentration.

Lead the work-from-home revolution with safe, effective, passive solutions

We are all looking for the next app to solve this new problem. But, we sometimes forget that we live in a physical reality, not a virtual one. And, while we are looking for the best technological solution, we are forgetting that sometimes our environment may be the problem.

Some answers do not lie within the digital domain, they are here, physically, within our own surroundings.

Solving the problem of poor quality audio in video conferencing is neither difficult nor expensive. All that's required is that we stop looking for a technical solution and work with a strategy which have been known and used for decades; **control our environment.**

Below are three very simple and highly effective solutions.

Solution #1: Create a permanent, acoustically enhanced home office

This option will only be available to a few. It not only involves a financial outlay, but available space as well.

The easiest way to tackle this project is if you already have a spare room you can adapt, however, with a bit of creativity, such an area can be developed. Converting an existing outdoor space or repurposing a disused caravan, either of which will be 'fun' and achievable projects for some.

It may even be possible to turn a small indoor space, which currently has limited function, into a mini recording studio, for the exclusive purpose of conducting video meetings. Such a project would be a more cost-effective option rather than creating an entire office.

Solution #2: Home décor

Soft furnishings, carpets, curtains, duvets, all act as sound absorbers and shorten the RT in an environment. This makes a bedroom a much better conferencing space than a kitchen, and may result in a sufficient improvement in the quality of sound being transmitted.

However, the solution is somewhat trial and error. A number of conferencing tests may have to be carried out to see if the desired results have been achieved.

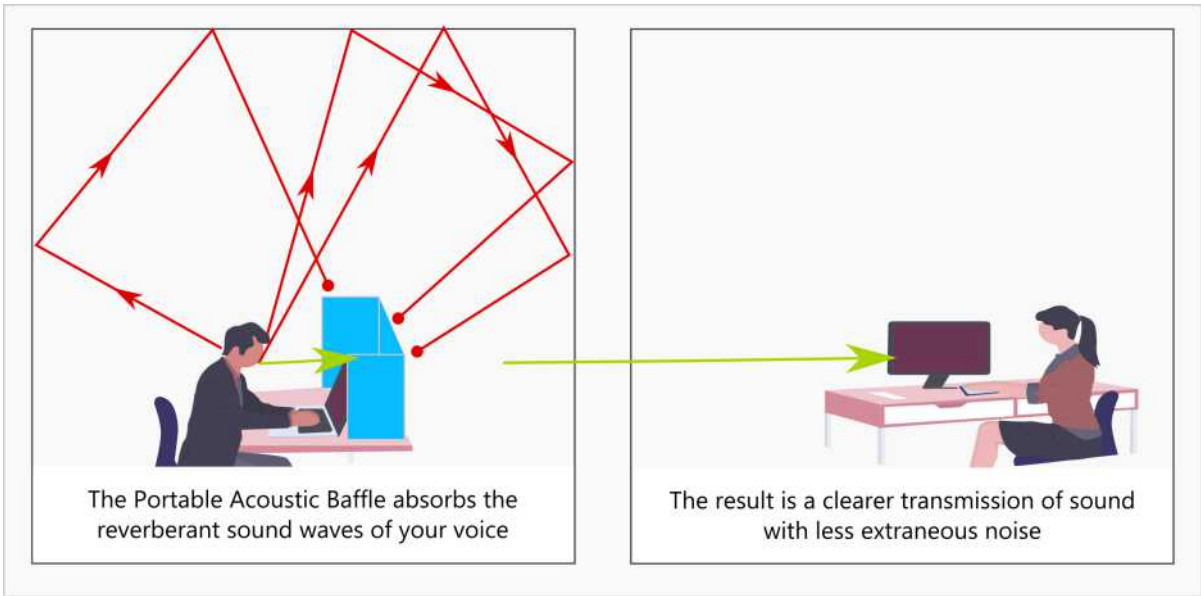
Although it is a good idea to make these recommendations to staff, it is important to also be sensitive to the fact that this is not an option for everyone. With limited space and other family members to consider, some people may not have the flexibility to choose where they can work, so expecting them to be able to implement this solution, may increase the stress they are already experiencing.

Solution #3: Portable Acoustic Baffles

This third solution is a new invention based on a proven acoustic engineering principle.

Developed by Essex based Sound-Insul8ion Limited, the Portable Acoustic Baffle (PAB) has been designed specifically to handle the problem we are now facing.

This free-standing, portable system encompasses your laptop or phone. It absorbs your voice, after the microphone has received it, reducing the subsequent reverberant field.



The result is firstly that your own spoken contribution to the conference is sharp and clear, and secondly, less of the background noise from your own environment will be picked up by your device and transmitted to distract and annoy the other participants.

The PAB demonstrates the use of an old and trusted, low-tech engineering principle being adapted for a very modern, high-tech problem.

As a portable and purpose-built solution, a PAB works for anyone conducting video conferences, regardless of the location or the décor.

The Portable Acoustic Baffle encompasses your device and controls reverberation

"The Portable Acoustic Baffle is an innovative new product which I strongly recommend using - particularly for those who have been working at home during this time. It greatly improves and enhances the sound quality of virtual meetings and is a brilliant invention."

Rt. Hon. Robert Halfon MP

The regular unit is designed to sit under standard kitchen counters

Portable Acoustic Baffle Sizes

The Portable Acoustic Baffle comes in five sizes to fit the space you are working in;

Regular units are approximately 400mm (40cm) high x 500mm (50cm) wide, developed to be used with laptops, tablets and mobile devices and also making them ideal to slide under most fitted kitchen wall units.

Large units are approximately 540mm (54cm) high x 600mm (60cm) wide, developed to be used in conjunction with laptops on stands sitting at desks or tables.

Desktop units are approximately 210mm (21cm) high and, at a depth of 100mm (10cm), heavyweight by design. These have been developed for use with multiscreen systems in accordance with the HSE guidelines on DSE (desk screen equipment).

Designed to meet your noise challenges

Both regular and large units are available in two depths. The right one for you depends on the amount of noise you are having to contend with, and the amount of reverberation, or echo, being generated within your space.

Lightweight

50mm (5cm) deep.

Ideal for rooms that have;

- Soft furnishings; carpets, curtains, cushions, pillows etc.
- Low background noise
- Low reverberation time

Heavyweight

100mm (10cm) deep.

Ideal for rooms that have;

- Hard surfaces
- Outside noise, like traffic
- Few soft furnishings
- High reverberation time

Separate work from home

The PAB creates a portable workstation wherever you need it to. Designed to encompass the device you are conferencing with, be it a laptop, phone or tablet, it controls the acoustic environment and provides the user with a sense of separation from other activities nearby. This encourages concentration and provides a controlled space in which to focus.

Easy fold away

With three handles for easy carrying, at the end of the workday the PAB folds neatly away, helping you maintain the physical and psychological separation between work and home.

Conclusion

"*The pessimist complains about the wind. The optimist expects it to change. The leader adjusts the sails.*" -John Maxwell

The new paradigm is presenting us with many challenges within our professional and private lives, whilst also exerting enormous stress on our health and well-being. However, this *IS* our new normal, and we must find ways to adjust to it.

We are fortunate that these changes have come about at a time when we already have more understanding of how we, as human beings, function. While digital technology has been developing at break-neck speed over the past three decades, so too has the research into our cognitive capabilities and limitations.

We also have decades of engineering research and development available to us, enabling us to navigate this time, not just safely, but boldly.

Experience the Portable Acoustic Baffle in action

Click here to experience the PAB.

We invite you to contact us to organise a free, no obligation, live demonstration of the PAB in action over your chosen conferencing app.

About Sound Insul8ion Limited

The Portable Acoustic Baffle has been invented by Sound Insul8ion Limited, and is constructed in the companys' Essex factory.

Founded by Acoustic Engineer, Paul McNaughton, Sound-Insul8ion Ltd is dedicated to creating solutions to control unwanted noise within our homes.

Paul studied Engineering Acoustics and Vibrations at the Institute of Sound and Vibration Research (ISVR), part of Southampton University. And worked as an acoustic consultant before going solo.

Today, with 23 years experience soundproofing different environments with bespoke systems, he continues to develop innovative products to help you create spaces where you can relax.

View full details of the Portable Acoustic Baffle portableacousticbaffle.com

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