White Paper:

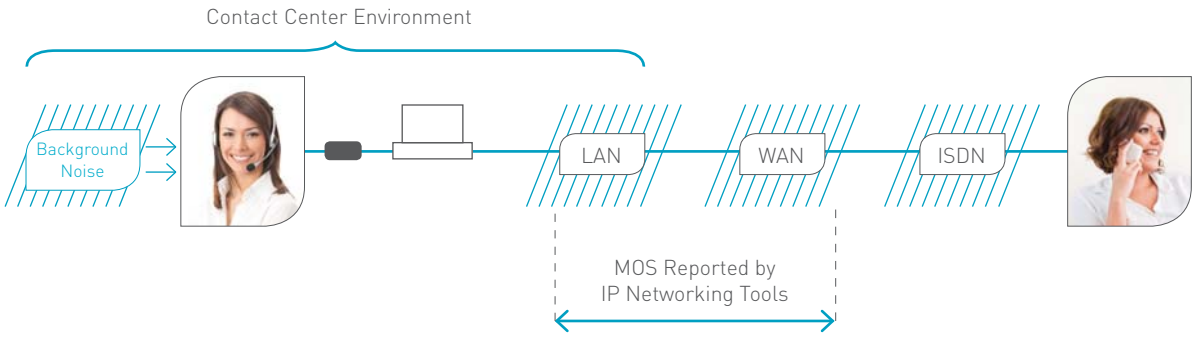
Your customers complain of poor voice quality, yet your I.T. people tell you it's OK.

Here's why...

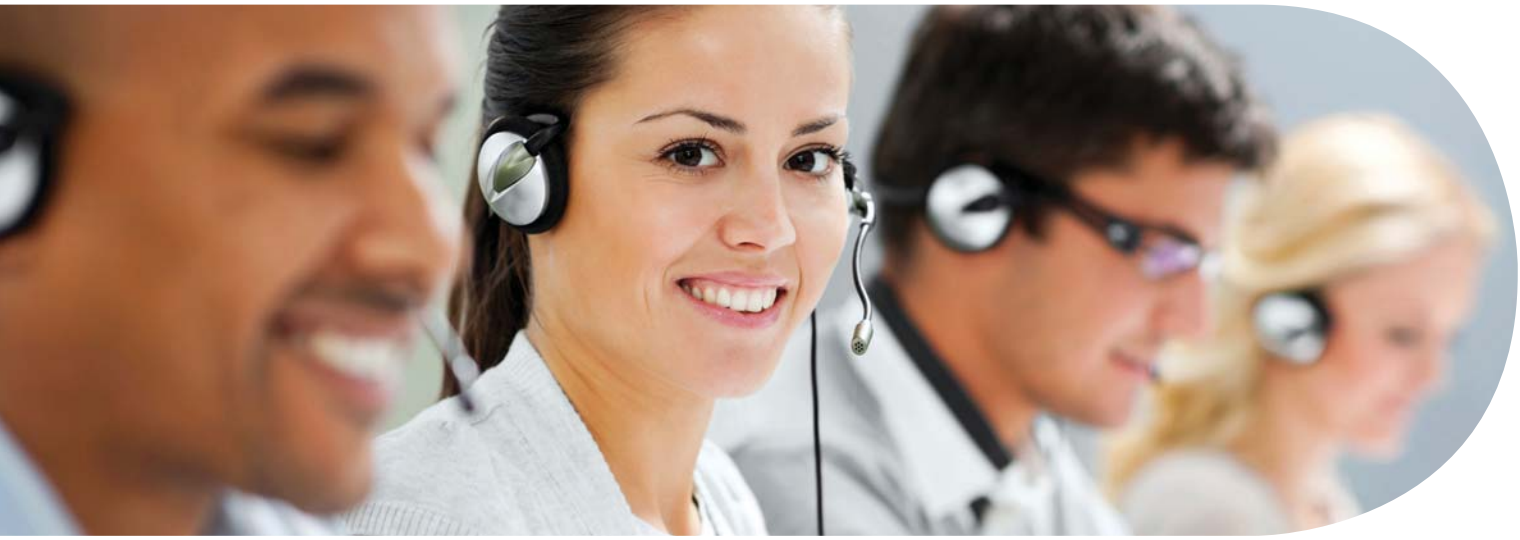
The importance of contact centre voice quality is well documented. Poor voice quality frustrates customers and reflects poorly on all stakeholders. Which is why contact centre voice quality must be measured and routinely monitored with methods that reflect the real experience of a live call.

Why typical Voice Quality reports don't tell you the whole picture.

The Voice Quality (VQ) measurements typically reported by contact centre I.T. environments are based on statistical estimates of the impact on voice quality, of various anomalies in IP data transmission.



But such methods have a scope of measurement that only covers a small portion of the telecommunications chain linking agent and customer. Consequently, their results do not reflect the impact of numerous other important factors that can significantly impact a conversational, real perception of voice quality.



What factors contribute to poor voice quality?

The VQ results typically reported by I.T. networking devices are proficient at statistically estimating the impact of:

- Bursty or Random Packet Loss
- Packet Out-of-Sequence Errors
- Packet Jitter

It is true - these issues are fundamental in their impact on VQ, and so it is vitally important that detrimental factors impacting each of these are identified and eliminated to ensure optimum VQ.

However, as these issues represent only a small part of the overall picture, they omit a number of non-data-transport related issues that can have a significant impact on the customers' perception of voice quality. These include:

- Network configuration
- Quality of agent's equipment
- Condition of agent's equipment
- Agent's use of agent equipment
- Compatibility of agents equipment with PBX
- Set-up/tuning of agent's equipment
- Contact centre environment
- Echo
- PBX trunk definitions
- Channel bandwidth
- One-way and round-trip delay
- Background noise

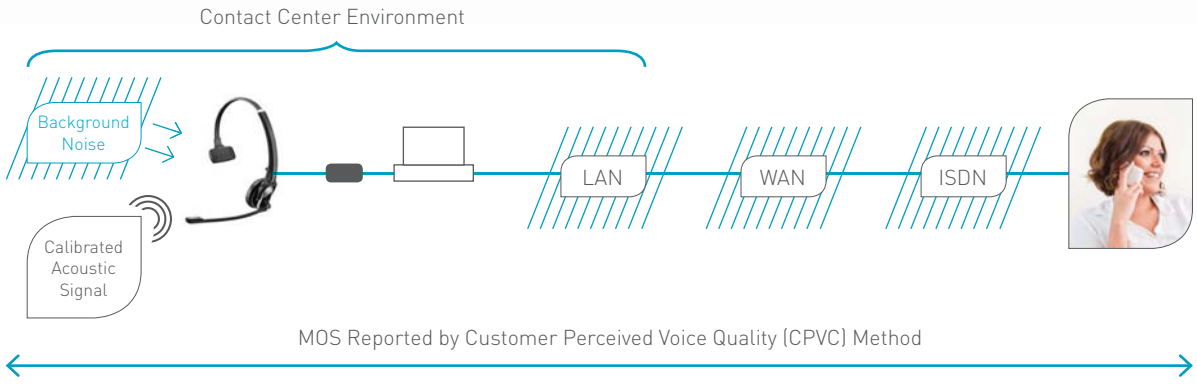
There is little benefit in having perfect data transmission performance in the IP network if agents have faulty or poorly adjusted headset equipment, or if the tromboning of transferred calls results in excessive attenuation or distortion. To some extent the impact of agents' equipment takes on an even greater significance as they can be subject to frequent damage, tampering with adjustments and day to day wear and tear.

Measuring the **true** Voice Quality perceived by the customer.

In order to measure the true **Customer Perceived Voice Quality (CPVQ)** the test methodology needs to include the Agents' equipment and environment, thus providing an all-encompassing assessment of the true voice quality as perceived by the customer.

CPVQ extends and enhances the measurement metrics provided by typical VQ testing and includes the most vulnerable and at-risk aspects of Voice Quality: the agent equipment and the environment in which it is used. This is achieved by **acoustically** injecting a calibrated, 'reference' audio signal at the agent end, and analysing the received 'degraded' signal at the destination end.

This provides a complete picture of all the factors affecting true voice quality, which allows more precise analysis and identification of issues and enables targeted corrective action.



In addition to the **acoustic injection** of the test signal, CPVQ test calls can be complemented by **Direct** (electrical) **injection** of the test signals at the headset interface. This allows inclusion of the bulk of the transmission system, but excludes the impact of agent equipment and the room environment.

The following diagram and chart highlight the impairment covered by each measurement method.

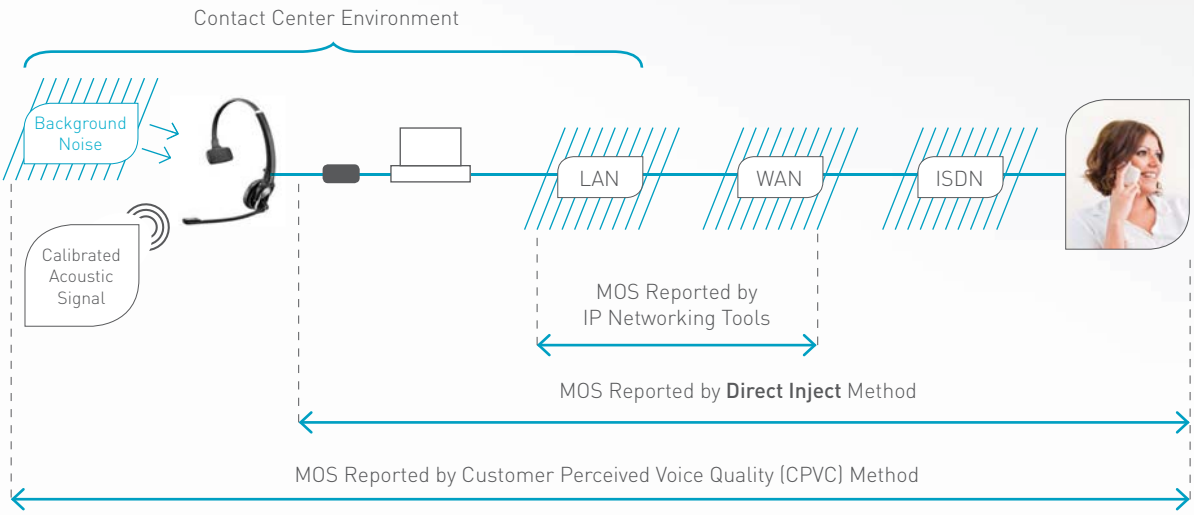


Table indicating the impairment coverage of various methods:

Impairment	IP Networking Tools	Direct Inject Method	CPVQ Method
Packet Loss	✓	✓	✓
Jitter	✓	✓	✓
Out of Sequence Packets	✓	✓	✓
Incorrect PABX/Gateway Gain Configuration	✗	✓	✓
Codec Performance	✗	✓	✓
Incorrect PC Audio Gain Configuration	✗	✓	✓
Incorrect USB Dongle Gain Configuration	✗	✓	✓
In-Channel Electrical Noise	✗	✓	✓
Contact Centre Background Noise	✗	✗	✓
Incorrect Headset Usage and Configuration	✗	✗	✓
Headset Performance and Quality	✗	✗	✓
Faulty Headset/Telephony Equipment	✗	✗	✓
Headset Mic Distortion	✗	✗	✓
Poor Headset Noise Cancellation	✗	✗	✓

Monitoring CPVQ as part of your Customer Service Quality Program.

A program to routinely monitor CPVQ should form an integral part of your overall customer service quality program.

Overall customer service quality and satisfaction is affected by many factors including:

- Agent knowledge and skills
- Agent's ability quickly and clearly provide the required information and resolution
- Average call answering time
- Average call waiting time
- Agent's phone etiquette
- Agent's overall language skill

In order maximise customer satisfaction it is important to ensure consistent high levels of CPVQ, as these will contribute to:

- Reduced customer misunderstanding of agent
- Improved call handling efficiency
- Improved customer perception of service quality and relations

How to implement an effective CPVQ program.

In order for a CPVQ program to be effective, it needs to be both simple and economical to implement and administer.

An effective CPVQ program commences at initial set-up and design of the Contact Centre and associated infrastructure to ensure that there are no constraints preventing the desired level of CPVQ from being achieved.

The Contact Centre design needs to consider:

- Correct selection of agents' equipment and its compatibility with the intended hard or soft phone
- Correct configuration of agents' equipment
- Room acoustics
- PBX set-up & configuration
- IP Network set-up & configuration
- Codec selection

This needs to be supported by the development of a Standard Operating Environment for the agents' position and training programs, to ensure all agents are aware of the correct configuration, adjustment and operation of their equipment.

Regular CPVQ monitoring is required to measure performance and provide early detection of any deviations from the desired CPVQ so corrective action can be taken before it impacts on customer satisfaction. This is best done by conducting regular random sample testing of CPVQ performance throughout the operating times of the contact centre.

CPVQ testing therefore needs to provide real-time results that are easy to interpret. Preferably the results would provide a simple and clear indication when problems exist and identify the potential source(s) so that immediate corrective action can be taken.

What Differentiates Trillium's CPVQ Solution?

Typically, conducting CPVQ measurements requires a very expensive, laboratory-grade Head and Torso, together with sophisticated signal generation and analysis equipment.

The primary problems with this type of arrangement are:

- Expensive
- Complex to operate
- Bulky and cumbersome to use and store
- Fragile
- Requires test procedures and scripts to be developed
- Interpretation of results is difficult and time consuming

The Trillium's CVPQ Solution is:

- Low cost
- Simple to operate
- Robust
- Easily transportable
- Includes integrated multi-facet test scripts
- Provides instant results that are clear and easy to interpret

About us.

Trillium is a specialist telecommunication/electronic engineering design and consulting company. Established in 1996, we provide expert product design, compliance testing and regulatory services to the Australian and International telecommunication and electronics industry.

Our wealth of experience sets us apart. Each member of our team is highly qualified and has many years of experience in telecommunications and electronics, with hands-on experience in product design, manufacturing, testing, quality control and compliance requirements.

Trillium will help you understand the Australian and International regulatory and performance requirements for your product. We can help with its design or modify your product to meet these requirements.

Multi-nationals, small enterprises, developers and entrepreneurs all use Trillium's services to reduce costs, streamline the compliance process and assist them to successfully introduce new products into the market.

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