Live Person Detection (LPD™) – A technological breakthrough

A Noetica White Paper

“A great deal of intelligence can be invested in ignorance when the need for illusion is deep.”

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1. Background

Outbound call centres detest answering machines of all kinds. Mobile voicemail, network services (such as BT's 1571) or old fashioned domestic answerphones, are all viewed as a waste of time, effort and money on a monumental scale. Although this varies depending on a wide range of factors such as list quality, nature and age, time of day and so on, it is generally quoted in the industry that an average of 50 percent of all calls made end up being answered by an answering machine of some description. As a percentage of answered calls, this proportion is much higher, of course.

Despite the fact that when these calls are delivered to agents they tend to be short (10-15 seconds usually for well-behaved agents, although this is open to abuse) they can account to somewhere around 25-30 percent of total agent working time. Some simple arithmetic can show that this can quickly add up to millions wasted each year even in a medium size call centre.

Take for instance a 100 seat outbound centre and let's make the reasonable assumption that the total cost for a seat is roughly equivalent to 1.5 FTE at an approximate conservative cost of £20K per FTE (including all overheads). A quick calculation will reveal that the annual sum wasted each year on calling answering machines is somewhere in the region of £850K!

If one compounds this figure with the loss of business resulting from the demoralising effect that dealing with endless recorded messages has on a workforce incentivised on financial results, it is very easy to see how a relatively small 100 seat operation can lose £1million pounds a year on this alone. To illustrate this point, we are talking about an average potential waste of £10,000 per seat per year! This is certainly not a trivial hit on the bottom line by any standards and can make the difference between profit and loss.

It should therefore not come as a huge surprise to anyone that call centres everywhere have had a massive incentive to search for some way to filter out those unwanted calls as effectively as possible; and when the stakes are so high there will always be those who will buy into any solution on offer whether real or fictitious.

And this is precisely what has been happening until now. Dialler manufacturers and vendors have been touting *Answer Machine Detection* or AMD as a miracle solution, quoting various unrealistic success rates at best tested in controlled lab conditions bearing no relation to the real world and at worst plucked out of thin air.

This is nothing short of wishful thinking. In many ways, the desperate demand for a solution has magically conjured up a pseudo-scientific method which is nothing but the emperor's new clothes. This method is called the *cadence* algorithm and has been in use around the world for many years now. Its rather pretentious name and widespread adoption have provided it with a false aura of unquestionable authority and undeserved credibility.

The cadence method tries to exploit the very rudimentary observation that people say "hello" at the beginning of a call and wait for an answer while answering devices tend to drone on with no pause [1].

The truth of the matter is that it doesn't work in all but a small percentage of calls that follow a very specific pattern.

Let's try and inspect it in the cold light of day. The claim is that this algorithm can determine with near certainty (some used to claim 98-99.9 percent success rates, but these claims have gone quiet of late) [2] [3] [4] whether a call had been answered by a human or a recording within less than a couple of seconds, by simply analysing a sound wave in real time within this brief period time.

We would challenge you, an intelligent human, to determine within one and a half seconds of any call you make being answered, whether it has been answered by a human or by an answering device. It is a nonsense, and everybody who has spent two minutes thinking about it knows that it is a nonsense. However, it is remarkable what people are prepared to convince themselves of given sufficient incentives to do so. Belief requires no proof, it seems.

Although there seems to be a rather unsettling scarcity of scientific research on the subject it is anecdotally accepted in the industry that the cadence method generally delivers a success rate of about 75-80 percent if the detection is allowed to run for three seconds or more. The problem is that regulators around the world (such as Ofcom in the UK) do not allow diallers the luxury of three seconds. The rules dictate that a call that has been answered needs to be connected within two seconds of it being established.

Even if three seconds were to be allowed, which is not the case, this would prove counterproductive anyway, as most people would hang up if they answered a call and heard nothing from the other side for three seconds. By the way, this is already a noticeable phenomenon when a two second pause is in use at the beginning of all autodialled calls. As a result, the cadence method can have a detrimental effect on call centre performance, so not only isn't it helping but causing real damage to the call centre's profitability.

Making abstraction of all this and considering all the other delays in the system, the cadence method will typically have around 1.5 seconds to make a decision in order to remain compliant. When applying this constraint, the detection success rate will drop from 75 percent to somewhere around 50 percent when complying with the regulators' restrictions. This is not much better than pure chance.

So you might as well toss a coin.

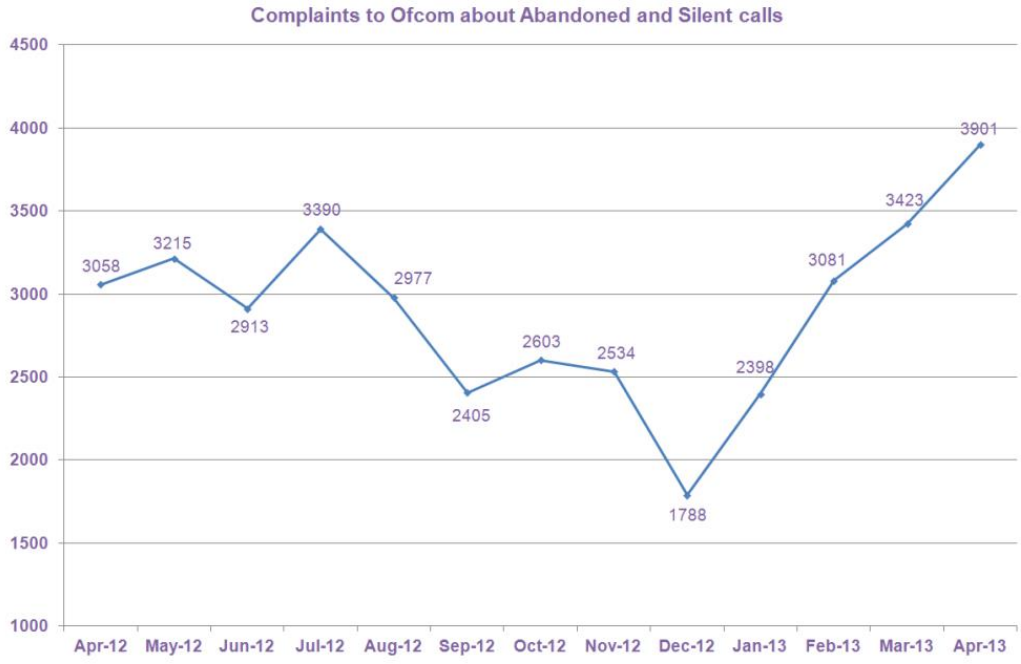
However, in the absence of anything else, call centres have continued to use cadence based AMD, persisting in their unreasonable belief that it is better than nothing in reducing the number of answering machine calls delivered to agents. The side effect of continuing to use this crude tool has been to indiscriminately classify a big chunk of calls as answering machines. Probabilistically it is not much different to classifying every second call as an answering machine.

Indeed, statistically, about half of these randomly 'identified' calls will be calls to answering machines. The problem, of course, is that the other half aren't. This other half are politely called 'false positives', meaning that these are calls to real live people who have been positively, yet falsely identified as machines. And here's the rub. Nobody knows how many false positive calls they are making as their number cannot be measured. They are nothing more than untraceable mistakes.

In many ways, asking the question "How many false positive calls am I making?" is equivalent to asking the old philosophical chestnuts: "If a tree falls in the forest and there is nobody there, does it make a sound?" or "Is the current King of France bald?" The paradox here is that if a dialler knew that a call was a false positive then it wouldn't be a false positive in the first place.

So, despite the evidence, what has happened was that call centres up and down the land who managed to somehow convince themselves that cadence based AMD within less than two seconds was possible, started using it on an industrial scale. Misidentified calls to answering machines (known as 'false negatives') did not stop being delivered to agents and the results were never as good as the technology promised to deliver, but at least they felt that they were doing something about it.

The trouble is that the inherent imprecision of this method means that together with the answering machines also a significant proportion of calls to live people also disappeared. What these unfortunate souls experienced was a phone call where the caller stays silent for a couple of seconds and then hangs up on them. Spooky and possibly unsettling for the recipients of these unintentionally sinister calls. However, the call centres making them remained blissfully unaware of this until people started to complain.



Source – Ofcom Telecoms Complaints Bulletin 2013 © Ofcom – All Rights Reserved [5]

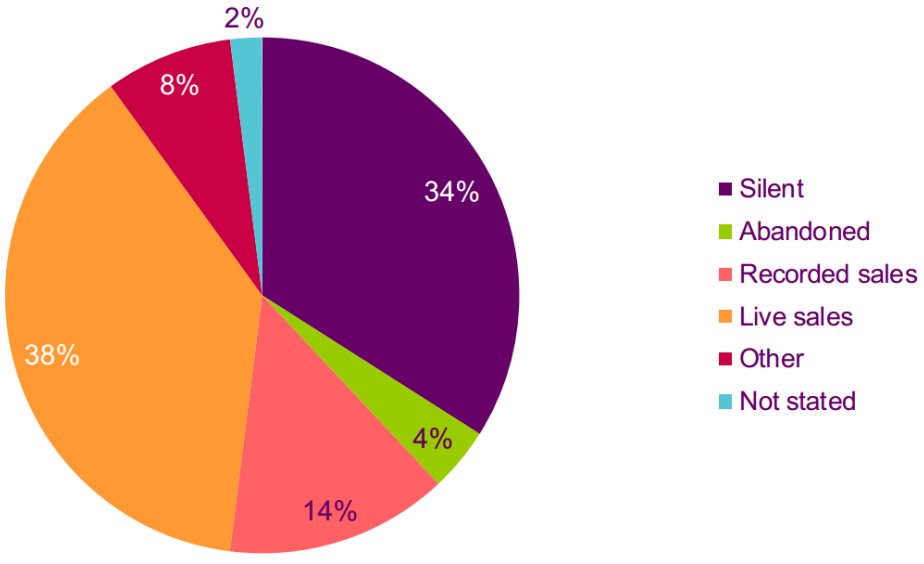
Although the number of complaints started and then increased more or less in line with the proliferation of this technology, it has taken a few years and a considerable amount of public pressure for the regulatory bodies to take it seriously and do something about it. Eventually, following years of consultation and debate, somewhere towards the end of the last decade, regulation emerged severely restricting the use of AMD in dialling systems.

The restrictions were so exacting and the possible penalties so draconian that it became an effective ban on the use of the cadence method for AMD. So for the last few years all but the most unscrupulous of outbound call centre operators have desisted from using this technology.

However, even under the current highly restricted regime, some operators persist in the belief (until recently with the quiet blessing of equipment vendors) that cadence-based AMD is too tempting an option to forego. The difficulties of measuring the real number of *false positives* and the carefully crafted but rather vague wording of the rules have promoted confusion and misleading methods of 'measurement' of the efficacy of the method.

However, Ofcom (the UK regulator) has recently (May, 2013) published the results of a statistical study of the number of nuisance calls received by a large sample of the UK population over the course of four weeks. The results are startling. Four in five (82%) UK adults with a landline phone reported experiencing a nuisance call[1] in the four week fieldwork period. Some, of course experienced a lot more than one.

Proportion of different types of calls received over four weeks



Source – Ofcom Landline Nuisance Calls Panel 2013 © Ofcom – All Rights Reserved [6]

[1] In the context of this source [6], "nuisance calls" include "unwanted calls".

The distribution of these calls confirm with uncanny precision the hidden extent of false positive calls generated by the use of current AMD methods. The fact that the number of silent calls (which are in their vast majority the result of false positive misidentification of answering devices[2]) is almost equal to the number of live sales calls provides the ultimate proof of the indiscriminate & crude nature of current AMD technology, and confirms our view that it is little better than tossing a coin.

No alternative has emerged since and the industry has been making desperate attempts to find ways around this issue with very little success. Until now, that is.

Noetica has been working on implementing and testing a completely new approach addressing the problem of answering devices in outbound call centres since the summer of 2012. Following successful prototyping and testing of this method, on 10 May 2013, the company filed a patent application with the UK Intellectual Property Office (application number: 1308508.9) for a new invention which we called Live Person Detection™ or LPD™ for short.

Following a successful meeting with Ofcom on 23 May 2013 the UK regulator has raised no objections to the use of LPD™ in live call centre operations. As Ofcom cannot endorse any specific technology, their keen interest and tacit approval is a great testimony to the viability of this method.

2. The LPD™ Method

This white paper describes the basic principles of this new method and its advantages. In its essence, the idea is a simple yet subtle one. Instead of looking for answering machines the system looks for real live people by engaging them in an initial conversation which involves pre-recorded phrases in the voice of the agent most likely to handle the call and monitoring the ensuing dialogue throughout.

It is only at the point when the algorithm decides that it is probable that a live person is on the line through real time analysis of the conversation that the call is handed over to an agent. In the vast majority of cases, the agent will be the very same one whose recorded voice the live recipient of the call has heard during the detection phase. The intention is that, if the campaign is set up correctly, the point at which the call transitions from recordings of the agent to the live voice of the agent is imperceptible to most call recipients.

The innovation lies in the way in which the algorithm is able to extend the detection period well beyond the two seconds that are allowed by the regulators while at the same time eliminating the initial detection silence so typical of the cadence method. Key to this being viable is that each agent records a series of three phrases (some of them possibly in several intonations) for each campaign that they are working for. Ideally, these recording would be made daily by each agent at the start of their shift in

[2] Calls abandoned by predictive diallers as part of their normal (non-AMD) operation are very unlikely to be “silent calls” these days as most diallers are compliant and would play a recording whenever they drop a call knowingly.

order to account for possible minor variations in the timbre and tone of their voices from one day to the next.

The algorithm relies on several basic principles. First of all, as soon as a dialled call is answered it starts a detection thread which listens for a high energy beep, typical of an answering device. If such a sound is detected, the call is immediately classified as an answering device. There is an option at that point to simply leave a message or just abandon the call.

In parallel, a second strand of the algorithm will determine in cooperation with the predictive dialler who is the most likely agent to receive this call, were it to be a live call and then uses the recording associated to that specific agent to attempt to engage the recipient in conversation whilst monitoring the incoming voice channel constantly.

There is a level of sophistication built into the method that controls the interplay between LPD™ and the predictive dialler (whatever dialler is in use) to ensure that live calls are delivered *just in time* to agents and that over-dialling is catered for. This is aimed at ensuring that the use of LPD™ technology does not reduce the efficacy of the predictive algorithm and does not increase the number of dialler abandoned calls to a level that would be any higher than the dialler would generate otherwise. In fact, as will become apparent below, LPD™ is actually likely to increase the efficiency of the dialler and reduce the number of dialler abandoned calls.

One of the main indicators of a call connected to an answering device is the 'recipient's' tendency to *talk over* the agent's recorded voice. If this is detected, the algorithm will proceed to a verification step where it will play some further recordings in order to establish categorically the nature of the call. It is, of course quite likely that during this stage, the first thread would identify the beep which would settle the detection categorically. Even if this does not occur in time, the system will determine unambiguously whether the call is live or not.

The algorithm relies on the following parameters:

Three recordings per agent per campaign. For each agent $\mathcal{A}$, the three pre-recorded messages are:

- A prompt: $\mathcal{R}_1(\mathcal{A})$ (for instance: "*Hello?*").
- An introduction $\mathcal{R}_2(\mathcal{A})$ (for instance: "*Hi. My name is Jane and I am calling on behalf of Acme Corporation to discuss your recent enquiry.*").
- A clarification $\mathcal{R}_3(\mathcal{A})$ (for instance: "*Pardon me. I didn't quite catch that?*").

Each campaign also requires the definition of three timing parameters:

- Initial silence duration: $\mathcal{P}_1$ (for instance, 250-1,000 milliseconds).
- Listening gap: $\mathcal{P}_2$ (for instance, 500-1,500 milliseconds).
- Clarification gap: $\mathcal{P}_3$ (for instance, 500-1,500 milliseconds).

Finally, each campaign also requires the definition of two retry limits:

- Initial silence breaker: L_1 (for instance, 3).
- Post-message silence breaker: L_2 (for instance, 2).

Here is a simplified description of the algorithm.

The dialler transfers each connected call to LPD™ together with the ID of the agent A that it has selected for this call. The algorithm will listen for a brief period P_1 for a voice signal (typically the recipient's "Hello") and if absent will play message $R_1(A)$ and wait for a period P_1 in a loop of up to L_1 iterations hoping to elicit some response. If no such response is forthcoming the call is classified as *unobtainable*. In effect, there is nobody at the other end.

Assuming that voice is detected either initially or during the initial loop, the system will wait for the recipient to pause and remain silent for a minimum period P_2 following which it will play recording $R_2(A)$, which would typically be a greeting followed by a brief explanation as to the reason for the call, in the voice of agent A, of course.

During the playback of recording $R_2(A)$, the method will listen to and analyse incoming sounds. If voice is detected during the playback, the call will become a suspect for an answering device as it is unusual (but clearly not impossible) for a human to *talk over* the agent's short introductory message. If no voice is detected, the call is considered to be live and immediately transferred to agent A[3].

A subtle aspect of the method exploits the period of time during which recording $R_2(A)$ plays out using it as a disambiguating factor in case there is no sound detected from the recipient. Such a pause on the other side would normally indicate one of two things. Either the live person is listening or this is a typical pause between the answering machine's outgoing message and the beep.

If the initial parallel thread of the algorithm does not detect a beep during the playback of $R_2(A)$, then it will err on the side of caution and assume that there is a live person there listening to the recorded agent. This may generate a very small percentage of *false negatives* (answering machines being connected to agents) but no *false positives* at all.

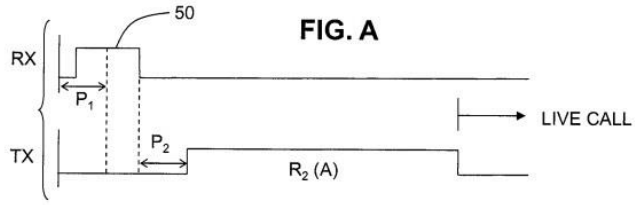
If voice was detected *talking over* message $R_2(A)$, then a verification step ensues. In this step the algorithm will wait for the recipient to fall silent for a minimum period P_2 and then it would play the clarification message $R_3(A)$. If no voice is detected, it will wait for a period P_3 and then repeat the message $R_3(A)$ followed by a silence of duration P_3 iteratively L_2 times. If still no voice is detected it

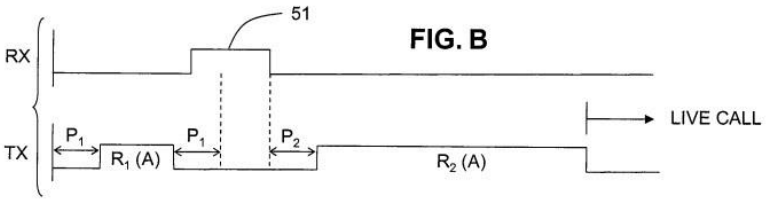
[3] The method allows for the possibility that agent A may be on another call (by either not having completed the previous call or already on another call do to the predictive algorithm). In this case, the call will be delivered to another agent, B, if available. This may happen only in a very limited number of cases. Agent B's script can then indicate that the recipient heard another agent's voice and explain the discrepancy. If no agent is available this would become a normal dialler nuisance/abandoned call, however, there is the option here of playing a fourth message in the voice of agent A explaining why the call will be terminated or offering the option to wait in a queue.

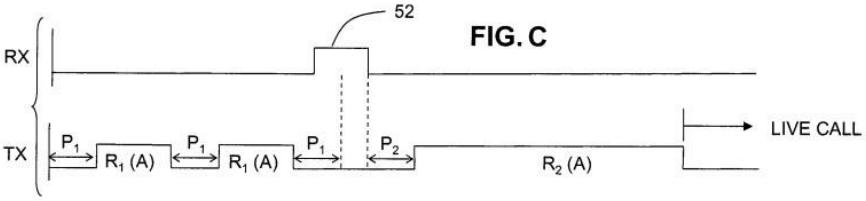
will classify the call to be an answering device. If however, at any point during this verification stage voice is detected (following the initial silence P_2) the call is deemed live and transferred to agent A.

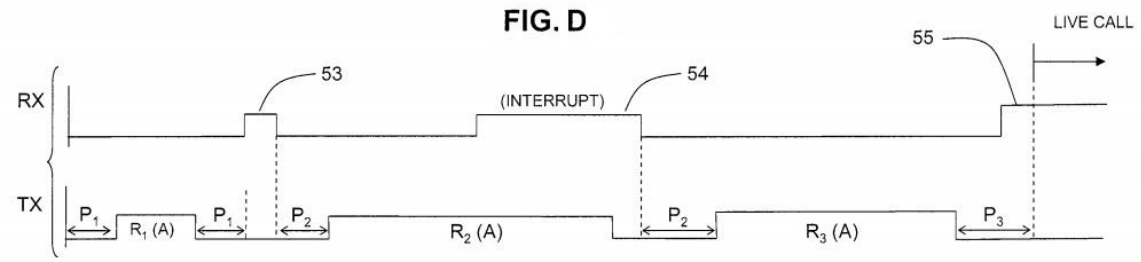
A refinement to this method would be to record L_1 variants of message $R_1(A)$, and L_2 variants of message $R_3(A)$, possibly with different levels of urgency and perhaps minor differences in intonation. This would add a natural air of authenticity to the recordings and would make the transition from recordings to live voice that much more smooth and believable.

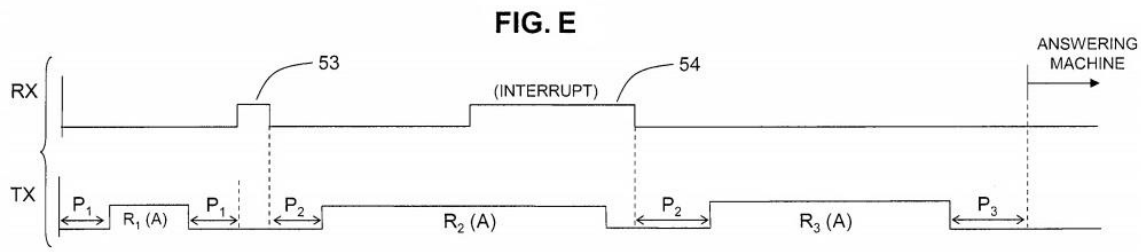
As an illustration, the following diagrams provide some examples of typical detection patterns:











3. Benefit analysis

LPD™ delivers a genuine technological breakthrough for the outbound dialling industry, with clear and measurable benefits for both its users and the public at large. This new technology will protect call centres from falling foul of the law with all the damage to reputation and the bottom line that breaking those rules can bring[4] while at the same time protecting the public from the scourge of endless silent calls.

The following is only a partial list of all the benefits that LPD™ can provide. Although, of course, the main aim of this invention is to make call centres more efficient, risk-free and profitable, there is a raft of incidental slightly less tangible advantages which flow from the use of this new technology.

3.1. Agent productivity

This is the key benefit of LPD™ technology. All indications to date show that use of LPD™ can safely prevent virtually all calls to answering devices from being delivered to agents without impacting on the pacing and efficiency of the predictive dialler (whatever dialler is in use).

As a result, depending on various factors such as list quality, time of day, and so on, agent productivity will increase by between 25 and 50 percent. This is truly revolutionary and almost on a par with the productivity increases that the introduction of predictive dialler technology has brought to the call centre industry all those years ago.

To bring this into some kind of perspective, for an average 100 seat outbound call centre, the estimated net gain would be the equivalent of the cost of around 30-40 FTE. The maths are pretty trivial, showing conservative saving estimates well in excess of £½ million, which would go directly to the bottom line.

3.2. No off-putting initial silence whatsoever

People can usually tell when they are called by an automated dialler from a call centre by the silence greeting them just after they pick up the phone. This is the point where you will lose a great deal of opportunities as people will say an initial “Hello?” and hearing nothing for a second or two will simply hang up.

The public is now pretty savvy and extremely impatient. The ubiquity and ease of electronic communication has managed to devalue the importance of a single call. If there is no sound coming from the caller when one picks up, most people will know that they are either being *detected* or assume that there is a problem with the connection. Whatever the reason, they will hang up pretty quickly.

So even if cadence based AMD was working, which it isn’t, it can cause more damage than good. Not only will you lose live calls through *false positives*, you will lose even more during the initial *detection* silence when you are not talking to the people you are calling for up to two seconds (and in some cases longer).

[4] For example, only recently TalkTalk, one of UK`s major telecoms providers was fined £750,000 for generating too many nuisance calls.

LPD™ removes this ill-effect completely. The person picking up an LPD™ enabled call, will hear a voice immediately.[5] Not only that, but it is highly probable that the voice that they will hear will be the same agent they will end up talking to and they will have no inkling that they were *detected* by listening to an initial recording.

3.3. Virtually eradicate *false positives* for good

If you are currently using AMD you will be well aware of the time, effort and sheer suspension of disbelief required in order to convince yourself, in the hope of being able in turn to convince the regulators that your 'reasoned estimate' of false positive AMD identifications is within an acceptable, and most importantly, legal limit.

You will also be sleeping uncomfortably at night knowing that your 'reasoned estimate' is based on nothing more than some rather flimsy statistics. You know what they say about lies and damned lies. Hand on heart, on any given day, you have no idea about the real number of silent calls your AMD technology has generated. Our educated guess, supported by recent evidence, is that that number is a lot higher than you may wish to hope.

LPD™ removes all this uncertainty. Not only will you be making practically no AMD related silent calls, but you will also be able to verify that this is the case. LPD™ produces recordings of the entire detection which, as opposed to previous methods is a lot longer than 1.5 seconds. Typically, you will be able to listen to all recordings of detected answering devices and hear their messages in most cases in their entirety.

Of course, you will sometimes hear a real person. This will be a rare and pretty unusual event. There is only one way to cause the algorithm to classify a call as an answering machine. It is extremely unnatural and we challenge you to find it. Our tests show that a live person would need to be pretty determined and persistent in order to impersonate an answering device.

To conclude, using LPD™ will give you the ability to do one better than what the regulators require and instead of providing a 'reasoned estimate' you will be able to provide real evidence of the accuracy of your detection technology.

3.4. Increased Agent Motivation

There is nothing more disheartening for an outbound call centre agent than listening to one answerphone message after another. This is demoralising to the point of despair. Agents are trained and paid to talk to customers and prospects, not to disposition endless calls as answering machines.

At certain times of day and when the list is not in its first flower of youth, agents can sit for hours on end without speaking to a single human being. Statistics show that it is not unusual to see averages of only one in every five or even six calls being to a live person. It's enough to drive anyone to insanity.

[5] This is configurable, but you have the choice of setting the initial pause to zero. We estimate that 250-500 milliseconds is probably optimal as it allows LPD™ to detect and early "Hello?" with no perceived ill-effect.

This is exacerbated in environments where agents are incentivised by financial performance. In these types of environments, agents need to be much more focused and self-motivated in order to achieve a reasonable income. Listening to voicemail messages does nothing for their morale and may result in losing the best performing ones altogether as they feel that they may be able to better achieve their full potential elsewhere.

The ensuing atmosphere in call centres plagued by high level of calls to answering devices is a kind of torpor and cynicism whereby calls are devalued and treated with indifference, so even when a real live call eventually materialises, the agent is less likely to generate a positive result. This may be a somewhat intangible effect but it is no less real.

This is precisely where LPD™ technology can make a massive difference. This is a benefit which is less palpable and more difficult to quantify but no less genuine and important. Call centres will ignore this effect at their peril.

3.5. Reduced Agent Handling Times (AHT)

Because of the way LPD™ technology works, the first 5-20 seconds of each calls are handled without any agent involvement (whether the call is to a live person or an answering device). Assuming an average call duration of about three minutes, this represents a typical 10 percent reduction in AHT. It may not sound like much but it is the equivalent of the cost of 15 FTE in a medium sized 100 seat call centre. In monetary terms this is more than £¼ million saving per annum.

3.6. Improved dialler performance (or fewer abandoned calls)

An interesting side effect of the use of LPD™ technology is the fact that not only does it not hamper the performance of the predictive dialler, but it actually helps improve it. The reason for this is the additional time that is added by virtue of LPD™ detection between a call being connected and the possible need to transfer that call to an agent.

This time buffer (of say, around 10 seconds on average) allows some diallers to be more intelligent about their pacing. For instance, if a call is connected, and no agents are free to take it, when LPD™ is not in use, it would result in a dialler abandoned call (nuisance call).

However, when LPD™ is in use, the call is transferred into the LPD™ mechanism in the hope that by the time it emerges as a live call (which is only around 50 percent probability anyway) an agent would become available. At the same time, the dialler can lower the pace slightly to ensure that such a “close shave” does not recur.

What this means is that a predictive dialler utilizing LPD™ intelligently, can generate the same performance with less abandoned (nuisance) calls. Alternatively, if required, it can generate the same level of abandoned calls but better performance (lower average idle time between calls). It is difficult to quantify the value of this benefit but it is certainly can have a positive effect on overall financial performance.

3.7. The ability to leave messages

Because of the way LPD™ works, your calls are likely to still be connected at the end of an answerphone message up to the usual beep. Because of this, you have the option to leave proper messages on your audience's answering devices (instead of just hanging up). This can be done with no human intervention and does not have any negative side effects such as extra nuisance calls.

The result is that, assuming that your messages are effective, some of the people you called will actually call you back, generating valuable inbound traffic and reducing the need for further outbound calls, making your outbound operation even more efficient overall. There are no quantitative measures to this effect, as it very much depends on the types of calls that you are making, but in some cases this can be a major bonus.

3.8. No greeting fatigue

Starting a conversation with a complete stranger tens if not hundreds of times a day using the same formulaic pattern of initial address can be a daunting prospect for any agent. Most experienced outbound advisors will tell you that the first few seconds of a call are crucial to the success of the entire transaction. If the recipient of an unsolicited call hears even the slightest tone of insincerity or boredom at the start of the call, they are much less likely to be receptive to your message.

However, it is very difficult for agents to remain sounding fresh and engaging throughout the day. At some point the sheer repetition will take its toll and results will start slipping purely out of 'greeting fatigue'. Typically, this manifests itself as fast talking, unintelligible sentences, and generally rushing the initial opening lines of the conversation.

LPD™ has the potential to eliminate this problem altogether. Since each agent will record their own greeting at the start of each campaign and then periodically when they log in to the system at the start of their shift, their opening sentence will always sound like each call is the first one of the day. This could make a big difference to their conversion rates.

4. Summary

The successful detection of answering devices has been a perennial issue plaguing the call centre industry for decades. Due to irresistible commercial pressures, automated methods of detection have been invented and adopted by the call centre industry despite lingering doubts about their effectiveness and credibility.

In recent years, existing methods of detection based on the cadence method have been proven to be counterproductive and to generate high levels of silent calls (the worst type of nuisance call). Regulators have stepped in and all but outlawed the use of these methods. This seemed to be the end of the matter until now.

On the 10 May 2013 Noetica filed a patent application for a new technology called LPD™ (Live Person Detection™) which claims to be able to resolve the apparently intractable problem of distinguishing automatically and accurately answering devices from live people in a manner that is safe and legal.

The method relies on the seamless transition between personalised recordings of each agent and their live voice whilst monitoring the sound signal received from the call recipient to determine whether it is consistent with a live person or a recorded message. All tests of the method performed to date produce highly accurate results and live trials will continue through the summer of 2013.

LPD™ will become generally available in the third quarter of 2013 as part of the Synthesys™ product suite from Noetica and later as an API which would enable other vendors to provide LPD™ commercially as part of their own offering.

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