Voice Biometrics Census

Steady Growth of Global Enrollments

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Opus Research's latest voice biometrics census, completed in July 2016, shows dramatic growth in enrollments (more than 137 million globally), signaling voice as a ubiquitous, highly personalized authentication factor with the capability to combine command and control with identification and access management.

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Momentum Builds for Voice-based Authentication

In late 2014, Opus Research conducted a global census of companies that had implemented voice biometric-based platforms and the number individuals who had already enrolled their voiceprints as factors for identification and verification. The census tallied over 150 instances where banks, telecommunications carriers, government agencies, healthcare/insurance companies and others were enrolling their customers and clients' voiceprints to support strong, speedy authentication, numbering nearly 60 million globally.

Opus Research's most recent census, completed in July 2016, shows dramatic growth in enrollments (more than 137 million globally) of voice biometric-based platforms while the number of instances held roughly the same. This yielded the following key findings:

➢ **Dramatic growth fueled by large-scale implementations: The years of trials are over. Dozens of customer-facing implementations have come online, each with the potential to bring millions, rather than thousands, of individuals into the fold. As a result, enrollments have grown 84% annually since the last census.**

➢ **Telcos and Financials led the way: Each vertical has room to grow. Telecommunication firms were first to have mass implementations; financials are hitting their stride, as are large-scale government services. Healthcare and insurance are at an earlier stage in the adoption curve.**

➢ **Core technologies standing up to tests: With large financials exhibiting confidence in the accuracy and efficacy of voice-based platforms now interoperate with existing IT, security, contact center, IVR and Web frameworks, as well as platforms that support multiple factors.**

➢ **On the road to 1 billion enrollments: Our projection for enrollments exceeds 600 million in 2020, but that could be quite conservative. The world's population now approaches 7.5 billion. Mobile carriers claim 6.8 billion subscribers, 3 billion of whom have smartphones with a high percentage protected by a form of biometric. User acceptance is no longer a barrier (e.g. Apple reported that 89% of the people who own iPhones equipped with TouchID use the feature, activating the device or unlocking apps at the rate of 80 times per day).**

Impressive Global Growth Around the World

At its present rate of enrollment, by 2020, over half a billion individuals will be able to use spoken words, rather than PINs, passwords or answers to personal questions to initiate conversations or transactions using their phones, laptops, tablets, smart speakers/appliances or connected cars. Another, equally large group of smartphone users will find that their voice – along with images of their face, iris, ear or fingerprint – will be used to wake up the device and sign on to the services or apps that they use everyday.

Figure 1: Enrolled Voiceprints (Million)
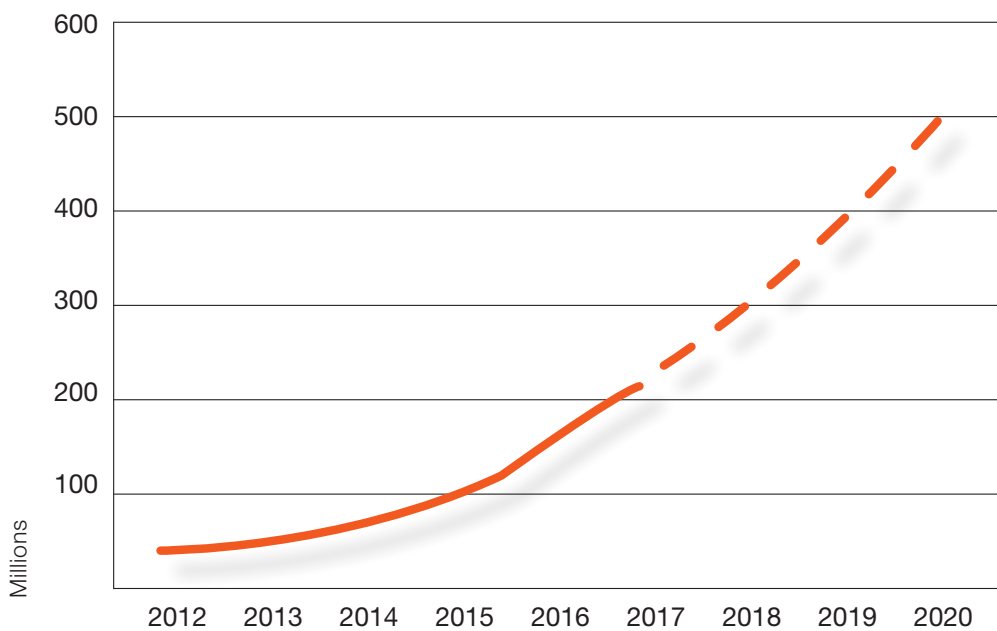
Source: Opus Research (2016)

The average (arithmetic mean) number of enrollees per implementation is up to 1.1 million, which represents a doubling in size when compared to the census that compiled in late 2014. If the 50 million-customer implementation in China is treated as an outlier [noted below], the average implementation still exceeds 700,000 enrollees, representing an increase of 69% over the prior census. The figure will follow this trajectory for the foreseeable future as "proof of concepts" and "trials" give way to full-blown, customer-facing implementations.

Looking at the distribution of implementations by size (Figure 2 below), there is a tranche of implementations in the 5-20 million range. The bulk of implementations are in the sub 3 million range. Once in production, the number of total enrollments is a function of the overall size of the targeted customer cohort (e.g. high net worth individuals, bank card customers, all customers); the marketing, education and support programs to encourage enrollment; and the nature of the underlying technology (e.g. active versus passive enrollment).

Figure 2: Distribution of Implementation by Enrollments
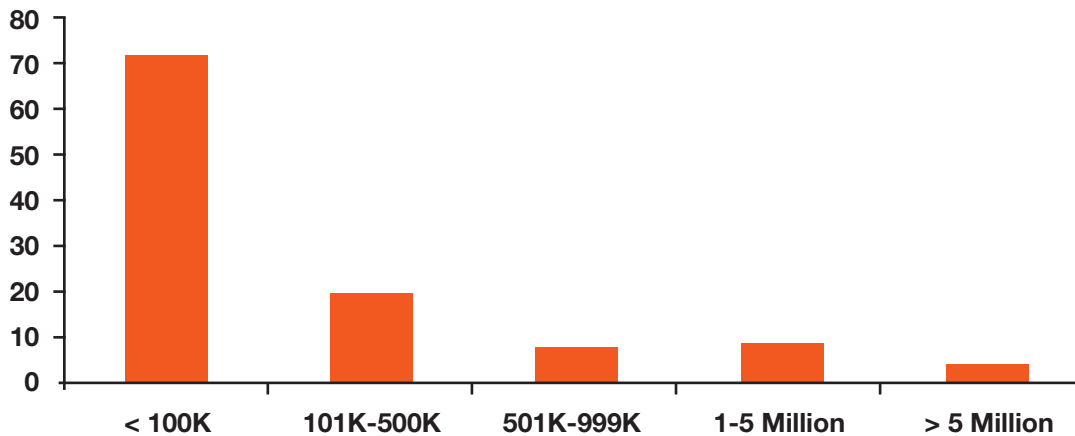
Source: Opus Research (2016)

Thanks to the concerted efforts of financial services giants and telecoms with customer bases that exceed 20 million regular callers, annual growth in enrollments has averaged over 80% during the past 3 years. With government agencies (e.g. tax offices and social security administrations) and healthcare providers around the world ready to bring their clients, customers and citizens into the world of voice authentication, the growth curve is poised to continue for the foreseeable future, as depicted in Figure 1 above.

China Syndrome: A Sea Change in Global Enrollments

There have always been pronounced differences in the adoption characteristics of the geographic regions under investigation. In the first census (completed late 2014), EMEA dominated the enrollment landscape, thanks largely to effective rollout strategies by major telecommunications companies and their contact center outsourcers. This year, as depicted in Figure 3 (below), APAC now accounts for nearly half of all enrolled individuals (48%).

Most notably, a single financial institution in China numbers 50 million enrolled clients. Meanwhile, global financial powerhouse Citi, which has 15 million commercial bank customers in 12 APAC countries, expects to enroll over 1 million customers in the next 12 months on its way to 3 million in three years. Likewise, Standard Chartered is rolling out a combination of biometric-based authentication offerings, including voice, for its customer base in Asia, the Middle East and Africa.

Figure 3: Enrollments by Region
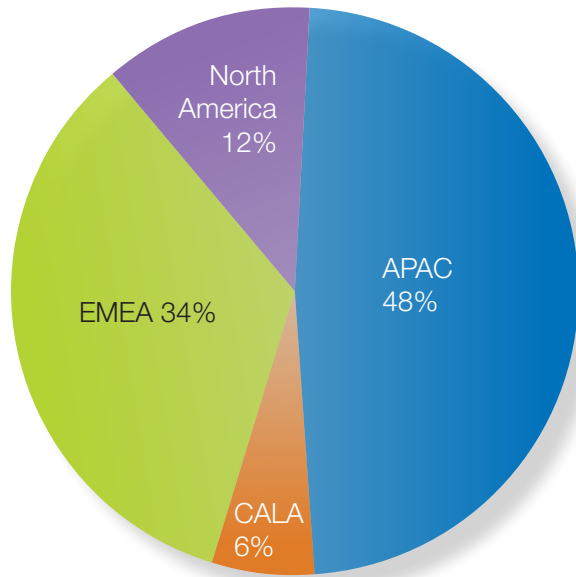
Source: Opus Research (2016)

Reflecting continued success among Turkish telecoms, coupled with bank programs in Europe and government initiatives in Africa, EMEA now accounts for a third (34%) of enrolled individuals. We expect accelerated growth in the region as the large commercial banks - like Barclays, HSBC and Lloyds, in addition to Citi -expand their voice and multi-factor authentication initiatives to reach the lion's share of their commercial banking customers.

Looking solely at enrollments, adoption in the Western Hemisphere is noticeably lagging behind. This is not for lack of interest or attention. As reflected in Figure 4 (below), North America, alone, accounts for nearly half of the implementations of voice biometric solutions. If you add the 5% of implementations taking place in Central America and Latin America (CALA), you see that 54% of all implementations are in the western hemisphere; yet they account for only 18% of enrolled individuals.

Figure 4: Implementation by Region
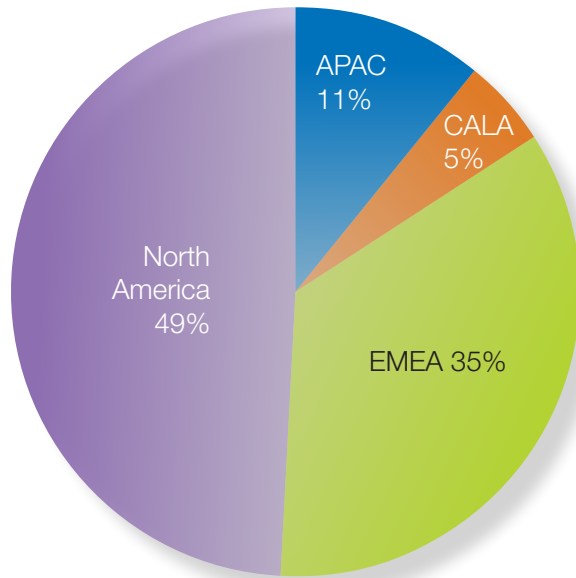
Source: Opus Research (2016)

The Western Hemisphere: Ready for Take-off

The voice biometrics landscape in the Western Hemisphere is a combination of high-visibility contact center-based implementations and mobile multifactor instances, with the potential to reach tens of millions of enrollments. They are joined by dozens of relatively small implementations that serve as proof-of-concepts or trials designed to demonstrate the efficacy of the underlying technologies.

While the trials have great growth potential, not every financial institution has the potential to grow from zero to 50 million enrollments in a couple of years. Yet real world experience in Europe, the Middle East and China shows that the move from 10,000 to 10 million in a short period of time is very reasonable.

In North America, large commercial banks and financial services companies, including RBC, Manulife and Citibank have moved from small-scale deployments into commercial offerings that promise to add millions of new enrollees. Wells Fargo, USAA and US Bank have demonstrated convenient ways to log onto their mobile apps using their voice, face or the touch of a finger. The move to digital commerce will accelerate the deployment of more biometric access.

In the Central America and Latin America (CALA), the migration from small to large-scale implementations is driven by initiatives surrounding financial services and government entitlements. Voice biometrics solutions rose to the challenge of enabling pensioners to supply reliable evidence that they are alive and eligible to receive their benefits from government or union retirement system managers. It fights fraud for suppliers and simplifies access from the pension recipients' point of view.

With banks poised to ramp up their consumer-facing offers, government agencies are stepping up expectations to incorporate biometric-based authentication into their service offering. North America, in particular, is poised for impressive growth. Healthcare service providers and insurance companies have also been investigating their options and may be coming online in the coming years. But there are a lot of regulatory and compliance issues to settle before the major ramp up of enrollments commences.

Treating Banks as the Bellwhether

It is no surprise that commercial banks and financial services providers are leading the charge to implement voice-based authentication. They were one of the industries to begin evaluating voice-based authentication to replace PINs and passwords over a decade ago. They were spurred on by regulators around the world who encouraged financial institutions to harden the security fabric and practices for phone-based commerce. They had tremendous incentive to investigate options for layered, multifactor authentication to prevent fraudsters from successfully spoofing a real customer's identity. Because phones were involved, voice was a natural factor to employ.

As depicted in Figure 5, over one-third of the instances, or implementations, of voice biometrics-based solutions are for the Finance industry. Government initiatives is second on the list, representing 23% of implementations. Telecom service providers, which were among the early adopters of voice authentication, are in a statistical tie with Healthcare and Insurance industries with about 12% of implementations.

Figure 5: Implementation by Industry

Telecom 13%
Other 15%
Healthcare/Insurance 12%
Government 23%
Finance 37%
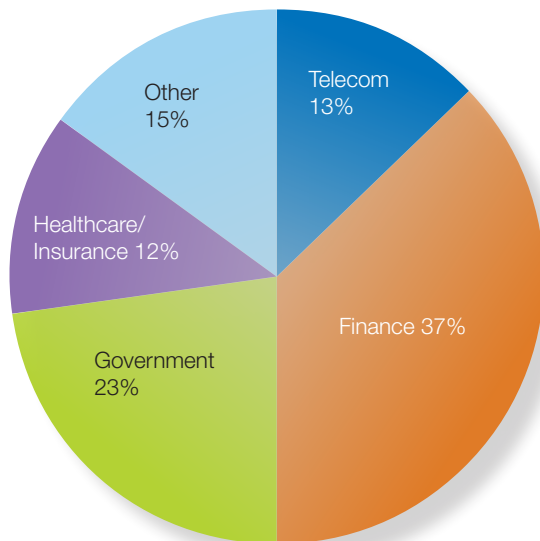
Source: Opus Research (2016)

Looking at verticals from the point of view of enrollees tells a very different story (Figure 6 below). Banking is, by far and a way, responsible for the most enrollments, with over half of all individuals. Then Telecom and Government are once again in a virtual tie with roughly one-fifth of the total. That leaves Healthcare and Insurance with less than 5% of the enrolled population.

Figure 6: Enrollments by Industry
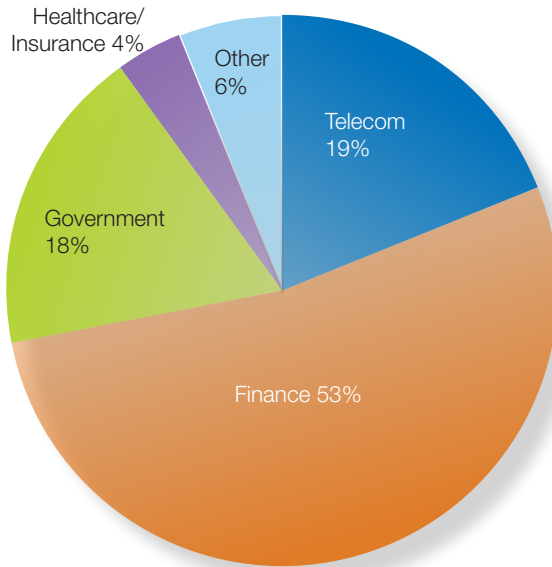
Source: Opus Research (2016)

Without the 50 million new enrollees from a financial institution in mainland China, the assessment of activity would be quite different. Telecom and Government, whose initiatives defined the ecosystem earlier this century, would each have 30% of the market. Finance would still represent a formidable share at around 25%. Healthcare/Insurance would still hover around 5%.

Shortened Sales and Implementation Cycles

Many of the banks that are rolling out voice biometrics-based services in 2016 had been trialing solutions for nearly a decade. They were satisfied that the technology works and had confidence that it will do so at large scale. Change agents or champions within the company have successfully brought key organizations into the fold. In doing so, they have benefit from the lessons learned by vendors, system integrators and even competitors who have had success in implementing.

The upward slope of the adoption curve tells the story of overcoming long-standing technological, organizational, compliance and financial issues that prevented rapid enrollment in the past, including:

➤ Technological: Voice biometrics-based solutions have proven that they reliably detect imposters and prevent fraud at large scale. In so doing, they have demonstrated compatibility with existing digital commerce and security infrastructures, workflows and protocols.

➤ Organizational: With many departments involved when new security practices are adopted, solutions must be "sold" internally and wheels set in place to train the personnel involved in providing incentives for customers to enroll their voiceprints and use their voice to authenticate.

➤ Compliance-related: Legal and regulatory issues are a double-edge sword for biometrics-based solutions. On a global basis, they encourage implementation of layered, multi-factor, risk-aware solutions but temper adoption by offering ambiguous guidance surrounding the treatment of biometrics as personally identifiable information (PII).

➤ Financial: Most importantly, executives must formulate a business case that reflects the financial value of moving to a new way of authenticating. Finance companies have done so based on reduced customer handling expenses resulting from shortening the time it takes to authenticate and thus totally eliminating the need to reset passwords. They've coupled that with the massive savings from fraud reduction and by quantifying the financial benefits of promoting loyalty by offering highly individualized services.

Establishing a Pattern for Other Verticals

The Finance sector provides a model that presages similar curves that we anticipate for the Government and Healthcare sectors. Each of these verticals has hundreds of millions of citizens or patients that will benefit from secure, highly personalized services and are addressing the adoption barriers that the Financial Services and Telcos have already overcome.

Telcos, however, are in a very pivotal position when evaluating their options for implementing voice-based authentication. The industry is entering its third wave of voice-based authentication, if you regard the ambitious efforts of Bell Canada to employ the technology to authenticate customers of its residential landline services earlier this century. Australia's Telstra was also a pioneer in providing the hosted platform for Centrelink (the Australian social security administration) for its proof-of-life and identity authentication.

As illustrated in Figure 7 (below), Telcos may be a key driver in rapid growth of enrollments, but they have issues to sort out in terms of establishing a unified identity across business units. Their lines of business include mobile and wireless services, as well as residential telephone, Internet and entertainment. They offer services to individuals, as well as "family plans" that include small groups that may or may not be on an individual plan. What's more, they have different identifiers (like phone numbers, account numbers) which may not necessarily bind an individual to a set of products and entitlements. In this context, it is hard to define when, how and why one would match a claimed identity to a stored voiceprint.

Looking at the Government vertical, it is very difficult to predict the precise timing for mass enrollments in a given sector. Based on discussions with vendors and a select group of prospective implementers, Opus Research believes that government agencies are next up to enroll tens of millions of individuals. We're monitoring efforts in Africa, Latin America, India, Afghanistan and elsewhere where government agencies use the enrollment of a biometric (which often includes voice) as a means for "inclusion," meaning eligibility to vote, carry on commerce and make or receive payments involving the government or other citizens.

Figure 7: Adoption-readiness by Vertical

	Technology	Organization	Compliance	Financial
Finance	Proven for CCTR & Mobile/ Multifactor	Accepted by security, CX, CCTR, Mobile	PCI & Privacy Shield laws globally	Proven ROI: cost savings & fraud loss reduction
Telco	Proven for CCTR & Mobile/ Multifactor	Challenge is across multiple Business Units	Has not proven to be an issue	Reduces CCTR costs, promotes loyalty
Government	Proven & accepted in multifactor	Tax, retirement, pension & "inclusion"	Privacy issues & treatment of biometrics under study	Believed to save money; promote e-government
Telco	Proven for CCTR & Mobile/ Multifactor	Challenge is across multiple Business Units	Has not proven to be an issue	Reduces CCTR costs, promotes loyalty
Healthcare	Largely untested in CCTR/ Moble	Fragmented across payers & providers	Adds HIPAA to list of strictures	Could prove ROI, as Finance did.

The Australian Tax Office (ATO) and New Zealand Inland Revenue department are also examples where government efforts to incorporate voice biometrics into their identification and verification efforts is starting to accelerate in ways that has material impact on our census.

Adoption among healthcare and adjacent verticals, including pharmaceuticals, physicians' networks, "wellness" specialists and others, is another area that is hard to handicap. Each of these fields puts high value on strong authentication of users both for privacy protection and to provide highly personalized services. These are areas with pronounced need for communications platforms that protect privacy and rely on high-confidence that a targeted or personal message is being delivered to the rightful recipient.

Dramatic Changes Afoot in Application Topology

The census is proving to be a poor measure of the impact of the major forces shaping mobile and digital commerce, when it comes to implementations of voice biometrics by application (Figure 8). As we enter the age of overwhelmingly mobile and digital commerce, nearly two-thirds of the implementations of voice based authentication technology remains closely mated to customer care contact centers. For the record, that is up from 41% in our last census.

... NEARLY TWO-THIRDS OF THE IMPLEMENTATIONS OF VOICE BASED AUTHENTICATION TECHNOLOGY REMAINS CLOSELY MATED TO CUSTOMER CARE CONTACT CENTERS. FOR THE RECORD, THAT IS UP FROM 41% IN OUR LAST CENSUS.
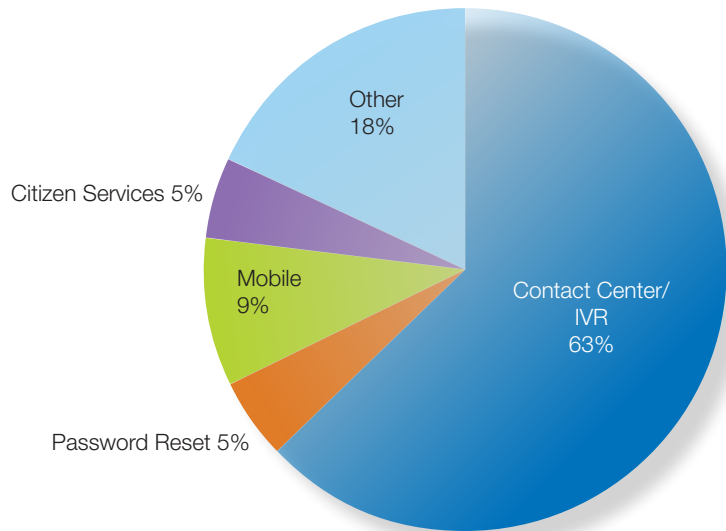
Figure 8: Implementations by Application

Source: Opus Research (2016)

Indeed, the growth in contact center-based implementations coincides with a marginalizing of mobile implementations, which accounted for less than 1% in our 2014 census. It also eclipses, to a certain extent, the number of instances where voice biometrics have been employed to support activities related to password reset. In both surveys, Citizen Services account for roughly 4-5% of implementations.

Figure 9: Enrollments by Application
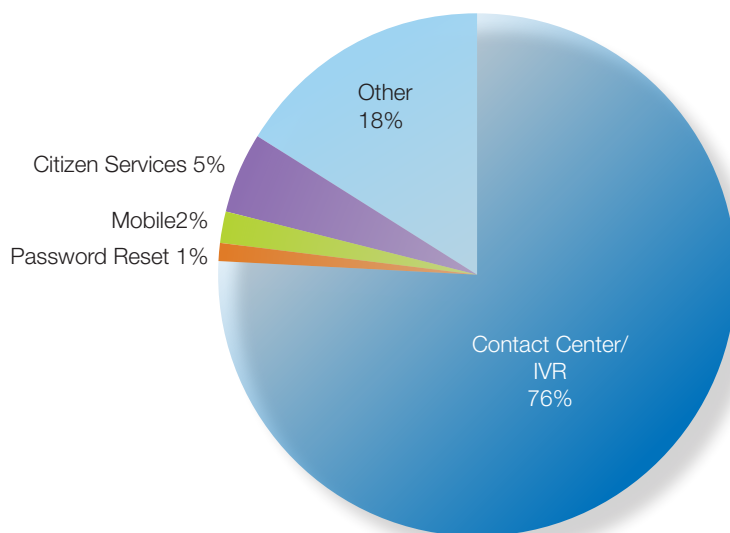
Source: Opus Research (2016)

Contact Centers Remain Central

The preeminence of the Contact Center in the voice biometrics world is especially pronounced when looking at enrollments (Figure 9). Over three-quarters of the people who have voluntarily enrolled their voiceprints or templates have done so through over the phone, through contact center-based resources. This phenomenon reflects two important deployment considerations. One is that contact center-based resources, including the IVR and live agents, are instrumental in facilitating enrollments. The other is that the business case for cost-savings resulting from shortened time to authenticate is based on the metrics and reporting that resides in the contact center. That's why it remains central.

Citizens Services is next up with a scant 5%, which is down significantly from our last census. That does not mean we should discount the high-potential for growth in government deployments. Instead, we believe that the timing of our census may have come at the end of a period of trials and evaluations that presage mass deployments in the coming years. We will watch developments in this domain closely because, when they move from trials to implementation, enrollments will take place in the tens of millions.

The 2% of enrollments presented as "Mobile" also appears to be undercounting. Our theory is that we have a problem surrounding the definition of terms used in assigning categories to applications. We know from other studies that as high as 85% of calls into contact centers originate from mobile phones. From the end-users' perspective, they are authenticating through mobile, but the authentication is taking place in an IVR or other resource closely integrated to the contact center.

As these "hybrid" implementations driven by multi-channel and omnichannel user cases, Opus Research will be retooling categories and definitions to capture more accurately the technology trends and usage models.

Retooling Our Thoughts of "The Other"

Of great interest is (or should be) the category termed "Other." The term is almost always used as a catch-all for items or activities that are not elsewhere classified. That is true in this case; yet it is important to point out, at this point in the ecosystem's evolution, some relevant patterns are emerging, reflecting the growth of the digital information age and the so-called Gig Economy.

Voice authentication is being pressed into service to support distance learning efforts by authenticating students before, during and after completing courses or tests. In another use case voice biometrics, in conjunction with mobile phones is used to support Time & Attendance confirmation for home healthcare workers. A similar configuration and protocol makes it possible to track criminals who are subject to home incarceration. The list will continue to grow.

Ramping up for the Age of IAuth (Intelligent Authentication)

Accelerated adoption of voice biometrics-based authentication is propelled by the rapid growth of digital commerce through mobile devices, home appliances and automotive entertainment consoles. Service and content providers trying to reach the users through Amazon's Alexa or GoogleNow seek simple ways for their customers or members to assert their identity and engage in conversations over secure communications links.

Voice is establishing itself as a ubiquitous user interface for the devices and services they use every day. That makes voice biometrics an equally ubiquitous, highly personalized authentication factor with the capability to combine command and control with identification and access management. Simple sign-on to secure communications links

via voice requires no special "reader" or proprietary piece of equipment. Plus the number of seconds of captured speech required for authentication is now around 10 seconds.

Brands, marketers and service providers that include voice among the authentication factors they offer for simple access and secure communications are already reaping the rewards of cost-savings that result from shortening the time it takes for individuals to authenticate themselves. Further savings result from fraud loss reduction that results from early identification of imposters.

Early integration of voice authentication into mobile, digital commerce offerings will have lasting value resulting from improved overall user experience. The full roster of biometrics – including fingerprint, face, iris – are important tools for personalization of digital services. In very short order, we expect voice to establish itself as the preferred modality because it is one that combines physical and behavioral biometrics with the ability to give a command, initiate a search or show emotion.

The stage is set for voice-based authentication to be integrated with the rule-based engines that govern existing enterprise customer care and security solutions. As that happens and Intelligent Assistance approaches take hold, expect voice biometrics enrollments, as well as authentication and authorization events, to accelerate in parallel.

A Note on our Methodology

Opus Research has complied a database of installations and estimated enrollments of voiceprints to provide a snapshot of the current voice-based authentication resources by region, application and vertical industry served. We make best efforts to generate accurate estimates of both installations and enrollments. We take great pains to protect the confidence of our vendors, therefore we make no effort to calculate market share either of installed base or estimated revenue. Findings represent our best efforts to eliminate "double counting" which arise when technologies are sold under reseller agreements and, in cases where companies provide guidance rather than numeric data.

We are grateful to the community of solution vendors who provided us with the anonymized information to support our findings and forecasts. Vendors from whom we requested and received data or guidance in our data gathering efforts include (in alphabetical order): AGNITIO, Auraya, BioTrust, Knurld, Nuance, Sensory, Validsoft, VoiceVault and Voice Biometrics Group.

About Opus Research

Opus Research is a diversified advisory and analysis firm providing critical insight on software and services that support multimodal customer care. Opus Research is focused on "Conversational Commerce," the merging of intelligent assistant technologies, contact center automation, intelligent authentication, enterprise collaboration and digital commerce. (www.opusresearch.net)

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