Voice first

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Think voice

Way back in time, much longer than recorded history, voice was and is still the primary mode of communication. It's evident that humans started using voice to interact long before they started to communicate in writing. Since the advent of computers and electronic machines, we've majorly used programming language or text commands to interact with them, and this requires some specific skill sets. Now with the evolution of voice technologies and smart machines, we see a shift from humans adapting to machines to machines evolving to cater to humans needs!

We first learned to interact with the world through voice and it is, therefore, the most natural, easy and spontaneous way for us to convey instructions instead of typing, navigating through multiple menus/screens or pressing multiple buttons to instruct a machine/ appliance. We are also wired to respond more easily to voice, or are "voice-activated": we respond to voice technologies just as we respond to actual people[1]. Voice interface today is transforming user-experience for all technological devices, capitalising on the true potential of voice to impact all walks of life. Moreover, voice plays an important role in helping connect the less tech-savvy populace of Tier-2 and Tier-3 cities to machines or applications.

Customer-focus is a strategic imperative for all enterprises and leveraging digital technologies provides significant competitive advantage in the face of ever-increasing customer expectations. Now, with rapid progress in AI-enabled speech-to-text and text-to-speech services, seamless voice-driven customer experience is a reality. As the ecosystem around voice-enabled technology matures, customers are starting to rely more on voice. Gartner estimates that by the end of this year 30% of our interactions with technology will be through conversations with smart machines.[2] This is not just in our homes but also in our offices where employee interactions with applications will be via voice.

1. "Wired for Speech | The MIT Press." https://mitpress.mit.edu/books/wired-speech. Accessed 6 Sep. 2019.

2. "Market Trends: Voice as a UI on Consumer Devices — What ... - Gartner." 2 Apr. 2015, https://www.gartner.com/en/documents/3021226/market-trends-voice-as-a-ui-on-consumer-devices-what-do-. Accessed 6 Sep. 2019.

Why now?

With more and more enterprises and industries adopting a customer-centric approach instead of a business-centric approach, businesses need to remain agile and create winning customer strategies, empowered by digital technologies to engage customers, increase customer stickiness and achieve profitable growth. Customers today demand experience along with products, services and interactions. Voice technologies create an avenue for reimagining customer experience and offer unprecedented opportunities to boost customer experience and strengthen customer loyalty.

Advances in Automated Speech Recognition (ASR), Machine Learning (ML) and Natural Language Understanding (NLU) along with massive amounts of training data and better-tuned AI algorithms have led to an exponential increase in capabilities to process voice at scale with greater accuracy. This, in turn, has allowed voice technology to become mainstream. It can now deliver contextual and highly personalised responses, creating a place for itself in the minds of consumers, and that's only getting better with use.

Benefits of voice technology for individual users

Voice technology is gaining acceptance because it offers the following benefits:

Saves time: Users can get lightning fast responses by instructing systems/machines, instead of typing or navigate through screens or steps to get the required response.

Multi-task with hands-free operation: Users can multi-task and interact with devices on the go, which frees up capacity to do something else simultaneously.

Easy to use: Natural Language Processing allows interaction with the device using a medium that users are comfortable with, bypassing instruction booklets and navigation through complex menus.

Convenient: Being able to converse with a voice assistant anytime is convenient as it allows a user-friendly, hassle-free and effortless experience.

Humans then no longer have to adapt and become smarter to interact with machines. Rather, with advances in technology and voice solutions, machines have become smarter enabling interaction with them using the most natural and convenient medium, voice.

What does this mean for customers?

Earlier, consumers preferred using voice technology for simpler, instructional tasks such as making phone calls, setting alarms, movies and news updates. However, with more mature and advanced voice technology, machines are now equipped to handle complex tasks by simply conversing with the user. This provides opportunities for enterprises to leverage voice:

- Augmenting human talent by delegating cumbersome, repetitive tasks to voice solutions, allowing humans to focus more on customer experience and cognitive activities
- Increased customer engagement through personalised suggestions based on voice recognition and simulating human conversational patterns for a frictionless customer experience
- Streamlined operations through end-to-end integration of applications powered by voice commands and final notifications being delivered as audio to users
- Enhanced productivity as multiple clicks, navigation across screens and typing of inputs are replaced by voice-first interactions that are time-efficient and accurate

Evolution of voice technology[3]

1962 – Shoebox

At the Seattle World's Fair in 1962, IBM presented a tool called Shoebox that could perform mathematical functions and recognize 16 spoken words as well as digits 0-9.

1970's – Harpy

Scientists at Carnegie Mellon University in Pittsburgh, Pennsylvania created Harpy. It could recognize 1,011 words, which is about the vocabulary of a three-year-old.

Early 1980's – Hidden Markov Model

The hidden Markov model begins to be used in speech recognition systems, allowing machines to more accurately recognize speech by predicting the probability of unknown sounds being words

1987 – Julie doll

The Julie doll from the Worlds of Wonder toy company came out in 1987 and could recognize a child's voice and respond to it

1990 – Dragon Dictate

Dragon launches Dragon Dictate, the first speech recognition product for consumers

1996 – IBM MedSpeak

IBM launches the MedSpeak, the first commercial product capable of recognizing continuous speech

2006 – Speech Analysis

The National Security Agency begins using speech recognition to isolate keywords when analyzing recorded conversations

2011 – Siri

Siri is an intelligent personal assistant. It uses voice queries and a NLU interface to answer questions

2012 – Google Now

Developed by Google for Google Search Mobile app, to make recommendations, perform actions by employing NLP

2014 – Alexa

A virtual assistant developed by Amazon. It is capable of voice interaction by using NLP algorithms

2014 – Cortana

It can set reminders, recognize natural voice and answer questions

2016 – Google Assistant

It offers voice commands, voice searching, and voice-activated device control

2019 – Alexa in Hindi

Regional Language capabilities introduced in Alexa

3. https://www.smartsheet.com/voice-assistants-artificial-intelligence
https://www.witlingo.com/the-rise-of-voice-timeline/
https://www.theverge.com/ad/17855294/a-brief-history-of-voice-assistants

Voice technology gaining acceptance

India has been one of the leading adopters of voice technology with 72% online consumers using voice assistants. According to a survey by market research firm International Data Corp, the smart speaker category grew by 43% in the second quarter of 2018.[4] Majority of the usage described in these statistics pertains to the B2C category predominantly in the following sections

Making homes smarter with voice technology

With an increase in the use of IoT devices at homes, we see people interacting with their homes as they would interact with an electronic device. Voice adds another layer of accessibility to this and allows users to interact with their homes as they would with another person. Voice assistants or smart speakers can be used to control television, lights, thermostat, alarm system, electricity switches and more. Using a centralised voice system to control all the smart home appliances not only provides great convenience but also helps save electricity as it provides an option to turn off appliances remotely.

Improve customer experience in Hospitality and Transport with voice technology

Another industry that finds attractive use cases for voice technology is the hospitality sector. Hospitality industry thrives on enhancing the customer experience and an AI-based voice platform provides a powerful means to do that. Hotels that provide leisure services can complement their services with the convenience and ease of use provided by voice technologies. For example a large hospitality chain looking at introducing AI based voice services in hotel rooms[5] which can be used by guests as 24/7 assistant to request room services, control lights and temperature and get information of hotel services at any time of the day.

Cab aggregators also use voice technology to help improve customer experience. Riders can now ask questions like “Hi, please tell me how long will it take for the cab to arrive”. Rider can get fare estimate, know the status of their ride, cancel ride among other activities.

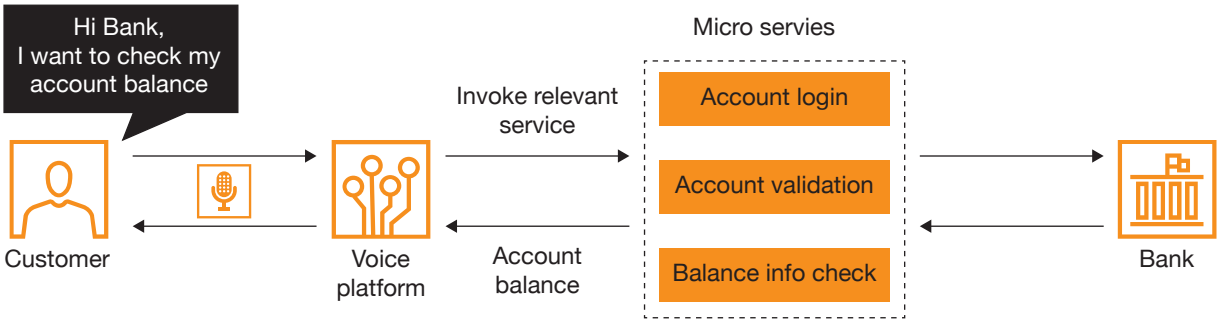
While there is a massive adoption of voice technologies in the B2C sector, we also see it having immense opportunities in B2B and B2B2C sectors. We see a surge in usage of voice technology in Banking, Insurance, Automotive and Education industries. A major example of leveraging voice in the banking industry is the recent release of a voice banking service as a skill by a large Indian bank.

4. Smart Speakers With Amazon Alexa, Google Assistant Invade Indian ....” 31 Jan. 2019, https://gadgets.ndtv.com/smart-home/features/smart-speakers-with-amazon-alexa-google-assistant-invade-indian-homes-1982063. Accessed 6 Sep. 2019.

5. “Marriott International to introduce innovative voice technology – CPP ....” 20 Jun. 2018, https://cpp-luxury.com/marriott-international-to-introduce-innovative-voice-technology/. Accessed 6 Sep. 2019.

Banking: The banking and financial services industry deals with huge amounts of transaction every day. Apart from transactions, they also need to resolve queries, register complaints and collect feedback. It has been observed that most customers prefer to speak with an operator rather than type in their questions or navigate through different menus and screens. Thus the number of use cases for voice in BFSi is large, one such example is highlighted below:

Illustrative flow: Balance check using voice technology:



Education: Another niche industry where voice could play a major role is Education. In populous countries like India, there exists a shortage of teaching staff, especially in the rural areas. Owing to low income, lack of infrastructural facilities and long working hours, voice technology is best suited to serve this section. Several schools in India, for example municipal schools in Amravati, Thanjavur and Mumbai - are utilising voice technology to help impart education to the children[6]. Affordable internet connectivity makes it possible for voice assistants to be online during school hours.

According to a teacher in one such school:

> **"The difference between teachers and the machine is that it corrects them in a very soft tone. The kids are able to hear the correct pronunciation but without feeling judged for getting something wrong."**

8. "'Alexa' turns teacher for school kids in rural areas - Times of India." 10 Jul. 2019, https://timesofindia.indiatimes.com/india/miss-alexa-and-tara-are-helping-civic-school-kids-bridge-learning-gap/articleshow/70070607.cms. Accessed 6 Sep. 2019.

Future of voice technology

Voice everywhere: Voice is everywhere, used in different scenarios by people of all ages. Reuters predicts that the voice market is to hit $7.8 billion by 202[7] and Juniper research indicates voice devices will be tripled to 8 billion by 2023.[8] The ability of voice technologies to handle complex processes is not a concern anymore as voice technologies have evolved over time and are now ready!

Developer ecosystem: More and more companies are embarking on a voice-only journey to build voice solutions for their customers. While devices with basic voice capabilities exist off the shelf, there is a huge opportunity for customisation. Building voice apps is slated to be the next big cottage industry in India. India has the world's largest developer ecosystem with over 3 million[9] mobile app developers. Many of these developers are geared towards building voice solutions on established and upcoming voice platforms.

With the evolution of the developer ecosystem, voice design experts will become more relevant and will help create the apt voice journey for customers. This in turn will provide the best voice user experience (VUX).* Designing of a voice journey differs from that of a mobile journey. Hence this offers a rich opportunity for designers to build their competencies in this domain. With the right voice design comes the right voice user experience which means an increase in the usage of voice solutions.

Voice localisation: Voice design involves various components, one of which is localisation. In a country like India where conversations happen in multiple languages, major voice technology providers will need to start thinking of launching local languages like Tamil, Bengali, Marathi, Gujarati to reach customers in the hinterlands and improve the adoption of voice solutions across regions.

***More on this in another PwC India paper on Voice User Experience**

7. "Voice Assistant Market 2019 – 2023: Share, Profit Growth ... - Reuters." 20 Aug. 2019, https://www.reuters.com/brandfeatures/venture-capital/article?id=146027. Accessed 6 Sep. 2019.

8. "Digital Voice Assistants in Use to Triple to 8 Billion by 2023." https://www.juniperresearch.com/press/press-releases/digital-voice-assistants-in-use-to-8-million-2023. Accessed 6 Sep. 2019.

9. "AI bots, smart speakers are at your (voice) command - Livemint." 26 Apr. 2018, https://www.livemint.com/Technology/UcQ0aoLsWTJ3BVVSmvyWZL/AI-bots-smart-speakers-are-at-your-voice-command.html. Accessed 6 Sep. 2019.

About PwC's Intelligent Automation (IA) practice

PwC India's IA practice assists clients in their automation journey from strategy through execution. Conversational AI is a critical aspect of this automation journey and voice plays a major role in it. PwC's IA practice has its Voice CoE that caters to the rising need of voice solutions in both Business-to-Customer (B2C) and Business-to-Business (B2B) market segments.

Our Voice CoE comprises both domain and technology professionals.

- Domain analysts include voice designers, voice architects and language specialists
- Technology analysts include certified solution architects, Automated Speech Recognition (ASR) and Natural Language Understanding (NLU) specialists

Our team has extensive experience in performing various activities like

- Identification and feasibility assessment of various features of voice platforms
- Building strategic solutions to solve niche problems
- Creating best practices to build scalable voice solutions and accelerators for rapid development and deployments.

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