Transforming Customer Experience with Digital Voice Assistants

Alekya Jonnala

Senior Software Engineering Manager in Amazon, Mentor for Society of Women Engineers,
Expert in implementing AI & ML Solutions at Scale, USA

Abstract   Since the last decade, the world has witnessed rapid technological advancements across various spheres of our lives. One such amazing technological breakthrough is Digital voice assistants coupled with Artificial intelligence capabilities. Digital voice assistants have emerged as pivotal tools across industries in enhancing customer services and improving overall customer experience leading to higher engagement and satisfaction. This research paper is about exploring potential impact of digital voice assistants in transforming customer interactions and exploring capabilities such as natural language processing commonly called as NLP, machine learning and voice recognition technologies. Furthermore, how businesses can leverage on the digital voice assistants into their strategy to streamline customer support, personalize interactions and optimize operational efficiencies. Few of the areas include integration of voice assistants into omnichannel strategies, accessibility across diverse customer demographics, and also potential challenges such as privacy concerns and technological limitations.

Keywords   Digital voice assistants, Customer experience, Natural language processing, Machine learning, Voice recognition, Omnichannel strategies, Personalized interactions, Operational efficiencies, Privacy concerns, Ethical considerations

1. Introduction

In today's hyper-connected digital landscape, the digital voice assistants have transcended their novelty status to become a valuable tool for consumers cutting across varied industries. Imagine a world where companies seamlessly predict and meet customer needs through voice assistants using digital. These smart tools are transforming customer interactions in the hyper competitive digital world and providing personalized support with unmatched convenience.

Harnessing the power of digital voice assistants, companies are not only able to enhance efficiency but entirely redefining what customer experience means.

Over the past few years, leading brands have been investing a lot over digital voice assistants as they look to gain edge over others and to reinvent customer service. Using technologies of Artificial Intelligence and Natural Language Processing (NLP), these assistants can craft responses in real-time based on likely customer questions across multiple channels. Whether they are answering customers' queries or giving product recommendations, these digital voice assistants enable the process to be efficient that traditional systems would find difficult to match up.

By leveraging vast datasets and using CRM systems and data analytics platforms, the integration provides businesses with insights into how customers behave in their preferred environments to offer efficient hyper-personalized interactions.

At the same time, digital voice assistants make lives easier and businesses like never before. They provide companies with more user-friendly, customer-facing interactions that allow businesses to establish better relationships with their customers. Customers increasingly orchestrate their everyday activities with the support of technology (Kunz, Heinonen, & Lemmink, 2019), leading to new opportunities and challenges (Kaplan & Haenlein, 2020). The service sector in particular has seen significant developments in recent decades, such as the increasing adoption of artificial intelligence (AI) applications and automated technologies, including service robots, chatbots or virtual assistants (Gummerus, Lipkin, Dube, & Heinonen, 2019), [1,2,3].

Initial academic research suggests that firms adopting such technologies will be able to achieve more personalized and efficient services, thereby contributing to value creation (van Doorn et al., 2017). Automated technologies are expected to be increasingly adopted in service frontlines (Kumar, Dixit, Javalgi, & Dass, 2016) and may even replace traditional forms of customer-employee interactions altogether (Marinova, deRuyter, Huang, Meuter, & Challagalla, 2017). AI-based

assistants may soon be able to perform most tasks currently carried out by service employees (Huang & Rust, 2018), whereas by 2025 an estimated 95% of customer interactions will be supported by AI technology (Forbes, 2018) [4,5,6,7].

2. What are Digital Voice Assistants

A digital voice assistant is a combination of hardware and software. Powered through a software application that uses artificial intelligence (AI), natural language processing and speech recognition to understand spoken commands or questions from consumers and provide answers in return. These voice assistants are capable of doing a large number of tasks and supporting voice-governed information, making them valuable to consumers.

Here are the important characteristics of digital voice assistants:

Voice Interaction: These assistants are set up to work more through giving spoken requests or inquiries, rather than writing something out and touching screens. Artificial Intelligence (AI) technologies is one of the important areas with advanced features that are emerging at a fast pace. Although these technologies seem to be extensively adopted, people do not intend to use them in some cases. Technology adoption has been studied for many years, and there are many general models in the literature describing it. However, having more customized models for emerging technologies upon their features seems necessary.

In this study, we developed a conceptual model involving a new system quality construct, i.e., interaction quality, which we believe can better describe adoption of AI-based technologies. In order to check our model, we used a voice assistant system (VAS) technology as an example of this technology, and tested a theory-based model using a data set achieved from a field survey. Our results confirm that interaction quality significantly affects individual's trust and leads to adoption of this technology, [8].

AI and NLP: - The application is powered by AI to understand natural language and context so the conversation can be more seamless, engaging in a "conversational" manner. In the development process of AI voice assistants, data analytics techniques may be employed to analyze user interactions, feedback, and usage patterns.

This data analysis can help optimize the performance and functionality of the voice assistant, ensuring that it effectively understands and responds to user commands and queries. AI voice assistants can be integrated into marketing strategies and customer engagement initiatives. For example, voice assistants can facilitate personalized marketing experiences by providing product recommendations, answering customer queries, and delivering targeted promotions based on user interactions and preferences. Effective use of AI voice assistants can contribute to enhancing user experience and engagement, which are key objectives in marketing research and customer relationship management, [9].

Integration: Integrate well with other smart devices and services, allowing them to control their environment or access information on different platforms. These technologies are developing at a very fast pace, gradually covering more and more areas: already now we can say how firmly they have settled in our lives. The term "speech technologies" means a fairly large layer of information technologies, but one of the most advanced products in this area is a voice assistant, which includes the use of all types of speech technologies: speech recognition, speech synthesis, a system for developing and analyzing voice information, and voice biometrics. [10].

Accessibility: As digital voice assistants can be controlled with the user's voice and not just physical inputs, they are making technology more accessible to those who may have difficulty typing or navigating traditional interfaces. The blind and the visually impaired have little to no internet presence because of the absence of solutions to get them online which can be both, hardware and software.

Existing technology used for enabling the blind or visually impaired to use the internet or any digital form of information is dependent on Braille displays and keyboards which are expensive and scarce. Another shortcoming of existing technology is that out of all the visually impaired population, less than 2% know how to interpret Braille. Hence a voice controlled system for the blind and the visually impaired was designed, which transceivers information in the form of audio. It enables the user to receive and send emails, access daily news, weather forecast, set reminders and alarms and make notes, [11].

Some of popular Digital voice assistants: Amazon-Alexa, Apple- Siri, Google-Assistant Microsoft-Cortana Samsung-Bixby.

They are activated via smartphone, and are available inside Mobile Devices, a smart speaker or even in the latest models of cars and use-cases just grow with integration into everyday life.

3. Current Industry Perspective on Digital Voice Assistants

Voice assistants have long since moved past a novelty in connected devices, rooms, and cars into everyday business tools across many key verticals. These AI-powered, NLP-based intelligent agents are changing the way businesses have traditionally operated - how they interface with their customers and clients, streamline overall customer interactions across departments to enhance productivity, and drive new ideas from set business protocols/platforms.

Here are few areas where Digital voice assistants are gaining ground:

Enhancing Customer Service

The big one with digital voice assistants is customer service. This integration of these digital assistants in customer support systems helps businesses offering 24/7 assistance, processing high-throughput inquiries and resolving concerns with minimal time/resources. Retail is a great use case, as

voice assistants can help both customers locate products while also inquiring about their orders and handling returns which improves satisfaction on top of reducing service costs.

(Fatin Aqilah Binti Mohamad Roslan et al., 2017,) Designed as simple voice response systems, these assistants have evolved to embed sophisticated functionalities like real-time processing, natural language understanding, and machine learning capabilities. Their emergence has ushered in an era of instantaneous responses, eliminating the traditional customer service lag, and they promise an unwavering 24/7 service availability, diverging from the conventional business hours. More significantly, they offer unprecedented levels of personalization by harnessing vast data repositories, adapting to individual user behaviours, preferences, and histories. This has not only enhanced user experience but also redefined cost structures for businesses, presenting opportunities for cost reductions and easy scalability without recurrent training, [12].

Revolutionizing Healthcare

Digital voice assistants are transforming patient care in the healthcare space and also processing some of the management side as well. Voice-enabled systems can schedule appointments, remind patients to take their medications and give very simple medical advice using symptoms reported by the patient.

Similarly, in hospitals they help doctors and nurses by fetching patient data to real-time updating medical records. To prevent the spread of COVID-19 and to continue responding to healthcare needs, hospitals are rapidly adopting telehealth and other digital health tools to deliver care remotely.

Intelligent conversational agents and virtual assistants, such as chatbots and voice assistants, have been utilized to augment health service capacity to screen symptoms, deliver healthcare information, and reduce exposure.

In this commentary, we examined the state of voice assistants (e.g., Google Assistant, Apple Siri, Amazon Alexa) as an emerging tool for remote healthcare delivery service and discussed the readiness of the health system and technology providers to adapt voice assistants as an alternative healthcare delivery modality during a health crisis and pandemic, [13].

Emergence of latest innovations, advanced machinery and equipment especially in the healthcare domain, have simplified the diagonalizing process to a wide extent. Smart techniques employed in medical applications resolved the detection and rectification of various diseases. This work involves analysing how usage of Artificial intelligence practice can improve patient experience across the gamut of the healthcare industry primarily in the Out Patient (OP) Segment, [17].

Boosting Manufacturing Efficiency

Digital voice assistants harness the power of voice recognition & AI to Enhance manufacturing operations and workplace safety. Voice commands for fetching factory analytics, scheduling work orders and warning teams of potential hazards by floor managers.

Not only does integration help increase productivity, it also ensures minimal downtime and improves the operational efficiency of a space. Voice-enabled assistants, such as

Alexa and Google Assistant, are among the fastest-growing information technology applications. Their technological foundation matured over the last years and reached a point where new application areas in challenging business environments become a certainty. Maintenance in manufacturing is one of these areas, [14].

Personalizing Education

The tech of digital voice assistants has also become important when it comes to education as the learnings provided by these are personalized. Educators can use voice technology to build immersive lessons, test their understanding of students through spoken quizzes and provide tailored feedback in the classroom. Non-traditional education institutions are able to provide assistance with homework and language practice lessons for voice-enabled devices, online tutoring services as well.

Artificial Intelligence (AI) has shown significant progress and its potential is growing. An application area of AI is Natural Language Processing (NLP). Voice assistants incorporate AI by using cloud computing and can communicate with the users in natural language. Voice assistants are easy to use and thus there are millions of devices that incorporates them in households nowadays. Most common devices with voice assistants are smart speakers and they have just started to be used in schools and universities. The purpose of this paper is to study how voice assistants and smart speakers are used in everyday life and whether there is potential in order for them to be used for educational purposes, [15].

Enabling Financial Services

Digital voice assistants are changing the way consumers bank, and that impact is being felt across a host of areas in banking. Users can request information related to account balances, funds transfer or investment details using the same voice-command functionality.

These assistants also reinforce security and can utilize multi-factor authentication via voice biometrics, providing strong defence of your valuable financial data. Virtual assistants have found their usefulness in a variety of fields and industries, their popularity increasing considerably in recent years.

At the same time, the interest of businesses, and also of clients, in their use on a global level, has also developed. The financial-banking industry is a promoter of the adoption of virtual assistants, an important number of institutions in this field is calling for the use of chatbots in assisting clients with the aim of fulfilling their various needs. Digital banking has thus become a new normality, in line with the rapid technological progress. This paper analyzes the concept of personalizing a virtual assistant with basic functions in the banking field, in order to evaluate its performance, [16].

In Automobile Industry

Digital voice assistants have transformed the way we interact with our cars from being able to control a variety of vehicles functions handsfree and access an array of services. These assistants (dubbed Siri in CarPlay, Google Assistant in Android Auto and Amazon Alexa Auto) are baked into

today's modern infotainment systems to let you make calls or texts; pick navigation routes for your drive home from work; control media playback and smart-home devices—all via the sound of your voice. Voice assistants go further than just being convenient - they make us better drivers because despite the constant flood of distractions, people can still keep their eyes on the road and be connected or entertained in a much needed information-on-the-go environment.

Thus voice-to-technology interaction not only revolutionizes our driving experience by allowing to do more while doing other things within less time but also transforms it into a unified user-friendly interface between humans and technology. The automobile industry is in a path of technological advancement. The latest cars have advanced security features, but they are costly. So, the common man who can afford low-end automobiles needs to compromise on the latest features such as advanced safety, voice commanding, connected cars, etc. Due to this, road safety and user-friendliness are decreasing, which is having a substantial adversarial impact on our society [18], [19], [20].

4. Impact of Customer Experiences with Digital Voice Assistants

Digital Voice Assistants are changing the customer experience forever. These assistants offer one of the most convenient ways by allowing us to interact without hands or touch, as a result providing great convenience whether it is information retrieval or transactional buying making them effortless.

Using technologies such as AI and NLP, voice assistants deliver personalized recommendations, predict user desires as well as simplify transactions on multiple devices. Onboarding and support staff can view targeted schedules to meet customer service needs faster, which, in turn makes the interaction more personalized with less friction - an ideal care experience.

In addition, voice assistants also deliver access to a wider set of demographics - including those in need who are disabled or have language problems and inclusive when it comes to customer service. And as more companies incorporate voice technology into their servicing strategies, the convenient and user-friendly experiences made possible by digital assistants are raising both bars even higher for customer-focused capabilities in an increasingly virtual world.

Artificial intelligence–enabled voice assistants (VAs), such as Amazon's Alexa, Google Assistant, and Apple's Siri, are available in smartphones, smart speakers, and other digital devices and channels. Use of these VAs is growing rapidly and are expected to significantly impact purchase intentions, [21].

Smart voice assistants (SVAs) have emerged as new artificial intelligence service platforms. They have the capacity to act like actual human assistants and modify traditional forms of human–computer interactions. So, consumers relate to their SVA as though it was a person, despite knowing that they are interacting with a machine, [22].

Tailored Recommendations and Responses: Using AI, voice assistants are able to learn user preferences and behaviours so as to provide personalized recommendations or responses. This personalized approach in delivering information and solutions boosts satisfaction.

Available 24/7: They provide support regardless of the time, making them ideal for an on-demand type customer service. Making these more readily available makes it easier to connect with the customer base, increasing their loyalty.

Fast Problem Resolution: With voice assistant, customers get an instant direction on resolving a problem by owing them immediate troubleshooting steps. This diminishes waiting times and helps in general service efficiency.

Connected purchases: Voice assistants can be linked to e-commerce platforms, allowing seamless transactions. With Voice Commerce, customers can place orders and monitor the progress of their shipment with only a few simple voice commands which will ensure that you are receiving faster payments from happier clients.

Greater Accessibility: Voice assistants can accommodate a variety of user requirements; cutting out the use of screens and making it easier for those with access needs or language barriers to communicate. It helps to make sure that customers from anywhere can interact with businesses.

Insight from Data: Voice assistants can analyze customer sentiment to provide businesses with data-driven insights about consumer preferences and behavior. With these insights, companies can modify their marketing strategy and product offering to accelerate growth and gain a competitive edge.

All leading digital voice assistants redefine the user experience by focusing on personalization, accessibility, efficiency and liveliness. Because as these technologies mature, they will reshape the way businesses connect with their customers leading to a new era in customer service excellence.

Mayer and Harrison (2019) emphasized the term "conversational commerce". Conversational commerce refers to buying activity by a customer through a digital assistant. Since the term was first introduced in 2016 (Messina, 2016), it has received adequate attention in industry reports. A recent research survey (Humanizing Digital 2020) found that consumers prefer proactive product recommendations when purchasing through an online channel and using digital assistants, [23].

New technologies such as Internet of Things (IoT), Augmented Reality (AR), Virtual Reality (VR), Mixed Reality (MR), virtual assistants, chatbots, and robots, which are typically powered by Artificial Intelligence (AI), are dramatically transforming the customer experience, [24].

Voice assistants can take various forms of in-place and mobile devices such as Bluetooth speakers (e.g., Amazon Echo) or built-in software agents for smartphones and computers (e.g., Apple Siri). With over 70 million U.S. owners, in-home voice assistants currently see a faster adoption rate than smartphones and tablets (Newman, 2018).

Their most popular functions are playing music, controlling smart home appliances, providing weather information, answering general knowledge questions, and setting alarms

(Sciuto et al., 2018).

However, from a commercial standpoint, digital assistants represent a novel touchpoint that allows for new forms of interaction between consumers and brands (Sterne, 2017).

Voice commerce (or voice shopping) identifies the act of placing orders online using voice assistants. This topic captures mainstream media headlines (e.g., Creswell, 2018; Chaudhuri & Terlep, 2018) and is often used to speculate about the dominance of U.S. tech giants—Google, Amazon, Apple (see Galloway, 2017). Although the number of consumers who have completed at least one purchase through a smart speaker is rising fast, the percentage of buyers using VAs varies widely among product categories. A report suggests that 21% of U.S. smart speaker owners have purchased entertainment such as music or movies, 8% household items, and 7% electronic devices (eMarketer, 2019).

Meanwhile, Alexa's users can order items like household products and fresh produce from a local Whole Foods and receive delivery within two hours [25,26,27,28,29,30,31].

5. Case Study

There are different ways in which personal assistants can be evaluated by voice; in some cases, the creators of the assistants offer an evaluation mechanism. However, rather than measuring how satisfied the users are with the assistants, they measure the capacity they have to perform specific tasks. For example, Amazon offers an evaluation guide for Alexa, where one of the tasks is to create a notification [36]. This allows evaluating the ability of Alexa to execute the task, but not the satisfaction of the user. Many of the works that stand out in the literature are focused on the evaluation of a single assistant and the tasks that it can perform from searches and configuration notifications, among other tasks. At the same time, they point out the challenges that users may face with attendees, for example, that sometimes the user must repeat the command that was used or that integration problems with other devices may arise, among other challenges [37].

A group of researchers of the Department of Future Technologies, University of Turku, Finland, investigated the usability, user experiences, and usefulness of the Google Home smart speaker. The Findings showed that Google Home is usable and user-friendly for the user [37], but the study did not include other assistants like Alexa or Cortana. The paper "Alexa, Siri, Cortana, and More: An Introduction to Voice Assistants" is an example, which not only makes an evaluation of the tasks that the assistants offer, like sending emails and messages, among others, but also includes topics such as privacy and the problems of security that the assistants face to handle the information of the users [38].

This section describes the results of the evaluation with 92 participants. It is interesting to mention that 99% of the participants were aware of the existence of the various assistants, but only 86% had used at least one of them. The results show no differences between the preferences of women and men. Figure 1 shows for each of the assistants

the result obtained to evaluate "How good were the answers?". The best two, by a wide margin, are Alexa and Google Assistant. The latter is the best one, beating Alexa by approximately 12% in the excellent category. Figure 2 shows a comparison of the sum of the responses of the participants separating each assistant to compare based on "How correct are the answers?". The superiority of both Google Assistant and Alexa is also apparent in this figure
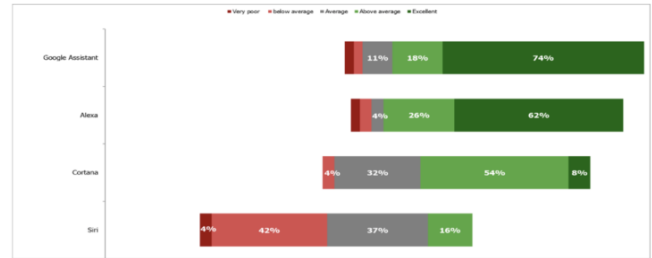

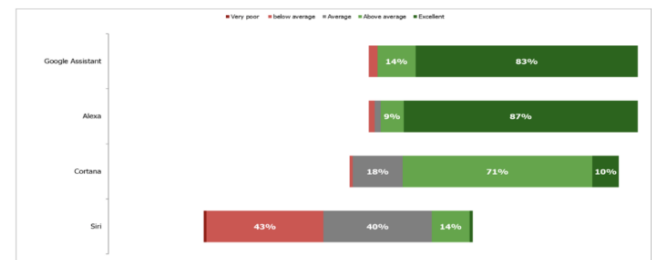**Figure 1.** Results for the question "How good were the answers?"

Figure 2. Results for the question "How good were the answers?"

Although there is no statistical evidence to confirm that Google is better than Alexa, in the results it can be noted that for the question "How good were the answers?" Google results are slightly better. This may be related to the fact obtained by many results of several studies: The female voice of Google Assistant tends to be more natural and express more emotions than the other assistants [40,41].

Personal Assistants	Quality	Correctness
Google Assistant	Excellent	Excellent
Alexa	Excellent	Excellent
Cortana	Above average	Above average
Siri	Average	Average

Figure 3. Summary of results for each assistant

6. Future Scope

To the future and beyond-and as shown by this list, there are many ways that voice-activated AI can improve the customer experience:

Next Gen NLP: Voice assistants will improve at working with and responding more correctly to natural language, slang as well as regional accents. These new changes make the conversation more user friendly and closely resemble human conversation.

Hyper-Personalization: Working in conjunction with these voice assistants, AI will better serve users based on

individual preference, behaviour data and historical interactions. This will enable the automated internal system (as AI) to cater much more individually and finely-tune, which eventually serves up at predicting what your customers are looking for.

Voice Assistant Integration with Smart Buildings, Vehicles and Commercial Spaces: Voice assistants integrated more widely into smart homes/cars/workplaces and play a role in realizing intelligent or automated interactions between IoT devices. This integration allows consumers to move smoothly between one environment and another and delivers coherent experiences adapted to the user context.

AR Integration: Voice assistants are combined with AR (Augmented Reality) techniques to enable more immersive interactions and guide customers through products/services. These features empower users to visualize products and be given step-by-step virtual assistance in real-time, which will help consumers with the process of engagement and decision making.

Large expansion of voice commerce (v-commerce): Making purchases by simply instructing consumers to do so through their voices will see a tremendous growth in shopping.

AI-driven Insights and Predictive Analytics: Customer needs can be predicted by using AI-drive insights on the data. Armed with this knowledge, businesses can provide proactive guidance, personalized offers and convenient assistance to drive better customer experiences and higher retention using virtual voice assistants.

Digital voice assistants provide a new way of browsing and interacting online. Now we can simply speak and listen to our devices, almost as if to a human assistant. However, the convenience of using our voice comes at a cost: On a cue, audio of our speech is streamed to the cloud of the service providers, where they are retained and processed at their discretion.

These speech data contain more information about us than simple text, including features of our voice, which can be used to identify us, and of our mood and energy level, which can be used to profile us to an extent that may not be justified by the convenience we get in return. To mediate between the interests of the user and those of the service providers, the General Data Protection Regulation (GDPR) puts the user in control of their personal data, [32].

Chatbots and voice assistants are digital transformers of the interface between companies and customers. They have become part of the current practice of companies and represent a distinct domain of business research. This trend is significant in the broad business context marked by the digital transformation of companies, the fast development of e-commerce and the omnichannel behavior of customers, [33]. The voice assistants are programmed for processing and understanding natural language systems, searching for the efficient communication between people and machines not only of a conversation, but also of the intentions and other additional data that are intrinsic to people-s speech. Such are the parameters which pose the greatest risks as pillars for the personalization of news in voice assistants, [34].

Privacy concerns & challenges:

The convenience of digital voice assistants should not overlook the pressing issues of privacy. The main concern is privacy since a lot of data needs to be collected and processed in order for these devices to operate effectively which increases the chance of unauthorized access and data loss. Possible incidents of intentional voice recording that are not uncommon or sometimes shared or used improperly can lead to significant trust issues over usage of digital assistants.

Digital assistants (DA) perform routine tasks for users by interacting with the Internet of Things (IoT) devices and digital services. To do so, such assistants rely heavily on personal data, e.g. to provide personalized responses. This leads to privacy concerns for users and makes privacy features an important component of digital assistants, [35].

Also voice recognition can pose significant challenges and be inaccurate many times, leading to frustration amongst users. A user may mispronounce a command and their request will go unrecognized or they executed the wrong phrase all together leading to user dissatisfaction over time and not to mention immensely hindering productivity.

7. Conclusions

Digital voice assistants are still on the cusp of evolution, and there is an entire universe for them to tap into any industry. Businesses have the opportunity to unlock a new generation of growth, efficiency and customer engagement by offering value added AI-, NLP- and advanced analytics products. Adopting these forms of technology will not only keep organizations relevant and a step ahead in the industry, but also give them the means to deliver frictionless, niche experiences that are tailored to evolving consumer expectations from today's digital-native consumers.

Ethical & Privacy implications may arise, as voice assistants collect more privacy-sensitive data, this will place a spotlight on ethical AI practices around these use cases and about user consent. Stringent regulations and Privacy- maintaining technologies have evolved in the current era to ensure responsible deployment & application of voice-assistant tech.

At the top, digital voice assistants have a wide area where they could be scaling in future to reimagine customer experiences of multiple industries. With greater integration of emerging technologies, a more tailored approach to personalization and wilful usage will keep voice assistants at the heart of revolutionary customer touch points.

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