

# VOICE-COMMERCE TECHNOLOGY ADOPTION IN THE INDIAN ONLINE RETAIL SECTOR: AN EXPLORATORY RESEARCH STUDY

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## ABSTRACT

*Among the rapidly developing technologies and business models spawned from e-commerce, voice commerce or V-commerce is rising in prominence. Encompassing voice-based interface and enhanced machine-human interaction, V-commerce seeks to enable and improve e-commerce transactions using voice-based interaction as a central feature. Besides ease of interaction for consumers, V-commerce promises higher volumes of transactions and revenue and increased cost-efficiency for businesses. As with any innovation, the success of V-commerce hinges on its adoption by consumers who engage in e-commerce transactions.*

*The present study seeks to improve understanding consumer reactions to and favorability towards adopting V-commerce. We explore the current state of V-commerce technology in India, identify the influences that may be responsible for adopting V-commerce among Indian consumers, and determine the segment most likely to use V-commerce in the future. Since India has been recognized as a burgeoning consumer market where the diffusion of V-commerce enabling technologies is at a nascent stage and due to potential accessibility issues in its multilingual milieu, we believe that insights gained from this study would be helpful to e-commerce operators.*

*A non-probability sample of e-commerce users based in major Indian cities was requested to complete an online survey yielding 119 usable responses. The online survey included questions on respondent demographics, V-commerce utilization, and questions eliciting their assessment of the importance of V-commerce features and benefits to their decision to engage in V-commerce. A principal components factor analysis revealed a dominant factor identified as a shopping experience. Engagement in V-commerce was found to be influenced (in descending order of importance) by a hands-free shopping experience, ease of use as compared to other means of access, a faster checkout process, convenience, the availability of personalized recommendations, product selection, better product recommendations, secure payment options, and accuracy of voice recognition. Regarding demographic differences, no significant difference was found in gender, but older respondents favored using V-commerce more than younger respondents.*

*The paper offers insights into the adoption of V-commerce among a sample of urban Indian consumers. While the choice of sample limits it, we believe managers could potentially focus on the variables that were found to be important in enhancing or diminishing consumers' motivation to use V-commerce. Further, we recommend that more research be conducted into the likely patterns of V-commerce diffusion in contexts other than unilingual and relatively homogeneous societies.*

**Keywords:** Adoption, Exploratory, Indian Online Retail Sector, Voice-Commerce.

## INTRODUCTION

As part of the ongoing advances in the convergence of digital technologies, the field of voice-based interface and machine-human interaction has grown considerably in recent years. Rapidly evolving technologies have supported the creation of several interfaces, including “voice-based interaction” such as Siri and Alexa, “voice-response systems” such as those used to provide telephonic assistance, and “voice-command-based customer interaction” at financial institutions and retailers. Voice-based interfacing has witnessed significant growth in stationary (i.e., home or office) and portable (i.e., mobile devices) settings. Advances in Natural Language Processing (NLP) techniques, rapid developments in machine learning, and a preference for machine-human interaction for speed and ease of use on the part of consumers have contributed to the burgeoning of voice-based interfacing.

Additionally, the global market for smart speakers, embodying a predominant manifestation of voice-based internet interfacing, is expected to grow to \$34.24 billion in 2028, showing a Compounded Annual Growth Rate (CAGR) of over 20% in the 2020s (Fortune Business Insights, 2023). In 2017, more than one in three US citizens utilized a smart speaker. It is estimated that 20% of all Google searches today are mobile searches (Simms, 2021), and half of those queries are estimated to be voice-based searches.

The harnessing of voice-interfacing in E-commerce services has led to the creation of voice-commerce or *V-commerce*. Retailers have recognized the potential for a significant change in consumer preference for e-commerce transactions. They are quickly adjusting to ensure they can benefit from V-commerce in terms of increased efficiency, speed, and cost savings in serving customers. There is also a growing interest in understanding how idiosyncratic patterns in voice interfacing and how adapting voice-interface systems to these patterns may lead to superior customer transaction outcomes.

Voice has traditionally been the most widely used form of human communication. Due to its spontaneity and natural connectivity, verbal communication has historically been valued over nonverbal communication (e.g., writing). Verbal communication differs from textual communication because it has a different tone, making the former more conversational and generally more straightforward to understand. The development of speech recognition and Artificial Intelligence (AI) technology has created a new world of opportunity and opened up the possibility of attaining a competitive advantage in meeting customer expectations in new, cost-effective ways. Technology-driven apps now invariably include voice-based interaction and have been improving at emulating human communication with more remarkable finesse and accuracy.

While voice-based interfacing and V-commerce growth has been accelerating, academic research on these phenomena needs to be improved. The few investigations into determinants and effects of V-commerce have been limited in scope and primarily restricted to the United States.

## RESEARCH OBJECTIVES

As V-commerce technology advances and becomes more mainstream and global companies expand their deployment to farther horizons, it is appropriate to consider the factors influencing the adoption of V-commerce in a context different from those studied in the limited extant research literature. With the Indian economy expected to become the world’s third-largest economy by 2027 and Indian consumer spending expected to reach approximately \$5 trillion by 2030 (Morgan, 2022), understanding Indian consumer behavior may have global implications. Unlike the monolingual markets of the United States and China, India’s population teems with linguistic and sub-cultural diversity, which may

challenge the algorithmic and processing capabilities of existing voice-response systems and, therefore, the speed of adoption of V-commerce. Therefore, this study aims to explore the current state of adopting V-commerce technology in India, identify the influences that may be responsible for adopting V-commerce among Indian consumers, and determine the segment most likely to use V-commerce in the future.

We will begin by summarizing some relevant research on voice-based technologies and V-commerce. Next, we will attempt to expand the research inquiry to the context of a developing country, India, which has seen phenomenal growth in internet usage through mobile devices and where the adoption of V-commerce has significantly increased in the past few years.

## LITERATURE REVIEW

According to OC&C Strategy Consultants, the adoption of various voice-assistant technologies (e.g., smart speakers) among consumers has been increasing, with 13% of households in the US owning a smart speaker in 2018 – a key enabler of V-commerce in the home environment – up from 3% in 2016. In fact, in the United States alone, the installed base of smart speakers doubled from 47 million in 2018 to 95 million in 2022 (Statista, 2023a). China is the second-largest market for smart speakers, with an estimated 27 million installations in 2019 (Feifei, 2023). The UK is the third-largest market for smart speakers, with an estimated 12 million users in 2019. The worldwide market for voice-assistant devices is projected to expand five times between 2021 and 2029, reaching US\$50 billion (Statista, 2023b).

Globally, V-commerce is poised for rapid growth over the next decade, riding on the coattails of rapid advances in AI-based voice-assistance and voice-response technologies. Amazon's Alexa-enabled Echo devices currently hold the largest market share (i.e., over 500 million), followed by Google Home (i.e., over 52 million). It is expected that V-commerce will grow to an annual spend of US\$80 billion by 2023 (Moar and Escherich, 2021). Besides the home environment, voice-based assistants are increasingly being incorporated into automobile interfaces and mobile phones, and voice shopping is being hailed as the future of mobile commerce (Batchelor, 2022). Automobile manufacturers are integrating speech solutions into their safety, navigation, and Global Positioning System (GPS) technology. Similarly, voice-recognition technology is starting to be widely used by other industries, including healthcare, retail stores, travel, and hospitality. As a result, voice applications are being customized to meet the demands of individual customers and create personalized customer experiences.

The immense growth of V-commerce has thus far been spearheaded by U.S.-based companies, with Chinese firms being a distant but growing second. However, both U.S. and Chinese firms are looking to expand beyond their domestic markets, and this poses a problem of moving from a largely unilingual milieu to multilingual milieus and catering to the needs of customers speaking languages other than the companies' native languages. Historically, many US-based E-commerce firms have had substantial failures in their entry into the Chinese E-commerce space due to a lack of understanding of the nuances of culture and language and resultant customer dissatisfaction (Stanworth et al., 2015). Further, even in the United States, voice recognition technology has been shown to have race and gender biases, leading to disparities in usage and, therefore, a possible deprivation of some segments of the population from the benefits of voice-based systems and V-commerce (Bajorek, 2019).

Mari (2019) explored technologies based on AI and the utility and effects of voice assistants on brands. She found that voice assistants converse naturally, use prediction of consumer inclinations, and influence consumer behavior. Choi and Kim (2020) found that

several factors, including perceived usefulness, perceived ease of use, privacy concerns, and compatibility with existing technology, influence the adoption of voice technology. The authors also highlighted the importance of understanding the consumer perspective and the need to address consumer concerns around privacy and security to promote the widespread adoption of voice technology identified several challenges that can hinder the adoption of voice technology, including technical difficulties, privacy concerns, and the need for more seamless integration with other technologies. The authors point out that although voice-recognition technology has the potential to offer several advantages, such as improved accessibility and convenience, there may also be downsides and difficulties that need to be taken into consideration. Concerns regarding privacy and security, accuracy and dependability problems, and user interface difficulties have been identified. According to overcoming these obstacles is essential to ensuring that voice-recognition technology is widely utilized and successful. The study also offers recommendations for overcoming these difficulties, such as enhancing voice-recognition technology, creating a more user-friendly consumer interface, and resolving privacy and security issues via legislation and industry standards.

Zaharia and Würfel (2021) found barriers to adopting smart speakers, including concerns around privacy and security, lack of trust, and limited functionality. A significant study by Berriche, et al. (2022) identified three forms of voice systems and a typology of voice-system users, proposing a model to predict intention to adopt V-commerce based on the system type and user characteristics.

Khan and Dube (2019) studied the adoption of voice assistant technology in the Indian retail sector, particularly emphasizing consumer perceptions and usage intentions. The authors discovered that although awareness of voice-assistant technology was well known, voice-assistants still needed to be widely adopted. The study also indicated that elements including simplicity of use, perceived utility, and perceived enjoyment significantly influenced consumer intention to use voice assistant technology in retail contexts. However, issues with privacy and security were pointed out as significant deterrents to adoption.

Mittal and Manocha (2023) explored the acceptance of V-commerce in India and the factors influencing consumer adoption of this technology. The study found that perceived usefulness, ease of use, social influence, and trust positively influenced consumers' attitudes toward V-commerce, whereas perceived risk was a negative influence. In another Asian country, Korea, Dohee, Hyenongkee, and Suho (2022) found that relative advantage and perceived ease of use are positive influences and perceived risk was found to be a negative influence on the acceptance or resistance to V-commerce.

Understanding how consumers perceive and engage with voice assistants in online retail remains limited. A research gap exists in comprehending the potential of revolutionizing customer interaction patterns, yielding benefits of efficiency of transactions as well as greater market penetration, longevity of customer relationships, and increased profitability for e-commerce operators. The potentially wide-ranging applications of voice assistants in e-commerce and other sectors, such as healthcare and education, call for a deeper study of adoption factors and the identification of adoption accelerators. As a supplement to the incipient field of research on V-commerce, we seek to use more immediate and tactical variables such as the ease of a hands-free shopping experience, security of payment options, and the accuracy of voice recognition.

## METHODOLOGY

Since this study is exploratory, a non-probability sample from several large metropolitan cities in India was employed. Potential participants were screened appropriately

and included in the analysis if they claimed to have regularly purchased both perishables and non-perishables from various E-commerce platforms. Respondents were recruited by the researcher and sent a link to a Qualtrics survey. The final usable sample consisted of 119 responses.

The online survey included questions on respondent demographics, V-commerce utilization, and questions eliciting their assessment of the importance of V-commerce features and benefits to their decision to engage in V-commerce. A five-point rating scale anchored by “Not Important” and “Very Important” was used for survey questions.

## RESULTS

Variable	Item	Frequency	Percentage
<b>Gender</b>	Male	78	65.5
	Female	41	34.5
<b>Age</b>	18-25	38	31.9
	26-35	15	12.6
	36-50	39	32.8
	above 50	27	22.7

Table 1 presents the demographic profile of the respondents in this study. The data was bi-modal, with most respondents aged 36-50 and 18-25. In terms of gender, approximately two-thirds of the sample were males. Among the females, the highest number of respondents fell into the age group of 18-25 years, and the highest number of male respondents fell into the age group of 36-50 years.

Scaled Item – 5 points	Component
More accurate voice recognition	0.867
Greater product selection	0.895
Better product recommendations	0.907
More secure payment options	0.901
Convenience	0.902
Hands-free shopping experience	0.911
Faster checkout process	0.897
Easier to use than other devices	0.922
Personalized recommendations	0.934

Next, we wanted to determine what variables would encourage and discourage online shoppers from using more V-commerce when shopping. Hence, we ran a principal components factor analysis on nine scaled items in the questionnaire. This was necessary to assess *construct validity*. As we can see from Table 2, the scale items are loaded on a common factor, allowing us to treat the items as a unidimensional construct. Further, the single-factor solution explained 81.7% of the variance in the data. We define this construct as a “*Shopping Experience*” factor for greater use of V-commerce in online retailing. We also ran a reliability analysis on this set of scaled items. The internal consistency number, measured by Cronbach’s alpha, was 0.972. Hence, it can be concluded that e-commerce

platforms that want to deliver a better V-commerce experience must adopt some, if not all nine, recommendations (i.e., since all nine loaded high).

<b>Scaled Items</b>	<b>Mean</b>	<b>St. Dev.</b>	<b>Rank</b>
Hands-free shopping experience	2.86	1.446	1
Easier to use than other devices	2.86	1.451	2
Faster checkout process	2.81	1.386	3
Convenience	2.65	1.394	4
Personalized recommendations	2.63	1.401	5
Greater product selection	2.60	1.374	6
Better product recommendations	2.60	1.446	7
More secure payment options	2.57	1.412	8
More accurate voice recognition	2.50	1.389	9

Table 3 presents the mean, standard deviation, and importance rankings of all the variables that were found to be influencing V-commerce usage. Based on the mean rating of each scaled item, the items were ranked from 1 to 9. Not surprisingly, post-COVID-19, the *hands-free shopping experience* ranked the highest and most important. Therefore, for V-commerce to be adopted by online shoppers, the overall experience has to be hands-free. Surprisingly and unexpectedly, *more accurate voice recognition* software was ranked last or least important. This suggests that customers consider this least important among other options. It is surprising to note that previous studies determined that the privacy and security of the e-commerce platform were critical. Our sample indicated that safety was of less relative importance. In summary, our sample suggests that all are important since all nine items were rated higher than the scale's mid-point of 2.50.

<b>Scale Items</b>	<b>Mean of "No" Respondents</b>	<b>Mean of "Yes" Respondents</b>	<b>K-S Test Statistics</b>	<b>Asymptotic Significance</b>
Faster checkout process	1.44	3.02	1.919	0.001
Easier to use than other devices	1.63	3.05	1.883	0.002
Better product recommendations	1.50	2.77	1.816	0.003
Personalized recommendations	1.56	2.80	1.740	0.004
More accurate voice recognition	1.38	2.67	1.682	0.007
More secure payment options	1.56	2.73	1.619	0.011
Convenience	1.56	2.82	1.594	0.012
Greater product selection	1.50	2.77	1.531	0.018
Hands-free shopping experience	2.00	2.99	1.418	0.036

Next, we wanted to identify the characteristics of those who were more likely to use V-commerce when engaging with online retailers in the future. Therefore, sample (n=119) respondents were split into two sub-groups: those who were likely to use (n<sub>1</sub>=103) and those who were not likely to use (n<sub>2</sub>=16) V-commerce in the future. A Kolmogorov–Smirnov (K-S) test was used to determine whether the two distributions differed (i.e., whether the samples came from the same population). Table 4 shows the means of the two sub-groups, the K-S test statistics, and appropriate asymptotic significance (i.e., p-values). It can be concluded from Table 4 that the two groups come from two different populations (i.e., not all V-commerce shoppers are the same). Hence, if online retailers want more consumers to use V-commerce in the future, they need to focus on *faster checkout processes* followed by *easier-*

*to-use devices*, better *product recommendations*, etc. Since all the p-values in Table 4 were significant at 0.05 (i.e., the two groups are different), it is recommended that e-commerce marketers pursue STP (Segmentation-Targeting-Positioning) with those who are most likely to utilize voice-assisted technologies when making purchases online. Therefore, a  $\chi^2$  test was conducted to determine if certain demographic variables (i.e., age, gender) could be used to segment the population into users vs non-users of V-commerce. While we found no relationship between gender and likely use of V-commerce (p-value = 0.392), we did find that age and potential use of V-commerce were related (p-value = 0.14). In fact, contrary to popular belief, individuals over 50 were the most likely to use V-commerce in the future. This would imply that older Indian consumers are likely to adopt newer voice-related technologies. Older consumers may prefer V-commerce because many may be uncomfortable typing and have physical limitations (e.g., arthritis, weak eyesight).

## CONCLUSIONS AND IMPLICATIONS

Based on this study on V-commerce adoption in the Indian online retail sector, it can be concluded that, overall, there is a growing demand for V-commerce technology in India. The study has revealed that innovators and early adopters in India increasingly embrace V-commerce platforms to meet their daily shopping needs, particularly for convenience goods like groceries. The study has identified several features, such as a *hands-free experience*, *easier-to-use*, *faster checkout process*, *convenience*, etc., as significant drivers of V-commerce adoption among Indian consumers.

The COVID-19 pandemic has accelerated the adoption of V-commerce, as more consumers turned to online shopping for their daily needs and required a hands-free experience as a primary indicator for the change. The study has identified age (not gender) as an influencer in adopting V-commerce services in India. However, the study has also highlighted some challenges that V-commerce companies face in India, including *linguistics*, *payment security*, *recognition of voice*, *accuracy*, and *reliability*. These challenges need to be addressed by online retailers to ensure the sustainable growth of the V-commerce technology industry in India. Overall, the study indicates that V-commerce has enormous potential in India, and businesses engaged in this market should concentrate on resolving issues and taking advantage of chances to satisfy the changing demands and expectations of Indian consumers.

Additionally, marketers must conduct campaigns targeting 50 and older consumers, as this group are likelier to adopt V-commerce technology than any other age group. Awareness about V-commerce and complementary technology among this age group has to be increased in rural areas. The government should encourage industries to introduce V-commerce technology in their shopping platforms to provide a better experience for consumers. Any improvements in current features will help increase consumer's adoption of V-commerce. The introduction of V-commerce on other shopping platforms besides groceries (e.g., home goods, decor, personal beauty, etc.) should be explored to generate additional traffic on their website. We recommend the addition of more V-commerce features, including but not limited to multi-language options, better product recommendations, availability of choices, and greater security for the payment done by the consumers.

## Limitations and Future Research

The present study was limited to markets in select large cities in India. While using a convenience sample in a limited geographical context may limit the generalizability of its findings, we hope that the insights gained from this study will spur and facilitate research into

the rapidly growing sector of V-commerce within the larger sphere of e-commerce and m-commerce. We recommend that research attention be directed at better understanding the choice mechanism for V-commerce adoption and identifying barriers to its adoption. With the rapid developments in AI-assisted technology and NLP, V-commerce will not only be increasing in sophistication but also in its spread around the globe, and there is tremendous potential for V-commerce technology and practices to be extended to non-profit and non-business contexts. Furthermore, we see the potential for voice systems to aid sub-literate population groups in fully partaking in the benefits of e-commerce in improving their business enterprises and personal lives. The large corpus of marketing research on consumer choice behavior, diffusion of innovations, and product development can be fruitfully brought to bear on the emerging field of V-commerce and create a distinct stream of research inquiry.

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