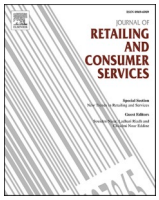
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Consumer engagement in chatbots and voicebots. A multiple-experiment approach in online retailing context

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ABSTRACT

The significant advancements in virtual assistant (VA) technology have fundamentally transformed customer interactions in online retail. Using the underpinnings of Media Richness Theory (MRT), the study investigates the nuanced impacts of VA interfaces on consumer engagement in online retailing. Employing a between-subject experimental design with 477 V A users, the research examines the influence of voicebots versus chatbots, diverse product types, and localization levels on cognitive, affective, and activation engagement dimensions. The study's findings suggest that voice assistants are more effective in enhancing cognitive and affective engagement in the case of experiential products. Furthermore, the study highlights that localization significantly moderates the relationship between VA type and user engagement, emphasizing the need for tailored VA interfaces to linguistic and cultural preferences for diverse markets. These insights underscore the importance of strategic VA selection aligned with product characteristics and localization for optimizing user engagement in online retail. The study offers actionable insights for retailers to enhance customer interactions and engagement through tailored VA strategies, potentially leading to improved conversion rates and customer satisfaction.

1. Introduction

In an era marked by rapid advancements in conversational technologies, online retailers continually seek innovative ways to engage with their customers (Kumar et al., 2024; Kumari, 2022; Madanaguli et al., 2023; Poushneh, 2021). The evolution of VA, particularly voice bots and chatbots, has emerged as a game-changer in frontline customer interaction (Noble and Mende, 2023; Castelo et al., 2023; Aslam, 2023a). These cutting-edge technologies are reshaping the traditional customer engagement paradigms, paving the way for more personalized, efficient, and seamless interactions (Kumari & Kumar, 2023; Kumar and Shankar, 2023; Moore et al., 2022; Agarwal et al., 2022; Rasool et al., 2020). In today's retail landscape, brands and organizations like H&M (fashion), Tommy Hilfiger (apparel and accessories), Sephora (personal care and beauty stores), eBay (e-commerce), and Whole Foods (a healthy food supermarket chain) have increasingly adopted chatbots and voicebots on their online platforms to enhance customer engagement through a seamless, efficient, and personalized customer experience (Sprinklr, 2023; FinancesOnline, 2023; Agarwal et al., 2023; Valorem Reply, 2021).

As per a recent Precedence Research (2023) study, the worldwide chatbots market expanded to $0.84 billion in 2022. Anticipations suggest substantial growth, with an expected reach of around $4.9 billion by 2032, demonstrating an impressive compound annual growth rate of 19.29% from 2023 to 2032. In fact, according to Gartner (2023), conversational user interfaces, digital customer service, and generative AI will transform customer service and support by 2028. Retailers utilize VAs, such as chatbots and voice bots, to reach and notify customers about sales, product launches, and seasonal offerings and address customer queries (Capgemini, 2019). Another study by Deloitte (2022) anticipated that by 2030, voice bots will contribute to 30% of total e-commerce sales. Findings from studies on voice bots reveal that 55% of VA users prefer speech recognition applications due to their hands-free functionality (Pew Research, 2017). It underscores the evident trend in

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the future of technology and the increasing adoption of voice-enabled AI solutions in retail.

With the growing prominence of VA in the retail sector, researchers in existing literature have made significant efforts to investigate the impacts of VA on consumer shopping behavior, specifically chatbots and voicebots in retailing (Aiolfi, 2023). The existing literature has undertaken comprehensive investigations into the usage of VA across a wide array of consumer behavior contexts, encompassing e-commerce (Li and Wang, 2023), retail fashion (Aslam, 2023b), financial services (Priya and Sharma, 2023), customer service in stock returns (Fotheringham and Wiles, 2023), and telemarketing (Li et al., 2023).

While existing research has delved into the factors influencing the adoption of AI-based conversational agents in service interactions, it predominantly focuses on utilitarian aspects such as perceived usefulness, ease of use, and convenience (Mariani et al., 2023; Balakrishnan et al., 2021; Fernandes and Oliveira, 2021). Though few studies acknowledged the challenges related to functional risks and barriers of using these VAs, there is limited exploration regarding the impact of how different VA interfaces affect user engagement (Malodia et al., 2022, 2023; Kamoonpuri and Sengar, 2023; Anayat et al., 2023). This limitation underscores a substantial gap in the nuanced impact of varying virtual assistant interfaces, particularly in enhancing customer engagement within retail settings. Understanding the richness of VA interfaces and their effectiveness in fostering customer engagement, drawing upon MRT, still needs to be explored within the retail domain.

Further, existing literature on service interaction via VA suggests that consumers elicit more service task requests via voice-based VA than text-based interactions, as the perceived efficiency of speech-based interactions surpasses that of typing (Rzepka et al., 2022). Conversely, studies on new technology adoption indicate that text-based VAs are more human-like than voice-based ones, positively impacting consumer perception of brand and purchase intentions (Ischen et al., 2022; Islam et al., 2018).

This duality in consumer preferences in different contexts between voice-based and text-based interactions underscores a significant gap in the comprehensive understanding of user perceptions of VA. Further investigation is warranted, focusing on elucidating the nuanced factors that shape these divergent preferences to bridge the gap. Specifically, an analysis of contextual variables within the evolving retail landscape presents a promising avenue for generating profound insights.

Additionally, investigating the moderating impact of localization could significantly contribute to understanding the adoption and preference patterns between voice and text-based interactions. A comprehensive study of these contextual elements would enrich our understanding of consumer behavior in virtual assistant interactions and offer practical implications for businesses aiming to optimize user experiences across different contexts and locales. Therefore, this research endeavors to bridge these gaps by comprehensively investigating the nuanced influences of other VA interfaces on consumer engagement within retail environments. This study aims to provide an in-depth understanding of how these interfaces shape consumer behavior by addressing these discrepancies and exploring the divergent impacts of voice-based and text-based interactions. Ultimately, this exploration intends to contribute actionable insights for retailers, marketers, and service providers seeking to optimize VA utilization strategies within retail contexts. It makes a distinctive mark on the academic landscape by providing insights into the subsequent research questions.

RQ1. How does the type of VA impact user engagement in the context of retailing?

RQ2. What is the combined impact of the VA type and the product type on user engagement in retailing?

RQ3. How do factors such as localization level moderate the relationship between VA type and retail user engagement?

Subsequent sections systematically addressed the three outlined RQs. Initially, the study investigated the impact of VA type on user engagement within the retail context. Statistical analyses and empirical evidence provided distinct insights into the influences of voice-based and text-based VA on cognitive, affective, and activation engagement, consistently aligning with the first RQ. In the second RQ, exploring the combined impact of virtual assistant type and product category on user engagement, the study conducted comprehensive analyses revealing varying engagement levels based on specific product categories when different assistant types were employed. Lastly, the third RQ intends to understand the moderating effects of localization level on the relationship between VA type and retail user engagement, underscoring how cultural nuances and regional differences significantly impact user preferences.

The RQs aim to provide valuable insights into consumer preferences for virtual assistant interfaces in retailing, carrying both academic and practical significance. Academically, this research enriches the existing knowledge on customer usage of VA in online retail. It distinguishes itself by comprehensively examining how the type of virtual assistant influences consumer behavior and how the nature of the product purchase (search vs experience) impacts user engagement in online retailing. Moreover, this study contributes novel insights by exploring the moderating effects of localization level on the relationship between VA type and user engagement in online retailing. Furthermore, this research contributes significantly to the field of MRT, initially introduced to elucidate the impact of different communication channels on communication effectiveness across various activities.

In terms of practical significance, the findings of this study will assist marketers and retailers in formulating and implementing marketing strategies and customer engagement tactics for VA. This research also enhances our understanding of consumer behavior regarding VA type, specifically voicebots and chatbots, and their impact on customer engagement.

2. Literature review

2.1. Voice-based assistant

The evolution of human-AI interaction technology has significantly transformed how brands and users interact (Rahman et al., 2023; Kumar et al., 2023; Haleem et al., 2022; Talwar et al., 2022). Voice-based assistants are artificial intelligence applications that use speech recognition and natural language processing to understand and respond to user commands (Guha et al., 2023). They streamline tasks, enhance accessibility, and provide convenient, hands-free access to information. Thus, integrating various devices revolutionizes human-computer interaction and fosters easier accessibility for all users (Malodia et al., 2021). Further, existing literature also highlighted the influence of consumers' terminal/instrumental values on engagement, subsequently influencing their behavioral intent for online brands (Kautish et al., 2022).

In the realm of VA, voice technology has emerged as a game-changer, transforming how consumers interact with various brands in retailing (McLean et al., 2021; Xu et al., 2021). Building upon the transformative role of voice technology in consumer-brand interactions, VA represents interactive platforms powered by artificial intelligence (Kang and Shao, 2023). These VAs interpret voice commands through advanced voice recognition and natural language understanding technology (Hernandez-Ortega and Ferreira, 2021). In the retailing context, they play a pivotal role in assisting users across various activities, including providing personalized recommendations, facilitating product and service searches, streamlining online purchase processes, tracking order statuses and delivery updates, and managing user queries (Mishra et al., 2022; Sharma et al., 2022a; Poushneh, 2021). These computer-driven applications possess adaptive capabilities, learning from and tailoring interactions to individual user preferences (Moussawi et al., 2023; McLean and Osei-Frimpong, 2019).

Further, adding to the understanding of AI-enabled services and their

impact on user experience, existing studies have explored the influence of AI-enabled service quality on flow dimensions and customers' awe experience in online fashion retail (Khare et al., 2023; Kautish and Khare, 2022). Their study integrated flow dimensions and the broaden-and-build theory, showcasing how AI-enabled services lead to positive emotions, such as awe experience, and augment the influence of online flow dimensions, namely perceived control, concentration, and cognitive enjoyment, in the Indian fashion e-tailing context. The study's findings underscored the encouraging role of engagement and cognitive enjoyment facilitated by online flow, wherein perceived control had a more negligible effect. Furthermore, the study offers more profound insights into the role of AI-enabled service in deepening and positively influencing customers' awe experience in online fashion shopping.

The current literature extensively explores the motivational factors driving individual adoption of voice-based assistants and emphasizes the ongoing development and growing significance of voice technology (Jain et al., 2022; Bălan, 2023). A recent study by Kautish et al. (2023) delved into unexplored territory, uncovering how motivated consumer innovativeness in using voice assistants influences purchase intentions and awe experiences in online fashion shopping. Additionally, the study highlighted that the awe experience mediates the relationship between motivated consumer innovativeness and purchase intentions, unveiling complex consumer behavior dynamics in voice assistant adoption and shopping intentions.

Therefore, our study aims to bridge existing gaps in understanding by leveraging the theory of MRT to examine how the attributes of voice assistants influence shifts in consumer preferences and engagement within the retailing landscape. Table 1 presents a comprehensive overview of the literature on SVA's characteristics, adoption trends, and engagement dynamics in the retail sector.

2.2. Text-based chatbots

Text-based chatbots engage users through written natural language commands and inputs (Li et al., 2023; Paliwal et al., 2020). They actively assist users in myriad retailing activities, encompassing personalized recommendations, product and service searches, online purchasing facilitation, order tracking, delivery updates, and query resolution (Vannucci et al., 2023; Suhaili et al., 2021). These adaptable computer-generated applications tailor interactions to align with users' preferences over time (Zogaj et al., 2023; Song et al., 2022).

Despite their inception in the 1960s, notably exemplified by ELIZA, a chatbot created by Weizenbaum in 1966, text-based chatbots have garnered significant attention in the last decade from researchers and technology companies due to an increase in their natural language processing capacity (Bansal et al., 2023; Wu and Yu, 2023; Sharma et al., 2022b). Over recent years, retailers have strategically integrated chatbots into online platforms and various messaging services as a vital component of their consumer services, prompting an investigation by several researchers (Behera et al., 2021; Rese et al., 2020).

While existing literature extensively delves into the adoption and usage of text-based chatbots across various contexts, employing diverse theoretical frameworks such as the Technology Acceptance Model (TAM) in branding (Zarouali et al., 2018), the extended Unified Theory

Table 1
Literature review

Author	Objective	Context	Theory	Findings
Malodia et al. (2023)	This study explores customers' readiness to use AI-powered voice assistants (VA) in service interactions. The study measures the enablers and inhibitors of VA usage, influenced by trust in Alexa, that affect customers' intentions to conduct transactions through VA.	Transactional service interactions	Dual-factor theory,	This study's findings show that convenience and a desire for status promote trust in VA, while risk perception hinders it. The trust in VA, in turn, positively impacts the intention to use them for transactions. Technology comfort further enhances this positive association.
Guerreiro and Loureiro (2023)	The researchers aim to investigate how emotional cues during conversations with VA can foster a sense of connection and lead consumers to perceive their relationship with the AI agent as "cool."	AI-Human Relationships	Attachment-aversion theory	Research on consumers revealed that their emotional, behavioral, and cognitive interactions with the intelligent voice assistant impact the perceived "coolness" of the VA.
Guha et al. (2023)	This study explores how artificiality and intelligence impact the ratings of VA, considering various moderators based on both theory and practical factors.	Voice assistant evaluations	Signaling theory	This article presents a new framework for assessing VA, emphasizing evaluating their artificiality and intelligence aspects.
Zierau et al., 2022	This study explores how voice-based interfaces affect user experiences, particularly their effects on consumers and firms. It also examines the differences in customer journeys between voice-based and text-based interfaces.	Consumer experiences and boost service outcomes	Media richness theory	This research illustrates how theories of human communication can create improved service experiences that enhance immersion, benefiting both consumers and businesses.
Uysal et al. (2022)	The prevalence of artificial intelligence assistants (AIAs) like Alexa in consumers' homes necessitates an examination of both their positive and negative impacts.	The role of AIAs such as Alexa are prevalent in consumers' homes	Integrating mind perception theory and social exchange theory	The results indicate that anthropomorphizing AIAs can threaten users' identity, leading to disempowerment, privacy concerns, and a negative impact on well-being.
Jain et al. (2022)	This study sheds light on how the opinions of individuals on the general worth of voice assistants impact their willingness to continue using them.	Brand Credibility	Uses and Gratification theory, Signaling theory, and Prospect theory	A significant finding of the study is that brand credibility plays a critical role in moderating the relationship between VA features and the overall perceived value of VA. In particular, a more substantial brand credibility leads to a reduction in users' perception of privacy risks.
Fernandes and Oliveira (2021)	This study investigates users' reasons for adopting intelligent digital voice assistants during service encounters.	Automated technologies in service encounters	Unified Theory of Acceptance and Use of Technology	The findings suggest that functional, social, and relational factors influence the adoption of intelligent digital voice assistants. Additionally, they underscore the moderating effect of user experience and the preference for human interaction.
Hasan et al. (2021)	The goal was to assess the impact of trust among customers, interactivity, risk perception, and new appeal on loyalty to brands for AI-enabled gadgets.	Consumer Behavior	Theory of Planned Behavior, the Technology Acceptance Model	The results indicate that while perceived risk negatively impacts brand loyalty, other factors positively influence it. The effect of using Siri's novelty value is influenced by brand involvement and consumer innovativeness. It is more pronounced for less brand-involved and more innovative consumers.

of Acceptance and Use of Technology (UTAUT) in public transportation services (Kuberkar and Singhal, 2020), and the behavioral reasoning theory (BRT) in travel and tourism (Dhir et al., 2021; Lalicic and Weismayer, 2021), limited studies have explored the pivotal attributes of chatbots influencing user shopping behavior (Kasilingam, 2020). Hence, this study aims to bridge this gap by leveraging the theory of MRT, specifically investigating how the attributes of text-based chatbots influence consumer preferences and drive user engagement within the retailing sphere.

2.3. Media richness theory (MRT) and influence of virtual assistant type on engagement

Daft and Lengel (1986) formulated MRT to investigate how different communication mediums transmit information, which aimed to match the richness of a medium to the message, considering factors like cues, feedback speed, ambiguity resolution, and symbolic meaning (Sheer, 2020). Unlike existing theories, MRT focused on the ability of different mediums (e.g., face-to-face, email) to effectively convey information based on their richness (Suh, 1999). It emphasized that richer mediums, offering cues and quick feedback, are more suitable for complex or ambiguous messages, whereas less rich mediums may suffice for simpler information (Hornung, 2015).

At its core, the theory remains consistent across studies that communication channels with more cues, such as feedback capability, channel utilization, language varieties, and personal attentiveness, are considered richer media and generally perceived as more satisfying, effective, and engaging (Agrawal and Mittal, 2022; Sheer, 2020). Researchers in the existing literature have used MRT to investigate consumer preferences concerning communication channels, considering their richness for service interactions. It includes studies on individuals' choices between electronic mail and voice mail in the context of B2B sales (Anders et al., 2020), comparative studies on virtual team communication across industries using video conferencing, email, and instant messaging (Tucker et al., 2023), as well as preferences for voice, text, or face-to-face communication in more intimate social settings over social media (Agarwal and Mehrotra, 2023; Sutcliffe et al., 2023; Shankar et al., 2022, 2023).

Additionally, recent literature highlights MRT's application in exploring the impact of communication channel richness on purchase intention and loyalty via AI-enabled retail interactions (Agarwal and Mehrotra, 2018; Sivathanu et al., 2023; Li et al., 2018). Researchers have also employed this theory to investigate the impact of channel richness, such as text, voice, and hybrid, on consumers' perceptions, decision-making, and shopping preferences during retail transactions (Vithayathil et al., 2020). Therefore, this theory holds promise for application in the context of our study, aimed at generating profound insights (refer to Fig. 1).

MRT's foundational principles are particularly relevant when assessing the impact of VA and text-based chatbots on consumer engagement in online retail. The VA, leveraging its human-like interaction capabilities, fosters a sense of social presence, enhancing user rapport and trust (Akdim and Casaló, 2023; Mishra et al., 2022). The personalized recommendations and swift, conversational nature of SVA contribute to their effectiveness and, consequently, users' affective engagement during retail interactions (Kang and Shao, 2023).

On the other hand, text-based chatbots often excel when users seek specific information, offering a more efficient mode for cognitive tasks during transactions (Flavián et al., 2023; Cambre and Kulkarni, 2019). Studies by Spence (2019) and Stoll et al. (2016) emphasized that different types of VA elicit varied user expectations and engagement levels, aligning with the principles of MRT where user satisfaction depends on the richness of interaction mediums (Malhotra and Ramalingam, 2023). Consequently, our study proposes that consumers may experience varying levels of engagement when interacting via voice and text-based VA within the retail environment.

Hence, based on the premise of MRT, our study aimed to explore how the distinct interaction interfaces of VA (voice-based vs text-based) affect user engagement during online shopping experiences. The theory's emphasis on richer communication cues aligns with the enhanced affective engagement facilitated by voice-based interfaces, whereas text-based interfaces may excel in cognitive information exchange. Therefore, our hypothesis, stemming from the premise established by MRT, stresses the importance of understanding these dynamics for businesses aiming to enhance customer engagement and satisfaction in the retail sector.

H1. The type of virtual assistant (Voice assistants vs. text-based chatbots) yields distinct levels of perceived user engagement.

2.4. Impact of product type and virtual assistant type on engagement

The categorization of products into search and experience types has long been a cornerstone of consumer behavior research (Habib et al., 2024; Luan et al., 2016; Lim et al., 2015). A search good refers to a product or service with discernible attributes allowing pre-purchase evaluation. Conversely, an experience good pertains to a product wherein identifying its characteristics before purchase is more complex or less apparent (Huang et al., 2009). Search products predominantly entail utilitarian, information-driven purchasing decisions, whereas experience products evoke hedonic experiences and emotional engagement during the buying process (Kaur et al., 2020; Yim et al., 2017; Barger et al., 2016). The impact of product type on consumer behavior has garnered substantial attention in recent research (Wang et al., 2022; Talwar et al., 2021; Kim et al., 2017). Researchers have recognized that product type can profoundly shape consumer attitudes, preferences, and

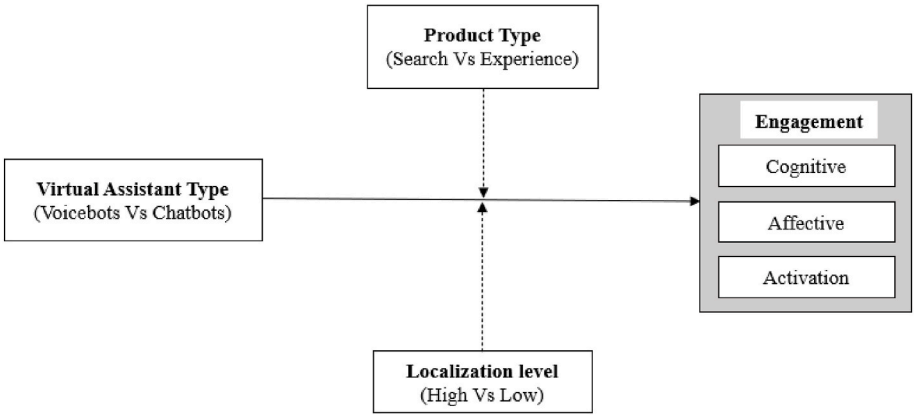


Fig. 1. Conceptual model.

purchasing behavior, particularly in technology-driven shopping and retailing (Nusrat et al., 2023; Kautish et al., 2021; Kim et al., 2017; Mehrotra and Agarwal, 2009).

Since search products primarily involve utilitarian and information-driven buying decisions, the information about them is readily accessible (Schouten et al., 2021). In contrast, acquiring information about experiential products presents challenges and is financially burdensome, as information can only be obtained after a physical experience (Atwal and Williams, 2017). Typically, consumers rely more on sensory experiences to evaluate these products (Desrochers et al., 2019). The distinction between search and experience products underscores consumers' emotional and experiential decision-making facets (Ladhari et al., 2020). Experience products evoke heightened emotional engagement and a quest for sensory pleasure (Kim, S. G., & Kang, 2018; Hepola et al., 2017). Hence, existing literature suggests that consumers may perceive VA as more engaging when shopping for experience products (Aw et al., 2022; Han, 2021). The emotional and sensory elements inherent in these products foster a deeper level of engagement. In simpler terms, VA's effect on user engagement is expected to differ in retailing scenarios based on whether the products are experience-oriented or search-focused.

H2. The type of product (search vs. experience) purchased via distinct VA yields distinct user engagements in terms of a) cognitive, b) affective, and c) activation dimensions.

2.5. Moderating the impact of localization

Localization entails customizing a product or content to suit a particular market or geographical region (Lommel, 2006). This process encompasses modifying the product's functional aspects to align with linguistic nuances, cultural norms, political landscapes, and legal frameworks prevalent in that specific area (Singh, 2011). Enhancing effective communication between VA and users hinges significantly on these devices' understanding of local slang, language nuances, and cultural intricacies (Moriuchi, 2019). This understanding mitigates potential misunderstandings and communication gaps during user interactions with VA (Dias and Jayakody, 2020; Andrist et al., 2015).

While companies reap various advantages from integrating VA into their marketing strategies, more research is needed on whether VA contributes to increased user engagement. Recent consumer trends signal a rising sense of community and localism across diverse product and service consumption contexts (Ali, 2023; Perera and Ranaweera, 2023; Shaik et al., 2023). This burgeoning sense of belongingness enables organizations to discern differences in consumer lifestyles, attitudes, and expectations.

Additionally, the increasing significance of VA in understanding native languages, supporting mixed speech recognition, and offering native interfaces impact their usability and adoption (Doumbouya et al., 2021; Dias and Jayakody, 2020; Lima et al., 2019). In this context, localization refers to the adaptation and customization of VA's content, language, and functionality to align with specific user requirements and preferences across different regions, cultures, or languages (Apple Inc, 2023; Moriuchi, 2019). This endeavor aims to render VA more relevant, comprehensible, and user-friendly for individuals from diverse linguistic and cultural backgrounds (Villa-Nicholas and Sweeney, 2020).

The context-specific alignment of products and services elevates user satisfaction and overall experience (Al-Nabhani et al., 2022). Cultural factors across various dimensions notably influence the localization expectations of digital service users (Ildir and Celik Rappas, 2022). Analogous to the localization of digital media services, the localization of VA involves tailoring digital content to conform to end users' locations and culturally specific expectations (Liu et al., 2016). Effectively localizing VA necessitates interpreting user instructions in the local language, accent, and slang while understanding locale-specific preferences (Maduku et al., 2023; Lawrence, 2021).

As the demand for localization continues to surge, and consumers perceive localized technologies as more user-friendly and comprehensible, VA developers actively pursue strategies and technology-driven personalization to customize their products and services for specific target audiences (Dwivedi et al., 2021). Therefore, the degree of localization plays a moderating role in influencing the impact of VA on user engagement.

H3. The localization level moderates the impact of a virtual assistant on user engagement: a) cognitive, b) affective, and c) activation. Therefore, in retailing, higher localization of VA is perceived to have higher user engagement compared to low levels of localization.

3. Methodology

3.1. Participants and design

Positivism is considered the most suitable research philosophy among positivism, interpretivism, and realism paradigms for an experimental design. (Saunders et al., 2009). Positivism is a philosophy that uses empirical, observable, and measurable data to gain knowledge. It is well-aligned with experimental research principles, which seek to establish cause-and-effect relationships through controlled manipulation of variables (Bryman, 2016). We gathered responses from 477 participants, with the most considerable portion (45.70%) belonging to the "26–35" age group, and 57% of respondents identified as male. These individuals were gathered through the reputable and reliable online platform Prolific Academic, enabling researchers to define their desired samples accurately (Huh et al., 2023). The experiment involved a 2 (virtual assistant type: voicebots vs. chatbots) × 2 (product type: search vs. experience) × 2 (localization level: high vs. low) between-subject experimental design. We employed a screening question, specifically, "Have you used any virtual assistant for online transactions?" to ensure the inclusion of relevant participants in the study. Four distinct measurement questionnaires were used to collect data from the participants. Specifically, two questionnaires were crafted for voice bots, while the other two were tailored for chatbots. These questionnaires encompassed scenarios covering both search and experience products. For detailed demographic profiles of the participants, please refer to Table 2.

Table 2
Demographic profile of the survey participants.

Virtual Assistant type	Voice bots		Chatbots	
Category	N	%	N	%
Gender				
Female	112	45.53	89	38.53
Male	133	54.07	140	60.61
Prefer not to disclose	1	0.41	2	0.87
Age				
18–25	19	7.72	22	9.52
26–35	124	50.41	94	40.69
36–45	74	30.08	85	36.80
>45	29	11.79	30	12.99
Education				
Below higher secondary	3	1.22	2	0.87
Graduate	122	49.59	120	51.95
Higher Secondary	58	23.58	62	26.84
Postgraduate and above	63	25.61	47	20.35
Experience with VA				
1–3 Years	104	42.28	88	38.10
Less than 1 Year	59	23.98	79	34.20
More than 3 Years	83	33.74	64	27.71

3.2. Stimuli development and manipulation check

We constructed a hypothetical VA usage scenario and statements related to online transactions of products and services to manipulate the VA-type scenarios. Two pretests, involving a total of 58 participants, including three experts from the retail industry and two virtual assistant specialists, were conducted to ensure the effectiveness of this manipulation. In the first pretest, we presented online transaction scenarios and statements for shopping through voice bots to 29 participants (Mean age = 28.5 years, 54.4% male). We requested them to assess, using a five-point Likert scale where 1 represents "strongly disagree" and five signifies "strongly agree," the degree to which the nature of these transactional interactions differed based on the virtual assistant type employed. Most respondents (mean = 4.01) agreed that the virtual assistant's characteristics influenced the nature of the engagement.

Similarly, for chatbots, we provided online transaction scenarios and statements for shopping via chatbots to another 29 participants (Mean age = 28.8 years, 53.4% male). We asked them to rate how much these transactional interactions varied depending on the type of virtual assistant used. Again, most respondents (mean = 4.09) concurred with this observation.

In the second pretest, we engaged two virtual assistant specialists and three retailing experts to validate the manipulation of virtual assistant types. We made minor adjustments based on the feedback provided by these experts. As a result, the pretests confirmed the appropriateness of our chosen stimuli and the effectiveness of manipulating voice bots and chatbots in the retailing sector.

3.3. Measures development

The measurement instruments were derived from existing scales, modified to fit the particular context, and organized into three sections. The initial section included inquiries concerning the demographic characteristics of the participants. The second section has engagement-based questions on an item scale adopted by Hollebeel et al. (2014). The three items of engagement are cognitive ($\alpha = 0.81$), which refers to the active and meaningful involvement of a person's mental processes in a particular task or activity; affective ($\alpha = 0.91$), which focuses on the individual's level of interest, enthusiasm, and motivation when engaging with an activity or task; activation ($\alpha = 0.87$) reflects the preference or frequency of individual in the activity in comparison to other activities (Kosiba et., 2018). The third section, adopted from Moriuchi (2019), comprises questions related to moderators, specifically localization ($\alpha = 0.91$). These questions determine whether the virtual assistant has been thoughtfully customized to meet the users' specific needs and cultural context. A panel of experts from industry and academia specializing in VA and retailing confirmed the content validity of the measurement instrument. The data collection employed a 5-point Likert scale across all constructs.

3.4. Experiment procedure

The experimental procedure encompassed presenting four distinct study scenarios to the participants (refer to Appendix 1). In the first study, participants were immersed in a scenario involving a transformative voice bot designed to enhance the online shopping experience. They were tasked with imagining themselves as online shoppers using their electronic devices. The goal was to acquire a new pair of headphones, with a twist: instead of manual searches, they were instructed to utilize a voice bot, a voice-activated shopping assistant. Participants engaged with the voice bot by conveying their preferences, such as "Find me wireless headphones with noise cancellation." The voice bot autonomously scoured the web to identify the best headphone options, streamlining the shopping process and saving participants time and effort. Over time, the voice bot adapted and improved based on understanding participants' needs and preferences, presenting them with the most relevant choices from past interactions. This technology served as a trusted shopping companion, adept at understanding users' desires. By using the voice bot, participants revolutionized their online shopping experience, discovering a wide array of product options and achieving a heightened level of shopping satisfaction, all from the comfort of their homes.

In the second study, participants, taking on the roles of enthusiastic travelers planning a Disney vacation, engaged with TravelPal, a voice-activated assistant, to streamline their hotel, flight, and park ticket reservations. They initiated the interaction with TravelPal by saying, "Hello, TravelPal," and then directed it to manage their travel arrangements. Participants specified their hotel preferences using voice commands such as, "Find me a family-friendly hotel near Disney with a pool." TravelPal promptly retrieved hotel options matching their criteria, providing details on amenities, proximity to Disney, and guest reviews, ensuring informed selections. Once a hotel was chosen, participants instructed TravelPal to complete the booking process, ensuring a secure and seamless experience. Participants provided their preferred flight departure details, leading TravelPal to search for optimal flight options based on price, duration, and layovers. Lastly, participants acquired Disney Park tickets by instructing TravelPal to "Buy two adult Disney tickets for three days." TravelPal facilitated the selection and purchase, providing information on offers and discounts. This study highlighted TravelPal's efficiency in enhancing vacation planning.

In the third study, participants were introduced to text-based chatbots. They were asked to envision scenarios where they found themselves needing various search products, such as headphones, groceries, or pizza while browsing online from their homes. Instead of navigating numerous websites, participants were encouraged to interact with the chatbot. The chatbot allowed participants to express their desires via text, instantly receiving tailored product recommendations. The chatbot continually evolving, learning from participants' interactions and developing into personalized shopping companions. Whether exploring gadgets, ordering food, or rewards, participants used te chatbot to enhance their shopping experiences, enjoying convenience, variety, and endless possibilities. This study revealed the significant transformative influence of chatbots on the online shopping experience for users.

In the fourth study, participants were introduced to a text-based chatbot to revolutionize how people engage in extraordinary experiences, including adventures, vacations, and culinary delights. Participants envisioned scenarios where they were searching for breathtaking journeys and delightful culinary adventures while at home, yearning for exceptional experiences. Instead of navigating through numerous websites, they were encouraged to interact with these chatbots, which utilized text-based communication to provide personalized recommendations, enabling them to discover the perfect hotels, plan dream vacations, create awe-inspiring travel itineraries, and secure coveted restaurant reservations. The chatbots' limitless learning capabilities, driven by participant interactions, ensured a profound understanding of user preferences, enabling them to deliver resonating experiences, whether participants sought hidden gems, luxurious escapes, tantalizing cuisines, or thrilling activities. Participants used these chatbots to uncover enchanting destinations, manage travel budgets, craft unforgettable itineraries, and access exclusive dining experiences, resulting in seamless journeys filled with many choices and memorable moments. This study demonstrated the transformative power of these chatbots in elevating and redefining the world of immersive experiences for users.

Following the presentation of the four scenarios, participants were provided with the developed measurement scale, adopted from previous scales, and modified as per the context to assess the key constructs of this research. Finally, the participants were thanked and debriefed.

Table 3
Measurement model.

Variables	FL	AVE	CR	Alpha
Cognitive (Hollebeek et al., 2014)		0.60	0.82	0.81
CP1	0.78			
CP2	0.80			
CP3	0.74			
Affective (Hollebeek et al., 2014)		0.73	0.91	0.91
AF1	0.81			
AF2	0.92			
AF3	0.93			
AF4	0.74			
Activation (Hollebeek et al., 2014)		0.70	0.87	0.87
AC1	0.75			
AC2	0.90			
AC3	0.86			
Localization (Moriuchi, 2019)		0.66	0.91	0.91
L1	0.86			
L2	0.88			
L3	0.75			
L4	0.82			
L5	0.75			

Abbreviations: FL - factor loading; Alpha - cronbach's alpha; AVE - average variance extracted; CR - composite reliability; CP – cognitive; AF – affective; AC – activation; L - localization.

4. Results

We conducted confirmatory factor analysis (CFA) using AMOS software to establish the validity and reliability of the measurement items in our survey questionnaire, following the methodology articulated by Tanjani et al. (2016). The outcomes of the CFA, illustrated in Table 3, underline the robustness of the constructs through Chronbac's alpha scores, surpassing the 0.70 benchmarks for all variables and ensuring a high level of internal consistency.

We assessed convergent and discriminant validity following the principles outlined by Hair et al. (2010). The average variance extracted (AVE) and composite reliability (CR) values associated with each construct exceeded the threshold of 0.50 and 0.70, respectively, unequivocally substantiating convergent validity (Fornell and Larcker, 1981).

We conducted a 2 (virtual assistant type: voicebots vs. chatbots) × 2 (product type: search vs. experience) × 2 (localization level: high vs. low) analysis of variance (ANOVA) and multivariate analysis of variance (MANOVA) to examine the hypotheses. The results show that the VA type significantly influences cognitive (F statistics (1,476) = 4.502, $p < 0.05$) and affective (F statistics (1,476) = 3.771, $p < 0.05$) engagement. In contrast, it does not significantly impact activation engagement (F statistics (1,476) = 2.531, p = ns). The findings in Table 4 reveal distinct effects of the VA type on cognitive engagement. Specifically, in retailing, cognitive engagement differed for voice-based assistants (M = 3.32, SD = 0.92) and text-based chatbots (M = 3.50, SD = 0.91). A similar pattern is observed for affective engagement, with the voice-based assistant (M = 3.16, SD = 0.85) and the text-based chatbot (M = 3.00, SD = 0.88) showing differences in their performance in the retailing context. These findings provide empirical support for the acceptance of hypothesis H1, confirming that the type of virtual assistant used in retailing significantly impacts cognitive and affective engagement.

Table 4
Virtual assistant type estimated means and standard deviation (SD).

Virtual Assistant Type	Cognitive	Affective	Activation
	Mean (SD)	Mean (SD)	Mean (SD)
Voice bots	3.317 (0.9153)	3.158 (0.8570)	2.969 (1.0517)
Chatbots	3.495 (0.9146)	3.003 (0.8777)	3.113 (0.9109)

Furthermore, we analyzed the interaction effect between virtual assistant type and product type on engagement dimensions. The results revealed a significant moderating influence of product type (F statistics (1, 476) = 3.529, $p < 0.05$) on the relationship between virtual assistant type and activation engagement.

Additionally, the findings in Table 5 demonstrate variations in engagement dimensions (cognitive, affective, and activation) among different virtual assistant types across various product types. Notably, customers using voice assistants for experience products exhibit more favorable engagement in online transaction scenarios (Cognitive mean = 3.32, Affective mean = 3.23, activation mean = 3.17) compared to their use for search products in online shopping situations (Cognitive mean = 3.31, Affective mean = 3.13, activation mean = 2.88).

Conversely, consumers engaging with text-based chatbots for search products display more favorable engagement in online shopping scenarios (Cognitive mean = 3.44, Affective mean = 3.04, activation mean = 3.17) than those using them for experience products in online transaction scenarios (Cognitive mean = 3.52, Affective mean = 2.99, activation mean = 3.09) Therefore, these results provide empirical support for the acceptance of hypothesis H2.

Furthermore, we analyzed to examine the moderating effect of localization. The results indicate that localization (F statistics (1, 476) = 6.481, $p < 0.01$) significantly moderates the impact of virtual assistant type on engagement dimensions. Furthermore, the findings in Table 6 demonstrate variations in cognitive, affective, and activation engagement across different virtual assistant types at varying levels of localization.

Specifically, customers who engage with voice assistants featuring a higher level of localization exhibit more favorable cognitive engagement in online shopping scenarios (Cognitive mean = 3.34, Affective mean = 3.22, activation mean = 3.01) compared to those engaging with text-based chatbots in similar online shopping contexts (Cognitive mean = 3.64, Affective mean = 3.16, activation mean = 3.22). In a similar vein, consumers who engage with voice assistants with a lower level of localization display more favorable cognitive engagement in online shopping scenarios (Cognitive mean = 2.94, Affective mean = 2.04, activation mean = 2.08) compared to transactions through text-based chatbots in online shopping situations (Cognitive mean = 2.46, Affective mean = 1.95, activation mean = 2.35). These results offer empirical support for the acceptance of hypothesis H3.

5. Discussion

In the dynamic landscape of digital commerce, the study's primary objective was to comprehensively investigate the nuanced influences of different virtual assistant interfaces on consumer engagement within retail environments based on MRT theory. To address this objective, the subsequent discussion is structured to align with the specific research questions posed. It systematically dissects the outcomes of each inquiry, highlighting their implications and providing an in-depth analysis of the results. These findings underscore significant implications for the progression of online retailing research.

First, the study's findings reveal that the distinct virtual assistant type (Voice assistants vs. text-based chatbots) yields distinct levels of perceived user engagement within the online retailing landscape (H1). The study's findings affirm that choosing specific virtual assistant types significantly impacts perceived user engagement within online retailing (H1). In addition, our investigation into the impact of virtual assistant type on user engagement within online retailing revealed intriguing insights. Notably, text-based chatbots exhibit marginally higher levels of cognitive engagement while slightly lagging in affective engagement compared to voicebots. It highlights the differing strengths that chatbots excel in cognitive tasks, whereas voicebots demonstrate prowess in maintaining affective engagement by understanding and responding to customer emotions. These results provide empirical support for hypothesis H1, highlighting the critical role of selecting the right virtual assistant type in achieving specific engagement goals in the retail sector. Businesses can leverage these insights to enhance customer interactions

Table 5
Virtual assistant type × product type estimated means and standard deviation (SD).

Product Type	Cognitive		Affective		Activation	
	Search	Experience	Search	Experience	Search	Experience
Virtual Assistant Type	Mean (SD)		Mean (SD)		Mean (SD)	
Voice bots	3.314 (0.9342)	3.324 (0.8767)	3.126 (0.8538)	3.230 (0.8658)	2.881 (1.0426)	3.169 (1.0518)
Chatbots	3.435 (1.0018)	3.522 (0.8743)	3.042 (0.9058)	2.986 (0.8671)	3.167 (0.8649)	3.088 (0.9326)

Table 6
VA type × localization level estimated means and standard deviation (SD).

Localization level	Cognitive		Affective		Activation	
	Low	High	Low	High	Low	High
VA Type	Mean (SD)		Mean (SD)		Mean (SD)	
Voice bots	2.944 (1.2295)	3.336 (0.8956)	2.042 (1.1323)	3.215 (0.8027)	2.083 (1.1203)	3.014 (1.0302)
Chatbots	2.460 (0.9977)	3.644 (0.8011)	1.948 (0.8592)	3.155 (.7714)	2.345 (0.9656)	3.223 (0.8499)

through tailored virtual assistant choices based on the desired engagement dimensions. Aligning with the established literature paradigm of MRT, these results elucidate how communication channels profoundly influence consumer behavior in retailing (Sivathanu et al., 2023; Li et al., 2018).

Second, the study results show that the type of product (search vs. experience) purchased via distinct VA yields distinct user engagements in cognitive, affective, and activation dimensions (H2). Specifically, our investigation into the combined influence of virtual assistants and product types on user engagement in online retailing reveals distinct patterns. Voice assistants prove more effective in enhancing cognitive and affective engagement, especially for experience products, while text-based chatbots demonstrate more robust engagement for search products. These insights emphasize the strategic importance of aligning virtual assistant strategies with product characteristics for optimal user experiences. By confirming hypothesis H2, this study offers actionable guidance for e-commerce businesses seeking to maximize engagement through tailored strategies aligned with product categories. E-commerce businesses should align their strategy on the employment of VA with the nature of their products to achieve optimal user experiences and outcomes.

Finally, the study reveals that localization level moderates the impact of a virtual assistant on user engagement (H3). Examining the moderating effect of localization on virtual assistant type and engagement dimensions sheds light on critical considerations for deploying virtual assistants in diverse market settings. The findings showcase the significant impact of localization levels on cognitive, affective, and activation engagements. Higher levels of localization favor cognitive engagement in online shopping scenarios using voice assistants, whereas lower levels depict variations in cognitive engagement, underscoring the influence of cultural and linguistic factors. These results emphasize the necessity for businesses to customize virtual assistant strategies, considering the crucial role played by cultural and linguistic factors in online retailing contexts, which is currently often overlooked in online retailing contexts. The findings provide empirical support for hypothesis H3 that the localized context of VA significantly impacts user engagement, and understanding these dynamics is crucial for businesses operating in diverse markets.

Contributing to a comprehensive understanding of customer engagement, each facet of our findings contributes significantly to understanding customer engagement in online retailing. The nuanced breakdown of virtual assistant types' impacts on cognitive and affective engagement elucidates the specific strengths of each interface. This comprehension aids businesses in tailoring their engagements, harnessing chatbots' cognitive prowess and voicebots' affective capabilities for optimal customer interactions. Moreover, the correlation between virtual assistant types and product categories deepens our comprehension, enabling businesses to strategically align their offerings with the appropriate assistant type, enhancing user experiences. Furthermore, the moderating effect of localization adds a layer of complexity, highlighting how cultural and linguistic factors shape user engagement. This understanding empowers businesses to navigate diverse markets by customizing virtual assistant strategies, acknowledging the pivotal role of localization in shaping user preferences.

These detailed findings offer a multifaceted understanding of customer engagement dynamics, emphasizing the importance of a nuanced approach that tailors strategies to specific engagement dimensions, product characteristics, and localization levels. In summary, these findings provide actionable insights for e-commerce businesses and researchers. By considering virtual assistant type, product characteristics, and localization levels, companies can tailor their strategies to optimize user engagement, leading to enhanced shopping experiences and improved conversion rates. This study accentuates the importance of a nuanced approach aligned with specific business goals and target market characteristics. Furthermore, the research extends our understanding of human-computer interaction and technology acceptance in e-commerce, emphasizing the value of comprehensively assessing user engagement across cognitive, affective, and activation dimensions.

6. Implications

6.1. Theoretical implications

This study makes several notable theoretical contributions that significantly advance our understanding of user engagement with VA in the online retailing context.

First, the study examines the impact of virtual assistant types (voicebots vs. chatbots) on user engagement. The findings highlight that chatbots evoke higher cognitive and affective engagement levels than voice bots. Such findings challenge and reframe conventional paradigms, unveiling the nuanced and intricate effects inherent in virtual assistant typologies on the multifaceted dynamics of user engagement

(Spence, 2019; Stoll et al., 2016). This scholarly endeavor significantly enriches theoretical foundations by unraveling the intricate interplay between virtual assistant types and customer engagement, thereby elevating our overarching comprehension of technology's impact within the evolving landscape of online retail.

Additionally, the study contributes to theoretical advancements by illuminating the intricate nexus between virtual assistant strategies, product characteristics, and user engagement within online retail. It extends existing theoretical frameworks by empirically showcasing the differential impact of voice-activated devices, particularly in heightening cognitive and emotive engagement within experiential product scenarios. This study enriches theories surrounding technology-mediated interactions, user engagement dynamics, and consumer behavior by offering empirical evidence on how varying VA types shape user experiences. Such insights deepen theoretical understanding by highlighting the strategic alignment required between virtual assistant strategies and the distinct attributes of products, elucidating how this symbiosis influences and optimizes user engagement dynamics within the evolving landscape of online retail.

Further, incorporating media richness theory into this research represents a substantial theoretical advancement, enriching our comprehension of how communication richness influences user engagement within online retail. By adopting MRT as a guiding framework, this study offers a refined perspective, delving into the intricate dynamics of user interactions with VA in online retail settings. This theoretical integration significantly augments our understanding of technology's impact on consumer behavior and engagement patterns. It establishes a foundation for discerning how the richness of communication channels, as conceptualized by MRT, intricately shapes and influences user engagement strategies specific to virtual assistant interactions within the nuanced landscape of online retail environments.

Finally, the research explores the moderating role of localization, demonstrating that higher levels of localization significantly enhance cognitive engagement in online shopping scenarios, primarily when using voice assistants. This pivotal finding underscores the imperative of tailoring virtual assistant interfaces to align with diverse linguistic and cultural preferences, particularly within varied markets. The theoretical essence lies in spotlighting the profound influence exerted by cultural and linguistic factors on user engagement dynamics. It accentuates the necessity for businesses to strategically embed localization strategies into their virtual assistant approaches, highlighting the practical implications and underscoring the theoretical framework that emphasizes the pivotal role of cultural adaptation in shaping and optimizing user engagement within the expansive domain of online retail experiences.

In summary, these contributions collectively enhance our understanding of the intricate interplay between virtual assistant types, product types, and localization levels, providing valuable insights for researchers and industry professionals seeking to improve customer interactions through VA in the dynamic realm of online retailing.

6.2. Managerial implications

The managerial implications of this study are both enlightening and actionable, offering a roadmap for online retailers to aim to elevate user engagement through VA. The study equips online retail organizations with actionable insights derived from the nuanced impacts of VA interfaces on user engagement in several ways.

First, the study's findings offer invaluable insights for online retailers aiming to enhance user engagement through virtual assistants. It provides a roadmap for companies to align their virtual assistant choice with specific engagement objectives. For instance, if the goal is to enhance emotional connections with customers, leveraging text-based chatbots might be more practical due to their efficacy in fostering cognitive and dynamic engagement. This strategic alignment can significantly elevate the customer experience, impacting satisfaction and conversion rates. Companies can conduct user-centric assessments to determine which virtual assistant type resonates better with their target audience at different touchpoints in the customer journey. As technology evolves and user behaviors change, a continuous assessment of virtual assistant effectiveness is necessary to adapt the VA strategy accordingly, ensuring it remains aligned with developing engagement objectives.

Second, aligning VA strategies with product characteristics emerges as a tangible solution for businesses seeking to enhance engagement. Categorizing products into experience or search goods allows for a more informed deployment of voice assistants to amplify cognitive and affective engagement for experiential products. Simultaneously, text-based chatbots or a hybrid approach can diversify and intensify user engagement for search product types. Incorporating robust analytics tools and feedback mechanisms is crucial to continuously refine VA strategies for each product category. This customized approach promises heightened user satisfaction and conversion rates, catalyzing sustained business growth. Additionally, investing in AI technology that supports natural language processing for voice assistants and user-friendly interfaces for chatbots can significantly enhance the user experience. This practical alignment customizes interactions and promises to elevate customer satisfaction and conversion rates, serving as a cornerstone for sustained business growth and success.

Finally, the study emphasizes the profound impact of localized VA on user engagement in online retail. Specifically, it highlights that higher levels of localization significantly enhance cognitive engagement, particularly with voice assistants. This localization transcends not mere convenience or sales enhancement; it represents a strategic acknowledgment of individuals even before they become customers. It enables organizations to demonstrate appreciation for customers from diverse backgrounds, ensuring a seamless, culturally relevant experience throughout their journey with the brand. It involves tailoring the assistant's language, incorporating appropriate slang, and integrating cultural nuances that cater to users' distinct needs and preferences across various nations. Thus, incorporating localization tactics into VA interfaces, including language, slang, and cultural nuances, becomes paramount for businesses operating in diverse markets. This localization significantly enhances user engagement, fostering stronger connections and loyalty within varied customer segments.

In conclusion, companies can tailor their strategies by considering virtual assistant type, product characteristics, and localization levels to create more compelling user experiences. This tailored approach has the potential to significantly elevate customer interactions, resulting in improved conversion rates and heightened customer satisfaction within the online retail sector.

7. Conclusion, limitations, and future research directions

This study, rooted in the MRT, unveils the intricate impacts of voicebots versus chatbots, diverse product categories, and localization levels on user engagement within online retail. It discerns that voicebots enhance cognitive and affective engagement, particularly with experiential products, while chatbots exhibit strength in cognitive tasks but slightly lag in fostering emotional connections. Aligning virtual assistant strategies with product categories emerges as crucial; voice assistants are more effective for experiential products, enhancing cognitive and affective engagement, whereas chatbots drive engagement for search-based products. Additionally, higher localization significantly amplifies cognitive engagement, especially in voice assistant interactions, highlighting the need for culturally attuned VA strategies across diverse markets. Ultimately, this research underscores the strategic importance

of tailored VA interfaces aligned with specific engagement goals, product characteristics, and localization levels in optimizing user engagement within the dynamic landscape of online retail, offering actionable insights for businesses to elevate customer interactions and experiences.

While this study offers valuable insights with significant implications for academic understanding and practical applications, it is essential to acknowledge certain limitations that can guide future research endeavors. The sample used may only partially represent all online retail contexts, and generalizing the findings to diverse industries and markets should require further study with more diverse samples.

Moreover, the study is based on cross-sectional data. Given the rapid evolution of technology and consumer behavior, the dynamics of VA in online retailing may require additional longitudinal studies that track the evolving impact of virtual assistant types, product types, and localization over time to capture changing consumer behaviors and preferences. Cross-cultural studies can delve deeper into the effect of localization on user engagement in various cultural contexts, allowing organizations to tailor their strategy to global markets.

The study fails to differentiate between user engagement with branded and non-branded products while availing via virtual agents. Future research should scrutinize how the findings may differ concerning virtual assistant usage when purchasing branded versus non-branded products. This investigation could reveal whether brand familiarity, trust, or perceived quality influences engagement dimensions differently across various virtual assistant types.

The study primarily considers the dichotomy between search and experience products. Future investigations might explore a more nuanced categorization or include a broader spectrum of product types to understand how diverse product categories influence user engagement with VA differently. Furthermore, rapid technological advancements in virtual assistant capabilities, such as AI-driven personalization or expanded functionalities, were not extensively explored. Future research could investigate how these advancements impact user engagement and interaction patterns in online retail settings. Lastly, a comprehensive investigation into the design elements and interface characteristics that contribute to various dimensions of user engagement with VA can assist firms in optimizing their strategies and improving the overall user experience in online shopping.

CRediT authorship contribution statement

Kumar Rohit: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Amit Shankar:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Gagan Katiyar:** Writing – review & editing, Visualization, Methodology. **Ankit Mehrotra:** Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Data curation. **Ebtesam Abdullah Alzeiby:** Visualization, Writing – review & editing.

Declaration of competing interest

The author(s) declare no conflict of interest with respect to the research, authorship, and/or publication of this article.

Data availability

Data will be made available on request.

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Appendix 1. Experimental scenarios

Experiment 1: Study of AI-based Smart Voice Assistant (SVA) solutions, such as Alexa and Google Assistant with focus on search products.

Hey there, shoppers! Today, I want to introduce you to an amazing innovation that has completely transformed my online shopping experience. 🎧🌐 Say hello to the VoxAssist Voice Bot! 🗣️✨ If you're someone who loves the convenience of online shopping, you won't believe how this voice-activated assistant can take your search for goods to the next level!

You're comfortably seated at home, browsing the internet on your tablet. You realize that you need to purchase a new pair of headphones. Instead of typing your search query manually, you decide to utilize the assistance of VoxAssist, a voice bot designed to enhance your online shopping experience.

With VoxAssist, all you need to do is voice your preferences, like saying, "Find me wireless headphones with noise cancellation." The voice bot will then swing into action, searching the web to locate the finest headphone options tailored to your needs. This efficient method not only saves you time but also spares you the hassle of laborious searches and manual browsing.

VoxAssist constantly learns and enhances its capabilities, becoming increasingly proficient in comprehending your requirements and personal preferences as time goes on. It presents you with the most relevant choices based on your previous interactions, acting as a trusted shopping companion who knows exactly what you want.

By leveraging VoxAssist, you revolutionize your search for goods, effortlessly discovering a world of options and experiencing a new level of shopping satisfaction from the comfort of your home.



Experiment 2: Study of AI-based Smart Voice Assistant (SVA) solutions, such as Alexa and Google Assistant with focus on experience products.

You're an avid traveller planning your dream vacation to visit the magical world of Disney. Excited about the adventure ahead, you decide to utilize the assistance of a voice bot named TravelPal to enhance your experience in booking a hotel, flight tickets, and purchasing Disney Park tickets ✈ - 🛫🌍.

To activate TravelPal, you simply use the wake word, "Hello TravelPal," and it responds with a warm greeting, ready to assist you. Through a voice command, you can direct TravelPal to take care of all the necessary arrangements for your Disney trip.

First, you provide TravelPal with your preferred travel dates, destination, and your hotel preferences. For instance, you might say, "TravelPal, find me a hotel near Disney with a pool and family-friendly amenities." TravelPal promptly initiates the search, considering your specified preferences and budget.

Leveraging its extensive database of hotels and travel information, TravelPal curates a list of hotels that align with your requirements. It furnishes you with comprehensive details for each hotel, including their proximity to Disney, available room types, offered amenities, and guest reviews. As TravelPal describes each option, you listen attentively, enabling you to make a well-informed decision. After you've selected your preferred hotel, you instruct TravelPal to proceed with the booking process. It seamlessly leads you through each step, securely managing your payment details and confirming all reservation particulars. TravelPal guarantees a seamless and stress-free hotel booking experience.

Following this, you convey your desire to book flight tickets for your Disney trip. TravelPal will request your preferred departure dates, airport preferences, and any specific airline choices you might have. It quickly searches for available flights and presents you with the best options based on your criteria, including prices, flight durations, and layover details. With TravelPal's assistance, you confidently select the most convenient flight for your journey.

Finally, it's time to purchase Disney Park tickets. You simply instruct TravelPal, saying, "TravelPal, buy two adult tickets for Disney for three days." TravelPal navigates through the Disney ticketing system, providing you with ticket options, prices, and any special offers or discounts available. It completes the purchase securely, ensuring you have the necessary park tickets for your desired duration.



Experiment 3: Study of AI-enabled text based Chatbots such as Google's Meena, Bank of America - Erica, Domino's - Dom, Amtrak Julie, American Express - Amex Bot with focus on search products.

Hey there, fellow shoppers! Today, I want to introduce you to a group of remarkable text-based chatbots that have completely transformed the way we shop online. Say hello to our shopping assistants: Google's Meena, Bank of America's Erica, Domino's Dom, Amtrak's Julie, and American Express's Amex Bot!



Get ready for a shopping experience like never before, thanks to these incredible text-based chatbots. They've completely transformed the way we shop online, making it easier and more enjoyable than ever. Imagine lounging at home, scrolling through your device, and suddenly realizing you need something—a new pair of headphones, groceries, or even a mouthwatering pizza.

Instead of diving into the chaos of multiple websites, just have a chat with our chatbot squad! With Meena, Erica, Dom, Julie, and Amex Bot, you can simply type your desires and watch the magic unfold. They're here to cater to your every need, finding the perfect options tailored just for you. But here's the best part—they're constantly learning from your interactions, becoming your ultimate shopping sidekicks who truly understand your style.

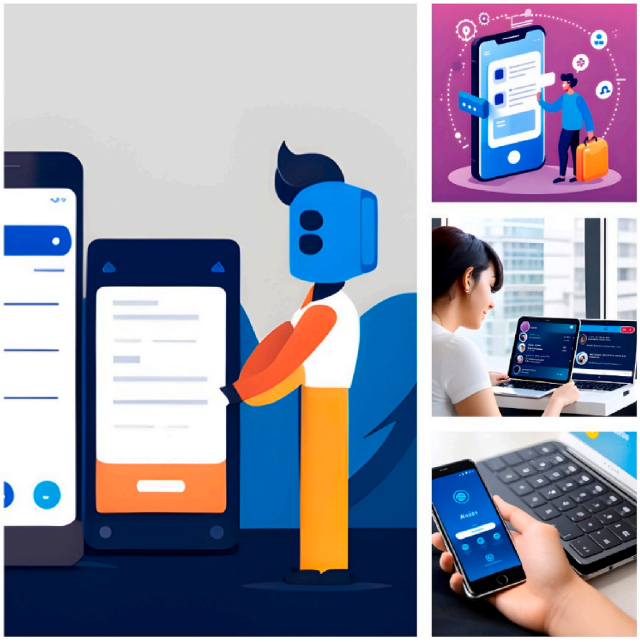
So, whether you're exploring the latest gadgets with Meena, managing your finances with Erica, ordering your favorite pizza with Dom, planning your train journey with Julie, or getting the lowdown on rewards with Amex Bot, these chatbots have got your back.

Get ready to embark on a shopping adventure full of convenience, choices, and endless possibilities—all with the tap of your fingertips. It's time to

shop like never before!

Experiment 4: Study of AI-enabled text based Chatbots such as Google's Meena, Bank of America - Erica, Domino's - Dom, Amtrak Julie, American Express - Amex Bot with focus with focus on experience products.

Calling all adventurers! Today, I'm thrilled to introduce a fantastic group of text-based chatbots that have completely transformed the way we immerse ourselves in unforgettable experiences. These innovative bots are your ultimate partners for discovering and booking extraordinary journeys, indulging in dream vacations, and savoring exceptional dining adventures.



Picture yourself at home, yearning for a breathtaking adventure or a delectable culinary delight. Instead of drowning in a sea of websites and options, all you need to do is chat with these incredible chatbots. Through the power of text-based communication, these chatbots curate personalized recommendations tailored to your preferences, aiding you in discovering the ideal hotels, planning to captivate journeys, designing dream vacations, and securing reservations at top-tier restaurants.

But what sets them apart is their limitless learning capabilities. By analyzing your interactions, they develop a profound understanding of your desires and preferences, allowing them to provide experiences that truly resonate with you. Whether your quest involves uncovering hidden gems, indulging in luxurious escapes, savoring tantalizing cuisines, or pursuing exhilarating activities, these chatbots will guide you to the extraordinary. So, whether you're exploring enchanting destinations, effortlessly managing your travel budget, crafting unforgettable itineraries, or unlocking exclusive dining experiences, these text-based chatbots serve as your trusted companions. Prepare to embark on a seamless journey filled with abundant choices, remarkable moments, and indelible memories, all at your fingertips.

Now is the time to redefine how we embrace and savor the world of experiences. Let these exceptional chatbots be your partners in elevating your adventures and relishing the very best that life has to offer. Prepare to ignite your wanderlust and indulge your senses with these extraordinary assistants!

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